Final Environmental Assessment for Advanced Helicopter Training System At Naval Air Station Whiting Field, Florida

August 2019

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FINAL

ENVIRONMENTAL ASSESSMENT

For

Advanced Helicopter Training System

At

Naval Air Station Whiting Field, Florida

August 2019

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ABSTRACT

Designation: Environmental Assessment

Title of Proposed Action: Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field

Project Location: NAS Whiting Field, Navy Outlying Landing Field (NOLF) Spencer, NOLF Pace, NOLF Site X, NOLF Harold, NOLF Santa Rosa, and NOLF Choctaw, Florida

Lead Agency for the EA: Department of the Navy

Affected Region: Santa Rosa County, Florida

Action Proponent: United States Fleet Forces, Department of the Navy

Point of Contact: Project Manager (Code EV22/TW)
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Date: August 2019

The United States Fleet Forces, a Command of the U.S. Navy (hereinafter, jointly referred to as the Navy), has prepared this Environmental Assessment (EA) in accordance with the National Environmental Policy Act, as implemented by the Council on Environmental Quality Regulations and Navy regulations. The Proposed Action would modernize the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing Five located at NAS Whiting Field and its associated NOLFs in Florida by implementing the AHTS. The AHTS would involve the replacement of TH-57 Sea Ranger training helicopters, replacement of existing ground based training systems (i.e., simulators), an increase in operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities, and an increase in personnel. The progressive transition from the TH-57 to a yet-to-be-determined commercially available helicopter, referred to as the TH-XX, would begin in 2021 with the transition to be complete in the 2025 timeframe. A conservative representative surrogate helicopter, the Eurocopter UH-72 Lakota, is used to analyze the potential impacts from the TH-XX in this EA because the Navy has not yet selected the specific helicopter that will replace the TH-57. Prior to the arrival of the TH-XX in 2021, new facilities and associated infrastructure would be constructed at NAS Whiting Field. This EA evaluates the potential environmental impacts associated with the Proposed Action and the No Action Alternative to the following resource areas: air quality, water resources, cultural resources, biological resources, noise, land use, infrastructure, public health and safety, hazardous materials and wastes, and environmental justice.

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EXECUTIVE SUMMARY

ES.1 Proposed Action

The United States (U.S.) Department of the Navy (hereinafter, referred as the Navy) proposes to modernize the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing Five located at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Field (NOLFs) in Florida by implementing the Advanced Helicopter Training System (AHTS). The AHTS would involve the replacement of TH-57 Sea Ranger training helicopters, replacement of existing ground based training systems (i.e., simulators), an increase in operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities, and an increase in personnel.

Implementing the AHTS would provide 130 newer, more capable, and more reliable training helicopters with associated Ground Based Training System to Training Air Wing Five at NAS Whiting Field. The TH-57 would be replaced with a yet-to-be-determined commercially available helicopter. As the specific commercial helicopter has not yet been selected, this document will refer to the new helicopter as the TH-XX. Additionally, for this Environmental Assessment (EA), a conservative representative surrogate helicopter, the Eurocopter UH-72 Lakota, which is larger and louder than comparable commercially available helicopters, is used to analyze the potential impacts from the TH-XX.

Training operations would progressively transition from the TH-57 to the TH-XX beginning in 2021, with transition to be complete in the 2025 timeframe. Proposed TH-XX training operations would generally be similar to existing training operations currently conducted with the TH-57. Flight training operations with the TH-XX would be conducted at airfields, and within airspace, already utilized by Training Air Wing Five. However, there would be an increase in the number of annual flight operations, to include training operations involving night vision device training, flying in formation at night, and search and rescue. Flight training operations would be conducted primarily at Whiting Field South and NOLFs Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw; TH-XX would continue to fly in and out of local municipal airports as necessary, including Pensacola International Airport and Peter Prince/Milton Airport among others, in executing flight training curriculum to gain required operational experience in Federal Aviation Administration-controlled airspace. All training operations would continue to observe all Federal Aviation Administration flight rules. Use of municipal airports by military aircraft is consistent with Federal Aviation Administration regulations and airport Master Plans.

Prior to the arrival of the TH-XX and Ground Based Training System in 2021, new facilities and associated infrastructure would be constructed at NAS Whiting Field to accommodate helicopter maintenance activities and ground based training requirements. The TH-XX and Ground Based Training System would arrive incrementally at NAS Whiting Field before two permanent facilities could be constructed, so two temporary transitional facilities would be constructed as an interim measure.

In order to meet the requirements of the AHTS, there would be an increase of 33 Training Air Wing Five military personnel, Helicopter Instructor Training Unit contractor personnel, contractor academic instructors, and contractor flight simulator instructors.

The Navy has prepared this EA in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and Navy regulations.

ES.2 Purpose of and Need for the Proposed Action

The purpose of the Proposed Action is to address the capability and capacity gaps of the current aging TH-57 helicopter training system operated by Training Air Wing Five at NAS Whiting Field. The AHTS would provide a newer, more capable, more reliable helicopter and training system to Training Air Wing Five. The proposed AHTS would meet the advanced helicopter and intermediate tilt-rotor training requirements through 2050.

The need for the Proposed Action is to provide capabilities for training and equipping combat-capable Naval forces ready to deploy worldwide. In this regard, the Proposed Action furthers the Navy's execution of its congressionally mandated roles and responsibilities under Title 10 United States Code (U.S.C.) section 8062. AHTS will be the primary training system for all U.S. Navy, U.S. Marine Corps, U.S. Coast Guard, and participating allied student rotary-wing and tilt-rotor combat pilots in support of worldwide operations at higher rates than have been seen over the last two decades.

ES.3 Alternatives Considered

In developing the proposed range of alternatives that meet the purpose of and need for the Proposed Action, the Navy carefully reviewed important characteristics of modernizing its rotary-wing and tilt-rotor integrated pilot production training program by implementing AHTS at NAS Whiting Field and its associated NOLFs. This review included requirements for helicopter training in light of Title 10 responsibilities, existing training requirements and regulations, and existing Navy infrastructure. Based on this review, the following factors were considered when exploring alternatives for the Proposed Action:

- Alternatives must meet overall training requirements.
- Alternatives must not disrupt ongoing rotary-wing and tilt-rotor pilot production at NAS Whiting Field and its NOLFs.
- Alternatives should maximize use of existing airfields that are dedicated to the student pilot training program.
- Alternatives must make effective and efficient use of existing infrastructure.
- Alternatives should avoid and/or minimize construction impacts to environmental resources.

Based on the considerations detailed above and meeting the purpose of and need for the Proposed Action, only one action alternative was identified for analysis within this document. This document evaluates the No Action Alternative and the Action Alternative.

Under the No Action Alternative, the Navy would not implement modernization of the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing Five located at NAS Whiting Field and its associated NOLFs. The facility construction projects would not occur. Training Air Wing Five would continue to use the TH-57 helicopter training system in its rotary-wing and tilt-rotor integrated pilot production training program at NAS Whiting Field and its associated NOLFs. The No Action Alternative would not meet the purpose of and need for the Proposed Action; however, the conditions associated with the No Action Alternative serve as reference points for describing and quantifying the potential impacts associated with the Proposed Action.

The Action Alternative is the preferred alternative. The Action Alternative is the only alternative considered by the Navy to meet the purpose of and need for modernizing the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing Five. The AHTS would provide a newer, more capable, more reliable helicopter and training system to Training Air Wing Five. The proposed AHTS would meet the advanced helicopter and intermediate tilt-rotor training requirements through 2050.

ES.4 Summary of Environmental Resources Evaluated in the EA

CEQ regulations, NEPA, and Navy regulations for implementing NEPA, specify that an EA should address those resource areas potentially subject to impacts. In addition, the level of analysis should be commensurate with the anticipated level of environmental impact.

The following resource areas have been addressed in this EA: air quality, water resources, cultural resources, biological resources, noise, land use, infrastructure, public health and safety, hazardous materials and wastes, and environmental justice. Because potential impacts were considered to be negligible or non-existent, the following resources were not evaluated in this EA: airspace, visual resources, socioeconomics, transportation, and geological resources.

ES.5 Summary of Potential Environmental Consequences of the Action Alternative and Major Mitigating Actions

Air Quality. Under the Action Alternative, emissions of criteria pollutants associated with construction and flight training operations would, based on the UH-72 surrogate, increase relative to the emissions under the No Action Alternative. The UH-72 is larger than the commercially available helicopters that could be selected as the TH-XX, thus, UH-72 air emissions are expected to be higher than the air emissions that would actually be generated by TH-XX. Use of the UH-72 for analysis provides a conservative (i.e., higher) estimate of air emissions associated with flight training operations under the Action Alternative. The region is currently in attainment for all National Ambient Air Quality Standards (NAAQS). Changes in mobile emissions from construction and flight training operations are not considered significant. Changes in mobile emissions are not subject to permit requirements or regulatory emission thresholds. The air emissions from training activities on the airfields would contribute to regional emission totals; however, the increased emissions would represent an average of less than 1 percent of the current regional inventory for all pollutants. Implementation of the Action Alternative would not result in significant impacts to air quality.

Water Resources. Implementation of the Action Alternative at NAS Whiting Field would not result in significant impacts to water resources from proposed facility development. The water quality of surface water and groundwater would not be impacted. Construction activities would avoid wetlands and floodplains impacts, and would be performed in compliance with Florida's General Construction Stormwater Permit. A Stormwater Pollution Prevention Plan (SWPPP) and Best Management Practices (BMPs) would be implemented to limit erosion and runoff into surface waters. Implementation of the Action Alternative would not result in significant impacts on water quality at NAS Whiting Field or the region.

Cultural Resources. There are no known archaeological resources within the Area of Potential Effects (APE) where ground would be disturbed from construction activities; as a result, there would be no effect under Section 106 of the National Historic Preservation Act (NHPA), and no significant impacts to archaeological resources under NEPA. There are no National Register of Historic Places-eligible architectural resources within the affected environments at NAS Whiting Field or NOLFs Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw, so there would be no effect under Section 106 of NHPA.

Therefore, under NEPA, there would be no significant impacts to historic architectural resources. The Navy consulted with the Florida Division of Historical Resources, and received concurrence on August 20, 2019 with the extent of the APE and the determination of No Historic Properties Affected. The Navy consulted with federally recognized tribes and no significant traditional cultural properties were identified. The Navy would have an archaeologist meeting the Secretary of the Interior's Professional Qualifications Standards present to monitor ground-disturbing activities from construction for potentially intact cultural resources. Implementation of the Action Alternative would not result in significant impacts to cultural resources or traditional cultural properties.

Biological Resources. The Action Alternative would not result in significant impacts to vegetation and terrestrial wildlife, would have no effect on federally threatened or endangered species, would not result in significant adverse effects on a population of a migratory bird species, including the take of bald eagles, and would not significantly impact any state protected species. Implementation of the Action Alternative would not result in significant impacts to biological resources.

Noise. Under the Action Alternative, no significant impacts from noise would occur. The Action Alternative would not result in any off-base noise impacts above 65 decibel (dB) day-night average sound level (DNL) at Whiting Field South. NOLF Choctaw is used by military jets for pattern training and the proposed TH-XX operations at NOLF Choctaw would not contribute a significant difference to the noise environment. For noise exposure in off-base locations in the immediate vicinity of the remaining five NOLFs, noise levels above 65 dB DNL would affect an additional 200 acres and 215 more people when compared to noise levels under the No Action Alternative. Noise levels for 196 of the 200 acres would be from 65 to <70 dB DNL at five NOLFs: 73 acres at NOLF Spencer, 37 acres at NOLF Pace, 18 acres at NOLF Site X, 1 acre at NOLF Harold, and 67 acres at NOLF Santa Rosa. Noise levels for the remaining 4 acres would be from 70 to <75 dB DNL at NOLF Santa Rosa. Noise levels for all 215 people would be from 65 to <70 dB DNL at two NOLFs: 148 people at NOLF Spencer and 67 people at NOLF Santa Rosa. None of the 215 people affected would experience noise above 70 dB DNL. Noise modeling results indicate an average increase of 5 dB DNL as compared to the No Action Alternative may be expected in these areas, due to a combination of an increase of 22 percent in flight operations and the change from the TH-57 to the TH-XX. The increase of 22 percent to flight operations would contribute a nearly 1 dB increase to the overall DNL while the change from the TH-57 to the TH-XX, based on the UH-72 surrogate, would be responsible for the remainder of the change. The UH-72 is larger and louder than the commercially available helicopters that could be selected as the TH-XX, thus, UH-72 modeled noise levels are expected to be higher than the noise levels that would actually be generated by TH-XX. Use of the UH-72 for analysis provides a conservative (i.e., higher) estimate of noise levels associated with flight training operations under the Action Alternative. On average, NAS Whiting Field receives less than 10 noise complaints per month from helicopter flight training operations, to include repeat complaints from one or more complainants (NAS Whiting Field, 2019a). NAS Whiting Field and Training Air Wing Five have standard operating procedures to receive and assess noise and/or safety complaints from members of the public, to ensure that training operations are conducted in accordance with Federal Aviation Administration regulations and established Navy flight rules and training profiles. These procedures would continue during and after transition to AHTS. The changes in modeled noise levels from the Action Alternative would vary slightly by location relative to flight paths. The changes in DNL and single-event noise levels would likely be noticeable at NOLFs Spencer and Santa Rosa, which are both areas that are currently exposed to regular helicopter traffic, but would not constitute a dramatic change to the intensity of noise in the local environment. Domestic animals, including horses, have likely habituated to existing helicopter activity at the NOLFs, and proposed changes to the type of helicopter and increased flight training operations would likely be insufficient to result in significant impacts. Implementation of the Action Alternative would not result in significant impacts to the noise environment.

Land Use. The Action Alternative would result in additional acreage requiring compatible land use considerations in potential development; however, these considerations are consistent with the No Action Alternative and land use planning processes already in place in Santa Rosa County. The Action Alternative would result in increased acres of off-base lands, including some designated residential, exposed to 65 to <70 dB DNL noise levels; however, these potential noise increases would occur in areas considered incompatible in the current Air Installations Compatible Use Zones (AICUZ) study and land use compatibility would remain similar to the No Action Alternative conditions. Clear Zones and Accident Potential Zones (APZs) would remain unchanged under the Action Alternative. All local and regional land use controls would continue to be implemented. The Action Alternative is consistent, to the maximum extent practicable, with the enforceable policies of the Florida Coastal Management Program and therefore, would not introduce significant effects to coastal zone resources. Concurrence on the Coastal Consistency Determination from the Florida Department of Environmental Protection was received on August 13, 2019. Implementation of the Action Alternative would not result in significant impacts to land use.

Infrastructure. The Action Alternative would result in increased quantity, consumption, or demand for water, wastewater, stormwater, solid waste management, and energy from a small increase in population that would be spread throughout Santa Rosa County. New facilities would also result in increased demand for infrastructure resources. Based on existing and future capacity and projected demand, Navy and local infrastructure systems are expected to have sufficient capacity to accommodate the increase in population and facility requirements. Implementation of the Action Alternative would not result in significant impacts to infrastructure.

Public Health and Safety. The Action Alternative would not result in changes to community emergency services. There would be no impacts to public health and safety from construction and demolition activities. There would be no change to the Clear Zones or APZs under the Action Alternative. The changes associated with the implementation of the AHTS do not pose a significant threat to public health and safety or aviation safety. The risk of Bird/Animal Aircraft Strike Hazard (BASH) would increase slightly due to the increase in annual operations but, no aspect of the Action Alternative would increase concentrations of birds/wildlife on or near the airfields. The Navy has determined that there are no environmental health and safety risks associated with the Proposed Action that would disproportionately affect children or the general public. Implementation of the Action Alternative would not result in significant impacts to public health and safety.

Hazardous Materials and Wastes. The Action Alternative would result in an increased volume of hazardous wastes used for helicopter maintenance, but no new hazardous materials are anticipated to be required to support maintenance activities. All hazardous wastes would be managed in accordance with applicable Federal, State, and local regulations and the installation's Hazardous Waste Management Plan. Any special hazards encountered would be removed and managed in accordance with applicable Federal and State regulations. Defense Environmental Restoration Program sites would be avoided to the extent practicable, or any excavation within an Installation Restoration Program (IRP) Site would follow specific protocols and all regulations. Implementation of the Action Alternative would not result in significant impacts to hazardous materials and wastes.

Environmental Justice. The Action Alternative compared with the No Action Alternative would impact population census block groups that are either fully or partially within noise contours from 65 to <70 dB DNL surrounding NOLFs Spencer and Santa Rosa, and would not impact populations at the other airfields. The intensity of noise levels between 65 and 70 dB DNL would be experienced equally by both populations identified as minority and low-income and populations not considered minority or low-income. Noise modeling results indicate an average increase of 5 dB DNL noise levels would likely be noticeable at NOLFs Spencer and Santa Rosa, which are currently exposed to regular helicopter traffic, but would not constitute a dramatic change to the intensity of noise in the local environment. As determined in Section 3.5.7 *Noise,* Environmental Consequences, the noise impacts would not be significant, and use of the UH-72 for analysis provides a conservative (i.e., higher) estimate of noise levels associated with flight training operations under the Action Alternative. Therefore, these impacts would not be disproportionally high and adverse on an environmental justice population, and the implementation of the Action Alternative would not result in significant impacts to environmental justice.

Table ES-1 provides a tabular summary of the potential impacts to the resources from the No Action Alternative and Action Alternative.

Table ES-1 Summary of Potential Impacts to Resource Areas

Resource Area	***No Action Alternative***	***Action Alternative***
Air Quality	The Proposed Action would not be implemented and the affected environment would remain unchanged; therefore, no significant impacts.	No significant impacts on air quality would occur. Emissions of criteria pollutants and greenhouse gases associated with helicopter operations and facility construction would increase relative to emissions under the No Action Alternative, but this increase would be too small to result in significant impacts on air quality.
Water Resources	The Proposed Action would not be implemented and the affected environment would remain unchanged; therefore, no significant impacts.	The Action Alternative would not result in significant impacts to water resources. Water quality of surface water and groundwater would not be impacted. Construction activities would avoid wetlands and floodplains impacts.
Cultural Resources	No change to cultural resources; therefore, no significant impact.	The Action Alternative would not result in significant impacts to cultural resources or traditional cultural properties.
Biological Resources	No change to biological resources; therefore, no significant impacts.	Negligible impacts from construction. Minor impacts to wildlife from increased helicopter training and noise. No effect to threatened and endangered species or migratory birds. No significant impact to biological resources.
Noise	Noise levels would decrease slightly from baseline levels and therefore, would not result in significant impacts.	Off-base locations in the immediate vicinity of the NOLFs would experience increased noise levels due to an increase of 22 percent in flight operations and the change from the TH-57 to the TH-XX, which would likely be noticeable but the areas are currently exposed to regular helicopter traffic. Changes would not constitute a dramatic change to the intensity of noise in the local environment. Implementation of the Action Alternative would not result in significant impacts to the noise environment.
Land Use	Noise levels would decrease slightly from baseline levels; therefore no significant impacts to land use or land use compatibility would occur.	No significant impacts to local or regional land use would occur. Acres of lands exposed to incompatible noise levels greater than 65 DNL would increase in some areas adjacent to the NOLFs; however, these incompatibilities are not considered significantly different from the affected environment. There would be no change to Clear Zones and APZs. All local and regional land use controls would continue to be implemented. The Action Alternative would be consistent, to the maximum extent practicable, with the enforceable policies of the Florida Coastal Management Program.

Table ES-1 Summary of Potential Impacts to Resource Areas

Resource Area	*No Action Alternative*	*Action Alternative*
Infrastructure	The Proposed Action would not be implemented and the affected environment would remain unchanged; therefore, no significant impacts.	The Action Alternative would not result in significant impacts to infrastructure and utilities.
Public Health and Safety	The Proposed Action would not be implemented and the affected environment would remain unchanged; no change to Clear Zones or APZs; the distribution of flight training operations at the NOLFs would change, but would not result in significant impacts.	No significant public health and safety impacts, including those related to flight safety and BASH risk, would occur. There would be no change to airfields, Clear Zones, or APZs; construction BMPs would be implemented.
Hazardous Materials and Wastes	The Proposed Action would not be implemented and the affected environment would remain unchanged; therefore, no significant impacts.	No significant impacts to hazardous materials and wastes would occur. Minor increases in hazardous materials use and hazardous waste generation would be managed in accordance with current regulations and procedures and would not exceed facility capacities; beneficial impacts from the removal of special hazards from building demolitions and renovations; disturbance of IRP sites would be conducted in accordance with the requirements of the selected remedy and in coordination with Florida Department of Environmental Protection and U.S. Environmental Protection Agency (USEPA).
Environmental Justice	The Proposed Action would not be implemented and the affected environment would remain unchanged; therefore, no significant impacts.	The Action Alternative would result in noise impacts, but no disproportionately high and adverse human health or environmental effects on minority and low-income populations, and impacts would not be significant.

Final
Environmental Assessment for Advanced Helicopter Training System
Naval Air Station Whiting Field, Florida
TABLE OF CONTENTS

List of Figures

List of Tables

List of Appendices

Abbreviations and Acronyms

Acronym	Definition
AHTS	Advanced Helicopter Training System
AICUZ	Air Installations Compatible Use Zones
APE	Area of Potential Effects
APZ	Accident Potential Zone
BASH	Bird/Animal Aircraft Strike Hazard
BMP	best management practice
CEQ	Council on Environmental Quality
CFR	Code of Federal Regulations
CO	carbon monoxide
CO_2	carbon dioxide
CO_2e	CO_2 equivalent
CWA	Clean Water Act
CZMA	Coastal Zone Management Act
dB	decibel
dBA	A-weighted sound level
DNL	day-night average sound level
DoD	Department of Defense
EA	Environmental Assessment
EIS	Environmental Impact Statement
EO	Executive Order
ESA	Endangered Species Act
GHG	greenhouse gas
ICRMP	Integrated Cultural Resources Management Plan
INRMP	Integrated Natural Resources Management Plan
IR	Installation Restoration
IRP	Installation Restoration Program
L_{eq}	Equivalent Sound Level
L_{max}	Maximum A-weighted sound level
NAAQS	National Ambient Air Quality Standards
NAS	Naval Air Station
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NOLF	Navy Outlying Landing Field
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
O_3	Ozone
PFAS	per-polyfluoroalkyl substances
PM_{10}	particulate matter less than or equal to 10 microns in diameter
$PM_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter
ROI	Region of Influence
SEL	Sound Exposure Level
SF	square foot (feet)
SHPO	State Historic Preservation Officer
SO_2	sulfur dioxide
S.R.	State Route
SWPPP	Stormwater Pollution Prevention Plan
U.S.	United States
U.S.C.	U.S. Code
USEPA	U.S. Environmental Protection Agency
VOC	volatile organic compound

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1 Purpose of and Need for the Proposed Action

1.1 Introduction

The United States (U.S.) Department of the Navy (hereinafter, referred to as the Navy) proposes to modernize its rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing Five located at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs), in Florida, by implementing the Advanced Helicopter Training System (AHTS). The AHTS would involve the replacement of TH-57 Sea Ranger training helicopters, replacement of existing ground based training systems (i.e., simulators), an increase in operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities, and an increase in personnel.

The TH-57 helicopter has been in service at NAS Whiting Field since the early 1970s as the primary training helicopter for U.S. Navy, U.S. Marine Corps, U.S. Coast Guard, and participating allied student rotary-wing pilots (to include tilt-rotor pilots). Implementing the AHTS would provide 130 newer, more capable, and more reliable training helicopters with associated Ground Based Training System to Training Air Wing Five at NAS Whiting Field. The TH-57 would be replaced with a yet-to-be determined commercially available helicopter. As the specific commercial helicopter has not yet been selected, this document will refer to the new helicopter as the TH-XX. Additionally, for this Environmental Assessment (EA), a conservative representative surrogate helicopter, the Eurocopter UH-72 Lakota, which is larger and louder than comparable commercially available helicopters, is used to analyze the potential impacts from the TH-XX.

Training operations would progressively transition from the TH-57 to the TH-XX beginning in 2021, with transition to be complete in the 2025 timeframe. Proposed TH-XX training operations would generally be similar to existing training operations currently conducted with the TH-57. Flight training operations with the TH-XX would be conducted at airfields, and within airspace, already utilized by Training Air Wing Five. However, there would be an increase in the number of annual flight operations, to include training operations involving night vision device training, flying in formation at night, and search and rescue. The need for increased training is due to the increased Fleet demand for helicopter pilots and additional tilt-rotor (e.g., Osprey MV-22) pilots that requires additional student training. Rotary-wing pilots currently make up more than 50 percent of all Naval pilots. The expected pilot training requirement is forecasted to be more than 600 rotary-wing pilots annually, which is estimated to continue to increase.

Prior to the arrival of the TH-XX and Ground Based Training System in 2021, new facilities and associated infrastructure would be constructed at NAS Whiting Field to accommodate helicopter maintenance activities and ground based training requirements. The TH-XX and Ground Based Training System would arrive incrementally at NAS Whiting Field before two permanent facilities could be constructed, so two temporary transitional facilities would be constructed as an interim measure.

In order to meet the requirements of the AHTS, an increase in military personnel and contractors at NAS Whiting Field would be necessary.

During the transition, both the TH-57 and TH-XX support, infrastructure, and maintenance actions would be required to continue helicopter pilot training without interruption in order to meet Fleet and U.S. Marine Corps operational requirements. As elements of the AHTS increase in number, the TH-57 helicopter, TH-57 training devices, and TH-57 support would diminish until the transition is complete.

The Navy has prepared this EA in accordance with the National Environmental Policy Act (NEPA), as implemented by the Council on Environmental Quality (CEQ) Regulations and Navy regulations.

1.2 Background

NAS Whiting Field was constructed in the early 1940s. The installation was commissioned as the Naval Auxiliary Air Station Whiting Field in July 1943 and has served as a Naval aviation training facility. The field's mission is to provide primary fixed-wing, propeller-driven aircraft and advanced helicopter training. NAS Whiting Field presently consists of two airfields (North and South Fields) separated by an industrial area.

As the home of Training Air Wing Five, NAS Whiting Field is the leading location for primary, intermediate tilt-rotor, and advanced helicopter pilot training. NAS Whiting Field is responsible for approximately 45 percent of the Chief of Naval Air Training Command's total flight time and approximately 15 percent of Navy and U.S. Marine Corps total flight time. Over 1,200 student pilots complete their flight training at NAS Whiting Field annually. Descriptions of primary, intermediate, and advanced training are provided in the following paragraphs.

All U.S. Navy, U.S. Marine Corps, U.S. Coast Guard, and participating allied student pilots must complete Primary Flight Training in the Joint Primary Aircraft Training System, the T-6 "Texan II." Primary flight instruction is provided at training squadrons assigned to Training Air Wings Four and Five, located at NAS Corpus Christi and NAS Whiting Field respectively. For those who successfully complete Primary Flight Training, approximately 500 student pilots are selected each year to pursue rotary-wing training along two separate tracks for Advanced Helicopter Training and Intermediate Tilt-rotor Helicopter Training.

Advanced Helicopter Training consists of undergraduate helicopter training for U.S. Navy, U.S. Marine Corps, U.S. Coast Guard, and participating allied student pilots who will go to helicopter follow-on pipelines. This phase of training will be flown in the TH-XX aircraft. This syllabus is divided into stages, including Ground, Contact, Instrument, Navigation, Formation, Tactical, Shipboard/SAR, and night vision devices. Each stage is subdivided into training blocks. The training blocks consist of a specified number of flights. At the completion of the Advanced Helicopter Training syllabus, students earn their "Wings of Gold" and are sent to Fleet Replacement Squadrons for follow-on instruction in Fleet aircraft.

Intermediate Tilt-rotor Helicopter Training consists of undergraduate helicopter training for U.S. Marine Corps and Navy students who will go to multi-engine and MV-22 pipeline training. This phase of training will be flown in the TH-XX aircraft. This syllabus is divided into stages, including Ground, Contact, Instrument, Formation, Tactical, and night vision devices. Each stage is subdivided into training blocks. The training blocks consist of a specified number of flights. At the completion of the Intermediate Tilt-rotor Helicopter Training syllabus, students graduate to the Advanced Multi-Engine Training syllabus which is provided at Training Air Wing Four, NAS Corpus Christi. The progression of student pilot training from primary to intermediate, to advanced prior to Fleet assignment is depicted in Figure 1.2-1.

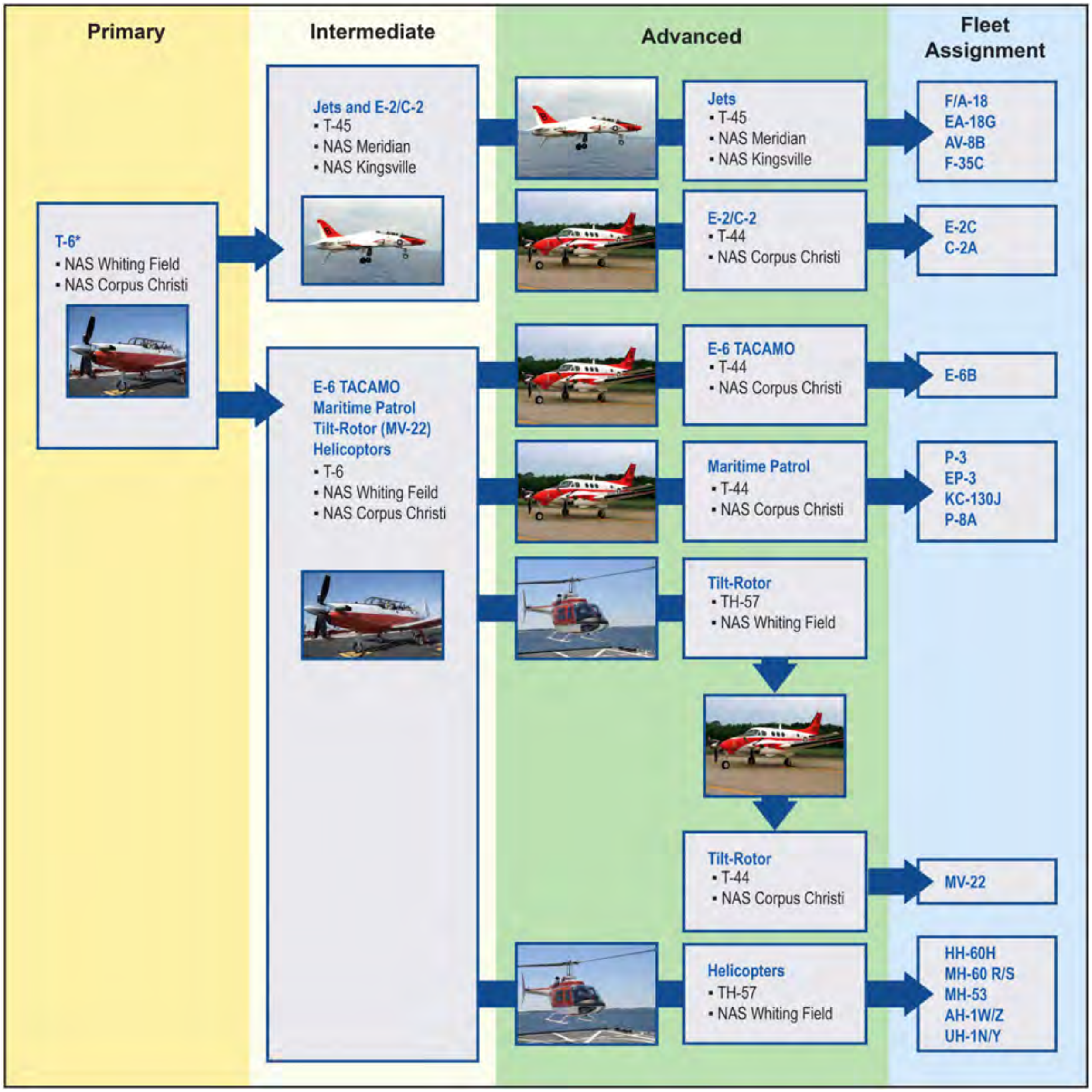

Figure 1.2-1 Progression of Student Pilot Training

The mission of Training Air Wing Five is to administer and coordinate the flight training of Student Naval Pilots. Training Air Wing Five interacts daily with the helicopter training squadrons and provides liaison between the Wing training squadrons and the Chief of Naval Air Training to implement the Chief of Naval Air Training approved flight and academic syllabus, oversee the flight instructor standardization training program, coordinate intra-squadron student loads and assignments, control U.S. Marine Corps instructor strength and assignment within the Wing, and monitor aircraft maintenance activities.

The TH-57 is used for intermediate and advanced rotary-wing flight training. The single-engine TH-57 has a cruising airspeed of 117 miles per hour, a range of 420 miles, and can seat one Instructor pilot and up to four student pilots or air crewman. As the older models of the TH-57 are approaching the end of their service life, requiring increased sustainment costs, the Navy must replace them efficiently and expeditiously while satisfying student training demands.

Photo of TH-57 by:
Petty Officer 1st Class Karlton

Designed to mitigate the capability and capacity gaps of the TH-57 training system, the AHTS is an integrated training system composed of a new commercial helicopter and associated Ground Based Training System. The Ground Based Training System includes simulators, classroom instruction, and a revised curriculum. To complement in-aircraft flight training, all Navy pilots use state-of-the-art simulators extensively. Simulator training is extremely realistic and includes all facets of flight operations and comprehensive emergency procedures, which allows students to practice in a risk-free environment. However, simulators cannot replace the experience provided by helicopter flight training. The AHTS curriculum provides the appropriate mix of simulated and in-aircraft flight training to maximize the student pilot training experience. Simulator training is a complement rather than a replacement to actual flight training.

1.3 Location

NAS Whiting Field is located in Santa Rosa County, in Florida's northwest coastal area, approximately 7 miles north of Milton and 20 miles northeast of Pensacola. Mobile, Alabama is approximately 79 miles west of the air station, and Tallahassee, the capital of Florida, is 174 miles to the east. The installation is approximately 3,913 acres in size (Figure 1.3-1). With 12 NOLFs, NAS Whiting Field maintains control of over 57 percent of the Navy's inventory of landing fields. NAS Whiting Field has two operational airfields: Whiting Field North and Whiting Field South. Operations at Whiting Field South are typically conducted Monday through Thursday (8:00 a.m. to 1:00 a.m.), Friday (8:00 a.m. to 10:45 p.m.), Saturday (9:00 a.m. to 6:30 p.m.), and Sunday (7:00 a.m. to 10:00 p.m.); however, flight training operations are also conducted within the local training area outside of these typical hours to meet mission-critical training requirements. Helicopter flight training operations are primarily conducted at Whiting Field South (Figure 1.3-2) and 6 of the 12 NOLFs: Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw (see Figure 1.3-1). Whiting Field North and the remaining NOLFs primarily support fixed-wing aircraft training. NOLF Choctaw supports both fixed-wing and rotary-wing training. There are no permanent personnel stationed at any of the NOLFs (Naval Facilities Engineering Command, Southeast, 2017a). Training Air Wing Five aircraft also fly in and out of local municipal airports as necessary, including Pensacola International Airport and Peter Prince/Milton Airport (see Figure 1.3-1) among others, in executing flight training curriculum to gain required operational experience in Federal Aviation Administration-controlled airspace. Training activities at Federal Aviation Administration-controlled fields and airspace are conducted on airspace available basis and could occur at other non-military airfields when available and feasible for use. All training operations observe all Federal Aviation Administration flight rules. Use of municipal airports by military aircraft is consistent with Federal Aviation Administration regulations and airport Master Plans.

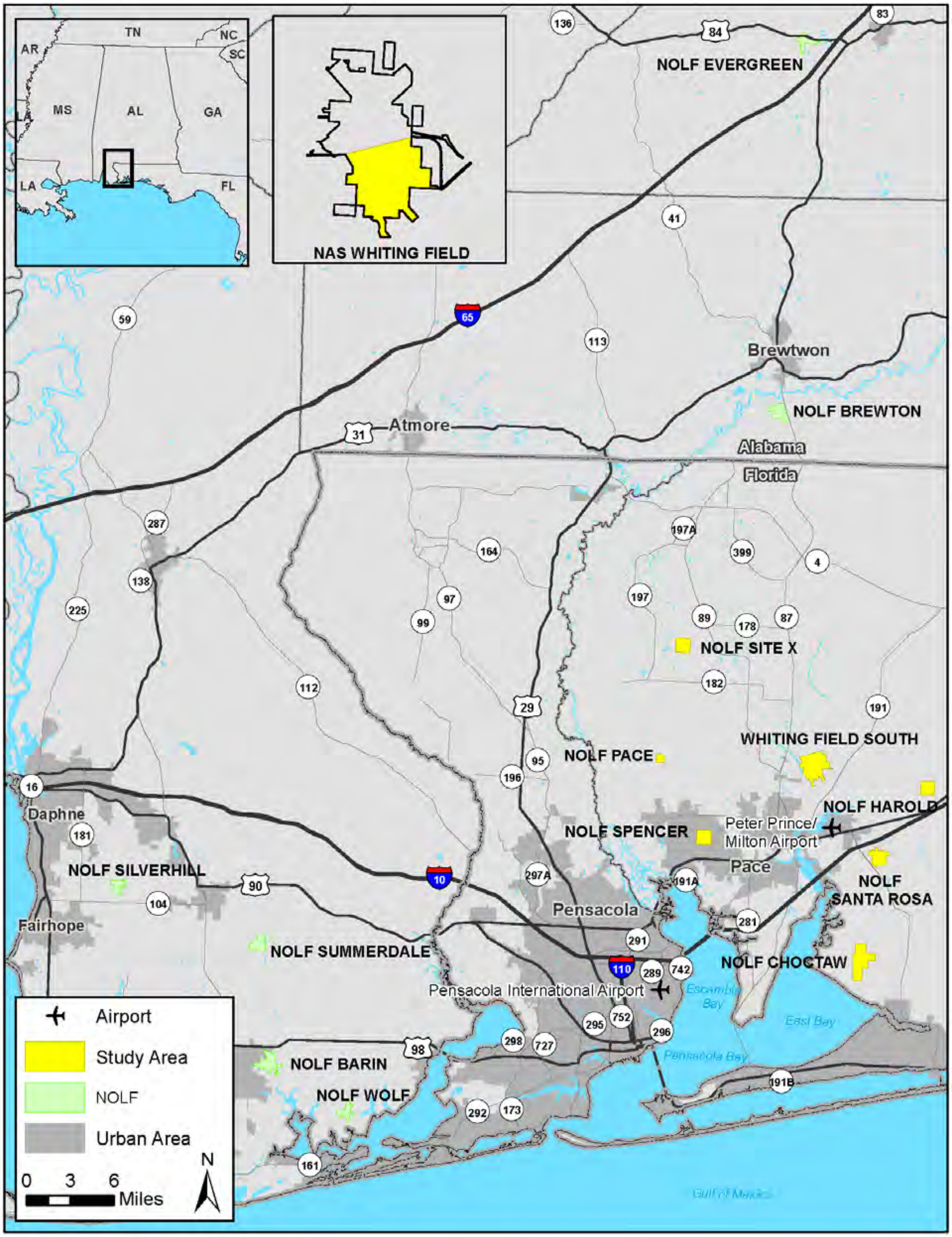

Figure 1.3-1 Location Map

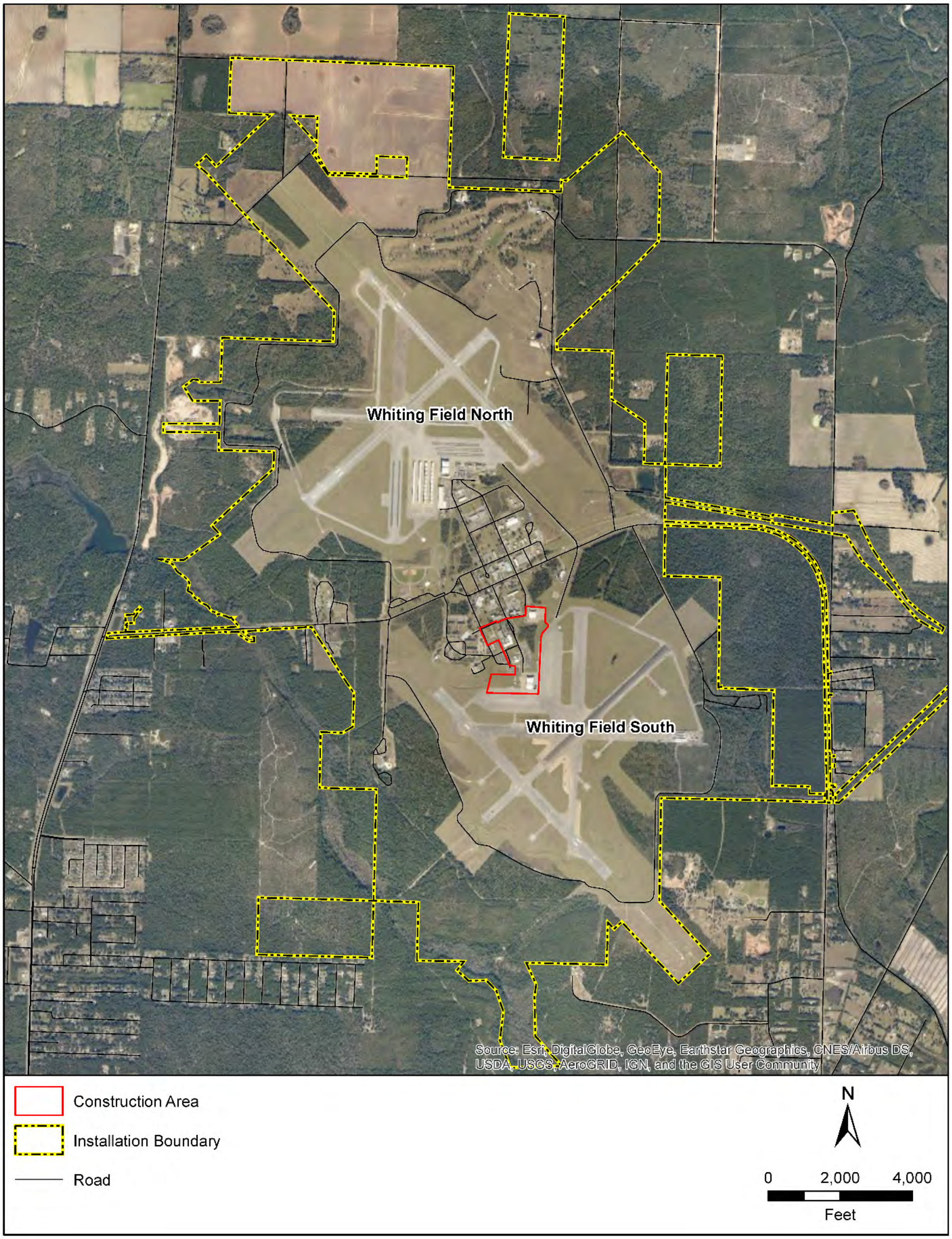

Figure 1.3-2 NAS Whiting Field

1.4 Navy Outlying Landing Fields

Each NOLF has a different configuration and layout that is designed to accommodate certain types of training and allow student pilots to complete the various elements of the pilot training curriculum. Student pilots receive a broad base of training experiences while conducting training in a variety of locations with different scenarios.

Standard Helicopter Pattern – a race track pattern with all turns in the same direction; the downwind portion is offset by 1,200 feet parallel to the runway. All altitudes are flown below 1,000 feet, with the downwind portion around 500 feet above ground level.

Autorotation Pattern – simulates a situation when engines are not producing sufficient power to continue in powered flight.

Tactical Pattern – training flight flown approximately 100 to 300 feet above the terrain and obstructions.

Tail Rotor/Boost Off Pattern – racetrack pattern with higher rates of climb and slower rates of descent during critical phases of flight.

Confined Air Landing Pattern – performing an approach to a hover to a point above the highest obstruction and then beginning a slow decent to a vertical landing.

External Load Pattern – begins with lifting the external load above all obstructions before joining a normal racetrack pattern; typically executed at a lower pattern altitude than normal pattern operations.

Pinnacle Pattern – standard racetrack pattern with a steeper than normal approach and landing on an elevated platform, surface, or hill.

1.4.1 NOLF Spencer

NOLF Spencer is a helicopter training airfield located approximately 9 miles southwest of NAS Whiting Field, in Santa Rosa County, Florida (Figure 1.4-1). This NOLF is used for helicopter training operations, including arrivals and departures, standard patterns, auto-rotations, tail rotor, and boost-offs. NOLF Spencer is predominantly covered in grass, with four runways, a few landing pad areas, and refueling facilities located toward the center of the airfield (Naval Facilities Engineering Command, Southeast, 2017a).

The primary helicopter operating at NOLF Spencer is the TH-57. NOLF Spencer is not currently equipped for nighttime use. Operations at this NOLF are typically conducted Monday through Friday (8:15 a.m. to 6:15 p.m.); however, operations are also conducted outside of these typical hours to meet mission-critical training requirements. The airfield has two identical sides that divide the field over the centerline; each side is divided into three lanes designed to accommodate normal and steep approaches, autorotation, and sliding landings. Up to 14 helicopters operate at a time at NOLF Spencer. Normal departure occurs from the northeast or southeast corners (Naval Facilities Engineering Command, Southeast, 2017a).

Figure 1.4-1 Navy Outlying Landing Field Spencer

1.4.2 NOLF Pace

NOLF Pace is a helicopter training airfield located approximately 11 miles north of the community of Pace in Santa Rosa County, Florida (Figure 1.4-2). This NOLF is used for helicopter training operations, including arrivals and departures, standard patterns, 180-degree autorotation patterns, and 90-degree autorotation patterns. NOLF Pace is a grass airfield with no paved helipads or runways. There is a small structure located in the southeast corner of the airfield that is used by the "crash crew" and for crew changes (Naval Facilities Engineering Command, Southeast, 2017a).

The primary helicopter operating at NOLF Pace is the TH-57. The airfield is not equipped for nighttime use. Operations at NOLF Pace are typically conducted Monday through Friday (8:15 a.m. to 6:15 p.m.); however, operations are also conducted outside of these typical hours to meet mission-critical training requirements. Up to eight helicopters operate at one time at NOLF Pace, with four helicopters on each side of the airfield. The field is divided into identical left and right sides by a centerline based on the course in use. Each side is divided into three lanes. Normal departures take place from the southeast corner of the field. Operations are prohibited south of the access road located along the eastern field boundary and in the northwest corner of the field (Naval Facilities Engineering Command, Southeast, 2017a).

1.4.3 NOLF Site X

NOLF Site X is a helicopter training airfield located approximately 12 miles northwest of NAS Whiting Field, in Santa Rosa County, Florida (Figure 1.4-3). This NOLF was recently obtained as part of a land exchange between the Navy and Escambia County. NOLF Site X is used for helicopter training operations, including practice landings, confined area landings, pinnacle landings, hovering, autorotation patterns, taxiing, and refueling events. NOLF Site X is predominantly covered in grass, with 2 pinnacle landing zone pads, 1 confined area landing zone landing area, 4 inboard asphalt landing lanes, 2 outboard asphalt landing lanes, 16 gravel landing pads, two concrete refueling pads, landing field markers, a 12-foot wide access road extending to Major Stephen W. Pless Medal of Honor Way, an unpaved perimeter road and security fencing surrounding the facility, and a satellite fire station, fueling area, and observation tower located toward the center of the airfield (Department of the Navy, 2018a).

The primary helicopter operating at NOLF Site X is the TH-57. Operations at NOLF Site X are typically conducted Monday through Thursday (9:00 a.m. to 12:45 a.m.) and Friday (9:00 a.m. to 10:30 p.m.); however, operations are also conducted outside of these typical hours to meet mission-critical training requirements. Operations during nighttime hours include both night vision device training and unaided flights that take place primarily on weekdays. Nighttime operations consist of practice landings, hovering, taxiing, and refueling events. Up to 14 helicopters operate at a time at NOLF Site X during daytime hours, and up to 9 helicopters operate at a time during nighttime hours. The westernmost outboard runway (oriented north-south), the northernmost outboard runway (oriented east-west) and the twelve concrete landing pads will be considered for future construction through the Navy's normal programming process. Until then, these deferred runways and landing pad locations will be utilized for helicopter flight training operations (Department of the Navy, 2018a).

Figure 1.4-2 Navy Outlying Landing Field Pace

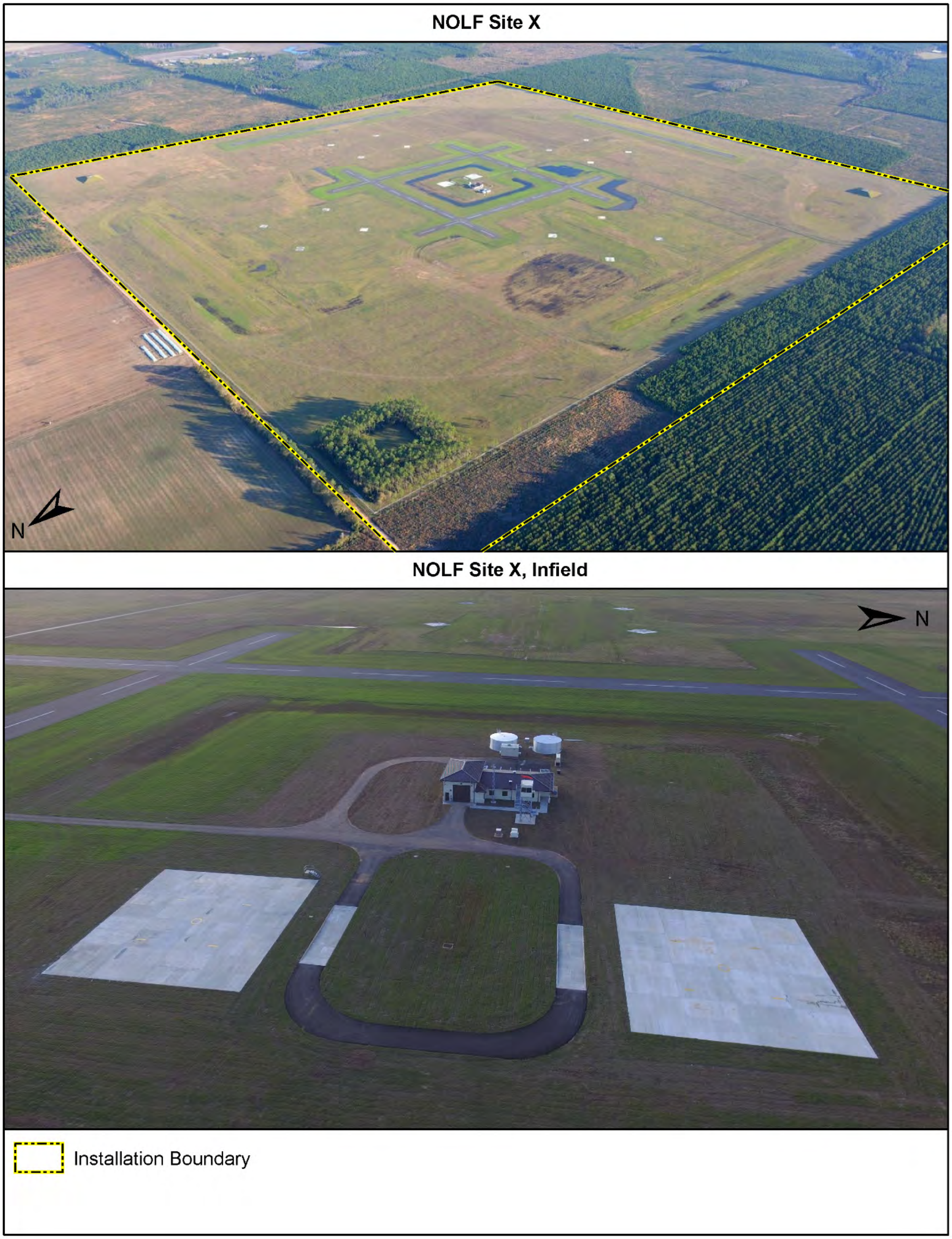

Figure 1.4-3 Navy Outlying Landing Field Site X

1.4.4 NOLF Harold

NOLF Harold is a helicopter training airfield located 8 miles east of NAS Whiting Field, in Santa Rosa County, Florida (Figure 1.4-4). NOLF Harold is grassed and does not have any paved runways or helipads. There is one small structure located at the airfield that is used by "crash crews" and for crew change. Operations at this NOLF are typically conducted Monday through Friday (8:15 a.m. to 6:15 p.m.); however, operations are also conducted outside of these typical hours to meet mission-critical training requirements. In addition, NOLF Harold has been evaluated as an airfield to conduct training operations during nighttime hours, so the typical operational hours could change to include routine nighttime operations (Naval Facilities Engineering Command, Southeast, 2017a).

Existing military operations at NOLF Harold are performed by TH-57 helicopters, and include standard patterns, 180-degree and 90-degree autorotation patterns, tactical patterns, external load patterns, pinnacle patterns, and confined area landing patterns. NOLF Harold is divided into two sides, depending on course in use. Up to 11 helicopters operate at a time at NOLF Harold during daytime hours, and if typical operating hours are changed, then up to four helicopters could operate at a time during nighttime hours. Normal departures take place from the northeast or southeast corner of the field based on transition requirements for mission training (Naval Facilities Engineering Command, Southeast, 2017a).

1.4.5 NOLF Santa Rosa

NOLF Santa Rosa is a former fixed-wing airfield that has been converted to a helicopter training airfield. Helicopters can perform operations during nighttime hours (10:00 p.m. to 7:00 a.m.) at the airfield. NOLF Santa Rosa is 8 miles southeast of NAS Whiting Field in Santa Rosa County (Figure 1.4-5). NOLF Santa Rosa is owned and operated by the Navy and is the second-busiest airfield in the NAS Whiting Field Complex. NOLF Santa Rosa has four paved runways/pads that are used as helicopter training aids (Naval Facilities Engineering Command, Southeast, 2017a).

Existing military operations at NOLF Santa Rosa are performed by TH-57 helicopters. Up to 12 helicopters operate at a time at this NOLF. Operations at NOLF Santa Rosa are typically conducted Monday through Friday (10:00 a.m. to 8:00 p.m.) and Saturday (11:00 a.m. to 6:15 p.m.) with some night vision device training operations conducted during nighttime hours; however, operations are also conducted outside of these typical hours to meet mission-critical training requirements (Naval Facilities Engineering Command, Southeast, 2017a).

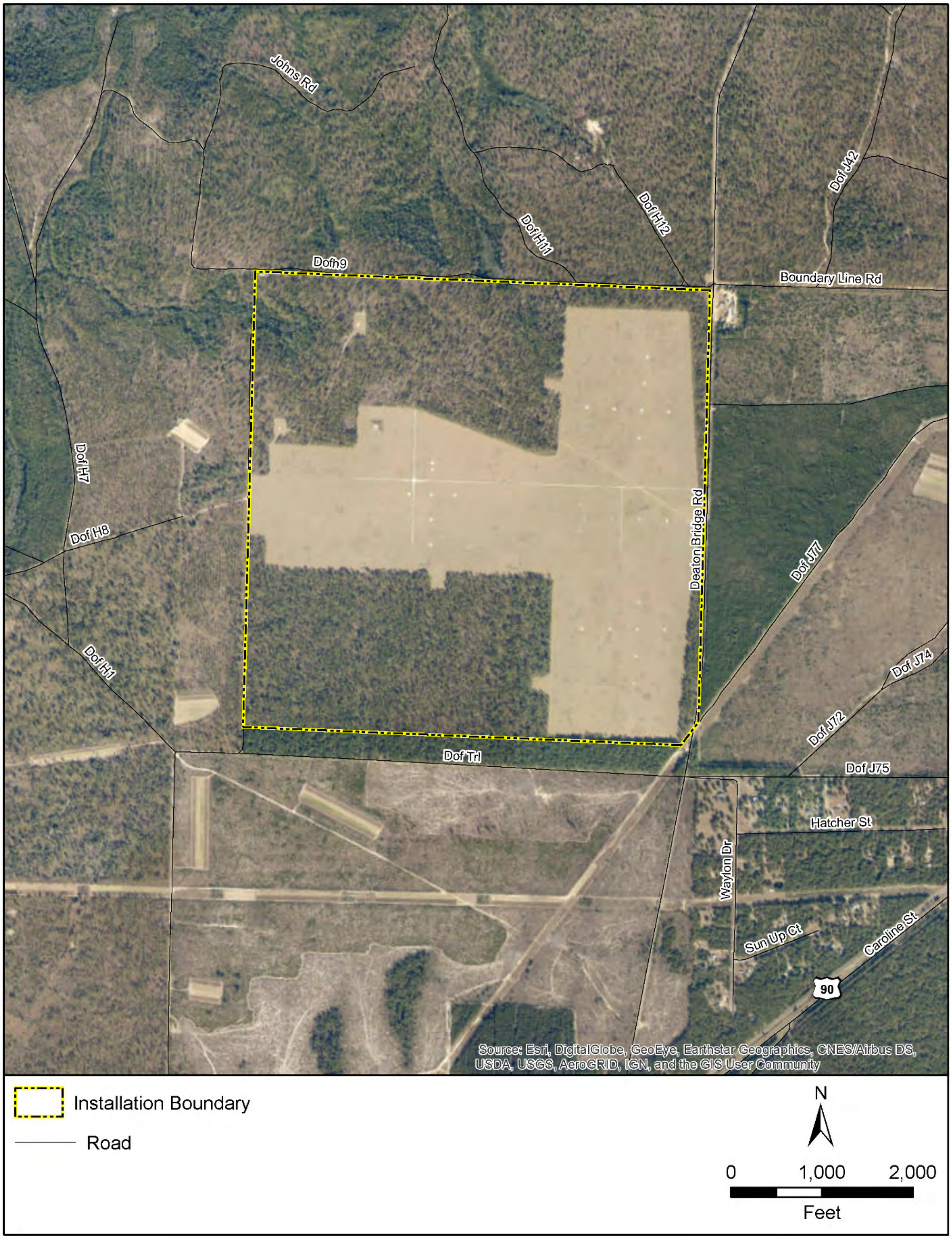

Figure 1.4-4 Navy Outlying Landing Field Harold

Figure 1.4-5 Navy Outlying Landing Field Santa Rosa

1.4.6 NOLF Choctaw

NOLF Choctaw is a fixed-wing and helicopter training airfield located approximately 14 miles southeast of NAS Whiting Field in Santa Rosa County, Florida (Figure 1.4-6). It has one 8,000-foot runway, Runway 18/36, with a parallel 8,000-foot taxiway (Naval Facilities Engineering Command, Southeast, 2017a).

NOLF Choctaw is a tower-controlled airfield operated and maintained by the Navy; however, it is used by the Navy, U.S. Air Force, Special Operations, Alabama National Guard, and others for pilot training and ground maneuvers. Existing military operations at NOLF Choctaw are conducted by T-6 and TH-57 aircraft from NAS Whiting Field, transient aircraft from NAS Pensacola and Eglin Air Force Base, and unmanned aerial vehicles. The Integrated Training Center at Eglin Air Force Base is the home to pilot and maintainer training for the F-35 Lightning II. This NOLF supports F-35 squadrons and has been used to support fleet squadron field carrier qualification training missions during daytime and nighttime hours (Naval Facilities Engineering Command, Southeast, 2017a).

Touch-and-Go – fixed-wing aircraft lands and takes off on a runway without coming to a full stop. After touching down, the pilot immediately goes to full power and takes off again. The touch-and-go pattern is counted as two operations (the landing is counted as one operation and the take-off is counted as another).

Field Carrier Landing Practices – training procedure that simulates landing a fixed-wing aircraft on the flight deck of a carrier. It is similar to a touch-and-go, but has specific altitudes, turning radii, and power settings to replicate, as closely as possible, the procedures of landing on a carrier.

Fixed-wing operations at NOLF Choctaw include arrivals, departures, touch-and-go's, and field carrier landing practices. Helicopter training operations include contact maneuvers, and day and nighttime pattern work. Helicopter patterns may be flown to the runway or the parallel taxiway. Aircraft are not routinely parked overnight at NOLF Choctaw, nor are maintenance activities conducted at the airfield. Usually, up to six helicopters operate at a time at NOLF Choctaw. Helicopter operations are typically conducted Tuesday through Friday (7:30 a.m. to 5:30 p.m.); however, helicopter operations are also conducted outside of these typical hours to meet mission-critical training requirements. (Naval Facilities Engineering Command, Southeast, 2017a).

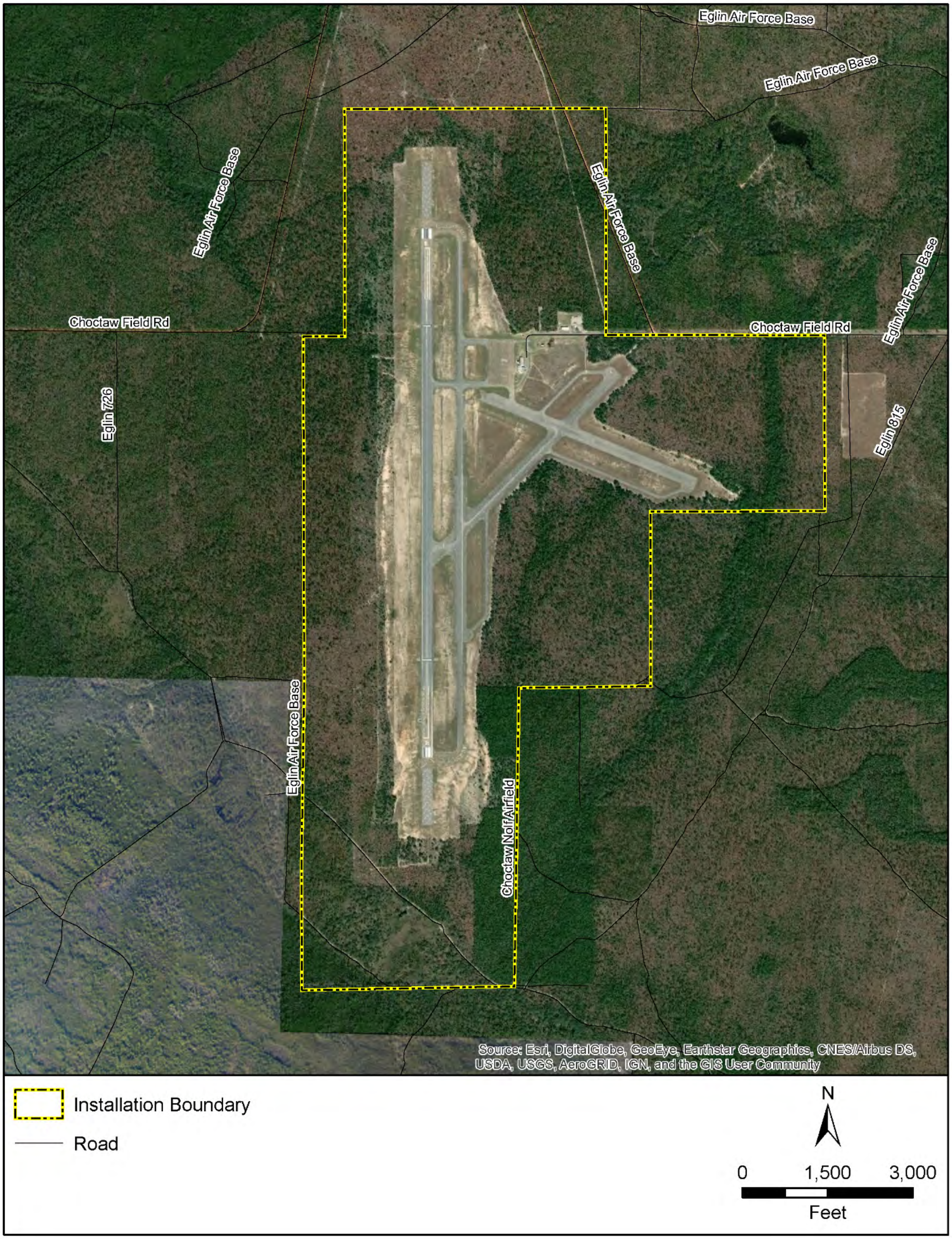

Figure 1.4-6 Navy Outlying Landing Field Choctaw

1.5 Purpose of and Need for the Proposed Action

> 10 U.S.C. section 8062: "The Navy shall be organized, trained, and equipped primarily for prompt and sustained combat incident to operations at sea. It is responsible for the preparation of naval forces necessary for the effective prosecution of war except as otherwise assigned and, in accordance with integrated joint mobilization plans, for the expansion of the peacetime components of the Navy to meet the needs of war."

The purpose of the Proposed Action is to address the capability and capacity gaps of the current aging TH-57 helicopter training system operated by Training Air Wing Five at NAS Whiting Field. The AHTS would provide a newer, more capable, more reliable helicopter and training system to Training Air Wing Five. The proposed AHTS would meet the advanced helicopter and intermediate tilt-rotor training requirements through 2050.

The need for the Proposed Action is to provide capabilities for training and equipping combat-capable Naval forces ready to deploy worldwide. In this regard, the Proposed Action furthers the Navy's execution of its congressionally mandated roles and responsibilities under Title 10 United States Code (U.S.C.) section 8062. AHTS will be the primary training system for all U.S. Navy, U.S. Marine Corps, U.S. Coast Guard, and participating allied student rotary-wing and tilt-rotor combat pilots in support of worldwide operations at higher rates than have been seen over the last two decades.

As TH-57 helicopters have been used to train pilots since the early 1970s, the technology used in their design is 50 years old, which by today's training standards, is considered obsolete. As a result, the TH-57 does not meet the future training requirements of the Navy and Marine Corps. Moreover, the aging TH-57s are rapidly reaching the end of their useful service life. In order to keep the TH-57 operational, costly repairs and maintenance are frequently required to extend its service life.

The infrastructure supporting TH-57 at NAS Whiting Field has been in operational use since the 1940s. For example, the existing hangar was built 75 years ago, was not designed for helicopters, and offers very limited protection against hazardous weather. The building containing eight existing simulators and training devices has no capacity for the AHTS simulators. Therefore, new facilities and associated infrastructure are required to be developed at NAS Whiting Field to support AHTS training and maintenance activities.

1.6 Scope of Environmental Analysis

This EA includes an analysis of potential environmental impacts associated with the Proposed Action and the No Action Alternative. The environmental resource areas analyzed in this EA include: air quality, water resources, cultural resources, biological resources, noise, land use, infrastructure, public health and safety, hazardous materials and wastes, and environmental justice. The study area for each resource analyzed may differ due to how the Proposed Action interacts with or impacts the resource. For instance, the study area for cultural resources may only include the construction footprint of a building whereas the noise study area would expand out to include areas that may be impacted by airborne or construction noise.

1.7 Key Documents

Key documents are sources of information incorporated into this EA. Documents are considered to be key because of similar actions, analyses, or impacts that may apply to this Proposed Action. CEQ guidance encourages incorporating documents by reference. Although these NEPA documents address actions that are separate and distinct from the Proposed Action analyzed in this document, the potential cumulative effects from these actions have been considered in the preparation of this document. Documents incorporated by reference in part or in whole include:

- **EA for Land Exchange Involving Naval Air Station (NAS) Whiting Field's Naval Outlying Landing Field (NOLF) Site 8 in Escambia County for Suitable Land and Improvements in Santa Rosa County, Florida, March 2018.** This EA addressed a land exchange between the Navy and Escambia County, Florida. Through the exchange, the Navy would convey NAS Whiting Field's NOLF Site 8 for suitable land and improvements located in Santa Rosa County, Florida (Site X) (Department of the Navy, 2018a). In addition, helicopter training operations would cease at NOLF Site 8 and begin at NOLF Site X. A Finding of No Significant Impact was signed on June 12, 2018. The land exchange is complete and NOLF Site X opened for helicopter training operations in January 2019.
- **Final Supplemental Environmental Impact Statement (EIS) for F-35 Beddown at Eglin Air Force Base, Florida, January 2014**. This Final Supplemental EIS reevaluated F-35 aircraft flight training operations not only at Eglin Air Force Base, but also other auxiliary fields, one of which was NOLF Choctaw (U.S. Air Force, 2014). This EIS is relevant to the AHTS EA because the EIS includes the best available data on noise environment at NOLF Choctaw. The Record of Decision for this Final Supplemental EIS was signed June 2014.
- **EA for Providing T-6 Joint Primary Aircraft Training System Solo Capability at Navy Outlying Landing Fields, Naval Air Station Whiting Field, Florida, January 2011**. This EA addressed the Navy's acquisition of approximately 203 acres of private land in Alabama, around NOLFs Barin and Summerdale, and modification and construction of runways at NOLFs Barin and Summerdale, as well as T-6 operations at NOLFs Wolf, Silverhill, Holley, and Choctaw (Department of the Navy, 2011). A Finding of No Significant Impact was signed on February 11, 2011.
- **EA for the Establishment of an Unmanned Aerial Vehicle Squadron at Naval Air Station Whiting Field, Santa Rosa County, Florida, September 2000**. This EA addressed the relocation of the Navy's Unmanned Aerial Vehicle Training Center from Fort Huachuca, Arizona, to NAS Whiting Field, Florida. The EA evaluated the relocation of training facilities, unmanned aerial vehicles, and personnel to NAS Whiting Field and NOLF Choctaw (Department of the Navy, 2000a). A Finding of No Significant Impact was signed December 6, 2000.
- **EA for the Replacement of the T-34C Training Aircraft with the Joint Primary Aircraft Training System at Naval Air Station Whiting Field, Florida, April 2000.** This EA addressed the Navy's replacement of the T-34C aircraft with the T-6 aircraft and associated equipment and facilities at NAS Whiting Field and five NOLFs. The EA also evaluated the continued use of five NOLFs for flight training operations: Barin, Choctaw, Brewton, Evergreen, and Saufley (Department of the Navy, 2000b). A Finding of No Significant Impact was signed on May 3, 2000.
- **Air Installations Compatible Use Zones (AICUZ) Study for Naval Air Station Whiting Field and 12 Navy Outlying Landing Fields, May 2017.** An AICUZ Study is a planning document that promotes land use development around air facilities that is compatible with Department of Defense flying missions. The 2017 AICUZ Study provides background information on the NAS Whiting Field, presents noise contours and zones associated with aircraft operations, establishes Accident Potential Zones(APZs), locates areas of incompatible land uses within noise zones, and recommends actions to encourage compatible land use (Naval Facilities Engineering Command, Southeast, 2017a).

- **Integrated Natural Resources Management Plan (INRMP), Naval Air Station Whiting Field Complex, Milton, Florida, 2018 Update.** This INRMP documents the program that provides for the conservation and rehabilitation of natural resources within the NAS Whiting Field Complex, while ensuring the continuation of the military mission (NAS Whiting Field, 2018).
- **Annual Integrated Cultural Resource Management Plan (ICRMP) Update for Naval Air Station Whiting Field Final Report, FY 2017**. This ICRMP Update provides guidelines for managing cultural resources and conserving and protecting significant cultural resources of NAS Whiting Field (NAS Whiting Field, 2017).

1.8 Relevant Laws and Regulations

The Navy has prepared this EA based upon Federal and State laws, statutes, regulations, and policies pertinent to the implementation of the Proposed Action, including the following:

- NEPA (42 U.S.C. sections 4321–4370h)
- CEQ Regulations for Implementing the Procedural Provisions of NEPA (40 Code of Federal Regulations [CFR] parts 1500–1508)
- Navy regulations for implementing NEPA (32 CFR part 775)
- Clean Air Act (42 U.S.C. section 7401 et seq.)
- Clean Water Act (CWA) (33 U.S.C. section 1251 et seq.)
- Coastal Zone Management Act (CZMA) (16 U.S.C. section 1451 et seq.)
- National Historic Preservation Act (NHPA) (54 U.S.C. section 306108 et seq.)
- Endangered Species Act (ESA) (16 U.S.C. section 1531 et seq.)
- Migratory Bird Treaty Act (16 U.S.C. sections 703–712)
- Bald and Golden Eagle Protection Act (16 U.S.C. section 668–668d)
- Comprehensive Environmental Response, Compensation, and Liability Act (42 U.S.C. section 9601 et seq.)
- Emergency Planning and Community Right-to-Know Act (42 U.S.C. sections 11001–11050)
- Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. section 136 et seq.)
- Resource Conservation and Recovery Act (42 U.S.C. section 6901 et seq.)
- Toxic Substances Control Act (15 U.S.C. sections 2601–2629)
- Executive Order (EO) 11988, Floodplain Management
- EO 12088, Federal Compliance with Pollution Control Standards
- EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations
- EO 13045, Protection of Children from Environmental Health Risks and Safety Risks
- EO 13834, Efficient Federal Operations
- EO 13175, Consultation and Coordination with Indian Tribal Governments

A description of the Proposed Action’s consistency with these laws, policies, and regulations, as well as the names of regulatory agencies responsible for their implementation, is presented in Chapter 5.0 (Table 5.1-1).

1.9 Public and Agency Participation and Intergovernmental Coordination

Regulations from the CEQ direct agencies to involve the public in preparing and implementing their NEPA procedures.

The Navy prepared a Draft EA to inform the public of the Proposed Action and to allow for the opportunity for public review and comment. The Draft EA review period began with public notices published in the Pensacola News Journal and Santa Rosa's Press Gazette indicating the availability of the Draft EA and the locations where public review copies were available. The Navy published a Notice of Availability of the Draft EA for three consecutive days in the Pensacola News Journal on the dates of June 28–30, 2019 and in the weekly Santa Rosa's Press Gazette on June 29 and July 3, 2019. The notice described the Proposed Action, solicited public comments on the Draft EA, provided dates of the public comment period (June 28 to July 19, 2019), and announced that a copy of the EA was available for review on the Navy's website, http://www.nepa.navy.mil/ahts and at the following libraries:

- Pensacola Library, 239 N. Spring Street, Pensacola, Florida
- Tryon Branch Library, 1200 Langley Avenue, Pensacola, Florida
- Century Branch Library, 7991 N. Century Boulevard, Century, Florida
- Genealogy Branch Library, 5740 N. Ninth Avenue, Pensacola, Florida
- Molino Branch Library, 6450-A Highway 95A, Molino, Florida
- Southwest Branch Library, 12248 Gulf Beach Highway, Pensacola, Florida
- Westside Branch Library, 1301 W. Gregory Street, Pensacola, Florida
- Pace Library, 4750 Pace Patriot Boulevard, Pace, Florida
- Milton Library, 5541 Alabama Street, Milton, Florida

Based on public comments, the Draft EA was additionally made available at:

- Jay Library, 5259 Booker Lane, Jay, Florida
- Genealogy Center, 6275 Dogwood Drive, Milton, Florida

Eight public comments were received during the Draft EA public review period; all were from members of the public. Primary concerns identified by the commenters included: noise impacts to adjacent residences and domestic animals, noise during nighttime flight training operations, low-altitude flight training operations near residences and bald eagles, and military helicopter training at civilian/commercial airports. All substantial comments are addressed in the Final EA as described in Section 1.10 Changes to the EA.

Through the public involvement process, the Navy coordinated with relevant federal, state, and local agencies and notified them and the public of the Proposed Action. Input from public agency responses are incorporated into the analysis of potential environmental impacts, as appropriate.

The Navy coordinated with the Florida Department of Environmental Protection regarding the Action Alternative. A Coastal Consistency Determination was prepared and submitted to Florida Department of Environmental Protection; concurrence was received on August 13, 2019 (*Appendix D, Coastal Consistency Determination*). The Navy determined the Proposed Action would be consistent to the maximum extent practicable with the enforceable policies of Florida's Coastal Management Program.

The Navy consulted with the State Historic Preservation Officer (SHPO) regarding this Proposed Action. The Navy determined that there would be no historic properties affected, to which the SHPO concurred on August 20, 2019. Additionally, the Navy consulted with the following federally recognized Native America tribes.

- Absentee-Shawnee Tribe of Indians of Oklahoma
- Alabama-Coushatta Tribe of Texas
- Alabama-Quassarte Tribal Town
- Chickasaw Nation
- The Choctaw Nation of Oklahoma
- Coushatta Tribe of Louisiana
- Eastern Shawnee Tribe of Oklahoma
- Jena Band of Choctaw Indians
- Kialegee Tribal Town
- Miccosukee Tribe of Indians
- Mississippi Band of Choctaw Indians
- The Seminole Nation of Oklahoma
- Seminole Tribe of Florida
- Shawnee Tribe
- Thlopthlocco Tribal Town
- Tunica-Biloxi Indian Tribe

The Coushatta Tribe of Louisiana responded that the project would not negatively impact any archaeological, historic, or cultural resources of the Coushatta people. The Shawnee Tribe concurred that no known historic properties would be negatively impacted by this project, and requested to be re-notified to resume immediate consultation in the event that archaeological materials are encountered during construction, use, or maintenance of the AHTS facilities at NAS Whiting Field. The Seminole Tribe of Florida responded with no objections to the project as long as an archaeologist who meets the Secretary of the Interior's Professional Qualifications Standards is present to monitor ground-disturbing activities from construction for potentially intact cultural resources, and that no new construction or ground disturbance will occur on any of the NOLFs. No responses were received from the remaining tribes.

1.10 Changes to the EA

Comments received during the Draft EA review period resulted in revisions to the EA during preparation of the Final EA. Revisions to the Final EA include technical edits and clarifications, which improve the accuracy and thoroughness of the analysis presented in the Draft EA, but do not alter any conclusions regarding the nature or magnitude of impacts on any resources.

Portions of the Executive Summary were revised to reflect corresponding changes in the main text of the EA. Section 1.9 was revised to reflect the public and agency participation process, including the addition of the Draft EA availability and summary of public comments.

Section 1.3 Location, Section 2.3.2.2 Training Operations, and the Airspace section in Chapter 3 were updated to reflect that in addition to helicopter flight training operations conducted primarily at Whiting Field South and NOLFs Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw, TH-XX would continue to fly in and out of local municipal airports as necessary, including Pensacola International Airport and Peter Prince/Milton Airport among others, in executing flight training curriculum to gain required operational experience in Federal Aviation Administration-controlled airspace. Training activities at Federal Aviation Administration-controlled fields and airspace are conducted on a space available basis and could occur at other non-military airfields when available and feasible for use.

Information was added to the Air Quality Impact Conclusion subsection in Section 3.1.3 to clarify that use of the UH-72 surrogate helicopter to analyze air emissions provides a conservative (i.e., higher) estimate of potential air quality impacts because the UH-72 is larger than the commercially available helicopters that could be selected as the TH-XX.

Biological Resources in Section 3.4.2 Affected Environment were updated to reflect that no known bald eagle nests are located within one mile of Whiting Field South or its NOLFs. Biological resources in Section 3.4.3.2 Environmental Consequences were updated with information on the Rotary-Wing Operating Procedures Manual directing aircraft pilots to report observations of increased bird or other animal activity compromising flight safety so the BASH threat may be addressed.

A new section, Section 3.5.3.3 Noise Effects on Domestic Animals, was added. Noise in Section 3.5.7.2 Environmental Consequences was updated with information that proposed changes to the type of helicopter and increased flight training operations would likely be insufficient to result in significant impacts to domestic animals. Information was added to the Noise Impact Conclusion subsection in Section 3.5.7.2 to clarify that use of the UH-72 surrogate helicopter to analyze noise provides a conservative (i.e., higher) estimate of potential noise impacts because the UH-72 is larger and louder than the commercially available helicopters that could be selected as the TH-XX.

Text was added throughout the Final EA regarding results of the Navy's correspondence and consultation with resource agencies and federally recognized tribes.

2 Proposed Action and Alternatives

This chapter describes the Proposed Action, development of the range of reasonable alternatives, alternatives considered in this Environmental Assessment (EA), alternatives considered but not carried forward for detailed analysis, and best management practices (BMPs).

2.1 Proposed Action

The United States (U.S.) Department of the Navy (hereinafter, referred to as the Navy) proposes to modernize the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing Five located at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs), in Florida, by implementing the Advanced Helicopter Training System (AHTS). The AHTS would involve the replacement of TH-57 Sea Ranger training helicopters, replacement of existing ground based training systems (i.e., simulators), an increase in operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities, and an increase in personnel.

2.2 Development of the Range of Reasonable Alternatives

The National Environmental Policy Act's (NEPA's) implementing regulations provide guidance on the consideration of alternatives to a federally proposed action and require rigorous exploration and objective evaluation of reasonable alternatives. Only those alternatives determined to be reasonable and to meet the purpose of and need require detailed analysis. In developing the proposed range of alternatives that meet the purpose of and need for the Proposed Action, the Navy carefully reviewed important characteristics of modernizing its rotary-wing and tilt-rotor integrated pilot production training program by implementing AHTS at NAS Whiting Field and its associated NOLFs. This review included requirements for helicopter training in light of Title 10 responsibilities, existing training requirements and regulations, and existing Navy infrastructure. Based on this review, the following factors were considered when exploring alternatives for the Proposed Action:

- Alternatives must meet overall training requirements. Requirements must be met for all training aspects of Navy, U.S. Marine Corps, and U.S. Coast Guard rotary-wing and tilt-rotor pilots, in light of Title 10 responsibilities (refer to Section 1.5).
- Alternatives must not disrupt ongoing rotary-wing and tilt-rotor pilot production at NAS Whiting Field and its NOLFs. Due to Navy and U.S. Marine Corps requirements for rotary-wing and tilt-rotor pilots, there can be no disruption to ongoing training. Training Air Wing Five's established TH-57 training syllabus, which has been developed over decades to safely and effectively train new pilots at NAS Whiting Field and its NOLFs, must be supported to continue pilot production with the TH-57 training system while AHTS implementation occurs.
- Alternatives should maximize use of existing airfields that are dedicated to the student pilot training program. The airfields at Whiting Field South and six NOLFs (see Section 1.4), with their supporting infrastructure and equipment, are dedicated to training rotary-wing and tilt-rotor student pilots. The different layout and configuration at each NOLF is designed to accommodate specific training requirements and allow student pilots to complete the various elements of the pilot training curriculum.

- Alternatives must make effective and efficient use of existing infrastructure. Navy guidance, as outlined in the May 2015 Chief of Naval Operations Shore Investment Guidance, is "to reduce overall shore footprint by demolishing or divesting unneeded facilities and recapitalize existing facilities in lieu of new construction" (Chief of Naval Operations, 2015). According to the *Requirements for Department of the Navy Facilities,* it is imperative that the Navy only builds, maintains, and utilizes the minimum infrastructure necessary to efficiently and cost effectively meet mission requirements and operational plans. Navy policy requires a careful analysis of facility requirements and optimization of existing infrastructure *(Requirements for Department of the Navy Facilities, December 19, 2016, and Embracing Opportunities Afforded by NDAA 2017 Section 2802, Classification of Facility Conversion Projects as Repair Projects, January 12, 2017)*.
- Alternatives should avoid and/or minimize construction impacts to environmental resources. Natural and cultural resources provide positive aesthetic, social, and recreational attributes. At the same time, these resources can also constrain development and restrict facility development activities.

2.3 Alternatives Carried Forward for Analysis

Based on the considerations detailed above and meeting the purpose of and need for the Proposed Action, only one action alternative was identified for analysis within this document. This document evaluates the No Action Alternative and the Action Alternative.

2.3.1 No Action Alternative

The Council on Environmental Quality (CEQ) regulations (40 Code of Federal Regulations [CFR] 1502.14[d]) require NEPA documents to evaluate the No Action Alternative. The No Action Alternative provides a benchmark that typically enables decision makers to compare the magnitude of potential environmental effects of the Proposed Action with conditions in the affected environment.

Under the No Action Alternative, the Proposed Action would not occur. The Navy would not modernize the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing Five by implementing the AHTS at NAS Whiting Field and its associated NOLFs. Moreover, training would not increase to accommodate Fleet's increased demand for pilots. The ever-increasing costs to maintain an aging fleet of TH-57s and associated equipment would be unsustainable. At some point without replacement, the TH-57s would be beyond repair. No AHTS facilities would be constructed and there would be no increase in personnel to support the AHTS.

Training operations with the TH-57 would continue to be conducted within existing airfields and airspace currently utilized by Training Air Wing Five. The No Action Alternative reflects the recent completion of a land exchange in which helicopter operations ceased at NOLF Site 8 and began at NOLF Site X in January 2019. As a result, the comparison of annual operations in Table 2.3-1 for the baseline and No Action Alternative reflects changes in operations due to the land exchange and new use of NOLF Site X. While the total number of operations under the baseline and No Action Alternatives remain the same, the distribution of operations among the NOLFs under the No Action Alternative would change because more operations are expected at NOLF Site X than were previously conducted at NOLF Site 8.

Table 2.3-1 Comparison of Annual TH-57 Operations for Baseline and No Action Alternative

Location	*Number of Annual Operations Baseline*	*Number of Annual Operations No Action Alternative*	*Change between the Baseline and the No Action Alternative*	*Percent Change*
Whiting Field South	76,500	76,500	0	0%
NOLF Spencer	269,400	251,200	-18,200	-7%
NOLF Pace	130,000	125,600	-4,400	-3%
NOLF Site 8	57,700	0	-57,700	-100%
NOLF Site X	0	111,600	111,600	100%
NOLF Harold	88,200	62,200	-26,000	-29%
NOLF Santa Rosa	204,800	202,500	-2,300	-1%
NOLF Choctaw	8,600	5,600	-3,000	-35%
Total	**835,200**	**835,200**	**0**	**0%**

Notes: The baseline number of annual operations reflects an average of operations data from NAS Whiting Field and NOLFs in 2014 through 2018.

The No Action Alternative would not meet the purpose of and need for the Proposed Action; however, as required by NEPA, the No Action Alternative is carried forward for analysis in this EA. The No Action Alternative will be used to analyze the consequences of not undertaking the Proposed Action, not simply to conclude no impact, and will serve to establish a comparative baseline for analysis.

2.3.2 Action Alternative (Preferred Alternative)

The Action Alternative is the preferred alternative. The Action Alternative is the only alternative considered by the Navy to meet the purpose of and need for the Proposed Action. Implementing the AHTS would modernize the rotary-wing and tilt-rotor integrated pilot production training program by providing a newer, more capable, and more reliable helicopter training system that addresses the capability and capacity gaps of the aging TH-57 helicopter training system operated by Training Air Wing Five at NAS Whiting Field and its NOLFs. The Action Alternative meets all of the screening factors described in Section 2.2.

The following sections provide details on four aspects of the Action Alternative: helicopter transition, training operations, facilities development, and personnel changes.

2.3.2.1 Helicopter Transition

The Action Alternative would provide a replacement of TH-57 helicopters with 130 TH-XX helicopters for Training Air Wing Five at NAS Whiting Field. Although 140 TH-57 helicopters were initially all operating at NAS Whiting Field, the number currently in operation is approximately 113 due to airframe attrition over the life of the TH-57 program. Training Air Wing Five would progressively transition to the TH-XX at a rate of 30 to 36 aircraft per year beginning in 2021, with the transition to be complete in the 2025 timeframe. The older TH-57 helicopters would gradually be retired during the transition period.

During the transition, both the TH-57 and TH-XX support, infrastructure, and maintenance actions would be required to continue meeting the student training needs of Training Air Wing Five. As the TH-XX increase in number, the TH-57 systems and support would diminish until the transition is complete.

2.3.2.2 Training Operations

All TH-XX flight operations would be conducted at existing airfields and within airspace currently utilized by Training Air Wing Five. Figure 2.3-1 shows the airspace for NAS Whiting Field and surrounding areas. Similar to existing TH-57 flight training operations, TH-XX flight training operations would be conducted primarily at Whiting Field South and NOLFs Spencer, Pace, Site X, Harold, Santa Rosa, Choctaw, and TH-XX would continue to fly in and out of local municipal airports as necessary, including Pensacola International Airport and Peter Prince/Milton Airport among others, in executing flight training curriculum to gain required operational experience in Federal Aviation Administration-controlled airspace. Training activities at Federal Aviation Administration-controlled fields and airspace are conducted on a space available basis and could occur at other non-military airfields when available and feasible for use. All training operations would continue to observe all Federal Aviation Administration flight rules. Use of municipal airports by military aircraft is consistent with Federal Aviation Administration regulations and airport Master Plans. Flight training operations at Whiting Field South and the NOLFs would generally be conducted during the typical operating hours described in Sections 1.3 and 1.4. However, it is anticipated that additional nighttime operations would be conducted by TH-XX at NOLFs Harold and Choctaw. New flight simulators would support the TH-XX in facilities to be located at NAS Whiting Field.

Proposed flight training with the TH-XX and Ground Based Training System includes helicopter familiarization, basic and radio instruments, and basic warfighting skills. Basic warfighting skills involve the following: energy management, night vision devices, terrain flight, formation flight, confined area and pinnacle landings, external load vertical replenishment operations, search and rescue with hoist, and shipboard operations. Flight patterns, altitudes, and airspeeds for training operations with the TX-XX would remain similar to those currently conducted with the TH-57. Nine additional simulators would be added to the Ground Based Training System in support of the TX-XX.

Navy and U.S. Marine Corps requirements for helicopter pilots are projected to continue to increase, as are total TH-XX training flight hours. The training curriculum is expected to be modified and expanded to take advantage of increased capabilities of the TH-XX in order to better prepare student pilots for follow-on training at the Fleet Replacement Squadrons. The new curriculum will include additional flight training operations that involve night vision devices, night formation flying, and search and rescue; skill sets identified as training gaps by Fleet helicopter pilots. The newer AHTS training syllabus would provide the right mix of virtual and actual training to maximize student pilot training

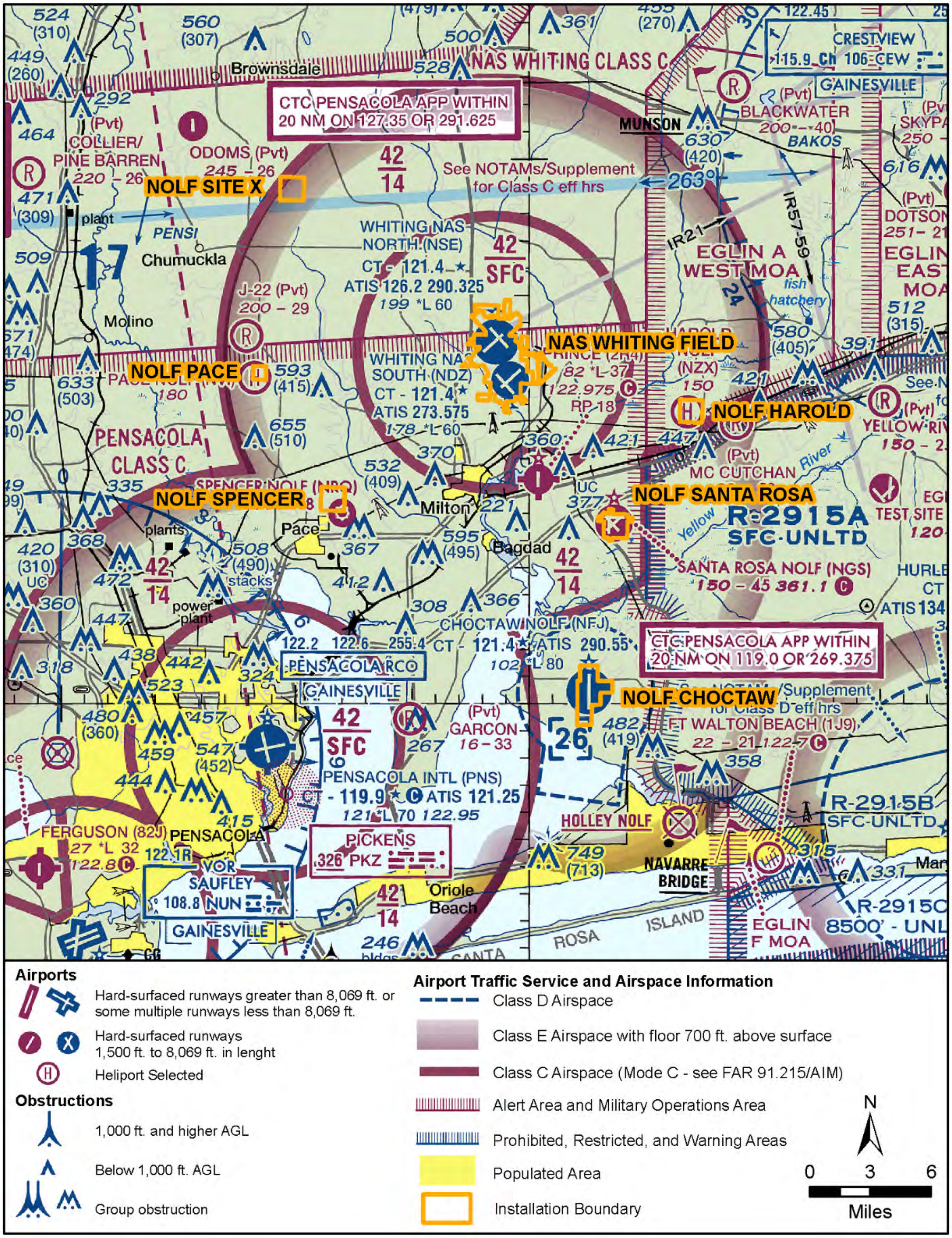

Figure 2.3-1 Airspace

Under the Action Alternative, the total number of flight training hours would increase by approximately 22 percent over the No Action Alternative as shown in Table 2.3-2.

Table 2.3-2 Comparison of Annual TH-57 Operations for No Action Alternative and TH-XX Operations for Action Alternative

Location	*Number of Annual Operations No Action Alternative*	*Number of Annual Operations Action Alternative*	*Change between the No Action Alternative and the Action Alternative*	*Percent Change*
Whiting Field South	76,500	93,400	16,900	22%
NOLF Spencer	251,200	306,500	55,300	22%
NOLF Pace	125,600	153,300	27,700	22%
NOLF Site 8	0	0	0	0%
NOLF Site X	111,600	136,100	24,500	-
NOLF Harold	62,200	75,900	13,700	22%
NOLF Santa Rosa	202,500	247,000	44,500	22%
NOLF Choctaw	5,600	6,800	1,200	22%
Total	**835,200**	**1,019,000**	**183,800**	**22%**

During the transition from TH-57 to TH-XX, it is likely that there would be a temporary surge in the number of helicopters present at NAS Whiting Field– up to 145 helicopters. Although there would be more helicopters present, not all of them would fly each day. The number of flight training operations in a given period is driven by the need to meet the requirements of the training syllabus, not the number of helicopters present. Nevertheless, there would be an increased level of maintenance activities for all helicopters present at NAS Whiting Field during the temporary surge when transitioning from TH-57 to TH-XX.

2.3.2.3 Facility Development

Under the Action Alternative, implementing AHTS would require new facilities and infrastructure. In particular, AHTS would require new TH-XX maintenance hangars and Ground Based Training System facilities for simulators. As the TH-XX and associated flight simulators would arrive before permanent facilities could be constructed, temporary facilities would also be required. There are four facilities projects, two permanent and two temporary. The estimated construction period for temporary facilities would begin as soon as late 2019/early 2020 and extend through 2021. The estimated construction period of permanent facilities would begin in 2023 and continue through 2026. The Navy would have a Secretary of the Interior qualified archaeologist present to monitor construction related ground disturbing activities for potentially intact cultural resources.

A detailed description of the proposed temporary and permanent facilities and infrastructure required to implement the AHTS at NAS Whiting Field is provided below. Two types of facilities would be required for the AHTS: TH-XX maintenance hangars and training facilities.

The primary function of the maintenance hangars is to support helicopter maintenance, repair, inspection, servicing, and flight preparation. The high bay area in hangars allows for aircraft maintenance in a controlled environment. Maintenance hangars also provide the space necessary for administrative support, air crew, flight planning, flight briefs and debriefs, training, and equipment storage.

Facilities and infrastructure required for training must accommodate Navy pilots, instructors, administrators, and support personnel. Training is conducted in Academic Training Centers, which can be located in various facilities throughout an installation. Academic Training Centers must provide adequate space in a configuration that supports training in classrooms; independent study at interactive workstations; and training in flight simulators, on various aircraft component mock-ups, and on maintenance devices. The approximately 47-acre project area, and key project buildings, are shown in Figure 2.3-2.

In October 2003, the Department of Defense (DoD) issued Instruction number 2000.16, "DoD Anti-terrorism Standards," requiring all DoD components to adopt and adhere to common criteria and minimum construction standards to mitigate anti-terrorism vulnerabilities and terrorist threats. The intent of these building standards is to integrate greater resistance to a terrorist attack into all inhabited buildings. That philosophy affects the general practice of designing inhabited buildings. Anti-terrorism Force Protection standards consist of restrictions for on-site planning, including standoff distances, building separation, unobstructed space, drive-up and drop-off areas, access roads, and parking; structural design; structural isolation; and electrical and mechanical design. Anti-terrorism Force Protection standards will be incorporated into the design of the new Navy administrative space, where applicable.

Permanent facility construction would comply with Unified Facilities Criteria 1-200-01 *DoD Building Code* and Unified Facilities Criteria 1-200-02 *High Performance and Sustainable Building Requirements* and all discipline and facility specific planning and design criteria. Permanent facility construction projects would incorporate Leadership in Energy and Environmental Design, commonly referred to as LEED, and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy conservation where possible.

Temporary Facilities

P-288 – AHTS Temporary Maintenance Hangar

The proposed temporary hangar would be a commercially available tension fabric structure. Construction would include a 52,534 square foot (SF) concrete pad with utility connections to support installation of a tension fabric structure and temporary trailers for crew, equipment, and administrative space for temporary use at Whiting Field South. The tension fabric structure would be located north of the existing aircraft parking apron located on the west side the existing hangar Building 1406 (Figure 2.3-2). The hangar would accommodate 30 helicopters (22 with rotors folded and 8 with rotors spread).

The structures would include full fire suppression and fire alarms throughout. This project would also provide new utility lines and connections to existing electrical, water, sewer, and communications utilities. The estimated construction period would be from January through November 2020.

This project is temporary in nature and once the permanent aircraft maintenance hangar is constructed, the tension fabric structure would be removed from the site and the utility systems and concrete pad would be secured/abandoned in place and used as supplemental ramp space for aviation ground operations.

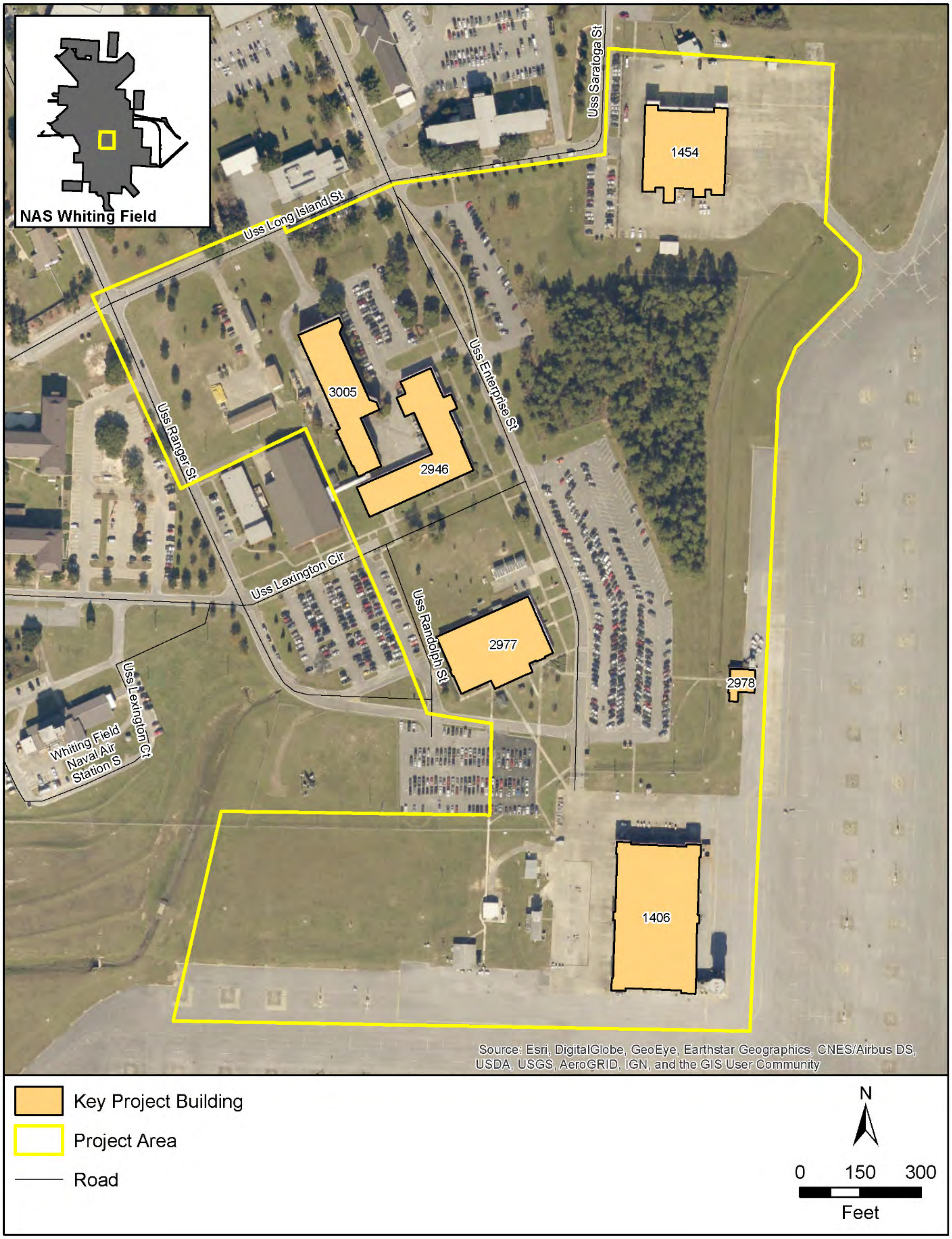

Figure 2.3-2 Project Area

NF 18-1783 - Temporary Ground Based Training System Structure

The proposed temporary Ground Based Training System would be a 15,000 SF temporary, relocatable, pre-engineered structure that would be installed on a concrete pad. The project would also include two temporary and relocatable administrative, breakroom, and restroom trailers totaling approximately 1,440 SF. The new structures would require connections to the existing electrical, water, sewer, communications, and telephone utilities that would be incorporated into the existing base infrastructure. The Ground Based Training System facility would be located on an empty lot on the corner of USS Long Island Street and USS Ranger Street (Figure 2.3-2). The building would accommodate up to eight Level 7 (electromechanical short-stroke) simulators and eight briefing spaces. The estimated construction period would be from fall 2019 through summer 2021.

Following construction of the permanent AHTS facility, the temporary Ground Based Training System improvements would be removed from the site and the utility systems would be secured/abandoned in place.

Permanent Facilities

P-286 – AHTS Aircraft Maintenance Hangar

The proposed permanent hangar would be an approximately 166,000 SF AHTS-compliant Type I aircraft maintenance hangar consisting of high bay space, crew and equipment space, administrative space, and data network areas. The project would include the extension of the aircraft parking apron near the hangar. The AHTS hangar would be designed to support three helicopter training squadrons and the associated 130 AHTS aircraft.

Site improvements would include grading, pavements, curbs, sidewalks, fencing, landscaping and signage. Mechanical utilities include new water, sanitary sewer, and stormwater collection systems. Electrical utilities include new primary and secondary systems, communication systems, and site lighting. Built-in equipment includes a floor-level fire suppression system in the maintenance bays.

P-286 would be located along the flight line (Figure 2.3-2) and would potentially involve the demolition of Buildings 1406, 1454, 2977, and 2978. The estimated construction period would be from 2023 through 2026.

P-282 – AHTS Flight Simulator Facility

The proposed AHTS Flight Simulator Facility would be a 52,052 SF operational trainer facility to accommodate 18 TH-XX flight trainers (12 Level 7 and 6 Level 6) and the associated support space. Construction would include a two-story steel frame building with a reinforced concrete structural slab with a pile foundation. The facility would include spaces for brief/de-brief, instructors, simulator maintenance, and administrative support. The facility would include fire protection; environmentally controlled heating, ventilation, and air conditioning system; electrical and mechanical utilities; parking lot; and site improvements. The project would demolish or partially demolish Building 3005 (34,776 SF) and renovate 2,928 SF of Building 2946 by relocating existing simulators and converting the space back to classrooms. P-282 would be located in the corner of USS Enterprise Street and USS Lexington Circle (Figure 2.3-2). The estimated construction period would be from 2023 to 2026.

2.3.2.4 Personnel

Under the Proposed Action, the overall personnel structure of Training Air Wing Five would remain similar to the baseline conditions in 2018. However, to meet the requirements of the AHTS, there would be an increase of 33 military personnel and contractors. A comparison of the number of TH-57 personnel under baseline conditions and AHTS personnel under the Proposed Action is shown in Table 2.3-3. The number of personnel under the No Action Alternative would be the same as the baseline. Under the Proposed Action, there would be an increase in the number of Training Air Wing Five military personnel, Helicopter Instructor Training Unit contractor personnel, contractor academic instructors, and contractor flight simulator instructors. During the transition from TH-57 to TH-XX, there is expected to be a temporary increase in the number of contract maintenance personnel because of the temporary need to maintain both aircraft. Once the transition is complete, the number of contract maintenance personnel and helicopter training squadron personnel is expected to remain the same under the Proposed Action.

Table 2.3-3 Comparison of Baseline TH-57 Personnel and Proposed AHTS Personnel

Personnel Type	***Baseline***	***Proposed Action***	***Change***
Training Air Wing Five Personnel: Officer	10	20	10
Training Air Wing Five Personnel: Enlisted	2	2	0
Training Air Wing Five Personnel: Contractor	41	41	0
Helicopter Instructor Training Unit Personnel: Officer	7	7	0
Helicopter Instructor Training Unit Personnel: Enlisted	0	0	0
Helicopter Instructor Training Unit Personnel: Contractor	1	5	4
Contractor Academic Instructors	35	50	15
Contractor Flight Simulators Instructors	32	36	4
Contract Maintenance Personnel	0	0	0
Helicopter Training Squadron Personnel: Officer	174	174	0
Helicopter Training Squadron Personnel: Enlisted	14	14	0
Helicopter Training Squadron Personnel: Contractor	32	32	0
Total	**348**	**381**	**33**

It is estimated that personnel associated with the Proposed Action would be accompanied by an average of 1.2 family members. This planning factor is applied based on a U.S. DoD demographic survey and profile of the military community (Department of Defense, 2014a). Active duty members include both married and single members, and family members include spouses, children, and adult dependents. Personnel and family members would be expected to locate to NAS Whiting Field and the surrounding areas.

2.4 Alternatives Considered but not Carried Forward for Detailed Analysis

The following alternatives support the purpose of and need for the Proposed Action, as well as meet the considerations in Section 2.2, but were not carried forward for detailed analysis in this EA because they would not appreciably change the potential environmental impacts of the action.

- Site at Other Locations at NAS Whiting Field. The Navy considered an alternative that would site the new simulator training and maintenance facilities at other locations on NAS Whiting Field. However, placement of new facilities anywhere near the existing flight training infrastructure would result in the same potential impacts as those associated with the Action Alternative because the natural resources are consistent throughout the potential construction sites. As a result, this alternative is not carried forward in this document for detailed analysis.

- Evaluate Additional Types of Commercial Helicopter. Several commercial helicopter models are anticipated to meet the AHTS requirements for the TH-XX. However, the specific information for these models needed to conduct a detailed noise and air quality impact analyses is not available to support timely analysis of the potential impacts of the Proposed Action. Because the noise and emissions data for any commercial options ultimately selected in the ongoing procurement process is anticipated to be consistent with, or less than, the surrogate TH-XX, this alternative is not carried forward in this document for detailed analysis.

The following additional options were not considered viable alternatives as they either do not support the purpose of and need for the Proposed Action, or do not meet the considerations in Section 2.2.

- Increased Use of Simulators. Based on the increased demand for student pilots, there is a corresponding increase in the demand for flight simulator use. However, increasing the proportionate use of simulators in pilot training is not considered as an alternative because it would not meet the purpose of and need of the Proposed Action. As noted above, Training Air Wing Five's established TH-57 training syllabus has been developed over decades to safely and effectively train new pilots and, consistent with industry standards, requires approximately 60 percent helicopter and 40 percent simulator training. Altering this ratio would not meet the training requirement. Simulator training complements but cannot replace the experience provided by helicopter flight training.
- Changing Flight Training Operations at NOLFs. Changing how the NOLFs are used for training (e.g., redistributing the flight operations between the NOLFs, changing the types of operations at the NOLFs, or only using some of the NOLFs for training) is not considered as an alternative because each NOLF has a different configuration, location, and layout that is designed to accommodate specific types of training and allow student pilots to complete the various elements of the pilot training curriculum on a continuous basis. The NOLFs are needed to support 180 or more sorties per day. Due to the limited number of aircraft that can operate at one time at any one airfield for safety reasons, numerous options must be available for aircrews to complete their training. Weather conditions also require NOLFs dispersed throughout the local area to allow training to continue when weather precludes the use of some airfields. Additionally, due to the varied and diverse training missions in the syllabus (e.g., contact, instrument, formation, night vision devices, etc.), certain NOLFs are used for specific training events to maximize training quality and safety. Student-only flights (solos) have more stringent operating requirements that limit the NOLFs they can use. Given these varied factors, the current balance of operations at each airfield has developed over time and operational experience to properly reflect and support the capabilities necessary to support the full training curriculum and production requirements. Any significant redistributions between, or limitations placed on, one or more NOLFs would negatively impact Training Air Wing Five's ability to safely, effectively, and efficiently train mission capable pilots.
- Transition to the AHTS at a Location other than NAS Whiting Field. The Navy did not consider an alternative that would implement the AHTS at an airfield other than NAS Whiting Field and its

NOLFs. This option would not support the purpose of and need for the Proposed Action, as the replacement of the TH-57 helicopter could not occur at a location where the TH-57 is not already based.

As a result, this EA addresses the No Action Alternative and the Proposed Action for modernizing the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing Five located at NAS Whiting Field and its associated NOLFs by implementing the AHTS.

2.5 Best Management Practices Included in the Proposed Action

This section presents an overview of the BMPs that are incorporated into the Proposed Action in this document. BMPs are existing policies, practices, and measures that the Navy would adopt to reduce the environmental impacts of designated activities, functions, or processes. Although BMPs mitigate potential impacts by avoiding, minimizing or reducing/eliminating impacts, BMPs are distinguished from potential mitigation measures because BMPs are (1) existing requirements for the Proposed Action, (2) ongoing, regularly occurring practices, or (3) not unique to this Proposed Action. In other words, the BMPs identified in this document are inherently part of the Proposed Action and are not potential mitigation measures proposed as a function of the NEPA environmental review process for the Proposed Action. Table 2.5-1 includes a list of BMPs.

Table 2.5-1 Best Management Practices

BMP	*Description*	*Impacts Reduced/Avoided*
General Construction Best Management Practices	These requirements are incorporated into the construction contract and include adherence to construction permit requirements, stormwater management, erosion control, maintenance of construction equipment, spill containment, and spill response.	Reduces potential water quality impacts.
Bird/Animal Aircraft Strike Hazard (BASH) Plan Implementation	BASH Plan minimizes aircraft risks from potentially hazardous wildlife strikes. The program establishes methods to decrease the attractiveness of the airfield/nearby areas to birds and animals, and provides guidelines for dispersing birds and animals when they compromise the safety of operations on the airfield.	Reduces impacts to biological resources and airfield safety related to aircraft strikes.
Airfield Operating Procedures	Management of procedures for aircraft approach and departure patterns.	Reduces potential for impacts to safety.
Air Installation Compatible Use Zones (AICUZ)	Balance the need for military aircraft operations and community concerns over aircraft noise and accident potential.	Protects the public's health, safety, and welfare and prevents encroachment from degrading the operational capability.
Encroachment Partnering	Programs such as Readiness and Environmental Protection Integration and Joint Land Use Studies protect these military missions by helping remove or avoid land use conflicts near installations and addressing regulatory restrictions that inhibit military activities.	Protects the public's health, safety, and welfare and prevents encroachment from degrading the operational capability.

Table 2.5-1 Best Management Practices

BMP	***Description***	***Impacts Reduced/Avoided***
Community Outreach	Open lines of communication with the surrounding community and stakeholders through noise complaint hotlines, public meetings, and newspaper advertisements.	Prevents encroachment from degrading the operational capability.
Leadership in Energy and Environmental Design	Construction projects would incorporate Leadership in Energy and Environmental Design and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy conservation where possible.	Leadership in Energy and Environmental Design buildings save energy, water, resources, generate less waste and support human health. Leadership in Energy and Environmental Design buildings attract tenants, cost less to operate and boost employee productivity and retention.
Low Impact Development	The term Low Impact Development refers to systems and practices that use or mimic natural processes that result in the infiltration, evapotranspiration or use of stormwater in order to protect water quality and associated aquatic habitat.	Provides habitat, flood protection, cleaner air and cleaner water. Low Impact Development practices aim to preserve, restore, and create green space using soils, vegetation, and rainwater harvest techniques.

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3 Affected Environment and Environmental Consequences

This chapter presents a description of the environmental resources and baseline conditions that could be affected from implementing the alternatives and an analysis of the potential direct and indirect effects of each alternative.

All potentially relevant environmental resource areas were initially considered for analysis in this Environmental Assessment (EA). In compliance with the National Environmental Policy Act (NEPA), the Council on Environmental Quality (CEQ), and the United States (U.S.) Department of Navy (hereinafter, referred to as the Navy) guidelines, the discussion of the affected environment (i.e., existing conditions) focuses only on those resource areas potentially subject to impacts. Additionally, the level of detail used in describing a resource is commensurate with the anticipated level of potential environmental impact.

"Significantly," as used in NEPA, requires considerations of both context and intensity. Context means that the significance of an action must be analyzed in several contexts such as society as a whole (e.g., human, national), the affected region, the affected interests, and the locality. Significance varies with the setting of a proposed action. For instance, in the case of a site-specific action, significance would usually depend on the effects in the locale rather than in the world as a whole. Both short- and long-term effects are relevant. Intensity refers to the severity or extent of the potential environmental impact, which can be thought of in terms of the potential amount of the likely change. In general, the more sensitive the context, the less intense a potential impact needs to be in order to be considered significant. Likewise, the less sensitive the context, the more intense a potential impact would be expected to be significant.

This section includes air quality, water resources, cultural resources, biological resources, noise, land use, infrastructure, public health and safety, hazardous materials and wastes, and environmental justice.

The potential impacts to the following resource areas are considered to be negligible or non-existent so they were not analyzed in detail in this EA:

Airspace: Similar to existing TH-57 flight training operations, proposed TH-XX flight training operations would be conducted primarily at Whiting Field South and Navy Outlying Landing Fields (NOLFs) Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw, and TH-XX would continue to fly in and out of local municipal airports as necessary, including Pensacola International Airport and Peter Prince/Milton Airport among others, in executing flight training curriculum to gain required operational experience in Federal Aviation Administration-controlled airspace. Training activities at Federal Aviation Administration-controlled fields and airspace are conducted on a space available basis and could occur at other non-military airfields when available and feasible for use. All training operations would continue to observe all Federal Aviation Administration flight rules. Use of municipal airports by military aircraft is consistent with Federal Aviation Administration regulations and airport Master Plans.. Proposed TH-XX flight training operations at these existing airfields and within airspace currently utilized by Training Air Wing Five, as shown in Figure 2.3-1, would follow established course rules and published operating procedures (Commander, Training Air Wing Five, 2019). Since TH-XX flight training would be very similar to TH-57 flight training, the overall types of operations at Whiting Field South and its NOLFs, Pensacola International Airport, and Peter Prince/Milton Airport are not expected to be affected by the transition to the TH-XX. The Proposed Action includes a 22 percent increase in the number of TH-XX flight training operations at Whiting Field South and its NOLFs. However, TH-XX flight training operations are not anticipated to exceed military aviation activity forecasts at Pensacola International Airport (Pensacola

International Airport, 2018) or Peter Prince/Milton Airport (Santa Rosa County, 2017) because: 1) TH-XX would have the capability to fly farther distances than the TH-57, allowing instrument flight training to be conducted at other municipal airports in addition to Pensacola International Airport; 2) some TH-57 nighttime flights previously conducted at Peter Prince/Milton Airport were shifted to NOLF Site X when it became operational in 2019 providing a second NOLF for nighttime operations; and 3) new TH-XX helicopters would require less maintenance and would be available to conduct more flight training operations during the weekdays. The Proposed Action does not involve any changes to the controlled airspace around Whiting Field South and its NOLFs. The Proposed Action would not change any airspace boundaries or altitudes; no requests would be made to change any of the current Federal Aviation Administration operating regulations. When flying between Whiting Field South and the NOLFs, Pensacola International Airport, and Peter Prince/Milton Airport, Training Air Wing Five helicopters operate within Alert Area A-292 and/or Class C/D/E/G airspace. General aviation would continue to have access to and be able to use this airspace. Both military and general aviation aircraft would continue to be required to observe all Federal Aviation Administration flight rules, which govern such things as operating near other aircraft, right-of-way rules, speed, and minimum altitudes. Therefore, negligible impacts to airspace would occur.

Visual Resources: The Proposed Action would involve the development of facilities and infrastructure at Naval Air Station (NAS) Whiting Field to support the necessary training, maintenance, and operational requirements of the Advanced Helicopter Training System (AHTS). The number of flight training operations would increase by 22 percent, but the overall types of flight training operations would remain generally the same as current conditions, even when considering the proposed changes in operational tactics. Military aircraft from NAS Whiting Field and its NOLFs have been conducting flight training operations in Santa Rosa County since the 1940s. The proposed TH-XX flight training operations would not contrast with the natural landscape differently than the current TH-57 operations. Therefore, impacts to visual resources would be negligible.

Socioeconomics: The Proposed Action would involve an increase of approximately 33 military personnel and contractors, which amounts to less than 1 percent increase in personnel at NAS Whiting Field. This personnel increase would have a negligible economic effect. Facility construction over the 8-year period would have a minor, short-term, beneficial impact on the economy of Santa Rosa County with the context of the substantial $1.4 billion annual economic impact the installation has on the county (Enterprise Florida, 2017). The effects from personnel and construction would not result in changes to the human or natural environment of the affected areas that would alter the job, business, or housing markets. Aircraft noise could negatively affect property values. Economic studies have analyzed the impacts of noise on the sale price of properties and have discovered a correlation between noise and the sale price of properties, although many other factors other than noise affect values (Fidell, 1996). Real property values are dynamic and influenced by a combination of factors, including market conditions, neighborhood characteristics, and individual real property characteristics (e.g., property age, size, and amenities). The degree to which a particular factor may affect property values is influenced by many other factors that fluctuate widely with time and market conditions. No definitive federal standards exist for quantifying the impact of aircraft, and given the dynamic nature of the real estate market and the varying degree to which any combination of factors may affect the value of a particular property, it is not possible to quantify how a potential change in aircraft operations may affect property values. Flight training operations under the Proposed Action would result in new noise exposure, from 65 to 70 decibel (dB) day-night average sound level (DNL), to 56 residences near NOLF Spencer and 25 residences near Santa Rosa. Noise levels above 65 dB DNL would not affect off-base residential properties at Whiting Field South and NOLFs Pace, Site X, Harold, and Choctaw. The effects from noise greater than 65 dB DNL on house values would vary from location to location and could be considered small compared to non-noise factors. Therefore, only negligible impacts to socioeconomics would occur.

Transportation: The Proposed Action would add 33 new personnel to the number of commuters to the installation. Even if all new personnel traveled to the installation daily, the increase in average daily traffic on the roadway network would only be approximately 66 vehicle trips. This would be a negligible, long-term impact on transportation. Assuming a 5-day work week during the 8-year construction period, an estimated 5 heavy trucks and 30 construction worker vehicles would travel to the site each work day on the roadway network (refer to *Appendix A, Air Quality Calculations*, for vehicle information). These vehicles would add an average of approximately 70 daily construction vehicle trips to existing traffic conditions in the study area. In the context of existing traffic levels on the NAS Whiting Field roadway access network and construction vehicles traveling to the installation, this temporary increase in worker vehicle and truck trips during facility construction would have a negligible impact on transportation. Therefore, negligible impacts to transportation would occur.

Geological Resources: The Proposed Action would have no impact on site geology and only minor, localized impacts on topography from grading activities associated with the construction of the AHTS facilities. These impacts to topography would not be significant. Some soil impacts would be temporary, for example, in the areas around the buildings to be demolished. Proposed construction of the temporary and permanent AHTS facilities, would involve soil impacts to approximately 6.5 acres. Best management practices (BMPs) for reducing soil erosion are included in the NAS Whiting Field Stormwater Pollution Prevention Plan (SWPPP) and are required by the Clean Water Act (CWA), Chapter 582 of the Florida Statutes, as well as the NAS Whiting Field Installation Natural Resources Management Plan (INRMP). BMPs would be implemented during demolition and construction to minimize direct and indirect adverse impacts due to soil loss from erosion and to stabilize soils once construction is completed. Therefore, negligible impacts to geological resources would occur.

3.1 Air Quality

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

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

3.1.1 Regulatory Setting

3.1.1.1 Criteria Pollutants and National Ambient Air Quality Standards

The principal pollutants defining the air quality, called "criteria pollutants," include carbon monoxide (CO), sulfur dioxide (SO_2), nitrogen dioxide (NO_2), ozone (O_3), particulate matter less than or equal to 10 microns in diameter (PM_{10}), particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead. CO, SO_2, lead, and some particulates are emitted directly into the atmosphere from emissions sources. O_3, NO_2, and some particulates are formed through atmospheric chemical reactions that are influenced by weather, ultraviolet light, and other atmospheric processes.

Under the Clean Air Act, the U.S. Environmental Protection Agency (USEPA) has established National Ambient Air Quality Standards (NAAQS) (40 Code of Federal Regulations [CFR] part 50) for these pollutants. NAAQS are classified as primary or secondary. Primary standards protect against adverse health effects; secondary standards protect against welfare effects, such as damage to farm crops and vegetation and damage to buildings. Some pollutants have long-term and short-term standards. Short-term standards are designed to protect against acute, or short-term, health effects, while long-term standards were established to protect against chronic health effects.

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

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

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

3.1.1.2 Mobile Sources

Hazardous air pollutants emitted from mobile sources are called Mobile Source Air Toxics. Mobile Source Air Toxics are compounds emitted from highway vehicles and non-road equipment that are known or suspected to cause cancer or other serious health and environmental effects. In 2001, USEPA issued its first Mobile Source Air Toxics Rule, which identified 201 compounds as being hazardous air pollutants that require regulation. A subset of six of the Mobile Source Air Toxic compounds was identified as having the greatest influence on health and included benzene, butadiene, formaldehyde, acrolein, acetaldehyde, and diesel particulate matter. More recently, USEPA issued a second Mobile Source Air Toxics Rule in February 2007, which generally supported the findings in the first rule and provided additional recommendations of compounds having the greatest impact on health. The 2007 rule also identified several engine emission certification standards that must be implemented (40 CFR parts 59, 80, 85, and 86; Federal Register Volume 72, No. 37, pp. 8427–8570, 2007). Unlike the criteria pollutants, there are no NAAQS for benzene and other hazardous air pollutants. The primary control methodologies for these pollutants for mobile sources involves reducing their content in fuel and altering the engine operating characteristics to reduce the volume of pollutant generated during combustion.

Mobile Source Air Toxics would be the primary hazardous air pollutants emitted by mobile sources during construction. The equipment used during construction would likely vary in age and have a range of pollution reduction effectiveness. Construction equipment, however, would be operated intermittently for the duration of construction, and would produce negligible ambient hazardous air pollutants in a localized area. Additionally, small quantities of hazardous air pollutants would be generated by helicopters flying below 3,000 feet above ground level. For all mobile sources, emissions of air toxics are small compared to emissions of criteria pollutants, and would be dispersed across large distances. Therefore, Mobile Source Air Toxic emissions are not considered further in this analysis.

3.1.1.3 Stationary Sources

Stationary sources of air pollution, such as boilers, power plants, and refineries, emit several different air pollutants.

New Source Review (Pre-construction Permit)

New stationary sources to be introduced to NAS Whiting Field would require permitting under the Clean Air Act New Source Review program. The minor New Source Review program is for pollutants from stationary sources that do not require Prevention of Significant Deterioration or nonattainment New Source Review permits. The purpose of minor New Source Review permits is to prevent the construction of sources that would interfere with attainment or maintenance of a NAAQS limit or violate the control strategy in nonattainment areas. Also, minor New Source Review permits often contain permit conditions to limit the sources emissions to avoid Prevention of Significant Deterioration or nonattainment New Source Review. New Source Review requirements are typically rolled into Title V Operating Permits during renewal.

Title V (Operating Permit)

The Title V Operating Permit Program consolidates all Clean Air Act requirements applicable to the operation of a source, including requirements from the State Implementation Plan, pre-construction permits, and the air toxics program. It applies to stationary sources of air pollution that exceed the major stationary source emission thresholds, as well as other non-major sources specified in a particular regulation. The program includes a requirement for payment of permit fees to finance the operating permit program whether implemented by USEPA or a state or local regulator. Navy installations subject to Title V permitting shall comply with the requirements of the Title V Operating Permit Program, which are detailed in 40 CFR Part 70 and all specific requirements contained in their individual permits.

3.1.1.4 Greenhouse Gases

GHGs are gas emissions that trap heat in the atmosphere. These emissions occur from natural processes and human activities. Scientific evidence indicates a trend of increasing global temperature over the past century due to an increase in GHG emissions from human activities. The climate change associated with this global warming is producing negative economic and social consequences across the globe.

Many scientific studies correlate the observed rise in global annual average temperature and the resulting change in global climate patterns with the increase in GHGs in the Earth's atmosphere from human (anthropogenic) activity (Intergovernmental Panel on Climate Change, 2013). The primary driver of climate change is thought to be emissions of GHGs, which are the result of the burning of fossil fuels for energy, deforestation, emissions released by landfills, the production of certain industrial products, the application of agricultural fertilizers, and the raising of livestock. These GHGs include carbon dioxide (CO_2), methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons, sulfur hexafluoride, and other fluorinated gases including nitrogen trifluoride and hydrofluorinated ethers (USEPA, 2016c).

Each GHG is assigned a global warming potential, which refers to the ability of a gas or aerosol to trap heat in the atmosphere (USEPA, 2016a). The GHGs with larger global warming potentials cause more heat to be retained per unit mass. This additional heat can disrupt the natural balance of global energy inputs, which leads to various changes in long-term atmospheric conditions (i.e., climate), depending on the resulting environmental feedback mechanisms (e.g., changes in snow and ice cover) (Intergovernmental Panel on Climate Change, 2013). The global warming potential rating system is standardized to CO_2, which has a value of one. The equivalent CO_2 rate of various GHGs is calculated by multiplying the emissions of each GHG by its global warming potential and adding the results together to produce a single, combined emissions rate representing all GHGs, referred to as the CO_2 Equivalent, abbreviated as CO_2e (USEPA, 2016a). In the United States, federal agencies and state governments have implemented programs and policies in an attempt to reduce GHG emissions to mitigate the extent of climate change and adapt to the impacts that are likely to occur.

Federal Policies Related to Climate Change

Legislation includes the Energy Policy Act of 2005, which addresses energy efficiency, renewable energy, energy tax incentives, and ethanol in motor fuels (USEPA, 2016d), and the Energy Independence and Security Act of 2007, which reinforces energy reduction goals for federal agencies. Under the Clean Air Act, the USEPA has developed and implemented GHG emission standards for stationary sources through the Greenhouse Gas Tailoring Rule and the Greenhouse Gas Reporting Program (USEPA, 2016e).

EO 13834, Efficient Federal Operations, requires federal agencies to meet statutory requirements in a way that increases efficiency, optimizes performance, eliminates unnecessary use of resources, and protects the environment. Agencies prioritize reduction of waste, cutting costs, and enhancing resilience of federal infrastructure and operations when implementing this policy. Agencies also track and report energy management activities, performance improvements, cost reductions, GHG emissions, energy and water savings, and other appropriate performance measures.

Department of Defense Policies Related to Climate Change

In accordance with 10 United States Code (U.S.C) Section 101(e)(8), military installation resilience refers to the capability of a military installation to avoid, prepare for, minimize the effect of, adapt to, and recover from extreme weather events, or from anticipated or unanticipated changes in environmental conditions, that do, or have the potential to, adversely affect the military installation or essential transportation, logistical, or other necessary resources outside of the military installation that are necessary in order to maintain, improve, or rapidly reestablish installation mission assurance and mission-essential functions.

The Department of Defense (DoD) and the Navy have established various directives pertaining to climate change, including DoD Directive 4715.21, from January 2016, which integrates climate change considerations into all aspects of the department (Department of Defense, 2016a). DoD components are charged with assessing and managing risks, and mitigating the effects of climate change on natural and cultural resource management, force structure, basing, and training and testing activities in the field environment.

Additionally, the DoD 2016 *Operational Energy Strategy* (Department of Defense, 2016b) sets forth plans to reduce the demand for energy and secure energy supplies. This policy also directs DoD components to reduce GHG emissions from operational forces. Other recent policies, updates, and/or directives include the Fiscal Year 2015 DoD *Sustainability Performance Plan* (Department of Defense, 2015) and the 2014 *Climate Change Adaptation Roadmap* (Department of Defense, 2014b), which focus on various actions DoD is taking to increase its resilience to the impacts of climate change. The Secretary of the Navy set goals to improve energy security, increase energy independence, and reduce the reliance on petroleum by increasing the use of alternative energy (Department of the Navy, 2010).

In an effort to reduce energy consumption, reduce GHGs, reduce dependence on petroleum, and increase the use of renewable energy resources, the Navy has implemented a number of renewable energy projects. The Navy has established Fiscal Year 2020 GHG emissions reduction targets of 34 percent from a Fiscal Year 2008 baseline for direct GHG emissions and 13.5 percent for indirect emissions. Examples of Navy-wide GHG reduction projects include energy efficient construction, thermal and photovoltaic solar systems, geothermal power plants, and the generation of electricity with wind energy. The Navy continues to promote and install new renewable energy projects.

State Policies Related to Climate Change

In the Southeast, communities must prepare for increases in precipitation, sea-level rise, and heat waves. The Florida peninsula has warmed more than one degree Fahrenheit during the last century. The sea is rising about one inch every decade, and heavy rainstorms are becoming more severe. In the coming decades, rising temperatures are likely to increase the frequency of unpleasantly hot days (USEPA, 2016b).

The Governor of Florida’s Action Team on Energy and Climate Change published a comprehensive Energy and Climate Change Action Plan, which addressed strategies for reducing GHG emissions and long-term strategies for reducing climate impacts to society, public health, economy, and natural environment. This action plan included projected impacts to Florida from climate change, such as temperature changes, precipitation changes, sea-level rise, and extreme weather, along with adaptation strategies for improving Florida’s resilience to these impacts. The action plan also provided policy recommendations for reducing GHG emissions and increasing energy security. These policy recommendations relate to energy supply and demand; a cap-and-trade system; transportation and land use; and agriculture, forestry, and waste management (Florida Governor's Action Team on Energy & Climate Change, 2008).

Local Policies Related to Climate Change

The 2016 – 2020 Local Mitigation Strategy Plan for the City of Gulf Breeze, the Town of Jay, the City of Milton, and Santa Rosa County, Florida identified and assessed the natural and technological risks of the County and its municipalities, and developed local strategies to reduce the impact of potential future disasters. This multi-jurisdictional plan focused on the risks posed by natural disasters and the vulnerability of the community to those risks. Several risks were analyzed including flooding, severe storms and lightning, tornadoes and waterspouts, wildfires, heat waves and droughts, winter storms and freezes, erosion, and tsunamis/rogue waves. The local mitigation strategy identified specific measures such as structural techniques (e.g., elevation of structures to protect from flood damage), environmental interventions (i.e., actions that reduce the vulnerability of communities by armoring them against the elements), and non-structural interventions (e.g., policies for avoiding hazard impacts and zoning restrictions) (Santa Rosa County Local Mitigation Strategy Task Force, 2018). The local mitigation strategy is implemented in part through policies in Santa Rosa County Comprehensive Plan (Santa Rosa County, 2016)

3.1.2 Affected Environment

NAS Whiting Field and NOLFs Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw are located in Santa Rosa County, which is within the Mobile (Alabama)-Pensacola-Panama City (Florida)-Southern Mississippi Interstate Quality Control Region. The Florida Department of Environmental Protection is responsible for implementing and enforcing state and federal air quality regulations in Florida. Santa

Rosa County is classified by the USEPA as unclassified/attainment for all criteria pollutants. Therefore, a General Conformity evaluation is not required for federal actions in this county.

The most recent available inventory of emissions in Santa Rosa County is shown in Table 3.1-1. Volatile organic compound (VOC) and nitrogen oxides (NO_x) emissions are used to represent ozone generation because they are precursors of ozone.

Table 3.1-1 Santa Rosa County Air Emissions Inventory (2014)

Location	*VOC (tpy)*	*CO (tpy)*	*NO_x (tpy)*	*SO_2 (tpy)*	*PM_{10}/ $PM_{2.5}$ (tpy)*	*CO_2e (tpy)*
Santa Rosa County 2014	47,750	64,574	6,067	1,788	15,447	1,676,924

Source: (USEPA, 2018a).
Note: tpy = tons per year

Table 3.1-2 shows air pollutant emissions from flight operations at Whiting Field South and the NOLFs under baseline conditions; this includes engine maintenance operations that occur at Whiting Field South.

Table 3.1-2 Annual Flight Operations and Engine Maintenance Air Emissions at Whiting Field South and NOLFs for Baseline

Location	*VOC (tpy)*	*CO (tpy)*	*NO_x (tpy)*	*SO_2 (tpy)*	*PM_{10}/ $PM_{2.5}$ (tpy)*	*CO_2 (tpy)*
Whiting Field South	27.0	35.8	2.3	1.7	0.1	2,378
NOLF Spencer	10.2	20.1	3.8	2.5	0.2	3,613
NOLF Pace	5.0	9.7	2.0	1.3	0.1	1,826
NOLF Site 8	4.0	6.9	1.4	0.9	0.0	1,243
NOLF Harold	3.9	7.4	1.4	0.9	0.1	1,319
NOLF Santa Rosa	7.7	15.3	2.9	1.9	0.1	2,770
NOLF Choctaw	0.6	1.0	0.2	0.1	0.0	174
Engine Maintenance Tests	103	126	4	4	0	4,953
Total	**161**	**222**	**18**	**13**	**1**	**18,276**

Note: NOLF Site X was not in existence during the years when baseline operations were collected.
tpy = tons per year

The USEPA reports that 147 million metric tons of CO_2e were emitted in Florida in 2017 (USEPA, 2018b). A majority of Florida's GHGs are from fossil fuel combustion related to consumer demand for electricity and transportation (Florida Governor's Action Team on Energy & Climate Change, 2008).

3.1.3 Environmental Consequences

Air Quality Potential Impacts:

- No Action: The Proposed Action would not be implemented and the affected environment would remain unchanged; therefore, no significant impacts.
- Action Alternative: No significant impacts on air quality would occur. Emissions of criteria pollutants and GHGs associated with helicopter operations and facility construction would increase relative to emissions under the No Action Alternative, but this increase would be too small to result in significant impacts on air quality.

Effects on air quality are based on estimated changes in direct and indirect emissions associated with the Action Alternative and the impact on regional air quality from the projected changes in emissions. The region of influence (ROI) for assessing air quality impacts is the county in which the project is located, Santa Rosa County. Santa Rosa County is classified by the USEPA as unclassified/attainment for all criteria pollutants. As a result, The Clean Air Act General Conformity Rule is not applicable. Other federal laws, such as NEPA and its implementing regulations, require the analysis of the significance of air quality impacts. Estimated emissions from the alternatives are compared with the regional emissions (see Table 3.1-1) to assess the potential for increases in criteria pollutant concentrations. Air emissions from the No Action Alternative are compared to the baseline, and air emissions from the Action Alternative are compared to the No Action Alternative.

3.1.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and the AHTS would not be implemented. There would be no change to total number of annual TH-57 operations. However, some TH-57 flight operations would be redistributed to NOLF Site X as NOLF Site 8 is no longer operational. Other NOLFs would see small reductions in annual operations as portions of their operations would be redistributed to NOLF Site X. While the overall number of annual TH-57 operations in Santa Rosa County would not change, there would be small changes in the type of operations performed (more of some patterns, less of some other patterns). Under the No Action Alternative there would be a small beneficial change to baseline air quality in Santa Rosa County, as indicated in Table 3.1-3. Therefore, no significant impacts to air quality or air resources would occur with implementation of the No Action Alternative.

Table 3.1-3 Annual Flight Operations and Engine Maintenance Air Emissions Air Emissions at Whiting Field South and NOLFs for No Action Alternative

Location	*VOC (tpy)*	*CO (tpy)*	*NO_x (tpy)*	*SO_2 (tpy)*	*PM_{10}/ $PM_{2.5}$ (tpy)*	*CO_2 (tpy)*
Whiting Field South	27.0	35.8	2.3	1.7	0.1	2,378
NOLF Spencer	9.5	18.7	3.6	2.4	0.1	3,370
NOLF Pace	3.9	5.8	0.8	1.2	0.0	727
NOLF Site X	4.9	9.3	1.8	1.2	0.1	1,677
NOLF Harold	2.3	3.6	0.5	0.7	0.0	477
NOLF Santa Rosa	7.6	15.1	2.9	1.9	0.1	2,739
NOLF Choctaw	0.4	0.7	0.1	0.1	0.0	113
Engine Maintenance Tests	103	126	4	4	0	4,953
Total	**159**	**215**	**16**	**13**	**0**	**16,434**
Net Change from Baseline (Total)	-132	-179	-14	-12	0	-14,056
Net Change as Percentage of Regional Emissions	-0.3%	-0.3%	-0.2%	-0.6%	0.0%	-0.8%

Note: tpy = tons per year

3.1.3.2 Action Alternative (Preferred Alternative) Potential Impacts

Under the Action Alternative, the Navy would implement the AHTS at NAS Whiting Field and its NOLFs. The AHTS would involve the replacement of TH-57 with the TH-XX, replacement of existing ground based training systems (i.e., simulators), an increased operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities, and an increase in personnel.

Construction

Construction of both temporary and permanent structures would occur over an eight-year period. Construction emissions for temporary and permanent facilities were calculated to provide annual air emission estimates, which are provided in Table 3.1-4. Construction emissions from the Action Alternative would not result in significant impacts to air quality. Detailed information is contained in *Appendix A, Air Quality Calculations*.

Table 3.1-4 Average Annual Construction Air Emissions for Action Alternative

Action	*VOC (tpy)*	*CO (tpy)*	*NO_x (tpy)*	*SO_2 (tpy)*	*PM_{10} (tpy)*	*$PM_{2.5}$ (tpy)*	*CO_2e (tpy)*
Action Alternative	1.1	5.7	11.8	3.3	3.6	1.1	1,339

Note: tpy = tons per year

Operations

The transition of aircraft from the TH-57 to the TH-XX is evaluated using an existing, surrogate helicopter, the UH-72 Lakota. The UH-72 is a twin-engine aircraft; in that it is not yet known whether a single-engine or a twin-engine commercial helicopter will be selected as the TH-XX, using a twin-engine as the surrogate is considered the most conservative alternative for purposes of assessing environmental impact. The UH-72 Lakota helicopter is in production today and basic flight emissions data are available. In order to assess emissions associated with this helicopter, data on emissions from landings and take-offs were obtained from an emission inventory prepared by the Netherlands government. However, military use of the TH-XX will require specialized military pattern flight operations for which specific flight emissions data are not available. Emissions generated by the UH-72 for these patterns were estimated by comparing how military patterns effect the emissions of another (larger heavier) military helicopter, the UH-1N Huey Twin, for which the full range of emissions data are available. The UH-1N was not used as a surrogate itself because it is too large and powerful to provide a relevant direct comparison for TH-XX emissions; however, use of this data does provide a reasonable means for determining UH-72 Lakota emissions when flying military patterns. As discussed above, this, in turn, provides conservative (i.e., more likely higher) emissions data for this analysis of expected emissions from the TH-XX. The derived emission factors for the UH-72 were applied to the Action Alternative operations. Table 3.1-5 contains the modeled annual steady state emissions associated with the use of the TH-XX under the Action Alternative, as compared to the No Action Alternative and regional air emissions. Detailed calculations are provided in *Appendix A, Air Quality Calculations.*

Table 3.1-5 Average Annual Flight Operations and Engine Maintenance Air Emissions for Action Alternative

Action	*VOC (tpy)*	*CO (tpy)*	*NO_x (tpy)*	*SO_2 (tpy)*	*PM_{10}/ $PM_{2.5}$ (tpy)*	*CO_2 (tpy)*
Whiting Field South	66.0	89.4	8.3	4.6	0.3	7,062.0
NOLF Spencer	23.0	45.5	11.3	6.2	0.4	8,879.4
NOLF Pace	11.6	22.7	5.9	3.2	0.2	4,616.8
NOLF Site X	11.7	22.5	5.4	3.0	0.2	4,306.9
NOLF Harold	5.6	8.6	1.4	0.8	0.1	1,144.6
NOLF Santa Rosa	18.5	36.5	9.2	5.1	0.3	7,247.6
NOLF Choctaw	1.0	1.6	0.3	0.2	0.0	270.4
Engine Maintenance Tests	252	307	14	10	1	13,629
Total	**389**	**534**	**56**	**33**	**3**	**47,157**
Net Change from No Action (Total)	230	319	40	20	3	30,723
Net Change as Percentage of Regional Emissions	0.5%	0.5%	0.7%	1.1%	0.0%	1.8%

Note: tpy = tons per year

Relative to the No Action Alternative, selection of a twin-engine TH-XX to replace the single-engine TH-57 for the Action Alternative would result in an increase in all emissions of criteria pollutants. Proportionately, the greatest increase would be those of SO_2 emissions, and this SO_2 increase would represent approximately 1 percent of the current regional inventory for this pollutant. The UH-72 is larger than the commercially available helicopters that could be selected as the TH-XX, thus, UH-72 air emissions are expected to be higher than the air emissions that would actually be generated by TH-XX. Use of the UH-72 for analysis provides a conservative (i.e., higher) estimate of air emissions associated with flight training operations under the Action Alternative. Therefore, the Action Alternative is not anticipated to result in a significant deterioration of regional air quality. As a result, emissions from operations under the Action Alternative would not result in significant impacts to air quality.

Greenhouse Gases

Northwest Florida is threatened by sea level rise, record-breaking heat indexes, increasing frequency and duration of extreme heat and drought, heavier rain, wildfires, inland and coastal flooding, storm surges exacerbated by stronger hurricanes, and decreasing freshwater availability (Climate Central and ICF International, 2015). Whiting Field and the NOLFs comprise nearly 1 percent of the land in Santa Rosa County. Nearly all of these sites lie outside of areas anticipated to bear the primary brunt of flood events (Santa Rosa County, 2016), though Choctaw and to a lesser extent, Santa Rosa NOLFs are located in proximity to these low lying areas. Training activities could be impeded by more frequent and stronger storms, wildfires, extreme heat events and flooding in surrounding areas.

Implementation of the Action Alternative would contribute directly to emissions of GHGs from the combustion of fossil fuels. The proposed action would increase the annual operations at Whiting Field and the NOLFs by approximately 22 percent, which directly results in an increase in GHGs. At this time the new platform to replace the TH-57 has not been selected. The transition from the TH-57 to the TH-XX has been captured in this analysis using a surrogate derived from the UH-1N helicopter platform, modified to take into account the smaller size of the anticipated TH-XX selection. The surrogate used for this analysis consumes more than twice the fuel of the TH-57, resulting in GHG increases in the proposed action for otherwise identical flight activities.

The Department of Defense and Department of the Navy principles for high performance and sustainable building requirements will be included in the design and construction of the buildings proposed for Whiting Field South in accordance with federal laws and Executive Orders. Low Impact Development will be included in the design and construction of the buildings as appropriate, however, existing storm water channels and systems satisfy the Low Impact Development in downstream and upstream basins. Facilities will incorporate features that provide the lowest practical life cycle cost solutions satisfying the facility requirements with the goal of maximizing energy efficiency. Facilities will be designed to meet or exceed the useful service life specified in the DoD Unified Facility Criteria. Demolition, construction, and clearing activities would generate approximately 6,695 tons of CO_2e total, or 1,339 tons annually. To put these emissions in perspective, 1,339 tons of GHGs is the equivalent of 262 cars driving the national average of 11,500 miles per year (USEPA, 2018c). These GHG emissions would only be generated during the construction period. The operation of new facilities may result in a small increase in installation-related GHG emissions, primarily through the consumption of electricity and possibly through the combustion of fossil fuels on-site if any oil or natural gas boilers or other heating units are installed in the new facilities.

Once the AHTS implementation is complete, routine activities, such as flight training operations that generate mobile source emissions, would generate approximately 30,532 additional tons of CO_2e each year, as compared to the No Action Alternative and as detailed in *Appendix A, Air Quality Calculations*. This is the equivalent of putting 5,966 cars on the road to drive an average of 11,500 miles each year (refer to *Appendix A, Air Quality Calculations*). GHG emissions related to the Action Alternative are further evaluated in the cumulative impact analysis, Section 4.4.1 *Air Quality*.

Air Quality Impact Conclusion

Under the Action Alternative, emissions of criteria pollutants associated with construction and flight training operations would, based on the UH-72 surrogate, increase relative to the emissions under the No Action Alternative. The UH-72 is larger than the commercially available helicopters that could be selected as the TH-XX, thus, UH-72 air emissions are expected to be higher than the air emissions that would actually be generated by TH-XX. Use of the UH-72 for analysis provides a conservative (i.e., higher) estimate of air emissions associated with flight training operations under the Action Alternative. The region is currently in attainment for all NAAQS. Changes in mobile emissions from construction and flight training operations are not considered significant. Changes in mobile emissions are not subject to permit requirements or regulatory emission thresholds. The air emissions from training activities on the airfields would contribute to regional emission totals; however, the increased emissions would represent an average of less than 1 percent of the current regional inventory for all pollutants. Overall, implementation of the Action Alternative would not result in significant impacts to air quality.

3.2 Water Resources

This discussion of water resources includes groundwater, surface water, wetlands, and floodplains. This section also discusses the physical characteristics of wetlands. Wildlife and vegetation are addressed in Section 3.4, *Biological Resources*.

Groundwater is water that flows or seeps downward and saturates soil or rock, supplying springs and wells. Groundwater is used for water consumption, agricultural irrigation, and industrial applications. Groundwater properties are often described in terms of depth to aquifer, aquifer or well capacity, water quality, and surrounding geologic composition. Sole source aquifer designation provides limited protection of groundwater resources which serve as drinking water supplies.

Surface water resources generally consist of wetlands, lakes, rivers, and streams. Surface water is important for its contributions to the economic, ecological, recreational, and human health of a community or locale. A Total Maximum Daily Load is the maximum amount of a substance that can be assimilated by a water body without causing impairment. A water body can be deemed impaired if water quality analyses conclude that exceedances of water quality standards occur.

Wetlands are jointly defined by USEPA and U.S. Army Corps of Engineers as “those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.” Wetlands generally include “swamps, marshes, bogs and similar areas.”

Floodplains are areas of low-level ground present along rivers, stream channels, large wetlands, or coastal waters. Floodplain ecosystem functions include natural moderation of floods, flood storage and conveyance, groundwater recharge, and nutrient cycling. Floodplains also help to maintain water quality and are often home to a diverse array of plants and animals. In their natural vegetated state, floodplains slow the rate at which the incoming overland flow reaches the main water body. Floodplain boundaries are most often defined in terms of frequency of inundation, that is, the 100-year and 500-year flood. Floodplain delineation maps are produced by the Federal Emergency Management Agency and provide a basis for comparing the locale of the Proposed Action to the floodplains.

3.2.1 Regulatory Setting

The Safe Drinking Water Act is the federal law that protects public drinking water supplies throughout the nation. Under the Safe Drinking Water Act, the USEPA sets standards for drinking water quality. Groundwater quality and quantity are regulated under several statutes and regulations, including the Safe Drinking Water Act.

The CWA establishes federal limits, through the National Pollutant Discharge Elimination System (NPDES) program, on the amounts of specific pollutants that can be discharged into surface waters to restore and maintain the chemical, physical, and biological integrity of the water. The NPDES program regulates the discharge of point (i.e., end of pipe) and non-point sources (i.e., stormwater) of water pollution.

The Florida NPDES stormwater program requires construction site operators engaged in clearing, grading, and excavating activities that disturb one acre or more to obtain coverage under an NPDES Construction General Permit for stormwater discharges. Construction or demolition that necessitates an individual permit also requires preparation of a Notice of Intent to discharge stormwater and a SWPPP that is implemented during construction. As part of the 2010 Final Rule for the CWA, titled *Effluent Limitations Guidelines and Standards for the Construction and Development Point Source Category*, activities covered by this permit must implement non-numeric erosion and sediment controls and pollution prevention measures.

Wetlands are currently regulated by the U.S. Army Corps of Engineers under Section 404 of the CWA as a subset of all "Waters of the United States." Waters of the United States are defined as (1) traditional navigable waters, (2) wetlands adjacent to navigable waters, (3) nonnavigable tributaries of traditional navigable waters that are relatively permanent where the tributaries typically flow perennially or have continuous flow at least seasonally (e.g., typically 3 months), and (4) wetlands that directly abut such tributaries under Section 404 of the CWA, as amended, and are regulated by USEPA and the U.S. Army Corps of Engineers. The CWA requires that Florida establish a Section 303(d) list to identify impaired waters and establish Total Maximum Daily Loads for the sources causing the impairment.

Section 404 of the CWA authorizes the Secretary of the Army, acting through the Chief of Engineers, to issue permits for the discharge of dredge or fill into wetlands and other Waters of the United States. Any discharge of dredge or fill into Waters of the United States requires a permit from the U.S. Army Corps of Engineers.

Section 438 of the Energy Independence and Security Act establishes stormwater design requirements for development and redevelopment projects. Under these requirements, federal facility projects larger than 5,000 square feet (SF) must "maintain or restore, to the maximum extent technically feasible, the pre-development hydrology of the property with regard to the temperature, rate, volume, and duration of flow."

The Coastal Zone Management Act of 1972 (CZMA) provides assistance to states, in cooperation with federal and local agencies, for developing land and water use programs in coastal zones. Actions occurring within the coastal zone commonly have several resource areas that may be relevant to the CZMA. The CZMA regulatory setting discussion is provided in Section 3.6.1

EO 11990, *Protection of Wetlands,* requires that federal agencies adopt a policy to avoid, to the extent possible, long- and short-term adverse impacts associated with destruction and modification of wetlands and to avoid the direct and indirect support of new construction in wetlands whenever there is a practicable alternative.

EO 11988, *Floodplain Management*, requires federal agencies to avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development unless it is the only practicable alternative. Flood potential of a site is usually determined by the 100-year floodplain, which is defined as the area that has a one percent chance of inundation by a flood event in a given year.

EO 13690, *Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input*, amends EO 11988 and establishes the Federal Flood Risk Management Standard to improve the nation's resilience to current and future flood risks, which are anticipated to increase over time due to the effects of climate change and other threats.

3.2.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under water quality resources at NAS Whiting Field.

3.2.2.1 Groundwater

Several units define the regional groundwater flow system in northwest Florida. In descending order from the land surface, these units include the Sand-and-Gravel Aquifer that forms the surficial system, the Upper Floridan Aquifer that forms the Intermediate System regional confining unit, the Bucatunna Clay confining unit (where present), and the Lower Floridan Aquifer (Richards, 1998).

The Sand-and-Gravel Aquifer occurs from ground surface to a depth of approximately 220 feet below ground surface in the Milton area and consists of quartz sand, gravel, silt, and clay (Richards, 1998). Because the Sand-and-Gravel Aquifer is contiguous with the ground surface and recharge occurs principally by direct infiltration of precipitation, the aquifer is particularly susceptible to contamination from surface sources. The Sand-and-Gravel Aquifer is the primary source of groundwater in the Milton area, including NAS Whiting Field (Richards, 1998).

The base of the Sand-and-Gravel Aquifer coincides with the top of the Intermediate System. The Intermediate System ranges in thickness from approximately 50 feet in northeast Walton County to approximately 1,000 feet in southwestern Santa Rosa County. It restricts the vertical flow of groundwater between the overlying Sand-and-Gravel Aquifer and the underlying Lower Floridan Aquifer System (Ryan, et al., 1998). The Lower Floridan Aquifer is not utilized in the Milton area (Richards, 1998).

3.2.2.2 Surface Water

NAS Whiting Field is located in the Perdido-Escambia River basin. Drainage from NAS Whiting Field flows via drainage ditches and unnamed perennial streams westward into Clear Creek and eastward into Bucket Branch and Coldwater Creek, all of which eventually flow into the Blackwater River. Clear Creek is adjacent to NAS Whiting Field to the southwest, and Bucket Branch, which flows into Coldwater Creek, is located approximately 0.5 miles east of NAS Whiting Field.

NAS Whiting Field is situated in proximity to Clear Creek (west and south of the base) and Big Coldwater Creek (east of the base), both of which flow into the Blackwater River. The Navy Recreation Boat Docks at Whiting Park are located on the south bank of the Blackwater River, two miles east of downtown Milton. The Blackwater River, which originates north of Bradley, Alabama, flows approximately 58 miles south to enter Blackwater Bay. The river is classified as a Class III Outstanding Florida Water, with intended uses being recreation and the propagation and maintenance of healthy populations of fish and wildlife. The water quality of the Blackwater River has, in general, been characterized as excellent (NAS Whiting Field, 2013).

3.2.2.3 Wetlands

NAS Whiting Field contains approximately 24.9 acres of potential jurisdictional wetlands associated with Clear Creek, approximately 0.9 mile (4,750 feet) of waters of the U.S., and 10.8 acres of man-made ponds. The wetland community associated with Clear Creek is palustrine scrub-shrub wetlands (NAS Whiting Field, 2013).

According to National Wetland Inventory maps, four wetlands exist at NAS Whiting Field. These wetlands are classified as either palustrine, unconsolidated bottom, semi-permanent, excavated; or palustrine, unconsolidated bottom, saturated, excavated. These wetlands are not in the immediate vicinity of the developed area of the base (U.S. Fish and Wildlife Service, 2019). The nearest wetland is associated with Clear Creek, which is approximately 0.8 mile from the proposed construction area.

3.2.2.4 Floodplains

NAS Whiting Field does not lie within a Federal Emergency Management Agency-designated flood hazard area (Federal Emergency Management Agency, 2006). The nearest 10-year floodplain is associated with Clear Creek, which is approximately 0.8 mile from the proposed construction area.

3.2.3 Environmental Consequences

Water Resources Potential Impacts:

- No Action: the Proposed Action would not be implemented and the affected environment would remain unchanged; therefore, no significant impacts.
- Action Alternative: The Action Alternative would not result in significant impacts to water resources; water quality of surface water and groundwater would not be impacted; construction activities would avoid wetlands and floodplains impacts.

In this EA, the analysis of water resources looks at the potential impacts on groundwater, surface water, wetlands, and floodplains. Groundwater analysis focuses on the potential for impacts to the quality, quantity, and accessibility of the water. The analysis of surface water quality considers the potential for impacts that may change the water quality, including both improvements and degradation of current water quality. The impact assessment of wetlands considers the potential for impacts that may change the local hydrology, soils, or vegetation that support a wetland. The analysis of floodplains considers if any new construction is proposed within a floodplain or may impede the functions of floodplains in conveying floodwaters.

3.2.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to baseline water resources. Therefore, no significant impacts to water resources would occur with implementation of the No Action Alternative.

3.2.3.2 Action Alternative (Preferred Alternative) Potential Impacts

The study area for the analysis of effects to water resources associated with the Action Alternative includes the project area within NAS Whiting Field (see Figure 2.3-2). There are no anticipated impacts at the NOLFs since there would be no construction or demolition of facilities at the NOLFs.

The Navy is required to comply with the requirements of the CWA to preclude non-point source discharges. To this end, all construction activities would be performed in compliance with Florida's General Construction Stormwater Permit. Proposed demolition and construction activities would require preparation of a SWPPP and use of BMPs to limit potential erosion and runoff. Construction related erosion control measures would include, but not be limited to, erosion control blankets, soil stabilizers, temporary seeding, silt fencing, hay bales, sand bags, and storm drain inlet protection devices. Hazardous wastes generated by demolition and construction activities would be managed in a manner that would prevent these hazardous materials from leaking, spilling, and potentially polluting ground and surface waters, and in accordance with applicable Federal, State, and Local regulations (see Section 3.9 *Hazardous Materials and Wastes*).

Groundwater

The Action Alternative does not involve the use of groundwater. Under the Action Alternative, there would be no significant impacts on groundwater resources at NAS Whiting Field. The Action Alternative would have no direct impacts to groundwater. The increase in operations at NAS Whiting Field would result in an increased risk of aircraft mishaps that could require the use of aqueous film-forming foam and indirectly impact groundwater. The Navy's revised military specification for aqueous film-forming foam would continue to reduce the volume of per-polyfluoroalkyl substances (PFAS) containing aqueous film-forming foam at NAS Whiting Field. Additionally, the Navy's continued monitoring of PFAS in groundwater used for drinking water would be protective of human health and the environment. As a result, the Action Alternative would not result in significant impacts to groundwater. Groundwater contamination is addressed in Section 3.9.3 *Hazardous Materials and Wastes*, Environmental Consequences.

Surface Water

Under the Action Alternative, excavation and grading activities would result in the potential for increased sediment being carried to nearby surface waters. BMPs would be implemented to minimize these impacts during construction and to stabilize soils once construction is completed. BMPs for reducing soil erosion are included in the NAS Whiting Field SWPPP and would comply with the CWA, Chapter 582 of the Florida Statutes, as well as the NAS Whiting Field INRMP. Construction activities associated with new facilities at NAS Whiting Field would result in an increase of approximately 6.5 acres of impervious surface. This would result in increases to surface water runoff and potential impacts to surface water quality. Projects resulting in increases to impervious surface would need to be included in NAS Whiting Field SWPPP to address BMPs that will reduce or eliminate stormwater that may carry non-point source pollutants to nearby surface waters. Therefore, the Action Alternative would not result in significant impacts to surface water during an average precipitation year and successful implementation of effective BMPs.

Wetlands

There are no wetlands within or adjacent to the proposed project area. The nearest wetland is associated with Clear Creek, which is approximately 0.8 mile from the proposed construction area. The excess runoff resulting from the new site construction would follow existing drainage patterns and increase flow to the intermittent channels and drainages that support wetland ecosystems. However, due to the distance of the nearest wetland from the construction area and BMPs that would be implemented, it is not anticipated for any sediment to be deposited in these wetlands. Therefore, the Action Alternative would not result in significant impacts to wetlands.

Floodplains

Under the Action Alternative, the proposed project area at NAS Whiting Field would not be located on or in the vicinity of a designated 100-year floodplain. Therefore, the Action Alternative would not result in significant impacts on floodplains or floodplain management at NAS Whiting Field.

Water Resources Impact Conclusion

Overall, as discussed above, implementation of the Action Alternative at NAS Whiting Field would not result in significant impacts to water resources from proposed facility development. The water quality of surface water and groundwater would not be impacted. Construction activities would avoid wetlands and floodplains impacts, and would be performed in compliance with Florida's General Construction Stormwater Permit. A SWPPP and BMPs would be implemented to limit erosion and runoff into surface waters. Overall, implementation of the Action Alternative would not result in significant impacts to water resources at NAS Whiting Field or the region.

3.3 Cultural Resources

This discussion of cultural resources includes prehistoric and historic archaeological sites; historic buildings, structures, objects, sites, and districts; and physical entities and human-made or natural features important to a culture, a subculture, or a community for traditional, religious, or other reasons. Cultural resources can be divided into three major categories:

- Archaeological resources (prehistoric and historic) are locations where human activity measurably altered the earth or left deposits of physical remains.
- Architectural resources include standing buildings, structures, landscapes, and other built-environment resources of historic or aesthetic significance.
- Traditional cultural properties may include archaeological resources, structures, neighborhoods, prominent topographic features, habitat, plants, animals, and minerals that Native Americans or other groups consider essential for the preservation of traditional culture.

3.3.1 Regulatory Setting

Cultural resources are governed by federal laws and regulations, including the National Historic Preservation Act (NHPA), Archaeological and Historic Preservation Act, American Indian Religious Freedom Act, Archaeological Resources Protection Act of 1979, and the Native American Graves Protection and Repatriation Act of 1990. Federal agencies' responsibility for protecting historic properties is defined primarily by sections 106 and 110 of the NHPA. Section 106 requires federal agencies to take into account the effects of their undertakings on historic properties. Section 110 of the NHPA requires federal agencies to establish—in conjunction with the Secretary of the Interior—historic preservation programs for the identification, evaluation, and protection of historic properties. Cultural resources also may be covered by state, local, and territorial laws.

3.3.2 Affected Environment

Cultural resources listed in the National Register of Historic Places (NRHP) or eligible for listing in the NRHP are “historic properties” as defined by the NHPA. The list was established under the NHPA and is administered by the National Park Service on behalf of the Secretary of the Interior. The NRHP includes properties on public and private land. Properties can be determined eligible for listing in the NRHP by the Secretary of the Interior or by a federal agency official with concurrence from the applicable State Historic Preservation Office (SHPO). A NRHP-eligible property has the same protections as a property listed in the NRHP. The historical properties include archaeological and architectural resources.

The Navy has conducted inventories of cultural resources at NAS Whiting Field and the associated NOLFs to identify properties that are listed or potentially eligible for listing in the NRHP. These inventories are summarized in the NAS Whiting Field Integrated Cultural Resources Management Plan (ICRMP) (NAS Whiting Field, 2014). The Cultural Resources Assessment completed prior to the Navy’s acquisition of NOLF Site X concluded that no NRHP-listed or eligible archaeological or architectural resources are located at NOLF Site X (Department of the Navy, 2018a).

The Area of Potential Effects (APE) for cultural resources is the geographic area or areas within which an undertaking (project, activity, program, or practice) may cause changes in the character or use of any historic properties present. The APE is influenced by the scale and nature of the undertaking and may be different for various kinds of effects caused by the undertaking. For this Proposed Action, the Navy determined that the APE includes the areas underlying modeled noise contours ≥65 dB DNL, where noise from aircraft operations under the Proposed Action may affect historic properties (Figures 3.3-1 through 3.3-7) (Section 3.5.2.1 *Day-Night Average Sound Level*, discusses DNL noise contours). At NAS Whiting Field, the APE also includes the project area associated with the facility and infrastructure development for AHTS maintenance hangars and supporting ground based training systems (see Figure 3.3-1). For archaeological resources, potential effects would be limited to the areas within the APE at NAS Whiting Field where ground disturbance would occur. These areas encompass approximately 47 acres at NAS Whiting Field.

3.3.2.1 Archaeological Resources

An archaeological survey of the few high probability and undisturbed areas at NAS Whiting Field was completed in 2013 (Naval Facilities Engineering Command, Southeast, 2013). The APE at NAS Whiting Field has no probability of containing significant archaeological resources, as it has been heavily disturbed. Based on previous disturbance, the project will have no effects to archaeological sites (Naval Facilities Engineering Command, Southeast, 2013). NOLF Site X was surveyed for archaeological resources and no NRHP-listed or eligible archaeological or architectural resources were recorded (Department of the Navy, 2018a). NOLF Harold was surveyed for archaeological resources. Two new archaeological sites and 18 archaeological occurrences were recorded. One of the sites was a prehistoric lithic and ceramic scatter that was recommended not eligible for listing in the NRHP until further work could be completed to properly define the site boundary. The second site was the buried remains of an early twentieth century road. This site was recommended not eligible for listing in the NRHP (NAS Whiting Field, 2017). No archaeological surveys have been completed at NOLF Spencer, Pace, Santa Rosa, or Choctaw (NAS Whiting Field, 2014).

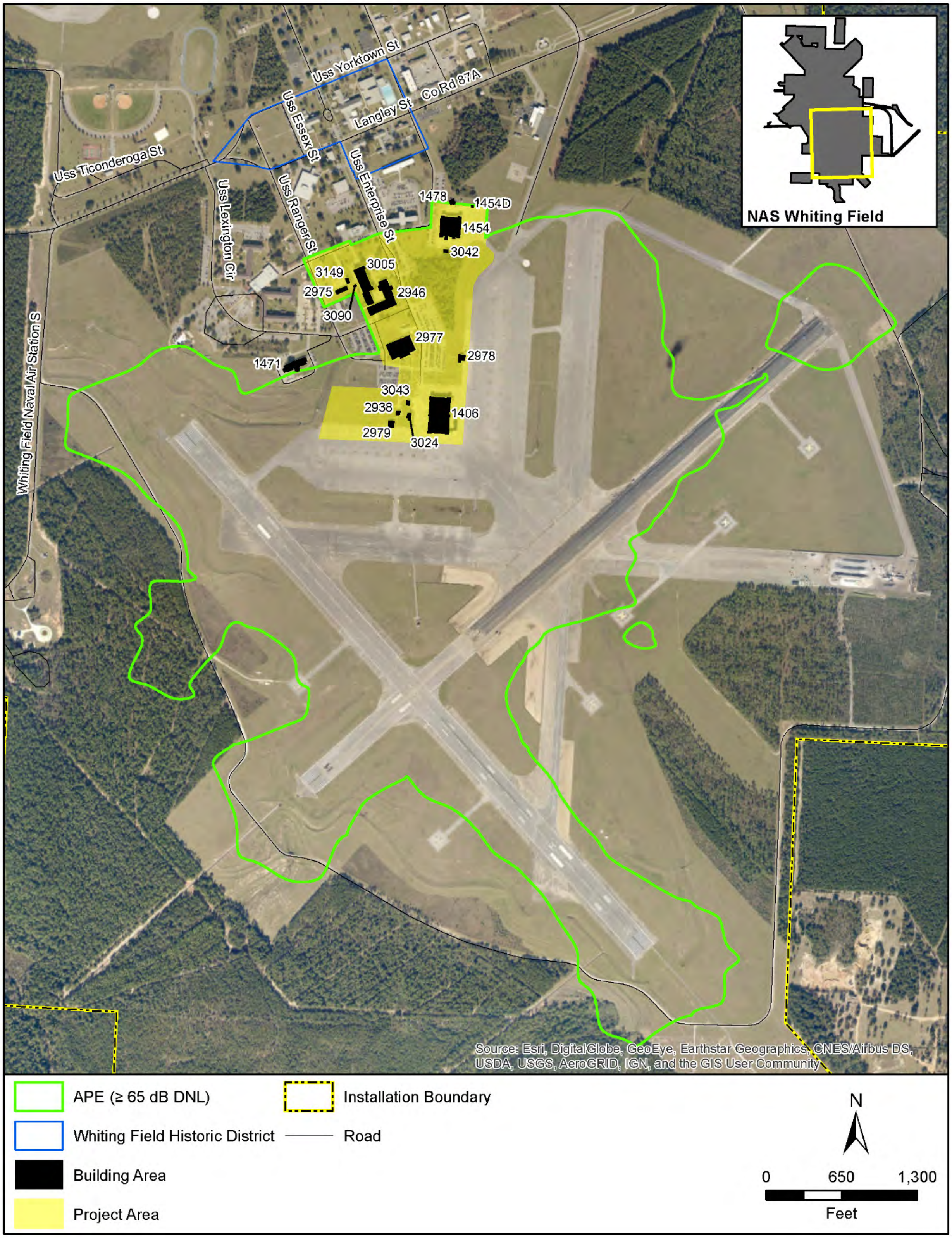


Figure 3.3-1 Whiting Field South Area of Potential Effects for Cultural Resources

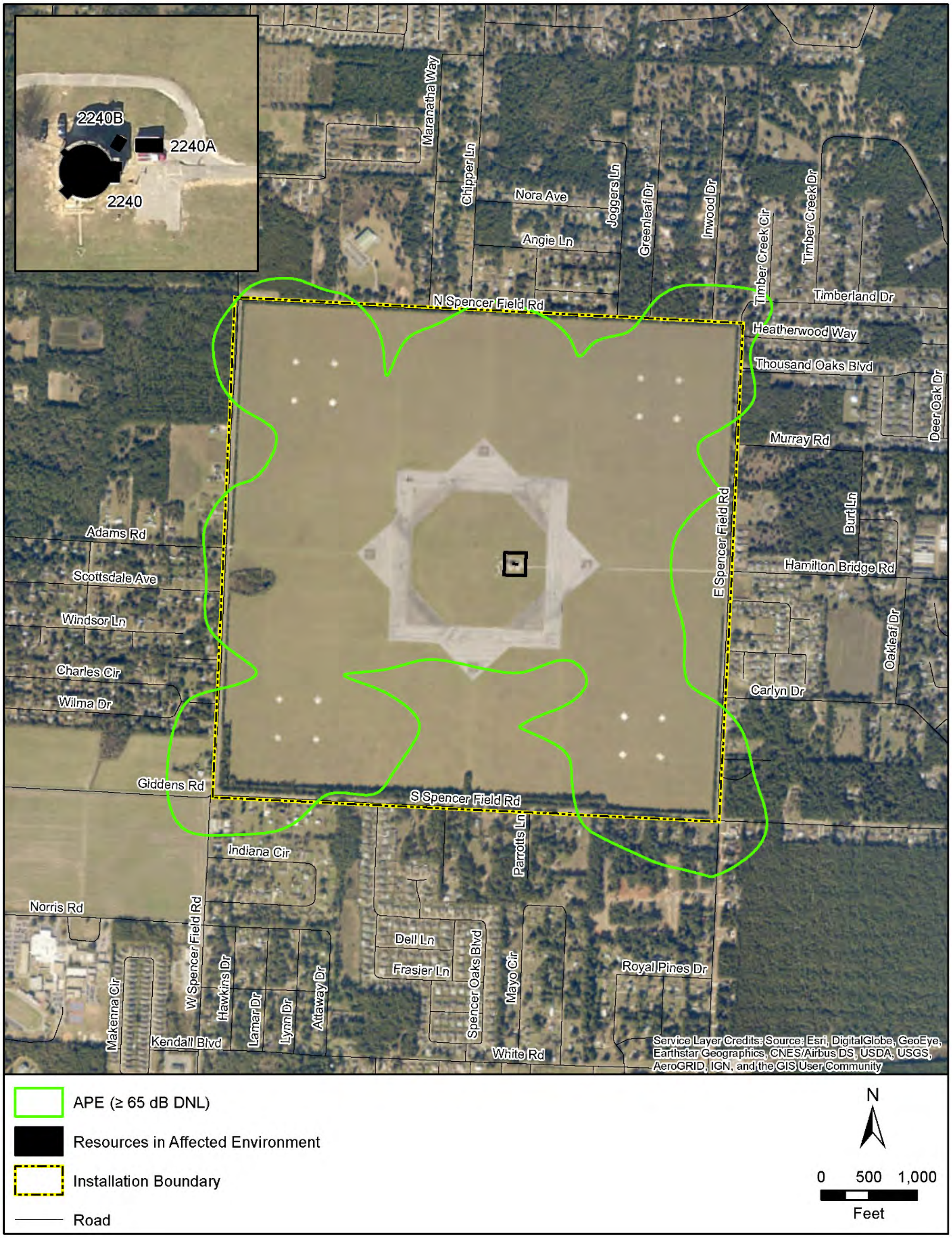


Figure 3.3-2 NOLF Spencer Area of Potential Effects for Cultural Resources

Figure 3.3-3 NOLF Pace Area of Potential Effects for Cultural Resources

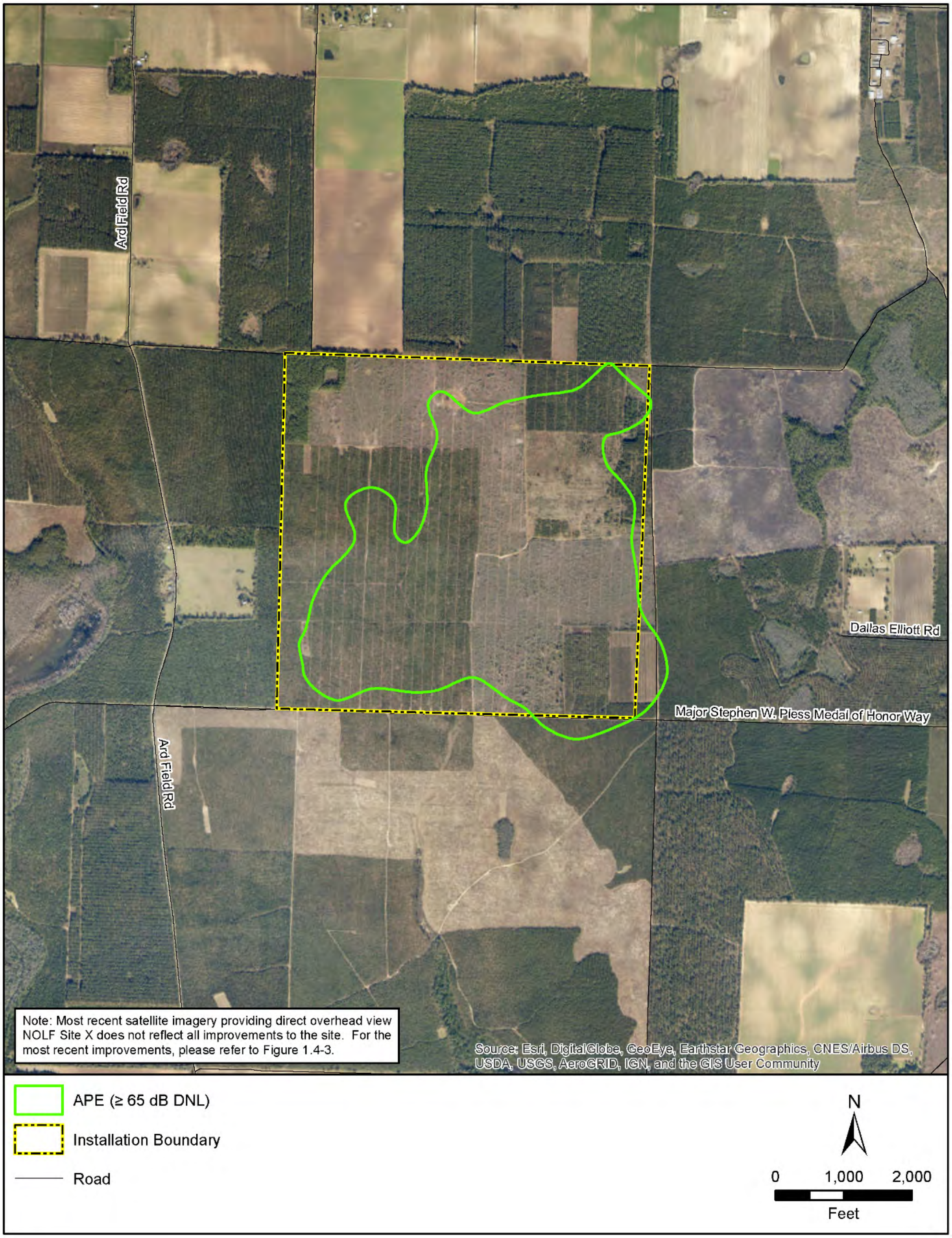


Figure 3.3-4 NOLF Site X Area of Potential Effects for Cultural Resources

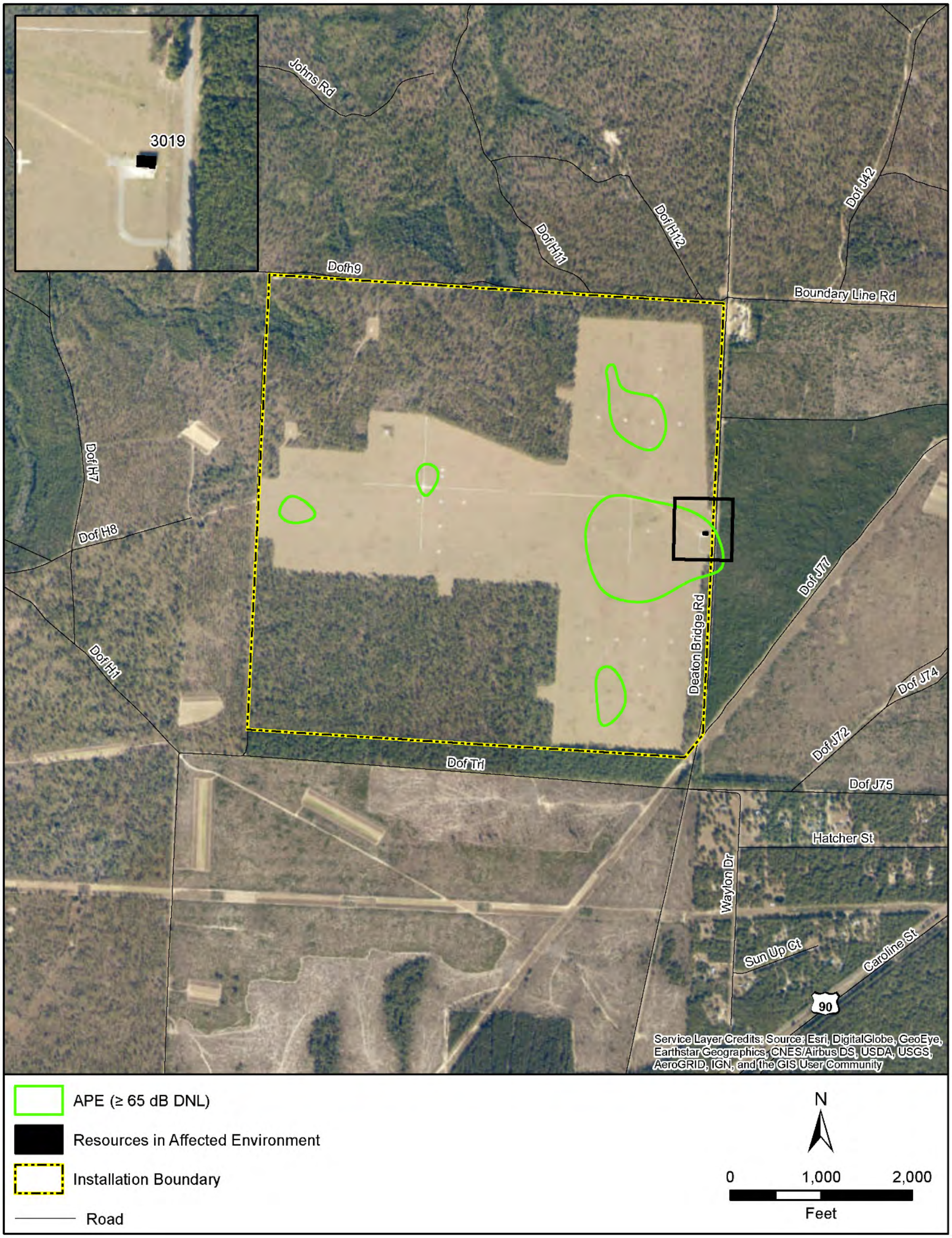


Figure 3.3-5 NOLF Harold Area of Potential Effects for Cultural Resources

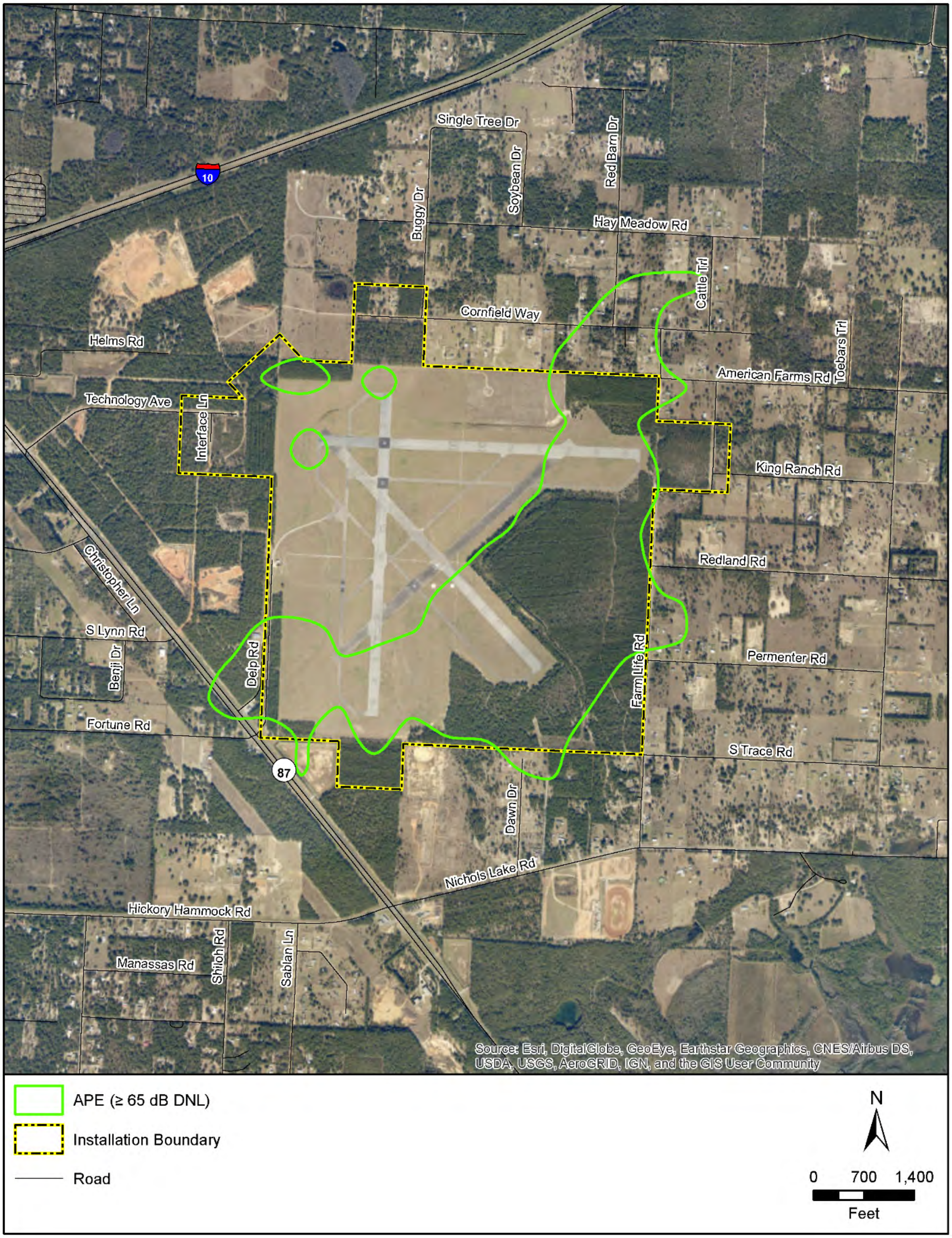


Figure 3.3-6 NOLF Santa Rosa Area of Potential Effects for Cultural Resources

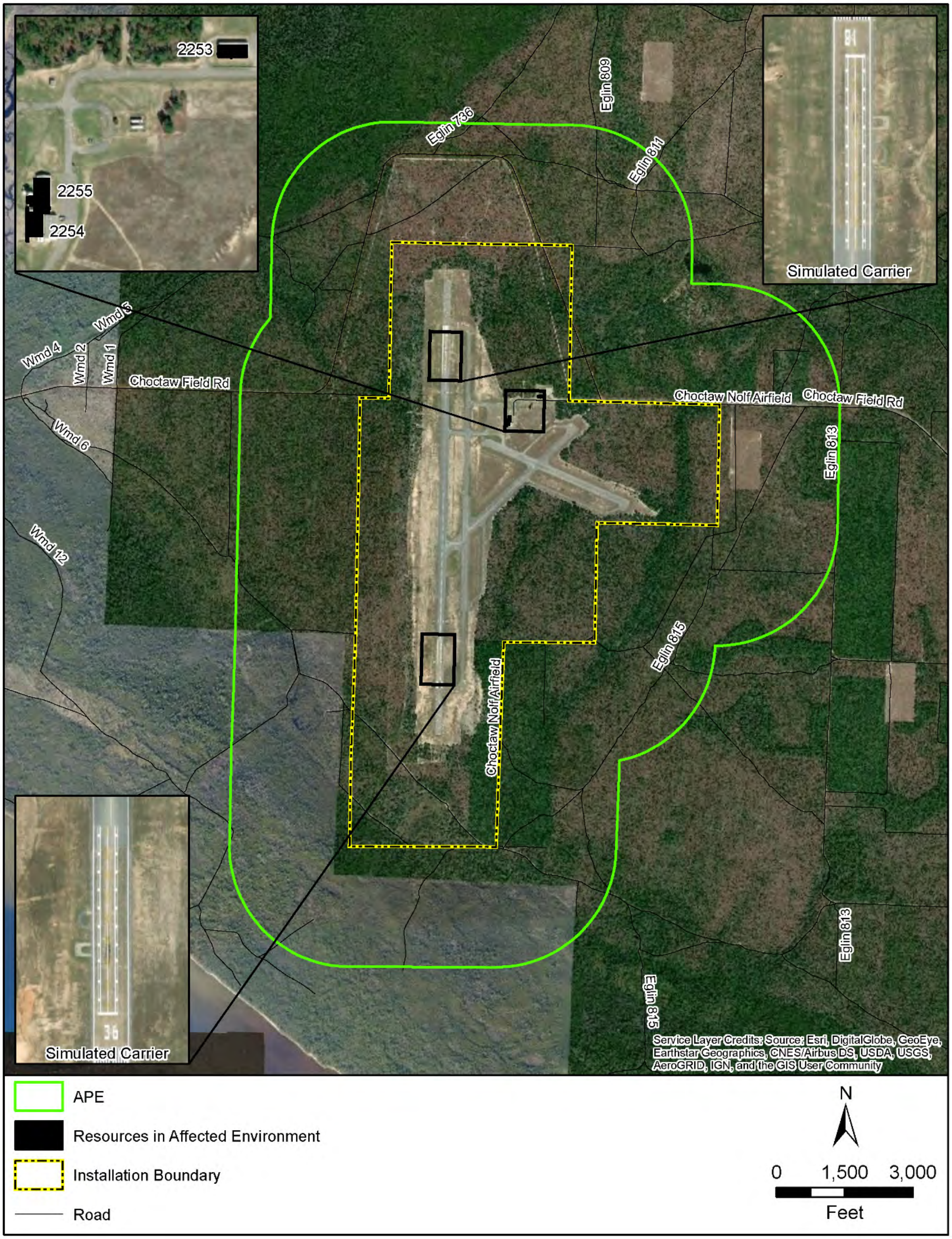


Figure 3.3-7 NOLF Choctaw Area of Potential Effects for Cultural Resources

3.3.2.2 Architectural Resources

A records search of the Florida Master Site Files found no eligible or listed historic architectural resources within the affected environment at NAS Whiting Field and the NOLFs (VanderPloeg, 2019). Fourteen buildings in the affected environment at NAS Whiting Field (Buildings 1406, 1454, 1454D, 1471, 1478, 2946, 2975, 2977, 2978, 2979, 3005, 3024, 3042, and 3043) were previously surveyed and determined not eligible for listing in the NRHP (NAS Whiting Field, 2017).

In consultation with the SHPO, Naval Facilities Engineering Command Southeast determined three buildings (Buildings 2938, 3090, and 3149) in the affected environment at NAS Whiting Field are not eligible for listing in the NRHP (Naval Facilities Engineering Command, Southeast, 2019). Building 2938 is an Airfield Lighting Vault and was built in 1965 (NAS Whiting Field, 2014). Naval Facilities Engineering Command Southeast determined Building 2938 is not eligible for listing in the NRHP under Criteria A–D. Buildings 3090 and 3149 were built after the end of the Cold War and were determined not eligible for the NRHP under Criterion Consideration G (for properties less than 50 years in age) (Naval Facilities Engineering Command, Southeast, 2019). The SHPO concurred with these determinations (Florida Department of State, Division of Historical Resources, 2019).One building (Building 2240) within the affected environment at NOLF Spencer was determined not eligible for listing in the NRHP. In consultation with the SHPO, Naval Facilities Engineering Command Southeast determined two resources (2240A and 2240B) within the affected environment at NOLF Spencer are not eligible for listing in the NRHP under Criterion Consideration G (Naval Facilities Engineering Command, Southeast, 2019). The SHPO concurred with this determination (Florida Department of State, Division of Historical Resources, 2019).

The affected environment at NOLF Choctaw has four resources determined not eligible for listing in the NRHP (Buildings 2253, 2254, 2255, and 202834 [Simulated Carrier - Runway]) (NAS Whiting Field, 2017).

In consultation with the SHPO, Naval Facilities Engineering Command Southeast determined Building 3019 in the affected environment at NOLF Harold is not eligible for the NRHP under Criterion Consideration G (Naval Facilities Engineering Command, Southeast, 2019). The SHPO concurred with this determination (Florida Department of State, Division of Historical Resources, 2019).

NOLF Pace, NOLF Santa Rosa, and NOLF Site X have no architectural resources eligible for listing in the NRHP within the affected environment (NAS Whiting Field, 2014); (Department of the Navy, 2018a).

3.3.2.3 Traditional Cultural Properties

NAS Whiting Field has not been the subject of a traditional cultural properties study and no traditional cultural properties have been identified at NAS Whiting Field or the associated NOLFs (NAS Whiting Field 2014).

The following federally recognized American Indian tribes have historically occupied and/or used NAS Whiting Field lands: Absentee-Shawnee Tribe of Oklahoma, Alabama-Coushatta Tribe of Texas, Alabama-Quassarte Tribal Town of the Creek Nation of Oklahoma, The Chicksaw Nation, Choctaw Nation of Oklahoma, Coushatta Tribe of Louisiana, Eastern Shawnee Tribe of Oklahoma, Jena Band of Choctaw Indians, Kialegee Tribal Town of the Creek Nation of Oklahoma, Miccosukee Tribe of Indians of Florida, Mississippi Band of Choctaw Indians, Shawnee Tribe, Seminole Nation of Oklahoma, Seminole Tribe of Florida, Thlopthlocco Tribal Town, Tunica-Biloxi Indian Tribe.

The Navy consults with federally recognized Indian tribes (or Native Hawaiian or Alaska Native Organizations) on actions with the potential to significantly affect protected tribal resources, tribal treaty rights, or Indian lands. The NAS Whiting Field ICRMP includes established protocols, such as Standard Operating Procedure 6: Native American Consultation, for consulting with tribes regarding cultural resources such as traditional cultural properties. No Tribe(s) with Usual and Accustomed grounds and stations have been identified at NAS Whiting Field or the associated NOLFs (NAS Whiting Field, 2014).

3.3.3 Environmental Consequences

Cultural Resources Potential Impacts:

- No Action: No change to cultural resources; therefore, no significant impact.
- Action Alternative: No significant impacts cultural resources or traditional cultural properties.

Analysis of potential impacts to cultural resources considers both direct and indirect impacts. Direct impacts may be the result of physically altering, damaging, or destroying all or part of a resource, altering characteristics of the surrounding environment that contribute to the importance of the resource, introducing visual, atmospheric, or audible elements that are out of character for the period the resource represents (thereby altering the setting), or neglecting the resource to the extent that it deteriorates or is destroyed. Indirect impacts primarily result from the effects that are farther removed from the immediate project area including visual, audible (noise), or atmospheric changes due to the project implementation.

The APE for cultural resources encompasses areas where ground-disturbing activities and alterations/modifications to buildings would occur. The APE also includes the areas underlying modeled noise contours ≥65 dB DNL, where noise from aircraft operations under the Proposed Action may affect historic properties.

3.3.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to cultural resources at NAS Whiting Field. Therefore, no significant impacts to cultural resources would occur with implementation of the No Action Alternative at NAS Whiting Field. Under the No Action Alternative, noise levels would increase at NOLF Site X and noise levels would decrease at the other five NOLFs. The buildings at NOLF Site X are not over 50 years in age or from the Cold War era; therefore, there would be no impact.

3.3.3.2 Action Alternative (Preferred Alternative) Potential Impacts

Archaeological Resources

Under the Action Alternative, the Navy proposes to modernize its rotary-wing and tilt-rotor integrated pilot production training program by implementing the AHTS. The AHTS would involve the replacement of TH-57 helicopters and ground based training systems, an increased operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities, and an increase in personnel. There are no known archaeological sites located within the APE at NAS Whiting Field where ground disturbance from AHTS facility development would occur.

NAS Whiting Field has been heavily impacted by previous disturbances such as construction of the existing buildings and flight line (NAS Whiting Field, 2014). Because of the previous disturbance, and the lack of previously identified archaeological resources in the APE, it is unlikely that the Action Alternative would have significant impacts to archaeological resources from ground disturbance associated with AHTS facility development. The Navy would have an archaeologist meeting the Secretary of the Interior's Professional Qualifications Standards present to monitor ground-disturbing activities from construction.

In the unlikely event that previously unrecorded archaeological sites were encountered during the construction, the Navy would stop work in the immediate area and follow *Standard Operating Procedure 5, Inadvertent Discoveries,* per the installation ICRMP (NAS Whiting Field, 2014). This process includes stopping the work, securing the area, and evaluating the site for NRHP eligibility in consultation with the SHPO, affected American Indian tribes, and other interested parties, pursuant to the implementing regulation of the NHPA (36 CFR Part 800), other applicable federal laws, and DoD and Navy regulations. Similarly, if American Indian human remains, funerary items, sacred objects, or items of cultural patrimony are encountered, the Navy would stop work in the area and comply with the Native American Graves Protection and Repatriation Act.

There are no known archaeological resources within the APE where ground would be disturbed from construction activities; as a result, there would be no effect under Section 106 of NHPA. Therefore, under NEPA, the Action Alternative would not result in significant impacts to archaeological resources.

Architectural Resources

As discussed in Section 3.3.2.2, there are no eligible architectural resources within the affected environments at NAS Whiting Field or NOLFs Spencer, Harold, Pace, Site X, Santa Rosa, and Choctaw, so there would be no historic properties affected under Section 106 of NHPA. Therefore under NEPA, there would be no significant impacts to historic architectural resources. The Navy consulted with the Florida Division of Historical Resources and documentation is included in *Appendix B, National Historic Preservation Act Section 106 Documentation.* On August 20, 2019, the Florida Division of Historical Resources concurred with the Navy determination that there would be no historic properties affected.

Traditional Cultural Properties

No known traditional cultural properties are located at NAS Whiting Field and NOLFs Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw. However, the Navy consulted with the following federally recognized tribes and consultation documentation is provided in *Appendix C, Tribal Government-to-Government Documentation.*

- Absentee-Shawnee Tribe of Indians of Oklahoma
- Alabama-Coushatta Tribe of Texas
- Alabama-Quassarte Tribal Town
- Chickasaw Nation
- The Choctaw Nation of Oklahoma
- Coushatta Tribe of Louisiana
- Eastern Shawnee Tribe of Oklahoma
- Jena Band of Choctaw Indians
- Kialegee Tribal Town
- Miccosukee Tribe of Indians
- Mississippi Band of Choctaw Indians
- The Seminole Nation of Oklahoma
- Seminole Tribe of Florida
- Shawnee Tribe
- Thlopthlocco Tribal Town
- Tunica-Biloxi Indian Tribe

The Coushatta Tribe of Louisiana responded that the project would not negatively impact any archaeological, historic, or cultural resources of the Coushatta people. The Shawnee Tribe concurred that no known historic properties would be negatively impacted by this project, and requested to be re-notified to resume immediate consultation in the event that archaeological materials are encountered during construction, use, or maintenance of this location. The Seminole Tribe of Florida responded with no objections to the project as long as an archaeologist who meets the Secretary of the Interior's Professional Qualifications Standards is present to monitor ground-disturbing activities from construction for potentially intact cultural resources, and that no new construction or ground disturbance will occur on any of the NOLFs. No responses were received from the remaining tribes. Consequently, no significant traditional cultural properties were identified through consultation with these tribes. Therefore, the Action Alternative would have no impact on traditional cultural properties.

Cultural Resources Impact Conclusion

There are no known archaeological resources within the APE where ground would be disturbed from construction activities; as a result, there would be no effect under Section 106 of NHPA, and no significant impacts to archaeological resources under NEPA. There are no NRHP-eligible architectural resources within the affected environments at NAS Whiting Field or NOLFs Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw, so there would be no effect under Section 106 of NHPA. Therefore under NEPA, there would be no significant impacts to historic architectural resources. The Navy consulted with Florida Division of Historical Resources, and received concurrence on August 20, 2019 with the extent of the APE and the determination of No Historic Properties Affected. The Navy consulted with federally recognized tribes and no significant traditional cultural properties were identified. The Navy would have an archaeologist meeting the Secretary of the Interior's Professional Qualifications Standards present to monitor ground-disturbing activities from construction for potentially intact cultural resources. Overall, implementation of the Action Alternative would not result in significant impacts to cultural resources or traditional cultural properties.

3.4 Biological Resources

Biological resources include living, native, or naturalized plant and animal species and the habitats within which they occur. Plant associations are referred to generally as vegetation, and animal species are referred to generally as wildlife. Habitat can be defined as the resources and conditions present in an area that support a plant or animal.

Within this EA, biological resources are divided into two major categories: (1) terrestrial vegetation and (2) terrestrial wildlife. Threatened, endangered, and other special-status species are discussed in their respective categories.

The ROI for biological resources includes the airspace and lands directly below the airspace at NAS Whiting Field and the NOLFs that would be used by Training Air Wing Five under the Action Alternative.

3.4.1 Regulatory Setting

Special-status species, for the purposes of this assessment, are those species listed as threatened or endangered under the Endangered Species Act (ESA) and species afforded federal protection under the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

The purpose of the ESA is to conserve the ecosystems upon which threatened and endangered species depend and to conserve and recover listed species. Section 7 of the ESA requires action proponents to consult with the U.S. Fish and Wildlife Service or National Oceanic and Atmospheric Administration Fisheries to ensure that their actions are not likely to jeopardize the continued existence of federally listed threatened and endangered species, or result in the destruction or adverse modification of designated critical habitat. Critical habitat cannot be designated on any areas owned, controlled, or designated for use by the DoD where an INRMP has been developed that, as determined by the Department of Interior or Department of Commerce Secretary, provides a benefit to the species subject to critical habitat designation.

Birds, both migratory and most native-resident species, are protected under the Migratory Bird Treaty Act, and their conservation by federal agencies is mandated by EO 13186 (Migratory Bird Conservation). Under the Migratory Bird Treaty Act, it is unlawful by any means or in any manner, to pursue, hunt, take, capture, kill, attempt to take, capture, or kill, [or] possess migratory birds or their nests or eggs at any time, unless permitted by regulation. Construction under the Action Alternative would follow this definition for impacts to migratory birds. The 2003 National Defense Authorization Act gave the Secretary of the Interior authority to prescribe regulations to exempt the Armed Forces from the incidental taking of migratory birds during authorized military readiness activities. The final rule authorizing the DoD to take migratory birds in such cases includes a requirement that the Armed Forces must confer with the U.S. Fish and Wildlife Service to develop and implement appropriate conservation measures to minimize or mitigate adverse effects of the proposed action if the action will have a significant adverse effect on a population of a migratory bird species. Aircraft operations associated with the Action Alternative are considered a military readiness activity.

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

3.4.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under biological resources at NAS Whiting Field and its NOLFs.

3.4.2.1 Terrestrial Vegetation

Vegetation includes terrestrial plant as well as freshwater aquatic communities and constituent plant species. Approximately 2,354 acres of forest, largely slash pine (*Pinus elliottii*) and longleaf pine (*P. palustris*), occurs on NAS Whiting Field and its associated NOLFs (NAS Whiting Field, 2018). As many as 15 distinct natural vegetation communities are found on NAS Whiting Field and its associated NOLFs including rivers and streams, swamps and marshes, upland hardwood and pine forests, bottomland forests, flatwoods, baygalls and sandhills, and wet prairies (Naval Facilities Engineering Command, Southeast, 2017b). Also present are three types of human-made or altered communities, pine plantations, cleared zones, and stormwater retention ponds, which also have the potential to support rare plant and animal species and Migratory Bird Treaty Act-listed birds. Wetlands are discussed in Section 3.2 *Water Resources*.

No federally protected plant species are known to occur within the ROI. Therefore, federally protected plant species are not discussed further in this EA.

Multiple state protected plant species occur within the ROI, but none of them would be impacted by construction or training exercises associated with the Proposed Action. Therefore, state protected plant species are not discussed further in this EA.

3.4.2.2 Terrestrial Wildlife

Wildlife includes all animal species, focusing on the species and habitat features of greatest importance or interest. Common wildlife species observed at NAS Whiting Field and its associated NOLFs include reptiles such as the eastern diamondback rattlesnake (*Crotalus adamanteus*), southern black racer (*Coluber constrictor priapus*), ground skink (*Scincella lateralis*), fence lizard (*Sceloporus undulatus*), green anole (*Anolis carolinensis*), chorus frog (*Pseudacris* sp.), and southern two-lined salamander (*Eurycea cirrigera*). Birds detected include the American kestrel (*Falco sparverius*), American robin (*Turdus migratorius*), northern harrier (*Circus cyaneus*), loggerhead shrike (*Lanius ludovicianus*), lesser scaup (*Aythya affinis*), savannah sparrow (*Passerculus sandwichensis*), Henslow's sparrow (*Ammodramus henslowii*), eastern meadowlark (*Sturnella magna*), and American crow (*Corvus brachyrhynchos*). Mammals observed include the white-tailed deer (*Odocoileus virginianus*), southeastern pocket gopher (*Geomys pinetis*), and nine-banded armadillo (*Dasypus novemcinctus*) (Printiss & Hipes, 1997a); (Printiss & Hipes, 1997b); (NAS Whiting Field, 2018).

Wildlife typically associated with disturbed or altered landscapes (i.e., agricultural fields, pastureland, urban development) and the forested habitat types of the NOLFs include common game and non-game species. Species identified on disturbed landscapes within NAS Whiting Field and its associated NOLFs include eastern glass lizard (*Ophisaurus ventralis*), gopher tortoise (*Gopherus polyphemus*), American crow, mourning dove (*Zenaida macroura*), blue jay (*Cyanocitta cristata*), eastern meadowlark, rough-winged swallow (*Stelgidopteryx serripennis*), northern harrier, Mississippi kite (*Ictinia mississippiensis),* loggerhead shrike, turkey vulture *(Cathartes aura*), American kestrel, northern flicker (*Colaptes auratus*), killdeer (*Charadrius vociferus*), white-tailed deer, and armadillo (NAS Whiting Field, 2018).

Federally Protected Species

Special-status wildlife species occurring or having the potential to occur in the ROI are listed in Table 3.4-1. Of these, only two are federally listed or candidate species, the reticulated flatwoods salamander (*Ambystoma bishopi*) and gopher tortoise.

The reticulated flatwoods salamander is the only federally listed species potentially occurring in the ROI. The species is known to occur at NOLF Holley (outside of the ROI), but potential depression marsh habitat for the species occurs in NOLF Santa Rosa.

The gopher tortoise is a candidate for federal listing and is present throughout much of the uplands at NAS Whiting Field and its associated NOLFs. In the ROI, the species is known to occur at NAS Whiting Field, NOLF Harold, and NOLF Santa Rosa. Gopher tortoises prefer xeric sites with sparse forest canopy. Many of the xeric uplands within NAS Whiting Field and its associated NOLFs, however, maintain dense canopies and minimal herbaceous layers. Tortoises are therefore often concentrated in small canopy openings and cleared areas including firebreaks, road edges, ditch openings, and airfield Clear Zones. Several species, including the gopher frog (*Lithobates capito*), eastern indigo snake (*Drymarchon couperi*), pine snake (*Pituophis melanoleucus mugitus*), and eastern diamondback rattlesnake, depend on gopher tortoise burrows for cover and shelter. Proper management of the xeric uplands in which the gopher tortoise lives is critical to the species' long-term viability at any site (NAS Whiting Field, 2018). Gopher tortoises are managed at NAS Whiting Field and its associated NOLFs in accordance with a Candidate Conservation Agreement (U.S. Fish and Wildlife Service, 2018) signed by the Navy, the U.S. Fish and Wildlife Service, and the Florida Fish and Wildlife Conservation Commission, among several other federal, state, and non-governmental agencies. The purpose of the Gopher Tortoise Candidate Conservation Agreement is to implement proactive gopher tortoise conservation measures across its eastern range, including monitoring and management measures, of which the Navy and NAS Whiting Field currently implement (U.S. Fish and Wildlife Service, 2018).

No critical habitat has been designated on NAS Whiting Field or any of the NOLFs being analyzed in this EA. NAS Whiting Field (2018) describes natural resources management actions that impart benefits to listed species and their habitats on NAS Whiting Field and its associated NOLFs and provides assurances that those actions will be implemented and will be effective.

The Migratory Bird Treaty Act provides for the protection of designated birds excluding non-native species such as the English house sparrow, European starling, and the rock dove. All native bird species that occur at NAS Whiting Field and its associated NOLFs are protected under the Migratory Bird Treaty Act.

Bald eagles have been observed at NAS Whiting Field and its associated NOLFs (NAS Whiting Field, 2018). According to the 2016 nesting season survey by the Florida Fish and Wildlife Conservation Commission, several bald eagle nests were located along Escambia Bay, Blackwater Bay, and Blackwater River, but none are within one mile of Whiting Field South or its NOLFs (Official State of Florida Geographic Data Portal, 2019).

Table 3.4-1 Special-Status Wildlife Known to Occur or Potentially Occurring in the ROI

Common Name	***Scientific Name***	***Federal Listing Status(1)***	***State Listing Status(1)***
REPTILES			
Florida pine snake	*Pituophis melanoleucus*	N	T
gopher tortoise	*Gopherus polyphemus*	C	T
AMPHIBIANS			
reticulated flatwoods salamander(2)	*Ambystoma bishopi*	E	E
BIRDS			
bald eagle	*Haliaeetus leucocephalus*	BGEPA	N
little blue heron	*Egretta caerulea*	N	T
Bachman's sparrow	*Peucaea aestivalis*	BCC	N
Henslow's sparrow	*Ammodramus henslowii*	BCC	N

Source: (NAS Whiting Field, 2018).

Notes: 1) BCC = Bird of Conservation Concern, BGEPA = Bald and Golden Eagle Protection Act, C = candidate species for federal Endangered Species Act listing, E = endangered, T = threatened, N = Not listed but of interest or concern to NAS Whiting Field natural resource managers.

2) Not documented in ROI, but potential habitat is present and species is known to occur in other portions of NAS Whiting Field and its associated NOLFs.

State Protected Species

In addition to the federally protected species detailed above, the Florida pine snake and little blue heron (*Egretta caerulea*) are two state-listed threatened species that are known to occur within the ROI. The Florida pine snake requires dry sandy soils for burrowing. It is most often found in open oak woodlands, abandoned fields, scrub, sandhills, and longleaf pine forest. It is known to occur at the NOLF Santa Rosa pine plantations and other upland habitats at NAS Whiting Field (NAS Whiting Field 2018). Forest management strategies such as thinning and prescribed burning improve habitat for this species as well as for gopher tortoises, which dig burrows that can be used by the Florida pine snake. The NAS Whiting Field INRMP protects habitat for Florida pine snakes through active management of factors such as invasive species control, landscaping and grounds maintenance, silviculture activities (particularly thinning and prescribed burns), and forest protection (NAS Whiting Field 2018).

The little blue heron is a wading bird that forages in shallow wetlands for small fish, aquatic crustaceans, amphibians, small reptiles, and insects. They rely on freshwater forage sites to raise young until they become more salt-tolerant, and nesting occurs on coastal islands near foraging sites. The species has been observed at NAS Whiting Field. The NAS Whiting Field INRMP protects habitat for little blue herons through active management of factors such as wetlands, erosion control, stormwater control, and marine coastal zone management.

3.4.3 Environmental Consequences

This analysis focuses on wildlife or vegetation types that are important to the function of the ecosystem or are protected under federal or state law or statute. Wildlife and vegetation are assessed for potential impacts from construction activities and flight training operations.

Biological Resource Potential Impacts:

- No Action: No change to biological resources; therefore, no significant impacts.
- Action Alternative: Negligible impacts from construction. Minor impacts to wildlife from increased helicopter training and noise. No effect to threatened and endangered species or migratory birds. No significant impact to biological resources.

3.4.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change to biological resources. Therefore, no significant impacts to biological resources would occur with implementation of the No Action Alternative.

3.4.3.2 Action Alternative (Preferred Alternative) Potential Impacts

The ROI for the analysis of effects to biological resources associated with the Action Alternative includes the airspace and lands directly below the airspace at NAS Whiting Field and the NOLFs that will be used by Training Air Wing Five.

Under the Action Alternative, impacts to biological resources could occur from an increase in helicopter training tempo (approximately 22 percent increase over No Action Alternative tempo) and construction of facilities and infrastructure in a 47-acre construction area (see Figure 2.3-2) to support the necessary training, maintenance, and operational requirements. There would be no change in existing airspace configurations and all flight operations would be conducted at existing airfields. In addition, construction of temporary and permanent structures would occur on previously developed and/or disturbed land.

Vegetation

Under the Action Alternative, construction of temporary and permanent facilities would occur on previously developed and/or disturbed land (Figure 2.3-2). Therefore, construction would have no impact on plant communities or special-status plant species. The increase in helicopter training tempo would have a negligible impact on plant communities and special-status plant species, as all flight operations would continue to be conducted at existing airfields that are developed. Therefore, the Action Alternative would not result in significant impacts to vegetation.

Terrestrial Wildlife

Under the Action Alternative, impacts to wildlife due to construction would be minor. Noise associated with construction may cause wildlife to temporarily avoid the area. Noise associated with construction activities, as well as an increase in general industrial activity and human presence, could evoke reactions in birds. Disturbed nests in the immediate vicinity of construction activity would be susceptible to abandonment and depredation. However, bird and wildlife populations in the vicinity of the proposed construction sites are already exposed to elevated noise associated with aircraft and general military industrial use. In addition, the demolition and construction activities would occur in a highly developed area, generally devoid of wildlife. As a result, indirect impacts from construction noise are expected to be minimal because the ambient noise levels within the vicinity are high under existing conditions and would be unlikely to substantially increase by the relatively minor and temporary nature of the proposed demolition and construction. In addition, construction would not result in the loss of any wildlife habitat.

The potential 22 percent increase in helicopter training tempo under the Action Alternative would expose wildlife to increased overflights and would create an increase in the potential for bird/animal aircraft strike hazard (BASH) incidents. The use of any aircraft near undeveloped areas has the potential to add noise and visual stressors to the natural environment and cause a response by wildlife. Impacts to wildlife due to aircraft audio and visual stressors include: “startle reflex” induced running or flight, increased expenditure of energy during critical periods, decreased time and energy spent on life functions such as seeking food or mates, increased susceptibility to predation, and interruption of breeding or nursing (Larkin, 1996); (Efroymson, Rose, Nemeth, & Suter, 2000).

While some bird and mammal species appear to habituate (become accustomed to and react less strongly over time) to repetitive noises better than other species (Conomy, Dubovsky, Collazo, & Fleming, 1998), (Krausman, et al., 1996), the likelihood of habituation by different wildlife species to rotary-wing aircraft activity is not predictable. In addition, the opposite response, i.e., the sensitization of individuals, such that they react more strongly to a recurring stimulus, and ultimately leave the area, can also occur. The end result is that wildlife individuals and populations exposed to a regularly recurring stimulus are expected to exhibit an increasing tolerance (lowered reactions) to that stimulus, but this cannot be construed as indicating that no impact has occurred (Bejder, Samuels, Whitehead, Finn, & Allen, 2009). However, under the Action Alternative, there would be no change in existing airspace configurations and all flight operations would be conducted at existing airfields. Wildlife in the vicinity of NAS Whiting Field and the NOLFs, where flight training operations regularly occur, are already exposed to aircraft audio and visual stimuli, and are not expected to react strongly to ongoing aircraft operations.

While wildlife may experience disturbance associated with increases in noise from helicopter operations under the Action Alternative, this potential effect is lessened in the context of the airfield environment, where the existing ambient noise and activity levels are high. Resident species within terrestrial habitats in the affected environment would likely have acclimated to the noise and visual disturbance generated by aircraft overflights and maintenance activities. Wildlife in the vicinity of NAS Whiting Field and its associated NOLFs are already exposed to a high level of long-term flight training operations, and are therefore less likely to be affected by increases in noise under the Action Alternative. Flight training operations under the Action Alternative would not have adverse impacts to wildlife population levels beyond those experienced under the No Action Alternative. Therefore, the Action Alternative would not result in significant impacts to terrestrial wildlife from proposed increases in flight training operations and associated noise.

Under the Action Alternative, the Navy would continue to implement a BASH Plan at NAS Whiting Field and its associated NOLFs. The BASH Plan minimizes aircraft risks from potentially hazardous wildlife strikes, and, in turn, protects wildlife from aircraft strikes. The program establishes methods to decrease the attractiveness of the airfield/nearby areas to birds and animals, and provides guidelines for dispersing birds and animals when they compromise the safety of operations on the airfield. Due to the continued implementation of the BASH Plan, it is expected that the number of wildlife strikes would remain relatively consistent with current levels and that local wildlife populations would not be subject to increased BASH risk. In addition, the Rotary-Wing Operating Procedures Manual directs aircraft pilots to report observations of increased bird or other animal activity compromising flight safety so the BASH threat may be addressed. Therefore, implementation of the Action Alternative would not result in significant impacts to terrestrial wildlife from BASH risk.

Federally Protected Species

One candidate species for federal listing, the gopher tortoise, is known to occur within the ROI (NAS Whiting Field, 2018). Although not known to occur within the construction area (see Figure 2.3-2), suitable depression marsh habitat exists at NOLF Santa Rosa for the federally endangered reticulated flatwoods salamander.

Threatened and endangered terrestrial species on NAS Whiting Field and its associated NOLFs are already habituated to high levels of noise associated with aircraft and other military operations. Increases in noise levels from construction activities to the ambient noise environment would be negligible and temporary. Construction would occur only on NAS Whiting Field in previously disturbed and cleared or developed areas. There would be no loss of habitat under the Action Alternative. The reticulated flatwoods salamander has not been documented, and its habitat is not present, in the areas where construction activities take place. In addition, the gopher tortoise is not expected to occur within the developed areas where construction would occur. Therefore, construction activities have no potential to affect these species.

Flight training operations under the Action Alternative would increase by 22 percent. The reticulated flatwoods salamander is not known to occur at Whiting Field South or any of the NOLFs associated with the Action Alternative, though their depression marsh habitat is present at NOLF Santa Rosa. Because their occurrence within the ROI is speculative, the potential effects on this species are not expected. The gopher tortoise is already exposed to ongoing flight training operations at NAS Whiting Field and its associated NOLFs. As indicated in Section 3.5 *Noise,* there would be no significant change in noise contours associated with the proposed increase in airfield operations, as compared with the No Action

Alternative, and ambient noise levels would not significantly increase. In addition, gopher tortoise populations at NAS Whiting Field and its associated NOLFs would continue to be monitored and managed in accordance with the Gopher Tortoise Candidate Conservation Agreement (U.S. Fish and Wildlife Service, 2018). Pursuant to the ESA, no effects to threatened and endangered species would occur; therefore, consultation with U.S. Fish and Wildlife Service is not required.

In 2007, the U.S. Fish and Wildlife Service finalized a rule authorizing the DoD to "take" migratory birds in the course of military readiness activities, under the Migratory Bird Treaty Act, as directed by the 2003 National Defense Authorization Act. Congress defined military readiness activities as all training and operations of the Armed Forces that relate to combat and the adequate and realistic testing of military equipment, vehicles, weapons, and sensors for proper operation and suitability for combat use.

For the purposes of this EA, the training operations at NAS Whiting Field and its associated NOLFs are considered a military readiness activity. The final rule authorizing the DoD to take migratory birds during military readiness activities provides that the Armed Forces must confer and cooperate with the U.S. Fish and Wildlife Service on the development and implementation of conservation measures to minimize or mitigate adverse effects of a military readiness activity if it determines that such activity may have a significant adverse effect on a population of a migratory bird species. As all training activities under the Action Alternative would continue to use the same airfields and airspace that are currently used for training, there would be no impact to Migratory Bird Treaty Act species' breeding habitats.

Construction under the Action Alternative is not considered a military readiness activity under the Migratory Bird Treaty Act. However, as previously discussed, bird populations in the vicinity of the proposed construction sites are already exposed to elevated noise associated with aircraft and general military industrial use. In addition, the demolition and construction activities would occur in a highly developed area, generally devoid of wildlife. As a result, indirect impacts from construction noise are expected to be minimal because the ambient noise levels within the vicinity are high under existing conditions and would be unlikely to substantially increase by the relatively minor and temporary nature of the proposed demolition and construction. Therefore, construction would not result in take of migratory birds as defined under the Migratory Bird Treaty Act or bald eagles under the Bald and Golden Eagle Protection Act, as injury or mortality to birds are not anticipated given the implementation of measures in the BASH Plan. Additionally, bald eagles would not be disturbed to the point that would significantly interfere with the eagle's normal breeding, feeding, or sheltering behavior, nor would it result in nest abandonment. The Action Alternative would not result in significant adverse effects on a population of a migratory bird species, including bald eagles.

The Action Alternative would not result in significant impacts to federally protected species.

State Protected Species

The Florida pine snake and the little blue heron would be exposed to general wildlife impacts as previously discussed. Neither species is expected to occur in the vicinity of the proposed demolition/construction and, therefore, would not be impacted by such activities. Florida pine snakes and little blue herons that occur in the ROI are already exposed to aircraft and training operation impacts. The Action Alternative would not change airspace or airfield configurations. The Action Alternative would not introduce any impacts to these species beyond conditions under the No Action Alternative. The Action Alternative would not result in significant impacts to state protected species.

Biological Resources Impact Conclusion

The Action Alternative would not result in significant impacts to vegetation and terrestrial wildlife, would have no effect on federally threatened or endangered species, would not result in significant adverse effects on a population of a migratory bird species, including the take of bald eagles, and would not significantly impact any state protected species. Overall, implementation of the Action Alternative would not result in significant impacts to biological resources.

3.5 Noise

This discussion of noise includes the types or sources of noise and the associated sensitive receptors in the human environment. Noise in relation to biological resources and wildlife species is discussed in Section 3.4, *Biological Resources*.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air or water, and are sensed by the human ear. Sound is all around us. The perception and evaluation of sound involves three basic physical characteristics:

- Intensity – the acoustic energy, which is expressed in terms of sound pressure, in decibels (dB)
- Frequency – the number of cycles per second the air vibrates, in Hertz
- Duration – the length of time the sound can be detected

Noise is defined as unwanted or annoying sound that interferes with or disrupts normal human activities. Although continuous and extended exposure to high noise levels (e.g., through occupational exposure) can cause hearing loss, the principal human response to noise is annoyance. The response of different individuals to similar noise events is diverse and is influenced by the type of noise, perceived importance of the noise, its appropriateness in the setting, time of day, type of activity during which the noise occurs, and sensitivity of the individual. While aircraft are not the only sources of noise in an urban or suburban environment, they are readily identified by their noise output and are given special attention in this EA.

3.5.1 Basics of Sound and A-Weighted Sound Level

The loudest sounds that can be detected comfortably by the human ear have intensities a trillion times greater than those of sounds barely detectable. This vast range renders a linear scale impractical to represent all sound intensities. The dB is a logarithmic unit used to represent the intensity of a sound, also referred to as the sound level. Table 3.5-1 provides a comparison of how the human ear perceives changes in loudness on the logarithmic scale. A difference of 3 dB is generally barely perceptible while a difference of 20 dB is typically experienced as a fourfold change in loudness.

Table 3.5-1 Subjective Responses to Changes in A-Weighted Decibels

Change	*Change in Perceived Loudness*
3 dB	Barely perceptible
5 dB	Quite noticeable
10 dB	Dramatic – twice or half as loud
20 dB	Striking – fourfold change

All sounds have a spectral content, which means their magnitude or level changes with frequency, where frequency is measured in cycles per second or hertz. To mimic the human ear's non-linear sensitivity and perception of different frequencies of sound, the spectral content is weighted. For example, environmental noise measurements are usually on an "A-weighted" scale that minimizes very low and very high frequencies in order to replicate human sensitivity. It is common to add the "A" to the measurement unit in order to identify that the measurement has been made with this filtering process (dBA). In this document, the dB unit refers to A-weighted sound levels.

Figure 3.5-1 (Cowan, 1994) provides a chart of A-weighted sound levels from typical noise sources. Some noise sources (e.g., air conditioner, vacuum cleaner) are continuous sounds that maintain a constant sound level for some period of time. Other sources (e.g., automobile, heavy truck) are the maximum sound produced during an event like a vehicle pass-by. Other sounds (e.g., urban daytime, urban nighttime) are averages taken over extended periods of time. A variety of noise metrics have been developed to describe noise over different time periods, as discussed in Section 3.5.2. *Nosie Metrics.*

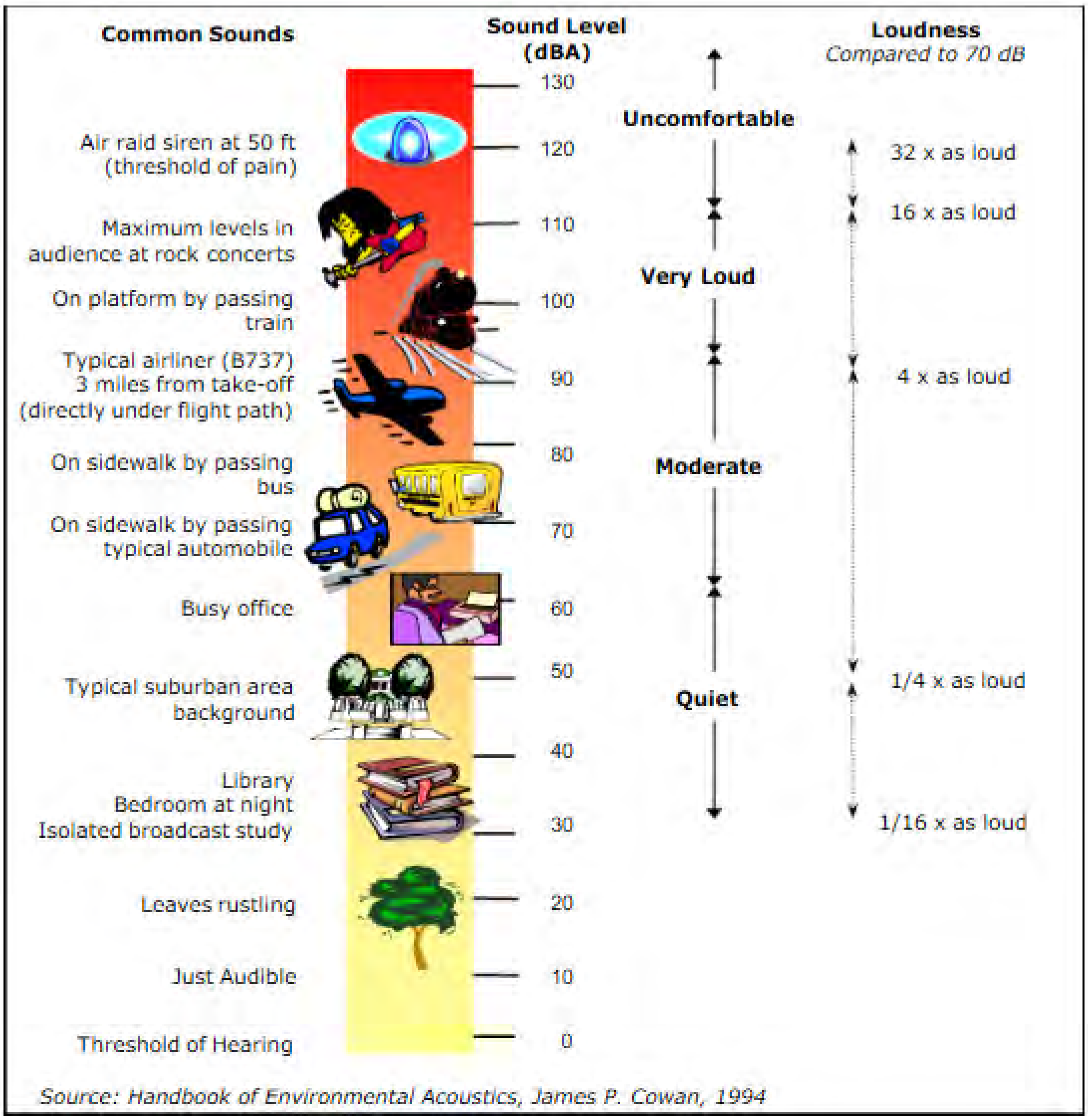


Figure 3.5-1 A-Weighted Sound Levels from Typical Sources

Noise levels from aircraft operations associated with this EA often exceed background noise levels at an airfield beneath main approach and departure corridors, in local air traffic patterns around the airfield, and in areas immediately adjacent to parking ramps and aircraft staging areas. As aircraft in flight gain altitude or distance from a receptor, their noise contributions at ground level generally decreases until becoming indistinguishable from the background ambient noise.

3.5.2 Noise Metrics

A metric is a system for measuring or quantifying a particular characteristic of a subject. Since noise is a complex physical phenomenon, different noise metrics help to quantify the noise environment. The following sections summarize the noise metrics used to complete the analysis in this EA.

3.5.2.1 Day-Night Average Sound Level

The DNL metric is the energy-averaged sound level measured over a 24-hour period, with a 10-dB adjustment assigned to noise events occurring after 10 p.m. and before 7 a.m. (acoustic night) to account for the added intrusiveness of sounds occurring while people are most likely at home or sleeping. The “daytime” and “nighttime” in calculation of DNL are sometimes referred to as “acoustic day” and “acoustic night” and always correspond to the times given above independent of the “day” and “night” used commonly in military aviation, which are directly related to the times of sunrise and sunset.

DNL does not represent a sound level heard at any given time but instead represents long-term exposure. In particular, DNL values are average quantities, mathematically representing the continuous sound level that would be present if all of the variations in sound level that occur over a 24-hour period were averaged to have the same total sound energy. The DNL metric quantifies the total sound energy received and is therefore a cumulative measure, but it does not provide specific information on the number of noise events or the individual sound levels that occur during the 24-hour day.

Scientific studies have found correlation between the percentages of groups of people highly annoyed and the level of their average noise exposure measured in DNL (Schultz, 1978), (USEPA, 1978). DNL has been determined to be a reliable measure of long-term community annoyance with aircraft noise and has become the standard noise metric used by the Federal Aviation Administration, USEPA, DoD, Federal Interagency Committee on Noise, American National Standards Institute, and World Health Organization, among others, for measuring noise impacts.

In accordance with DoD Instruction 4165.57, DNL noise contours are used for recommending land uses that are compatible with aircraft noise levels. Studies of community annoyance in response to numerous types of environmental noise show that DNL correlates well with impact assessments (Schultz, 1978); there is a relationship between DNL and the level of annoyance experienced (refer to *Appendix E, Noise Methodology and Calculations*).

DoD recommends land use controls beginning at the 65 dB DNL level. Research has indicated that about 87 percent of the population is not highly annoyed by outdoor sound levels below 65 dB DNL (Federal Interagency Committee on Urban Noise, 1980). Most people are exposed to sound levels of 50 to 55 dB DNL or higher on a daily basis. Therefore, the 65 dB DNL noise contour is used to help determine compatibility of military aircraft operations with local land use, particularly for land use associated with airfields.

3.5.2.2 Equivalent Sound Level

A cumulative noise metric useful in describing noise is the Equivalent Sound Level (L_{eq}). L_{eq} is the continuous sound level that would be present if all of the variations in sound level occurring over a specified time period were smoothed out as to contain the same total sound energy. The same calculation for a daily average time period such as DNL but without the penalties is a 24 hour equivalent sound level, abbreviated $L_{eq(24hr)}$. Other typical time periods for L_{eq} are 1 hour ($L_{eq(1hr)}$) and 8 hours ($L_{eq(8hr)}$).

3.5.2.3 Sound Exposure Level

The Sound Exposure Level (SEL) metric is a composite metric that represents both the intensity of a sound and its duration. Individual time-varying noise events (e.g., aircraft overflights) have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. SEL provides a measure of total sound energy of the entire acoustic event, but it does not directly represent the sound level heard at any given time. During an aircraft flyover, SEL captures the total sound energy from the beginning of the acoustic event to the point when the receiver no longer hears the sound. It then condenses that energy into a 1-second period of time and the metric represents the total sound exposure received. The SEL has proven to be a good metric to compare the relative exposure of transient sounds, such as aircraft overflights, and is the recommended metric for sleep disturbance analysis (DoD Noise Working Group, 2009).

3.5.2.4 Maximum Sound Level

The highest A-weighted sound level measured during a single event where the sound level changes value with time (e.g., an aircraft overflight) is called the maximum A-weighted sound level or L_{max}. During an aircraft overflight, the noise level starts at the ambient or background noise level, rises to the maximum level as the aircraft flies closest to the observer, and returns to the background level as the aircraft recedes into the distance. L_{max} defines the maximum sound level occurring for a fraction of a second. For aircraft noise, the "fraction of a second" over which the maximum level is defined is generally 1/8 second (American National Standards Institute, 1988).

3.5.3 Noise Effects

An extensive amount of research has been conducted regarding noise effects including annoyance, effects on domestic animals and wildlife, property values, structures, terrain, and archaeological sites. Annoyance, workplace noise, and effects on domestic animals are summarized below; the remaining effects are described in *Appendix E, Noise Methodology and Calculations*.

3.5.3.1 Annoyance

As previously noted, the primary effect of aircraft noise on exposed communities is long-term annoyance, defined by USEPA as any negative subjective reaction on the part of an individual or group. The scientific community has adopted the use of long-term annoyance as a primary indicator of community response and there is a consistent relationship between DNL and the level of community annoyance (Federal Interagency Committee on Noise, 1992).

3.5.3.2 Workplace Noise

In 1972, the National Institute for Occupational Safety and Health published a criteria document with a recommended exposure limit of 85 dBA as an 8-hour time-weighted average ($L_{eq(8hr)}$). This exposure limit was reevaluated in 1998 when National Institute for Occupational Safety and Health made recommendations that went beyond conserving hearing by focusing on the prevention of occupational hearing loss. Following the reevaluation using a new risk assessment technique, National Institute for Occupational Safety and Health published another criteria document in 1998, which reaffirmed the 85 dBA recommended exposure limit (National Institute for Occupational Health and Safety, 1998). These workplace noise exposure recommendations are applicable to construction and demolition activities, and are not applicable to the evaluation of aircraft noise on off-base populations (see Section 3.5.3.1 Annoyance for the effect of aircraft noise on exposed communities).

3.5.3.3 Noise Effects on Domestic Animals

Hearing is vital to animals' ability to react, compete, seek mates and reproduce, forage, and communicate and survive in its environment. Primary noise effects may include direct, physiological changes to the auditory system, and most likely include the masking of auditory signals that interfere with an animal's ability to hear signals from mates or predators (Pennsylvania State University, 2019), (Dufour, 1980). Animal responses to aircraft are influenced by many variables, including size, speed, proximity (both height above ground and lateral distance), engine noise, color, flight profile, and radiated noise. Mammals in particular appear to react to noise at sound levels higher than 90 dB, with responses including the startle response, freezing (e.g., becoming temporarily stationary), and fleeing from the sound source (Pennsylvania State University, 2019). Many studies on domestic animals suggest that some species appear to acclimate to some forms of sound disturbance (Manci, Gladwin, Villella, & Cavendish, 1988). Horses have been observed to react to overflights of jet aircraft (Dufour, 1980). Observations noted that horses galloped in response to jet flyovers (U.S. Air Force, 1994), and exhibited intensive flight reactions, random movements, and biting/kicking behavior (Bowles, 1995). However, no injuries or abortions occurred, and there was evidence that the mares adapted somewhat to the flyovers over the course of a month. Aircraft overflights did not appear to affect survivability or reproductive success. There was also some indication that habituation to these types of disturbances was occurring (U.S. Air Force, 1994).

3.5.4 Noise Modeling

Computer modeling provides a tool to assess potential noise impacts. DNL noise contours are generated by a computer model that draws from a library of actual aircraft noise measurements. Noise contours produced by the model allow for a comparison of existing conditions and proposed changes or alternative actions, even when the aircraft studied are not currently operating from the installation. For these reasons, on-site noise monitoring is seldom used at military air installations, especially when the aircraft mix and operational tempo are not uniform.

The noise environment for this EA was modeled using the NOISEMAP suite of computer programs containing the core computational programs called NMAP, version 7.3. NOISEMAP analyzes all the operational data (types of aircraft, number of operations, flight tracks, altitude, speed of aircraft, engine power settings, and engine maintenance run-ups), environmental data (average humidity and temperature), and surface hardness and terrain. The results of the modeling are DNL noise contours, which are lines connecting points of equal value (e.g., 65 dB DNL and 70 dB DNL). Modeled DNL contours are depicted on noise contour maps, which provide a visual depiction of the overall geographic area covered by the different levels of noise. Noise zones cover an area between two noise contours and are usually shown in 5-dB increments (e.g., 65–69 dB DNL and 70–74 dB DNL).

NOISEMAP was used to calculate fixed-wing flight operations, ground run-up, and hover operations. For helicopter flight operations, this EA used NOISEMAP's Advanced Acoustic Model for modeling TH-57 (for baseline and the No Action Alternative), and UH-72 Lakota (for the Action Alternative). The UH-72A helicopter was selected as a surrogate aircraft for modeling purposes because the actual aircraft that will serve as the TH-XX has not been selected. The UH-72 is a twin-engine aircraft; in that it is not yet known whether a single-engine or a twin-engine commercial helicopter will be selected as the TH-XX. Using a twin-engine as the surrogate is considered the most conservative alternative for assessing noise impacts because the surrogate is expected to be as loud, or louder, than whatever commercial helicopter is ultimately selected. The UH-72A is currently in use as a helicopter training aircraft for U.S. Army primary pilot training and the U.S. Navy rotary-wing test pilot course. Though larger than then the expected TH-XX based on Navy requirements documents, the UH-72A has a record of operational procedures and reference noise data to allow modeling to proceed.

In addition to DNL contours, single-event sound levels for SEL and L_{max} are provided for several points of interest surrounding each airfield.

3.5.5 Regulatory Setting

Under the Noise Control Act of 1972, the Occupational Safety and Health Administration established workplace standards for noise. The minimum requirement states that constant noise exposure must not exceed 90 dBA over an 8-hour period. The highest allowable sound level to which workers can be constantly exposed is 115 dBA, and exposure to this level must not exceed 15 minutes within an 8-hour period. The standards limit instantaneous exposure, such as impact noise, to 140 dBA. If noise levels exceed these standards, employers are required to provide hearing protection equipment that will reduce sound levels to acceptable limits.

The joint instruction, Chief of Naval Operations Instruction 11010.36C and Marine Corps Order 11010.16, *Air Installations Compatible Use Zones (AICUZ) Program,* provides guidance administering the AICUZ program, which recommends land uses that are compatible with aircraft noise levels. Per Chief of Naval Operations Instruction 11010.36C, NOISEMAP is to be used for developing noise contours for fixed-wing aircraft, while the Advanced Acoustic Model is used for rotary-wing aircraft.

3.5.6 Affected Environment

Many sources may generate noise and warrant analysis as contributors to the total noise impact. The predominant noise sources consist of aircraft operations, both at and around the airfields at NAS Whiting Field and its NOLFs. Other components such as construction, aircraft ground support equipment for maintenance purposes, and vehicle traffic produce noise, but such noise generally represents a transitory and negligible contribution to the average noise level environment. The Federal Government supports conditions free from noise that threaten human health and welfare and the environment. Response to noise varies, depending on the type and characteristics of the noise, distance between the noise source and whoever hears it (the receptor), receptor sensitivity, and time of day. A noise-sensitive receptor is defined as a land use where people involved in indoor or outdoor activities may be subject to stress or considerable interference from noise. Such locations or facilities often include residential dwellings, hospitals, nursing homes, educational facilities, and libraries. Sensitive receptors may also include noise-sensitive cultural practices, some domestic animals, or certain wildlife species. There are numerous sensitive receptors located around the NAS Whiting Field and its NOLFs, and these receptors are discussed in this section as well as in Section 3.6, *Land Use*. Potentially noise-sensitive wildlife species are discussed in Section 3.4, *Biological Resources*.

3.5.6.1 Installation Noise Environment

The main sources of noise at NAS Whiting Field are aircraft operations, which include take-offs, landings, touch-and-go operations, and engine maintenance run-ups at the station. These noise sources potentially affect land use on the installation as well as land uses in surrounding developed areas. Land uses in surrounding areas, such as residential developments, schools, and churches, may be potentially incompatible with flight operations. Noise studies have been conducted at NAS Whiting Field and its outlying fields to define applicable AICUZ noise exposure zones. These zones provide guidance for promoting compatible uses in areas surrounding NAS Whiting Field.

3.5.6.2 Aircraft Noise

The affected environment for noise was modeled using an average of aircraft operations data at NAS Whiting Field and its NOLFs from 2014 through 2018. While average annual operations were used for purposes of this analysis, actual annual operations at Whiting Field South and the NOLFs can fluctuate.

Because the Proposed Action for this EA would only affect Whiting Field South, the northern airfield is not modeled. Whiting Field South includes an average of approximately 97,700 annual airfield operations; 78 percent of those are TH-57 helicopters under baseline conditions, as shown in Table 3.5-2. The remaining approximate 21,200 operations are associated with other transient aircraft that operate out of Whiting Field South as an Aviation Park. These transient operations are grouped into four categories according to aircraft type: single-engine training aircraft (T-6), multiple-engine propeller aircraft (T-44), multiple-engine cargo aircraft (C-130), and corporate jets (C-21A). Most operations occur during the acoustic daytime with approximately four percent during the nighttime (10 p.m. to 7 a.m.) The TH-57 currently conducts run-up, hover, and maintenance operations at the Whiting Field South at 22 modeled ground locations. Up to 2 percent of pre-flight and fuel pit runs occur during the DNL nighttime while all maintenance occurs during acoustic daytime. Details of the noise modeling are included in the noise study prepared for this project in *Appendix E, Noise Methodology and Calculations*.

Table 3.5-2 Annual Operations at Whiting Field South for Baseline

Aircraft Type	***Operation Type***	***Baseline***
Helicopter(1)	Departures / Arrivals	64,698
	Patterns	11,835
T-6	Ground Controlled Approach	2,367
Aviation Park(2)	Departures / Arrivals	18,800
Total	**All**	**97,700**

Notes: 1) TH-57 for baseline.
2) Includes passenger propeller, cargo propeller, and corporate jet aircraft.

As part of this Proposed Action, aircraft operating at NAS Whiting Field use six NOLFs for flight training operations: Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw. Helicopter activity at the NOLFs includes arrival and departure operations as well as the training profiles listed in Table 3.5-3.

Table 3.5-3 Helicopter Training Profiles

ID	*Profile Name*	*Description*
1	Standard Pattern	Race track with 500 foot downwind altitudes
2	90 Degree Autorotation Pattern	Race track with descent initiated at mid-point of final turn
3	180 Degree Autorotation Pattern	Race track with descent initiated at start of final turn
4	Tactical Low Altitude Pattern	Low altitude and high-speed
5	High-speed Tactical Pattern	Race track with increased speed
6	Tail Rotor/Boost Off Pattern	Race track with increased initial climb rate
7	Confined Area Landing Pattern	Simulate a landing to location with limited clearance
8	External Load Pattern	Includes external load
9	Pinnacle Pattern	Approach and land on an elevated platform

Table 3.5-4 summarizes the number of annual operations at the NOLFs under baseline conditions, with a total of approximately 758,000 TH-57 operations distributed across all six NOLF locations. Standard pattern and both autorotation patterns are conducted at all NOLFs. External Load and Pinnacle patterns are conducted only at NOLFs Site X and Harold. The majority of Night Vision Device training occurs at NOLFs Santa Rosa, Site X and Harold. Additional details of the noise modeling at the NOLFs is included in the noise study in *Appendix E, Noise Methodology and Calculations*.

Table 3.5-4 Annual TH-57 Operations at NOLFs for Baseline

Airfield	*Baseline Operations*	*Training Patterns Conducted*[2]
NOLF Spencer	269,351	1,2,3,5,6
NOLF Pace	129,947	1,2,3,5
NOLF Site 8[3]	57,714	1,2,3,4,5
NOLF Site X	0[1]	All
NOLF Harold	88,237	1,2,3,4,5,7,8,9
NOLF Santa Rosa	204,824	1,2,3,4,5,6
NOLF Choctaw	8,628	1,2,3
Total	**758,701**	-

Notes: 1) NOLF Site X was not in existence during the years when baseline operations were collected.
2) Refers to the list of operation types discussed above in Table 3.5-3.
3) NOLF Site 8 was closed in January 2019 and was not modeled for this EA.

Noise Exposure

Noise exposure modeled for the affected environment is expressed in DNL noise contours. The noise contours reflect average noise levels based upon cumulative data averaged over the year. Table 3.5-5 presents noise exposure in terms of estimated off-base acreage and population for the affected environment. Population estimates were calculated using U.S. Census Bureau data for average number of persons per household in Santa Rosa County (U.S. Census Bureau, 2017a). The number of houses was determined through the use of aerial imagery. The number of houses was then multiplied by the average number of persons per household to determine the population within noise levels. Under baseline conditions, there are no estimated off-base noise impacts above 65 dB DNL at Whiting Field South and NOLF Harold. Near NOLF Spencer, off-base noise impacts in the 65 to <70 dB DNL range are estimated to affect 2 acres and 6 people. NOLF Pace and NOLF Santa Rosa each have an estimated 2 off-base acres affected by noise from 65 to <70 dB DNL, with no affected population.

Table 3.5-5 Estimated Off-Base Acreage and Population within Noise Zones for Whiting Field South and NOLFs for Baseline

Noise Zone (dB DNL)	*Acreage Baseline*	*Population Baseline*
NOLF SPENCER		
65 to <70	2	6
NOLF Spencer Total	**2**	**6**
NOLF PACE		
65 to <70	2	0
NOLF Pace Total	**2**	**0**
NOLF SANTA ROSA		
65 to <70	2	0
NOLF Santa Rosa Total	**2**	0

Note: NOLF Site X is not included in this table because no operations were conducted at NOLF Site X under baseline conditions (2014 through 2018). NOLF Choctaw is not included in this table because helicopter operations proposed in this EA would not significantly affect the noise environment at NOLF Choctaw, which is dominated by military jets.

Figures 3.5-2 through 3.5-7 depict the noise contours for Whiting Field South and NOLFs Spencer, Pace, Harold, Santa Rosa, and Choctaw that were modeled for baseline conditions. While Table 3.5-5 focuses on noise levels greater than 65 dB DNL, Figures 3.5-2 through 3.5-7 also depict the 60 dB DNL noise contour. The 65 dB DNL is the established federal standard for determining potential for high annoyance. This level has been identified in both the Federal Aviation Administration's Part 150 Program and DoD's AICUZ Program, as a threshold for land use recommendations. Consistent with this guidance, 65 dB DNL is used to show areas with potential for high annoyance in this analysis. However, aircraft noise does occur outside the 65 dB DNL contour. In order to more fully reflect the noise environment, the EA includes noise contours of 60 dB DNL as well as a detailed noise analysis for specific points of interest.

In addition to DNL contours, single-event sound levels for SEL and L_{max} are provided for several points of interest surrounding each airfield (see Figures 3.5-2 through 3.5-6). Table 3.5-6 lists the points of interest used in this study along with a description of their locations. The closest schools, hospitals and places of worship are approximately 3 miles south of Whiting Field South in the City of Milton, FL, sufficiently far from the airfields to not be at risk of noise impacts.

Table 3.5-6 Modeled Representative Points of Interest

Location	*ID*	*Description*
Whiting Field South	1	Trinity Church Road
	2	Brake Road
NOLF Spencer	3	Southeast Corner
	4	Wilma Drive
	5	Murray Road
	6	East Side
NOLF Site X	7	Southwest (Intersection of Ard Field Road and Major Stephen W. Pless Medal of Honor Way)
	8	Northwest (Ard Field Road)
	9	North (Hwy 178)
NOLF Harold	10	Northeast Corner
	11	Southeast Corner
	12	Waylon Drive
	13	Sun Up Court
NOLF Santa Rosa	14	Southeast Corner
	15	East (Redland Road)
	16	American Farms Road
	17	Cornfield Way
NOLF Pace	18	Northeast (Willard Norris Road)
	19	Southwest
	20	South
	21	Mahogany Drive

Note: NOLF Choctaw is not included in this table because the helicopter operations proposed in this EA would not significantly affect the noise environment at NOLF Choctaw, which is dominated by military jets.

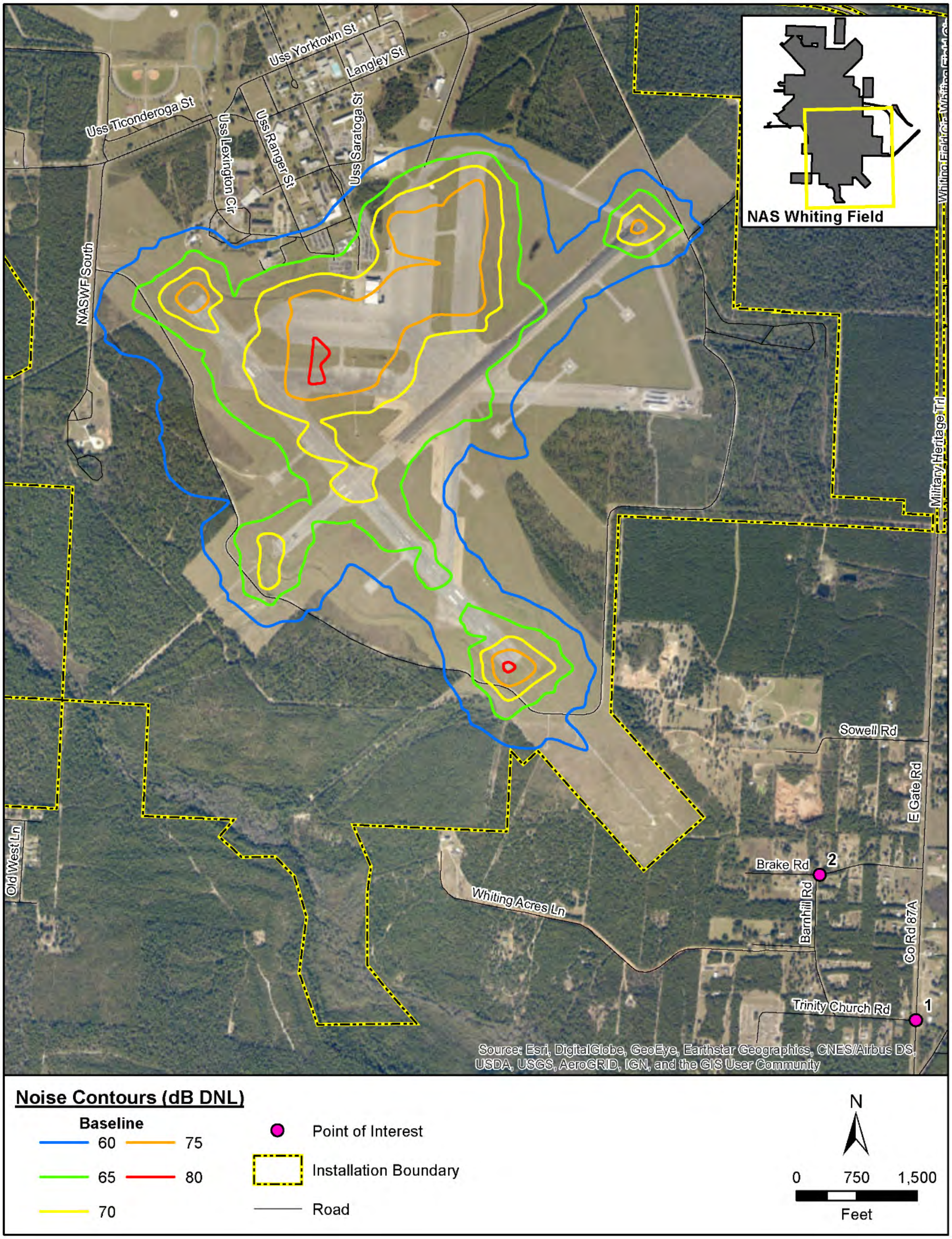


Figure 3.5-2 Noise Contours and Points of Interest at Whiting Field South for Baseline

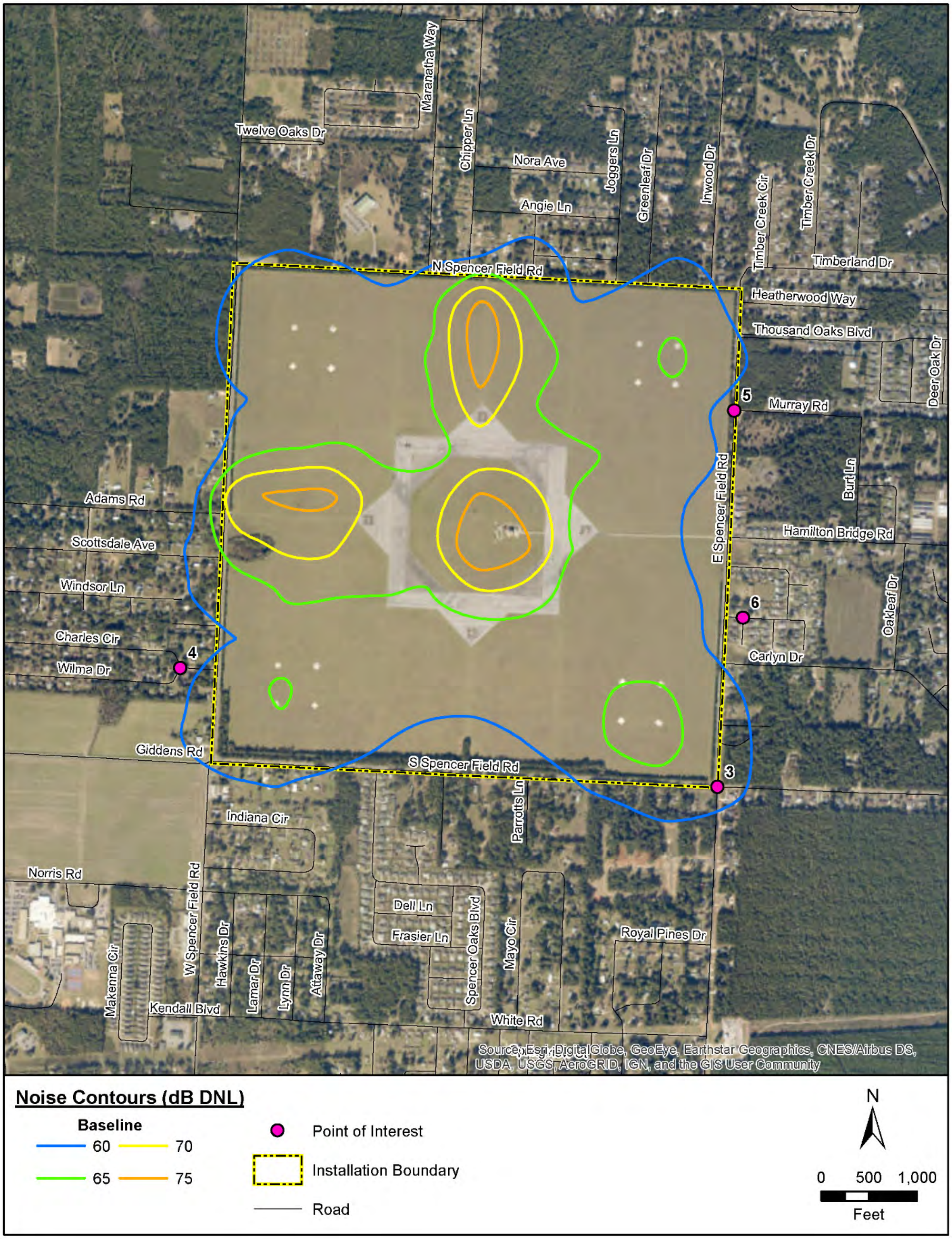


Figure 3.5-3 Noise Contours and Points of Interest at NOLF Spencer for Baseline

Figure 3.5-4 Noise Contours and Points of Interest at NOLF Pace for Baseline

Figure 3.5-5 Noise Contours and Points of Interest at NOLF Harold for Baseline

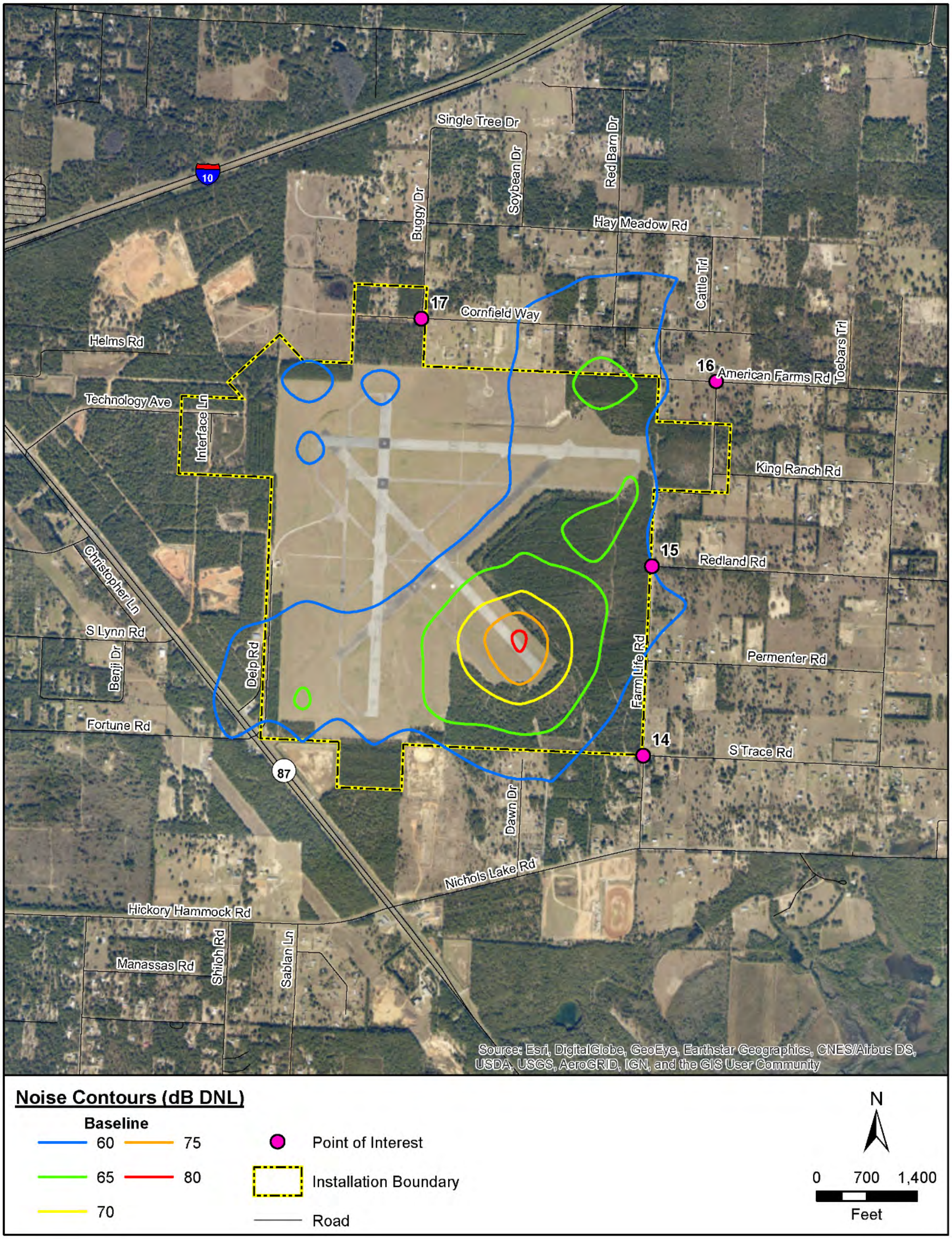
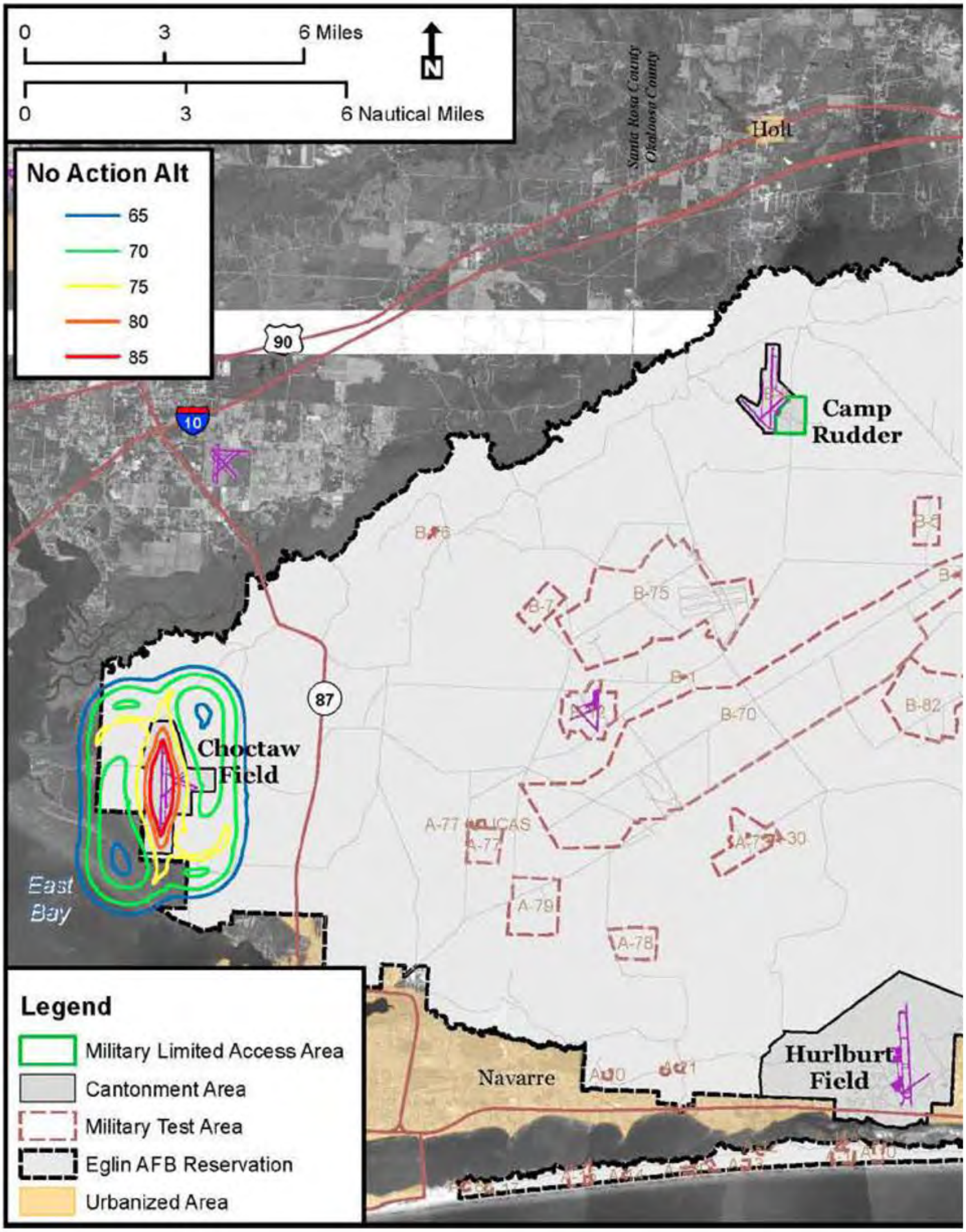


Figure 3.5-6 Noise Contours and Points of Interest at NOLF Santa Rosa for Baseline



Source: Supplemental Environmental Impact Statement for F-35 Beddown at Eglin Air Force Base, Florida (U.S. Air Force, 2014)

Figure 3.5-7 Noise Contours at NOLF Choctaw for Baseline

Whiting Field South. Under baseline conditions, the noise contours 65 dB DNL and above are completely within the NAS Whiting Field installation boundary (Figure 3.5-2). Noise levels were modeled for the two points of interest at the intersection of Trinity Church and East Gate Roads as well as Brake and Barnhill Roads are 44 and 49 dB DNL, respectively. The top five aircraft noise contributors to the DNL at those locations generate single-event sound levels ranging from 72 to 78 dB SEL and 57 to 66 dB L_{max} due to TH-57 arrivals and departures to Whiting Field South.

NOLF Spencer. Under baseline conditions, the 65 dB DNL noise contour extends beyond the airfield boundary up to 200 feet to the west and less than 100 feet to the north (Figure 3.5-3). The noise contours 70 dB DNL and above are within the airfield boundary. Noise levels were modeled for four points of interest (three along the eastern border and one in the southwest) surrounding NOLF Spencer. The maximum of 61 dB DNL occurs at the southeast corner point of interest and the other three points of interest range from 58 to 59 dB DNL. The top five aircraft noise contributors to the DNL at those locations generate single-event sound levels ranging from 85 to 98 dB SEL and 70 to 93 dB L_{max}. The maximum levels occur in the southeast portion of NOLF Spencer due primarily to high-speed tactical patterns flown by the TH-57.

NOLF Pace. Under baseline conditions, the 65 dB DNL noise contour extends beyond the airfield boundary up to 200 feet to the west and to the north (Figure 3.5-4). The noise contours 70 dB DNL and above are within the airfield boundary. Noise levels were modeled for three points of interest surrounding NOLF Pace with the maximum of 56 dB DNL occurring at the southwest location and the other points range from 36 to 50 dB DNL. The top five aircraft noise contributors to the DNL at those locations generate single-event sound levels ranging from 60 to 87 dB SEL and 48 to 79 dB L_{max}. Two points of interest are greater distances from NOLF Pace, as compared to the other NOLFs, and therefore, are responsible for the wide range of sound levels. Standard pattern flight profiles are the primary noise contributors to these locations surrounding NOLF Pace.

NOLF Site X. Baseline operations were not modeled at NOLF Site X because the NOLF was recently acquired by the Navy and did not exist during the years when baseline operations data were collected, from 2014 through 2018.

NOLF Harold. Under baseline conditions, all modeled noise contours are completely contained within the airfield boundary (Figure 3.5-5). Noise levels were modeled for four points of interest surrounding NOLF Harold (one to the northeast and three to the southeast). The maximum of 58 dB DNL occurs at the southeast corner of the airfield while the other points range from 45 to 56 dB DNL. The top five aircraft noise contributors to the DNL at those locations generate single-event sound levels ranging from 73 to 92 dB SEL and 60 to 84 dB L_{max}. The large range of values is due to the larger distance the southernmost point is from the other closer to the airfield boundary. Standard pattern flight profiles are primary noise contributors to these locations surrounding NOLF Harold.

NOLF Santa Rosa. Under baseline conditions, the 65 dB DNL noise contours are mostly contained within NOLF Santa Rosa, except for a portion to the north extending 300 feet beyond the airfield boundary (Figure 3.5-6). Noise levels were modeled for four points of interest surrounding NOLF Santa Rosa (one to the north and three to the east). The maximum of 59 dB DNL occurs at the point east on Redland Road while the other points range from 54 to 56 dB DNL. The top five noise contributors to the DNL at those locations generate single-event sound levels ranging from 78 to 89 dB SEL and 66 to 78 dB L_{max}.

Standard pattern flight profiles are primary noise contributors at three locations while autorotation and Tail Rotor/Boost profiles dominate at Cornfield Way to the north of NOLF Santa Rosa.

NOLF Choctaw. Unlike the previous NOLFs, military jets utilize NOLF Choctaw for pattern training. Given the large difference in noise levels between military jets and helicopters, the TH-57 helicopter noise contribution to the noise environment at NOLF Choctaw is negligible so they have not been modeled for this EA. Figure 3.5-7 depicts the DNL contour lines from the U.S. Air Force's Supplemental Environmental Impact Statement for F-35 Beddown at Eglin Air Force Base, which modeled noise in 2014 at NOLF Choctaw, and considered helicopter operations as part of that analysis (U.S. Air Force, 2014).

Noise-sensitive uses, such as residential developments, schools, hospitals, and places of worship, may be potentially incompatible with noise from aircraft operations. Such noise-sensitive receptors surrounding Whiting Field South and identified in the 2017 AICUZ include single-family residential dwellings southeast of Whiting Field South associated with the Clear Creek, Pine Hill, and Miniature Estates subdivisions, as well as other residential developments in the vicinity along East Gate Road and Munson Highway (Naval Facilities Engineering Command, Southeast, 2017a). On average, NAS Whiting Field receives less than 10 noise complaints per month from helicopter flight training operations, to include repeat complaints from one or more complainants (NAS Whiting Field, 2019a).

3.5.7 Environmental Consequences

Analysis of potential noise impacts includes estimating likely noise levels from the Action Alternative and determining potential effects to noise-sensitive receptor sites.

> Noise Potential Impacts:
>
> - No Action: Noise levels would decrease slightly from baseline levels and therefore, would not result in significant impacts.
> - Action Alternative: Off-base locations in the immediate vicinity of the NOLFs would experience increased noise levels due to an increase of 22 percent in flight operations and the change from the TH-57 to the TH-XX, which would likely be noticeable but the areas are currently exposed to regular helicopter traffic. Changes would not constitute a dramatic change to the intensity of noise in the local environment. Implementation of the Action Alternative would not result in significant impacts to the noise environment.

3.5.7.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and the AHTS would not be implemented. There would be no change to total number of annual TH-57 operations. However, the proportion of TH-57 operations occurring at each NOLF would change as some TH-57 flight operations would be redistributed to NOLF Site X. Other NOLFs would see small reductions in annual operations as portions of their operations would be redistributed to NOLF Site X. Table 3.5-7 lists the resulting annual TH-57 operations that would occur under the No Action Alternative. The 57,714 operations evaluated at NOLF Site 8 under baseline conditions are evaluated at NOLF Site X under the No Action Alternative. NOLF Site X is closer to NAS Whiting Field than NOLF Site 8 so it serves as a more convenient training location and can support all TH-57 training profiles. For these reasons, 53,879 operations from other NOLFs would shift to NOLF Site X under the No Action Alternative resulting in a total of 111,593 TH-57 annual operations at NOLF Site X. All other NOLFs would experience decreases in operations of 1 to 35 percent relative to baseline conditions.

Table 3.5-7 Annual TH-57 Operations at Whiting Field South and NOLFs for No Action Alternative

Location	*Number of Annual Operations Baseline*	*Number of Annual Operations No Action Alternative*	*Change between Baseline and No Action Alternative*
Whiting Field South	76,533	76,533	0
NOLF Spencer	269,351	251,221	-18,130
NOLF Pace	129,947	125,611	-4,336
NOLF Site 8	57,714	0	-57,714
NOLF Site X	0	111,593	+111,593
NOLF Harold	88,237	62,221	-26,016
NOLF Santa Rosa	204,824	202,472	-2,352
NOLF Choctaw	8,628	5,583	-3,045
Total	**835,234**	**835,234**	**0**

Table 3.5-8 presents noise exposure in terms of estimated off-base acreage and population affected by the No Action Alternative, compared to the baseline. At Whiting Field South and NOLFs Harold and Site X, the No Action Alternative would not result in any off-base noise impacts above 65 dB DNL. At NOLF Spencer, the No Action Alternative would result in an estimated reduction of 1 acre and no change in population affected by noise from 65 to <70 dB DNL when compared to the baseline. For NOLFs Pace and Santa Rosa, the No Action Alternative would not result in any additional acreage or population affected by noise above 65 dB DNL, when compared to the baseline.

Table 3.5-8 Estimated Off-Base Acreage and Population within Noise Zones for Whiting Field South and NOLFs for No Action Alternative

Noise Zone (dB DNL)	*Acreage*			*Population*		
	Baseline	*No Action Alternative*	*Change*	*Baseline*	*No Action Alternative*	*Change*
NOLF SPENCER						
65 to <70	2	1	-1	6	6	0
NOLF Spencer Total	**2**	**1**	**-1**	**6**	**6**	**0**
NOLF PACE						
65 to <70	1	1	0	0	0	0
NOLF Pace Total	**1**	**1**	**0**	**0**	**0**	**0**
NOLF SANTA ROSA						
65 to <70	2	2	0	0	0	0
NOLF Santa Rosa Total	**2**	**2**	**0**	**0**	**0**	**0**

Notes: Whiting Field South and NOLFs Harold and Site X are not included in this table because the No Action Alternative would not result in any off-base noise impacts above 65 dB DNL. NOLF Choctaw is not included in this table because helicopter operations would not significantly affect the noise environment at NOLF Choctaw, which is dominated by military jets.

Figures 3.5-8 through 3.5-12 depict the noise contours for NOLFs Spencer, Pace, Site X, Harold, and Santa Rosa that were modeled for the No Action Alternative compared to the noise contours for baseline.

As the number of TH-57 flight training operations is the same for both the baseline and No Action Alternative, the noise contours for Whiting Field South, under the No Action Alternative, are the same as those shown in Figure 3.5-2. NOLF Choctaw was not modeled for the No Action Alternative because helicopter operations would not significantly affect the noise environment at NOLF Choctaw, which is dominated by military jets. Details of the noise modeling are included in the noise study prepared for this project in *Appendix E, Noise Methodology and Calculations*.

Whiting Field South. As there would be no change to operations at Whiting Field South under the No Action Alternative, the noise exposure would not change relative to the baseline conditions presented in Section 3.5.6. *Noise*, Affected Environment.

NOLF Spencer. Under the No Action Alternative, the noise levels would decrease by less than 1 dB DNL in the vicinity of NOLF Spencer compared to the baseline (Figure 3.5-8) due to a 7 percent decrease in operations. The 65 dB contour would extend beyond the airfield boundary approximately 150 feet to the west and less than 100 feet to the north. The noise contours 70 dB DNL and above would remain within the airfield boundary. Noise levels at the four points of interest surrounding NOLF Spencer would decrease by up to 1 dB, when rounded to whole numbers, to a range of 58 to 61 dB DNL, as listed in Table 3.5-9.

Table 3.5-9 Noise Levels at Points of Interest near NOLF Spencer for No Action Alternative

ID	*Location*	*No Action Alternative (dB DNL)*	*Change Relative to Baseline (dB DNL)*
3	Southeast Corner	61	0
4	Wilma Drive	58	-1
5	Murray Road	59	0
6	East Side	59	0

The top five aircraft noise contributors at those locations would generate the same single-event sound levels as baseline because TH-57 would perform the same flight profiles with top SELs of 85 to 98 dB and L_{max} of 70 to 93 dB. Consistent with baseline, the Standard Pattern would generate the greatest sound levels at Southwest Corner, Wilma Drive, and Murray Road while the high-speed tactical profile would generate the greatest single-event levels at the East Side location. The single-event sound levels would not change but the frequency of flight training operations would decrease by approximately 7 percent because those operations would be shifted to NOLF Site X.

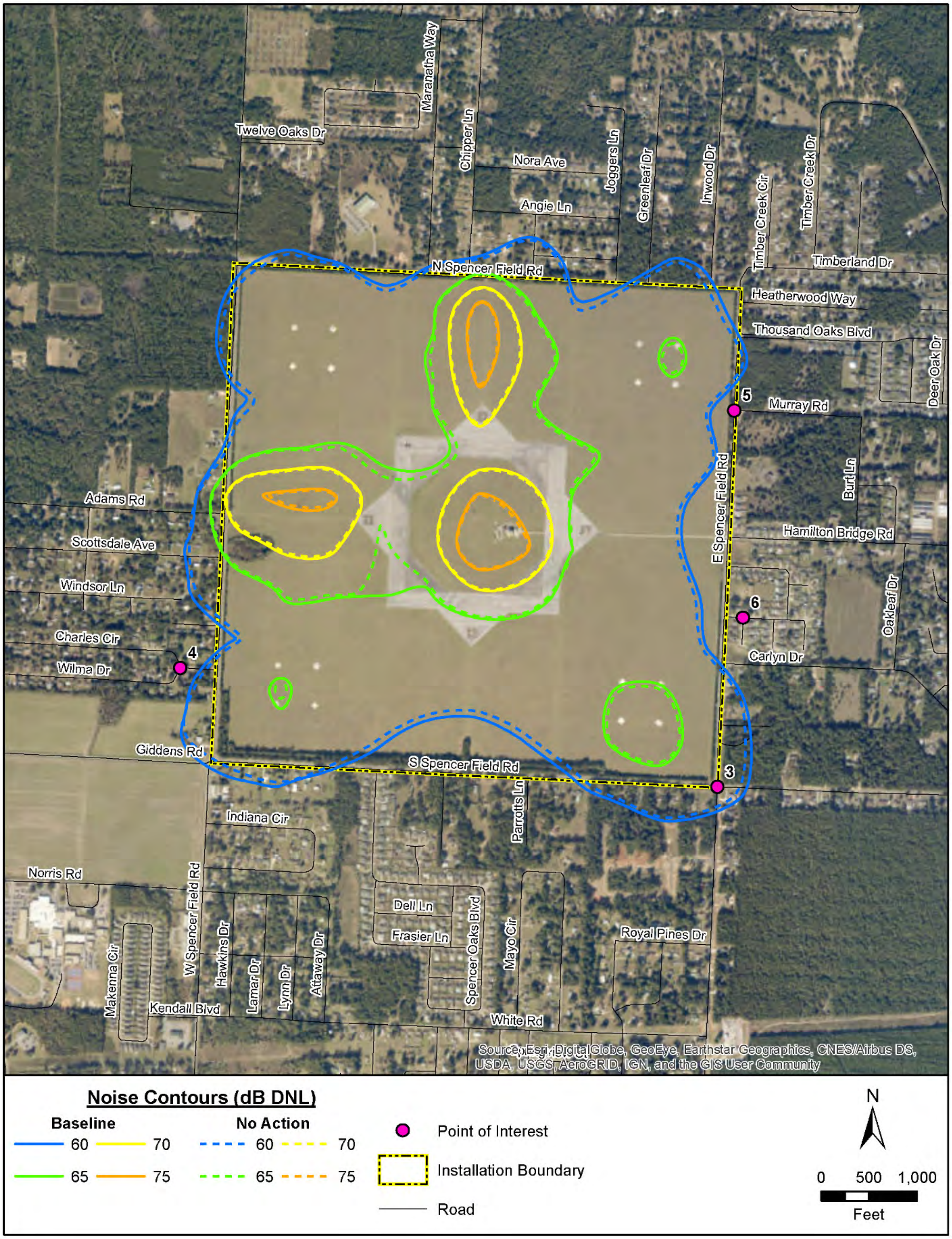


Figure 3.5-8 Noise Contours and Points of Interest at NOLF Spencer for No Action Alternative

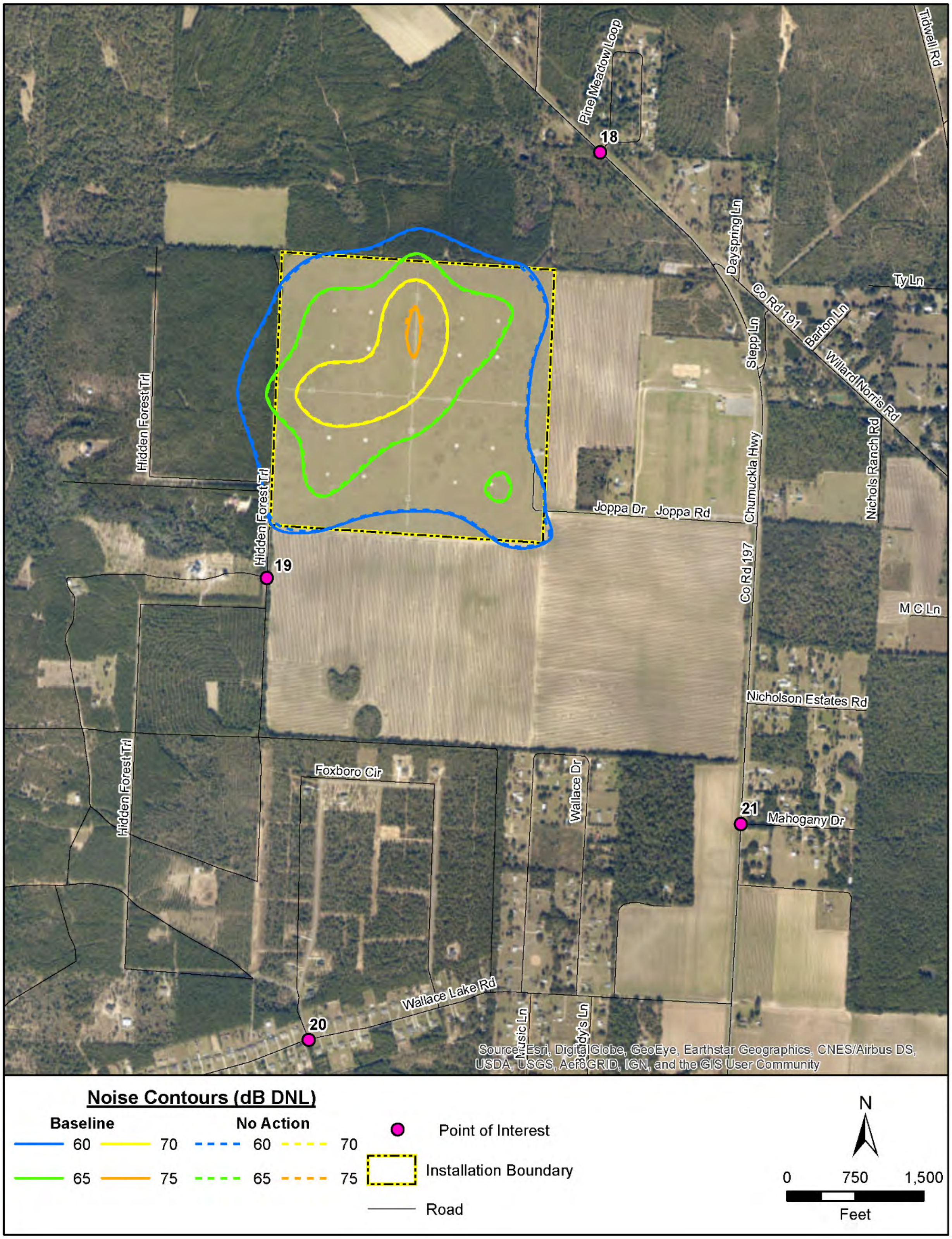


Figure 3.5-9 Noise Contours and Points of Interest at NOLF Pace for No Action Alternative

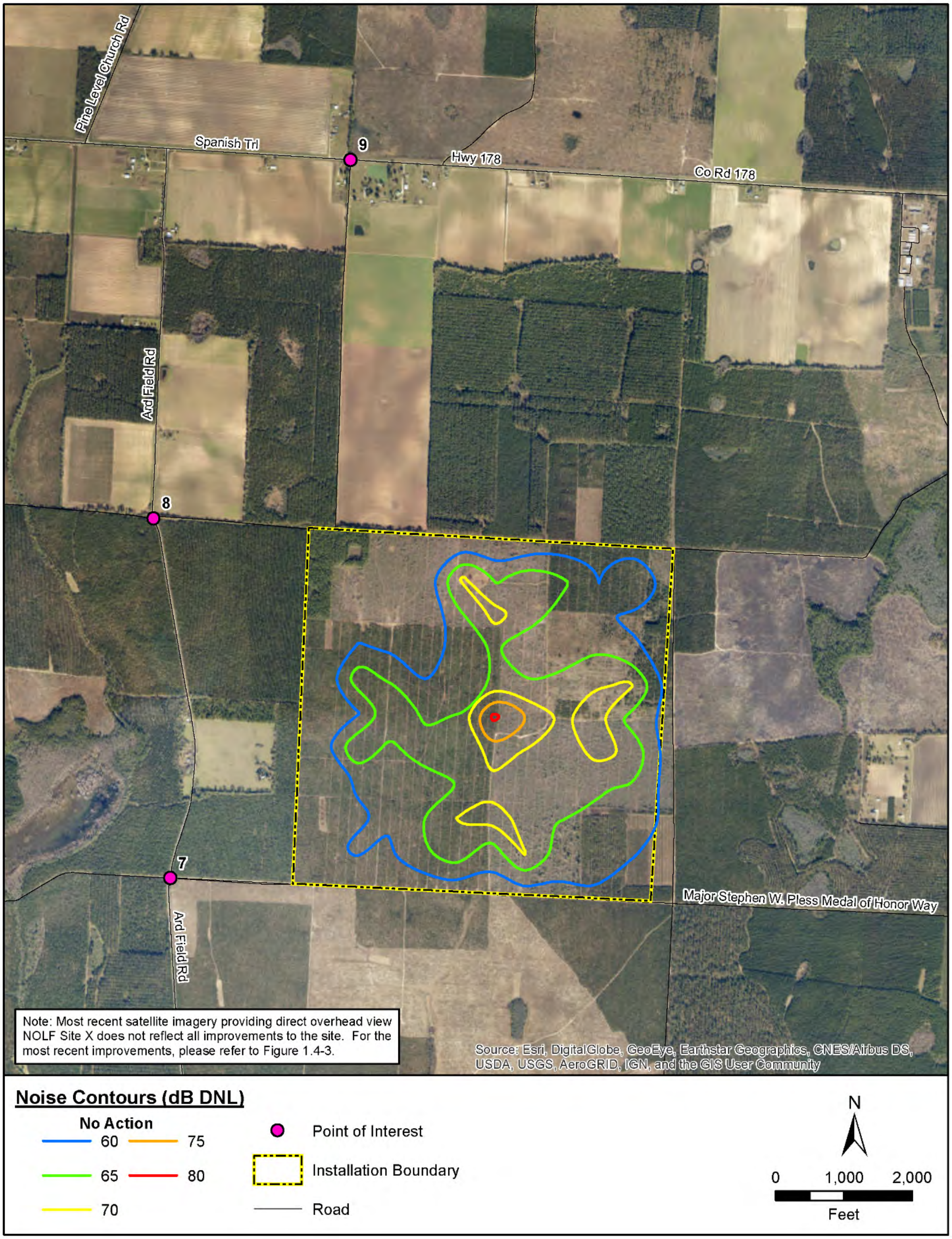


Figure 3.5-10 Noise Contours and Points of Interest at NOLF Site X for No Action Alternative

Figure 3.5-11 Noise Contours and Points of Interest at NOLF Harold for No Action Alternative

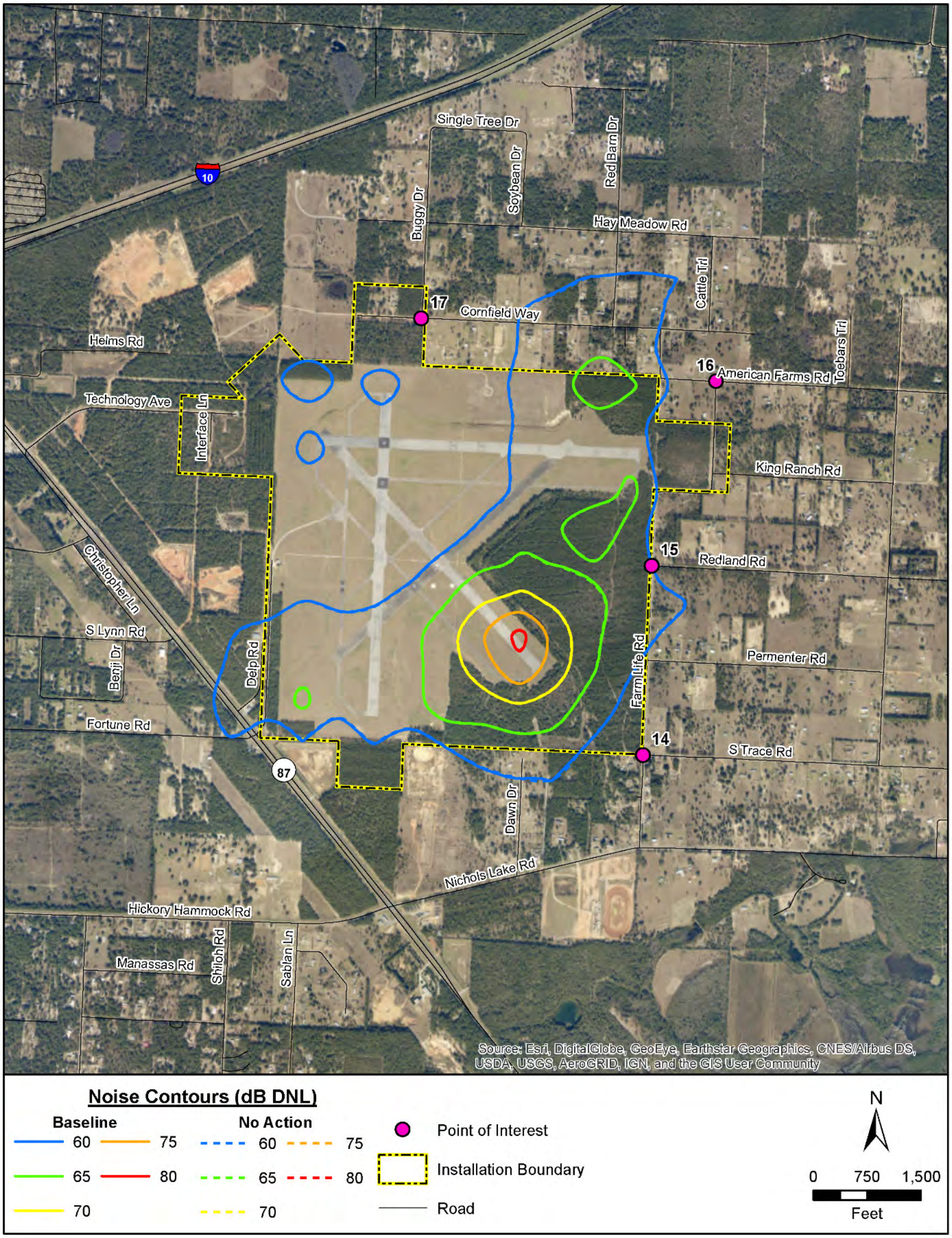


Figure 3.5-12 Noise Contours and Points of Interest at NOLF Santa Rosa for No Action Alternative

NOLF Pace. Under the No Action Alternative, noise levels would decrease by less than 1 dB DNL in the vicinity of NOLF Pace compared to the baseline (Figure 3.5-9) due to a 3 percent decrease in operations. The 65 dB contour would extend beyond the airfield boundary up to 200 feet to the west and to the north. The noise contours 70 dB DNL and above would remain within the airfield boundary. Noise levels at the four points of interest surrounding NOLF Pace would remain the same, as shown in Table 3.5-10. The maximum of 56 dB DNL would remain the same at the southwest location and noise levels at the other points of interest would range from 36 to 50 dB DNL. The relatively small areas exposed to 65 dB DNL would decrease slightly under the No Action Alternative.

Table 3.5-10 Noise Levels at Points of Interest near NOLF Pace for No Action Alternative

ID	*Location*	*No Action Alternative (dB DNL)*	*Change Relative to Baseline (dB DNL)*
18	Northeast (Willard Norris Road)	50	0
19	Southwest	56	0
20	South	36	0
21	Mahogany Drive	44	0

The top five aircraft noise contributors at those locations would generate the same single-event sound levels as baseline because TH-57 would perform the same flight profiles with top SELs between 60 to 87 dB and L_{max} of 48 to 79 dB. Consistent with baseline, the Standard Pattern would generate the greatest sound levels at all four representative points. The single-event sound levels would not change but the frequency of flight training operations would decrease by approximately 3 percent because those operations would be shifted to NOLF Site X.

NOLF Site X. Under the No Action Alternative, noise levels 65 dB DNL and above would be completely within the airfield boundary (Figure 3.5-10). Noise levels at three points of interest surrounding NOLF Site X would be 35 to 48 dB DNL, as shown in Table 3.5-11. The maximum of 48 dB DNL would occur at the southwest location on Ard Field Road. There is no comparison of NOLF Site X noise levels with baseline noise levels because NOLF Site X was recently acquired by the Navy and did not exist during the years when baseline operations data were collected, from 2014 through 2018.

Table 3.5-11 Noise Levels at Points of Interest near NOLF Site X for No Action Alternative

ID	*Location*	*No Action Alternative (dB DNL)*	*Change Relative to Baseline (dB DNL)*
7	Southwest (Ard Field Road and Major Stephen W. Pless Medal of Honor Way)	48	N/A
8	Northwest (Ard Field Road)	44	N/A
9	North (Hwy 178)	35	N/A

The top five aircraft noise contributors at those locations would generate the same single-event sound levels as baseline because TH-57 would perform the same flight profiles with top SELs between 59 to 86 dB and L_{max} of 47 to 74 dB.

NOLF Harold. Under the No Action Alternative, noise levels would decrease up to 2 dB DNL in the vicinity of NOLF Harold compared to the baseline (Figure 3.5-11) due to a 29 percent decrease in operations. All modeled noise contours would remain within the airfield boundary. Noise levels at the four points of interest surrounding NOLF Harold would be 43 to 56 dB DNL, decreases of 1 to 2 dB DNL relative to baseline conditions, as shown in Table 3.5-12.

Table 3.5-12 Noise Levels at Points of Interest near NOLF Harold for No Action Alternative

ID	*Location*	*No Action Alternative (dB DNL)*	*Change Relative to Baseline (dB DNL)*
10	Northeast Corner	55	-1
11	Southeast Corner	56	-2
12	Waylon Drive	49	-2
13	Sun Up Court	43	-2

The top five aircraft noise contributors at those locations would generate the same single-event sound levels as baseline because TH-57 would perform the same flight profiles with top SELs between 73 to 92 dB and L_{max} of 60 to 84 dB. Consistent with the baseline, the Standard Pattern would generate the greatest sound levels at all four representative points. The single-event sound levels would not change but the frequency of flight training operations would decrease by approximately 29 percent because those operations would be shifted to NOLF Site X.

NOLF Santa Rosa. Under the No Action Alternative, noise levels would decrease a negligible amount in the vicinity of NOLF Santa Rosa compared to the baseline (Figure 3.5-12) due to a 1 percent decrease in operations. The 65 dB DNL contours would continue to extend north 300 feet beyond the airfield boundary. Noise levels at the four points of interest surrounding NOLF Santa Rosa would not change relative to the baseline as shown in Table 3.5-13. The maximum of 59 dB DNL would occur to the east on Redland Road while the other points would range from 54 to 56 dB DNL.

Table 3.5-13 Noise Levels at Points of Interest near NOLF Santa Rosa for No Action Alternative

ID	*Location*	*No Action Alternative (dB DNL)*	*Change Relative to Baseline (dB DNL)*
14	Southeast Corner	55	0
15	East (Redland Road)	59	0
16	American Farms Road	56	0
17	Cornfield Way	54	0

The largest military noise contributors at those locations would not change from baseline conditions and sound levels generated would range from 78 to 89 dB SEL and 66 to 78 dB L_{max}. The standard pattern flight profiles would continue to be the primary noise contributors at the first three locations while autorotation and Tail Rotor/Boost profiles would dominate at the Cornfield Way locations to the north of NOLF Santa Rosa.

NOLF Choctaw. Unlike the previous NOLFs, military jets would continue to use NOLF Choctaw for pattern training. Given the large difference in noise levels between military jets and helicopters, the TH-57 helicopter noise contribution to the noise environment at NOLF Choctaw would continue to be negligible so they have not been modeled for this EA. There would be a negligible difference in noise exposure at NOLF Choctaw due to the No Action Alternative.

Under the No Action Alternative, there would be slight decreases in noise exposure as described above at Whiting Field South and NOLFs Spencer, Pace, Harold, and Santa Rosa. At NOLF Site X, noise levels 65 dB DNL and above would be completely within the airfield boundary. At NOLF Choctaw, there would be a negligible difference in noise exposure. Therefore, the No Action Alternative would not result in significant impacts to the noise environment.

3.5.7.2 Action Alternative (Preferred Alternative) Potential Impacts

Under the Action Alternative, there would be construction of temporary and permanent facilities near the Whiting Field South flight line (see Figure 2.3-2). Noise from construction activities along the flight line would be intermittent and more than 1.5 miles from the nearest residential receptors. Aircraft noise would be at a much greater sound level and would mask any construction noise (Thalheimer, 2000). For these reasons, construction noise is not considered further.

Under the Action Alternative, the TH-57 would transition to the TH-XX and there would be a 22 percent increase in flight training operations at Whiting Field South and NOLFs Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw. Table 3.5-14 lists the annual TH-XX operations that would occur under the Action Alternative.

Table 3.5-14 Annual TH-XX Operations for Action Alternative

Location	*Number of Annual Operations No Action Alternative*	*Number of Annual Operations Action Alternative*	*Change between No Action Alternative and Action Alternative*
Whiting Field South	76,533	93,369	+16,836
NOLF Spencer	251,221	306,495	+55,274
NOLF Pace	125,611	153,250	+27,639
NOLF Site X	111,593	136,145	+24,552
NOLF Harold	62,221	75,911	+13,690
NOLF Santa Rosa	202,472	247,022	+44,550
NOLF Choctaw	5,583	6,811	+1,228
Total	**835,234**	**1,019,003**	**+183,769**

For a full discussion of noise modeling and background data used for this analysis, refer to Section 3.5.2 Noise Metrics, Section 3.5.4 Noise Modeling, as well as the noise study in Appendix E, Noise Methodology and Calculations.

Table 3.5-15 presents noise exposure in terms of estimated off-base acreage and population affected by the Action Alternative, compared to the No Action Alternative. At Whiting Field South, the Action Alternative would not result in any off-base noise impacts above 65 dB DNL. At NOLF Spencer, the Action Alternative would result in an estimated 73 more acres and 148 more people affected by noise from 65 to <70 dB DNL, when compared to the No Action Alternative. At NOLFs Pace, Site X, and Harold, the Action Alternative would not affect any people, but would result in an estimated 37 more acres at NOLF Pace, 18 more acres at NOLF Site X, and 1 more acre at NOLF Harold affected by noise from 65 to <70 dB DNL, when compared to the No Action Alternative. At NOLF Santa Rosa, the Action Alternative would result in an estimated 71 more acres affected by noise from 65 to <75 dB DNL, and 67 more people affected by noise from 65 to <70 dB DNL when compared to the No Action Alternative. The increase in operations would contribute an approximate increase of 1 dB DNL at all NOLFs when compared with the No Action Alternative, with a smaller increase at Whiting Field South because use operations include T-6 and corporate jet aircraft. The change in aircraft type from TH-57 to the TH-XX would contribute an approximate 3 to 6 dB increase to both single-event levels and DNL noise levels at each NOLF due to differences in the size and power of the modeled helicopters.

Table 3.5-15 Estimated Off-Base Acreage and Population within Noise Zones for Whiting Field South and NOLFs for Action Alternative

Noise Zone (dB DNL)	*Acreage*			*Population*		
	No Action Alternative	*Action Alternative*	*Change*	*No Action Alternative*	*Action Alternative*	*Change*
NOLF SPENCER						
65 to <70	1	74	+73	6	154	+148
NOLF Spencer Total	**1**	**74**	**+73**	**6**	**154**	**+148**
NOLF PACE						
65 to <70	1	38	+37	0	0	0
NOLF Pace Total	**1**	**38**	**+37**	**0**	**0**	**0**
NOLF SITE X						
65 to <70	0	18	+18	0	0	0
NOLF Site X Total	**0**	**18**	**+18**	**0**	**0**	**0**
NOLF HAROLD						
65 to <70	0	1	+1	0	0	0
NOLF Harold Total	**0**	**1**	**+1**	**0**	**0**	**0**
NOLF SANTA ROSA						
65 to <70	2	69	+67	0	67	+67
70 to <75	0	4	+4	0	0	0
NOLF Santa Rosa Total	**2**	**73**	**+71**	**0**	**67**	**+67**

Notes: Whiting Field South is not included in this table because the Action Alternative would not result in any off-base noise impacts above 65 dB DNL. NOLF Choctaw is not included in this table because military jets use NOLF Choctaw for pattern training and the proposed TH-XX operations at NOLF Choctaw would not contribute a significant difference to the noise environment.

The 22 percent increase in flight training operations under the Action Alternative would result in increased noise levels predominantly from 65 to 70 dB DNL over agricultural areas at NOLFs Spencer, Pace, and Site X (see Table 3.6-6 in Section 3.6 Land Use). Additional helicopter overflights near agricultural areas have the potential to affect domestic animals. However, domestic animals, including horses, have likely habituated to existing helicopter activity at these NOLFs, and proposed changes to the type of helicopter and increased flight training operations would likely be insufficient to result in significant impacts.

Figures 3.5-13 through 3.5-18 depict the noise contours for Whiting Field South and NOLFs Spencer, Pace, Site X, Harold, and Santa Rosa that were modeled for the Action Alternative, compared to the noise contours for the No Action Alternative. NOLF Choctaw was not modeled for the Action Alternative because helicopter operations would not significantly affect the noise environment at NOLF Choctaw, which is dominated by military jets. Details of the noise modeling are included in the noise study prepared for this project in *Appendix E, Noise Methodology and Calculations*.

Whiting Field South. Under the Action Alternative, noise levels would increase at Whiting Field South compared to the No Action Alternative (Figure 3.5-13). Noise levels 65 dB DNL and above would remain completely within the Whiting Field South boundary. Noise levels for two points of interest at the intersection of Trinity Church and East Gate Roads, as well as Brake and Barnhill Roads, would be 52 and 53 dB DNL, respectively, as listed in Table 3.5-16. These levels would represent up to an 8 dB DNL increase at Trinity Church Road compared to the No Action Alternative. However, the levels computed in this analysis only include the aircraft contribution to noise. If the vehicular traffic noise along Munson Highway and Marty Martin Road is accounted for, then the No Action Alternative ambient levels may be higher than reflected in Table 3.5-16 and the increase would be smaller.

Table 3.5-16 Noise Levels at Points of Interest near Whiting Field South for Action Alternative

ID	*Location*	*Action Alternative (dB DNL)*	*Change Relative to No Action Alternative (dB DNL)*
1	Trinity Church Road	52	+8
2	Brake Road	53	+4

TH-XX departure and arrival operations would be the largest military noise contributors at those representative locations generating sound levels ranging from 76 to 81 dB SEL and 59 to 68 dB L_{max}. These events would be approximately 2 to 3 dB greater than under the No Action Alternative, and the events would occur approximately 22 percent more frequently. The single-event sound levels only apply for a short duration when the aircraft is at a close distance to the point of interest.

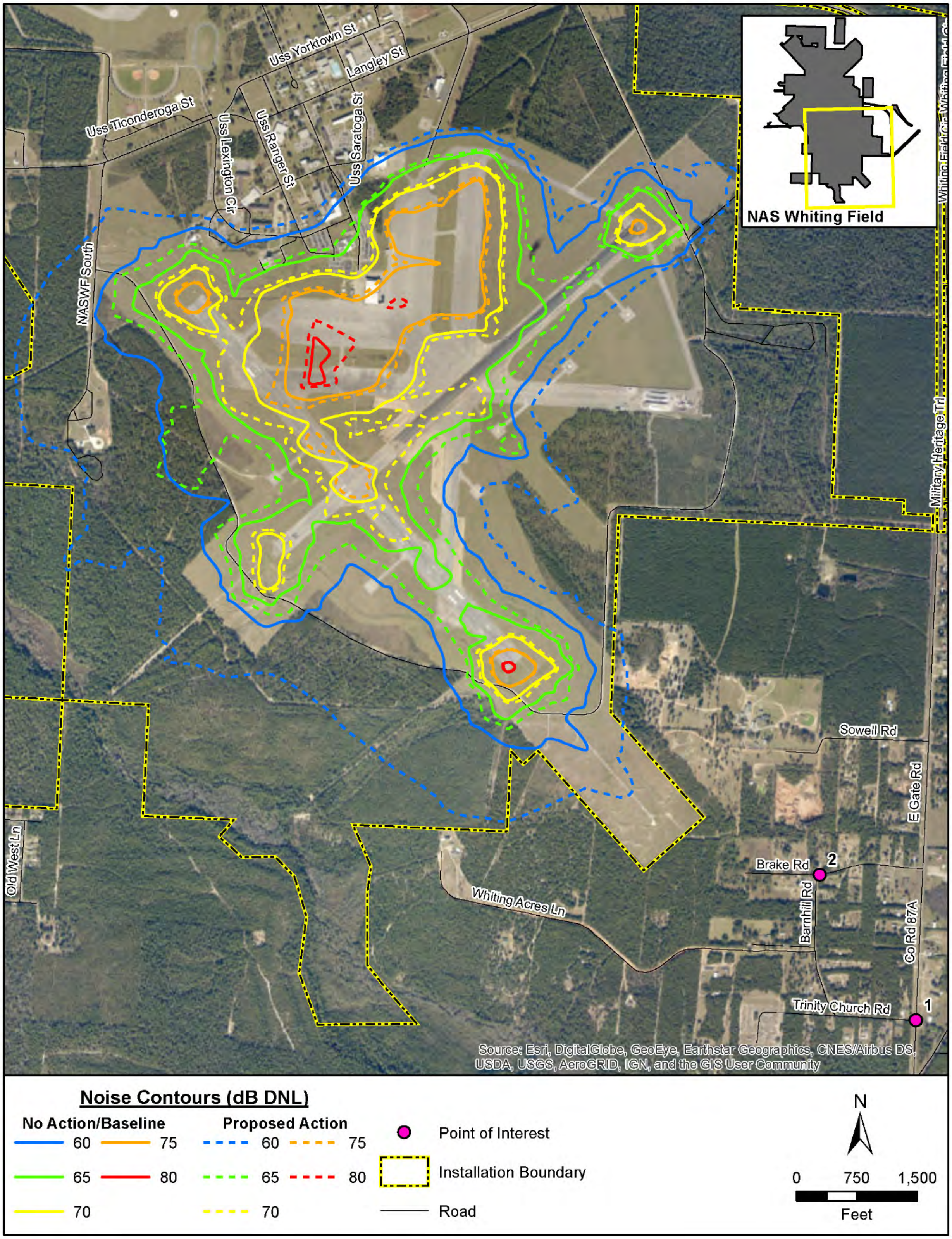


Figure 3.5-13 Noise Contours and Points of Interest at Whiting Field South for Action Alternative

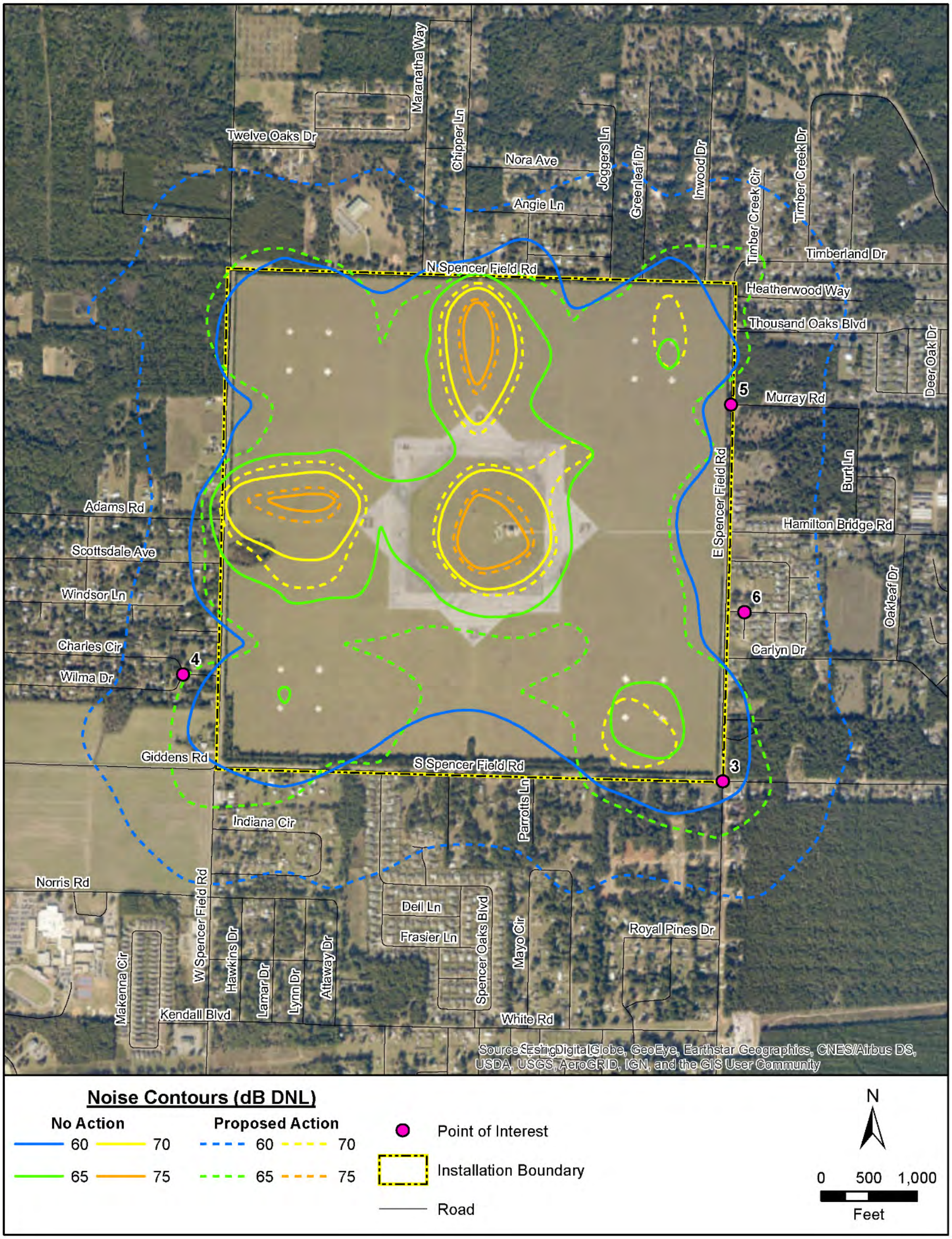


Figure 3.5-14 Noise Contours and Points of Interest at NOLF Spencer for Action Alternative

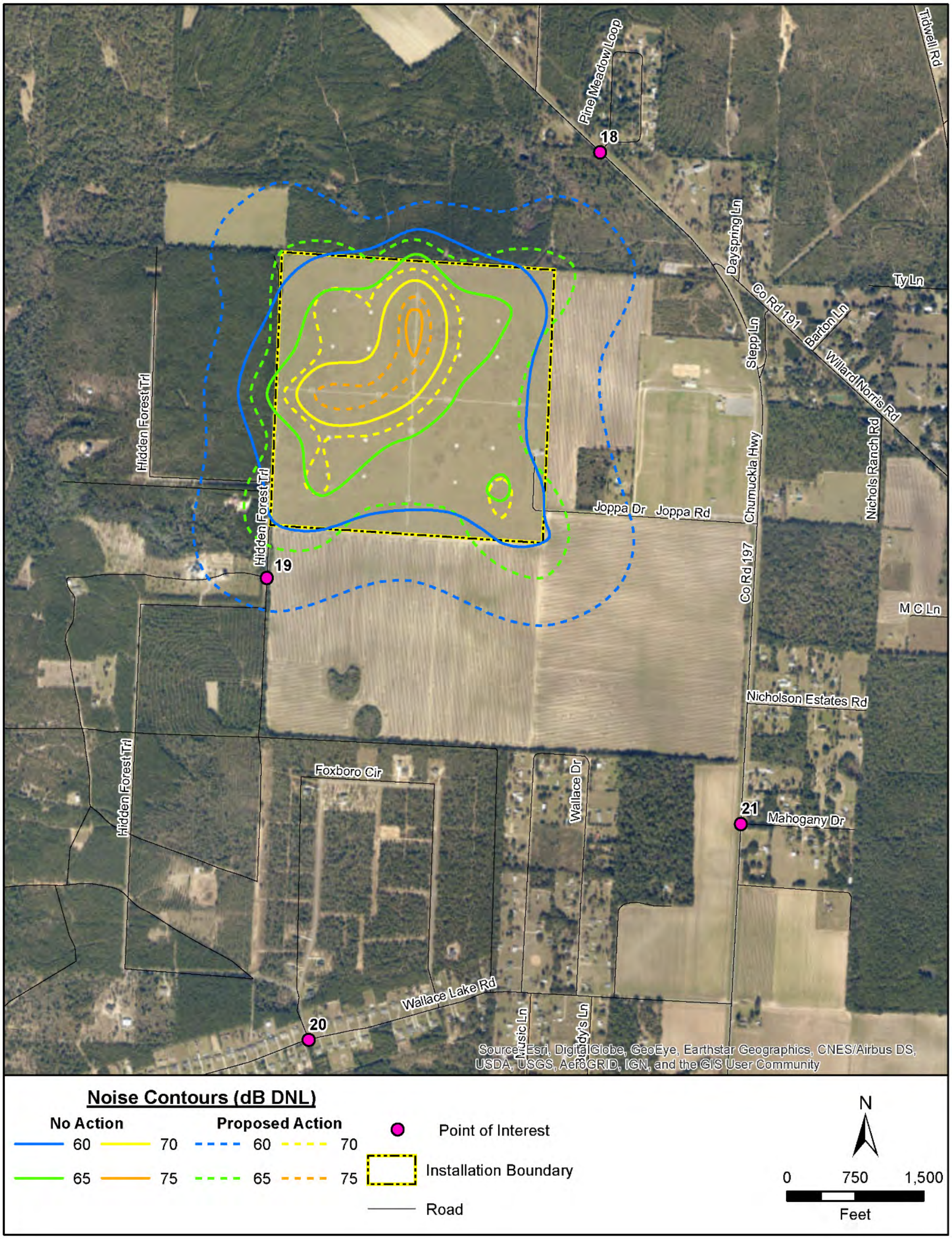


Figure 3.5-15 Noise Contours and Points of Interest at NOLF Pace for Action Alternative

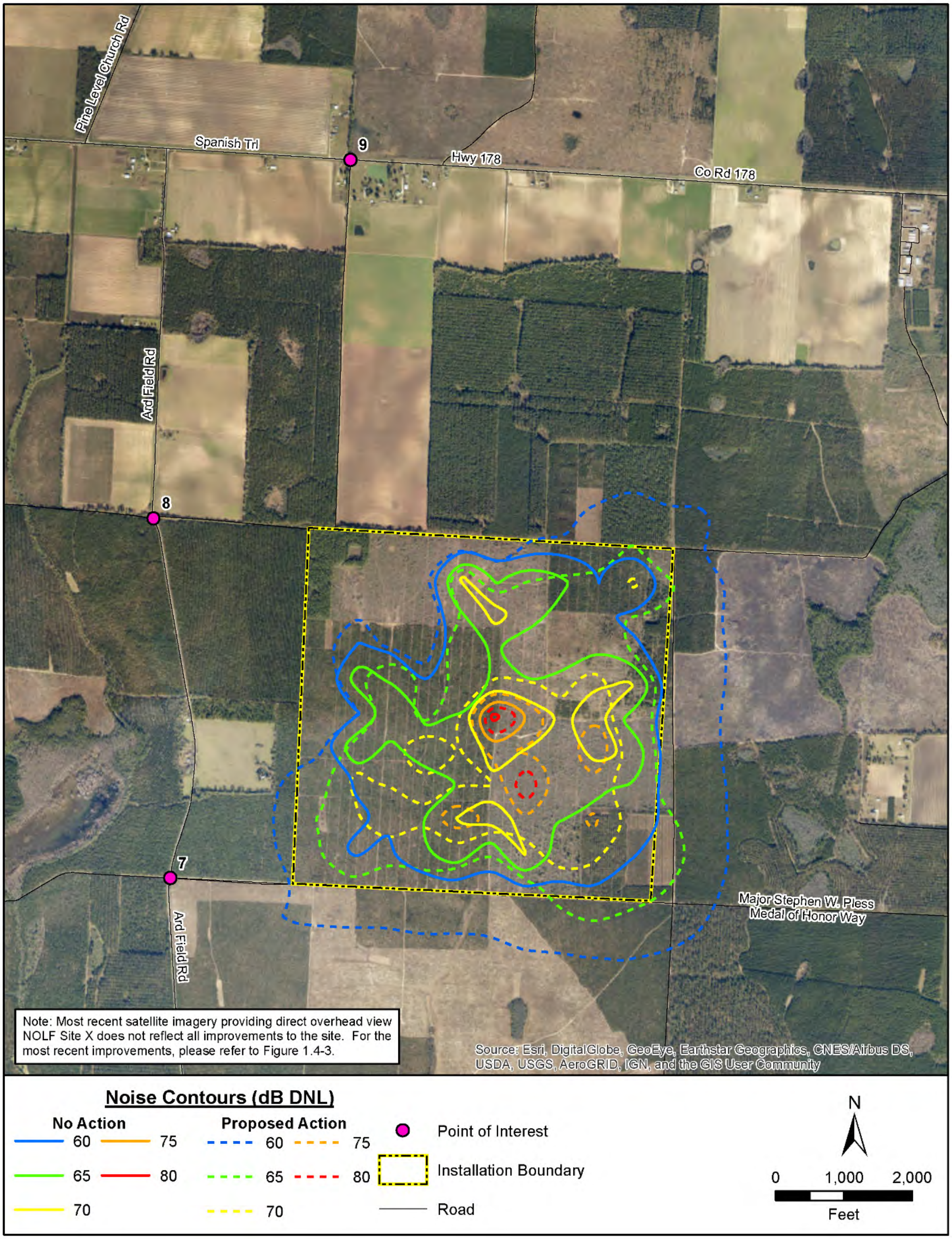


Figure 3.5-16 Noise Contours and Points of Interest at NOLF Site X for Action Alternative

Figure 3.5-17 Noise Contours and Points of Interest at NOLF Harold for Action Alternative

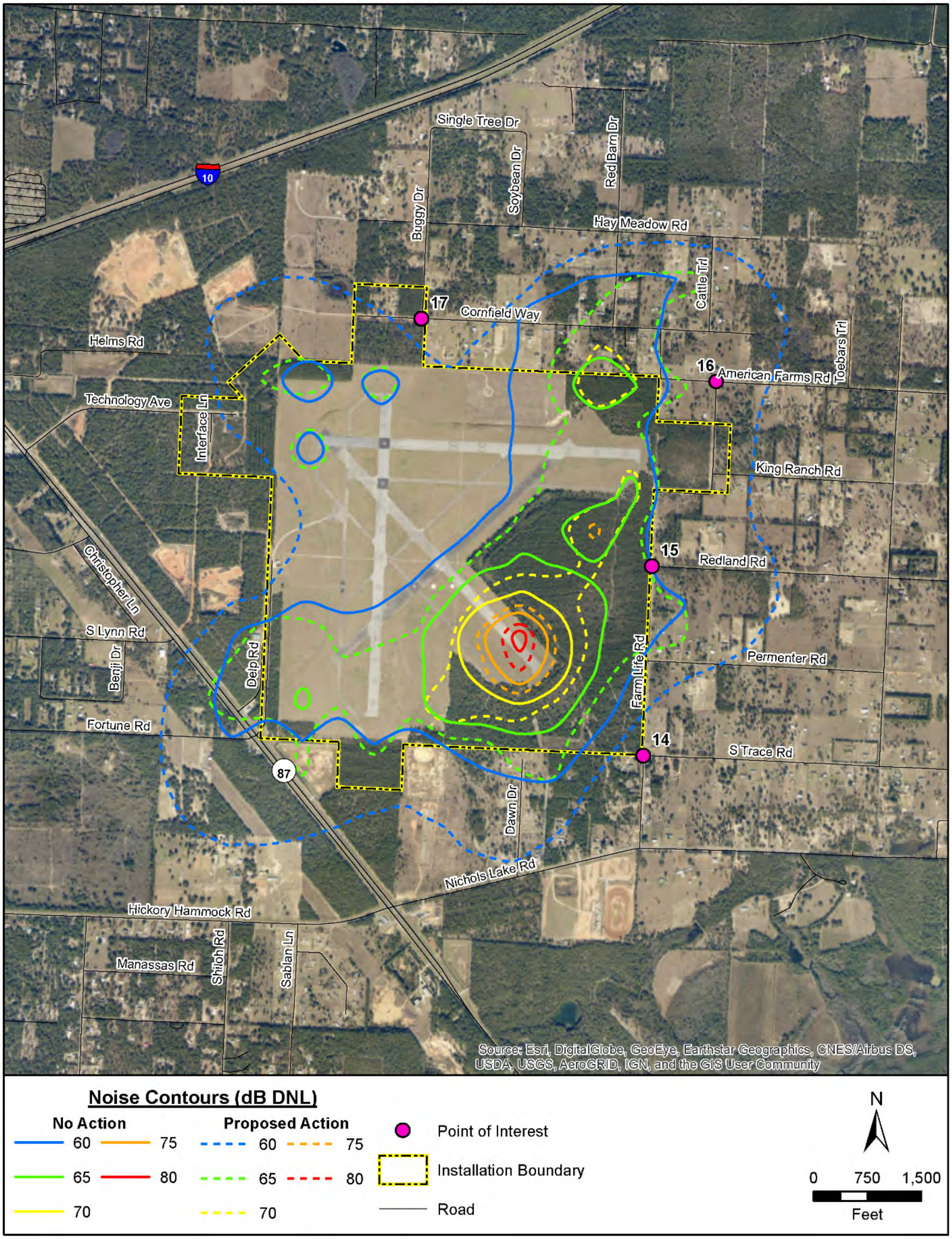


Figure 3.5-18 Noise Contours and Points of Interest at NOLF Santa Rosa for Action Alternative

NOLF Spencer. Under the Action Alternative, noise levels would increase at NOLF Spencer compared to the No Action Alternative (Figure 3.5-14). The 65 dB DNL contour would extend up to 500 feet beyond the airfield boundary in several areas around the airfield. Noise levels for four points of interest surrounding NOLF Spencer would increase by up to 5 dB DNL in the range from 64 to 66 dB DNL, as listed in Table 3.5-17.

Table 3.5-17 Noise Levels at Points of Interest near NOLF Spencer for Action Alternative

ID	*Location*	*Action Alternative (dB DNL)*	*Change Relative to No Action Alternative (dB DNL)*
3	Southeast Corner	66	+5
4	Wilma Drive	64	+5
5	Murray Road	64	+5
6	East Side	64	+5

TH-XX standard patterns would be the largest military noise contributors at the first three points and TH-XX high-speed tactical patterns would be the top contributor at the east side point with sound levels ranging from 88 to 101 dB SEL and 75 to 95 dB L_{max}. These events would be approximately 2 to 3 dB greater than under the No Action Alternative and the events would occur approximately 22 percent more frequently. The values only apply for a short duration when the aircraft is at a close distance to the point of interest.

NOLF Pace. Under the Action Alternative, noise levels would increase at NOLF Pace compared to the No Action Alternative (Figure 3.5-15). The 65 dB DNL contour would extend beyond the airfield boundary by approximately 300 feet in several areas around the airfield. The 70 dB and greater contours would continue to be within the airfield boundary. Noise levels for four points of interest surrounding NOLF Pace would increase by 5 to 6 dB DNL, as shown in Table 3.5-18. The maximum of 62 dB DNL would occur at the southwest location and the other points would range from 42 to 55 dB DNL.

Table 3.5-18 Noise Levels at Points of Interest near NOLF Pace for Action Alternative

ID	*Location*	*Action Alternative (dB DNL)*	*Change Relative to No Action Alternative (dB DNL)*
18	Northeast (Willard Norris Road) Corner	55	+5
19	Southwest	62	+6
20	South	42	+6
21	Mahogany Drive	49	+5

TH-XX departures would be the primary noise contributors at Mahogany Drive while standard TH-XX patterns would be the top contributors at the remaining three locations with sound levels ranging from 68 to 94 dB SEL and 53 to 85 dB L_{max}. These events would be approximately 6 to 7 dB greater than under the No Action Alternative, and the events would occur approximately 22 percent more frequently. These maximum single-event levels only apply for a short duration when the aircraft is at a close distance to the point of interest.

NOLF Site X. Under the Action Alternative, noise levels would increase at NOLF Site X compared to the No Action Alternative (Figure 3.5-16). The 65 dB DNL contour would extend up to 300 feet beyond the airfield boundary to the southeast and less than 50 feet to the northeast. Noise levels for three points of interest surrounding NOLF Site X would be 46 to 52 dB DNL, as shown in Table 3.5-19. The maximum of 52 dB DNL would occur at the southwest location on Ard Field Road. If the vehicular traffic noise on Highway 178 is accounted for, then the No Action Alternative ambient noise levels may be higher than reflected in Table 3.5-19 and the increase would likely be smaller.

Table 3.5-19 Noise Levels at Points of Interest near NOLF Site X for Action Alternative

ID	*Location*	*Action Alternative (dB DNL)*	*Change Relative to No Action Alternative (dB DNL)*
7	Southwest (Ard Field Road and Major Stephen W. Pless Medal of Honor Way)	52	+4
8	Northwest (Ard Field Road)	48	+4
9	North (Hwy 178)	46	+11

TH-XX autorotation and departure operations would be the largest military noise contributors at those representative locations with sound levels ranging from 67 to 87 dB SEL and 54 to 77 dB L_{max}. These events would be approximately 3 dB greater than under the No Action Alternative, and the events would occur approximately 22 percent more frequently. The single-event levels only apply for a short duration when the aircraft is at a close distance to the point of interest.

NOLF Harold. Under the Action Alternative, noise levels would increase at NOLF Harold compared to the No Action Alternative (Figure 3.5-17). The 65 dB DNL would extend beyond the airfield boundary up to 100 feet to the east. Table 3.5-20 lists noise levels for the four points of interest surrounding NOLF Harold that would be from 49 to 63 dB DNL, an increase of 5 to 7 dB relative to the No Action Alternative.

Table 3.5-20 Noise Levels at Points of Interest near NOLF Harold for Action Alternative

ID	*Location*	*Action Alternative (dB DNL)*	*Change Relative to No Action Alternative (dB DNL)*
10	Northeast Corner	60	+5
11	Southeast Corner	63	+7
12	Waylon Drive	55	+6
13	Sun Up Court	49	+6

TH-XX Standard patterns would be the largest military noise contributors at those representative locations with sound levels ranging from 77 to 100 dB SEL and 64 to 96 dB L_{max}. These events would be approximately 8 to 12 dB greater than under the No Action Alternative, and the events would occur approximately 22 percent more frequently. The values only apply for a short duration when the aircraft is at a close distance to the point of interest.

NOLF Santa Rosa. Under the Action Alternative, noise levels would increase in the vicinity of NOLF Santa Rosa compared to the No Action Alternative (Figure 3.5-18). The 65 dB DNL contour would extend beyond the airfield boundary up to 1,500 feet to the northeast, up to 500 feet to the east and south, and 800 feet to the west. Table 3.5-21 lists noise levels for the four points of interest surrounding NOLF Santa Rosa. The maximum of 62 dB DNL would occur on Redland Road and American Farms Road while the other points would range from 57 to 58 dB DNL.

Table 3.5-21 Noise Levels at Points of Interest near NOLF Santa Rosa for Action Alternative

ID	*Location*	*Action Alternative (dB DNL)*	*Change Relative to No Action Alternative (dB DNL)*
14	Southeast Corner	57	+2
15	East (Redland Road)	62	+3
16	American Farms Road	62	+6
17	Cornfield Way	58	+4

TH-XX standard pattern, arrival, and autorotation operations would be the largest military noise contributors at those representative locations with sound levels ranging from 80 to 98 dB SEL and 66 to 90 dB L_{max}. Under the Action Alternative, these events would be up to 12 dB greater than under the No Action Alternative and the events would occur approximately 22 percent more frequently. The single-event levels only apply for a short duration when the aircraft is at a close distance to the point of interest.

NOLF Choctaw. Unlike the previous NOLFs, military jets would continue to utilize NOLF Choctaw for pattern training. Given the large difference in noise levels between military jets and helicopters, the replacement of the TH-57 with the proposed TH-XX helicopter at NOLF Choctaw would not contribute a significant difference in noise to the environment surrounding the airfield. Therefore, the Action Alternative would not create significant noise impacts at NOLF Choctaw.

Noise Impact Conclusion

Under the Action Alternative, no significant impacts from noise would occur. The Action Alternative would not result in any off-base noise impacts above 65 dB DNL at Whiting Field South. NOLF Choctaw is used by military jets for pattern training, and the proposed TH-XX operations at NOLF Choctaw would not contribute a significant difference to the noise environment. For noise exposure in off-base locations in the immediate vicinity of the remaining five NOLFs, noise levels above 65 dB DNL would affect an additional 200 acres and 215 more people when compared to noise levels under the No Action Alternative. Noise levels for 196 of the 200 acres would be from 65 to <70 dB DNL at five NOLFs: 73 acres at NOLF Spencer, 37 acres at NOLF Pace, 18 acres at NOLF Site X, 1 acre at NOLF Harold, and 67 acres at NOLF Santa Rosa. Noise levels for the remaining 4 acres would be from 70 to <75 dB DNL at NOLF Santa Rosa. Noise levels for all 215 people would be from 65 to <70 dB DNL at two NOLFs: 148 people at NOLF Spencer and 67 people at NOLF Santa Rosa. None of the 215 people affected would experience noise above 70 dB DNL. Noise modeling results indicate an average increase of 5 dB DNL as compared to the No Action Alternative may be expected in these areas, due to a combination of an increase of 22 percent in flight operations and the change from the TH-57 to the TH-XX. The increase of 22 percent to flight operations would contribute a nearly 1 dB increase to the overall DNL, while the change from the TH-57 to the TH-XX, based on the UH-72 surrogate, would be responsible for the remainder of the change. The UH-72 is larger and louder than the commercially available helicopters that could be selected as the TH-XX, thus, UH-72 modeled noise levels are expected to be higher than the noise levels that would actually be generated by TH-XX. Use of the UH-72 for analysis provides a conservative (i.e., higher) estimate of noise levels associated with flight training operations under the Action Alternative. On average, NAS Whiting Field receives less than 10 noise complaints per month from helicopter flight training operations, to include repeat complaints from one or more complainants (NAS Whiting Field, 2019a). NAS Whiting Field and Training Air Wing Five have standard operating procedures to receive and assess noise and/or safety complaints from members of the public, to ensure that training operations are conducted in accordance with Federal Aviation Administration regulations and established Navy flight rules and training profiles. These procedures would continue during and after transition to AHTS. The changes in modeled noise levels from the Action Alternative would vary slightly by location relative to flight paths. The changes in DNL and single-event noise levels would likely be noticeable at NOLFs Spencer and Santa Rosa, which are both areas that are currently exposed to regular helicopter traffic, but would not constitute a dramatic change to the intensity of noise in the local environment. Domestic animals, including horses, have likely habituated to existing helicopter activity at the NOLFs, and proposed changes to the type of helicopter and increased flight training operations would likely be insufficient to result in significant impacts. Overall, implementation of the Action Alternative would not result in significant impacts to the noise environment.

3.6 Land Use

This discussion of land use includes current and planned uses and the regulations, policies, or zoning that may control the proposed 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. Two main objectives of land use planning are to ensure orderly growth and compatible uses among adjacent property parcels or areas. However, there is no nationally recognized convention or uniform terminology for describing land use categories. As a result, the meanings of various land use descriptions, labels, and definitions vary among jurisdictions. Natural conditions of property can be described or categorized as unimproved, undeveloped, conservation or preservation area, and natural or scenic area. There is a wide variety of land use categories resulting from human activity. Descriptive terms often used include residential, commercial, industrial, agricultural, institutional, and recreational.

3.6.1 Regulatory Setting

In many cases, land use restrictions are codified in installation master planning and local zoning laws. Chief of Naval Operations Instruction 11010.40 establishes an encroachment management program to ensure operational sustainment that has direct bearing on land use planning on installations. Additionally, the joint instruction Chief of Naval Operations Instruction 11010.36C and Marine Corps Order 11010.16 provides guidance administering the AICUZ program, which recommends land uses that are compatible with noise levels, accident potential, and obstruction clearance criteria for military airfield operations.

Through the CZMA, Congress established national policy to preserve, protect, develop, restore, or enhance resources in the coastal zone. This Act encourages coastal states to properly manage use of their coasts and coastal resources, prepare and implement coastal zone management programs, and provide for public and governmental participation in decisions affecting the coastal zone. To this end, CZMA imparts an obligation upon federal agencies whose actions or activities affect any land or water use or natural resource of the coastal zone to be carried out in a manner consistent to the maximum extent practicable with the enforceable policies of federally approved state coastal zone management programs. However, Federal lands, which are "lands the use of which is by law subject solely to the discretion of the Federal Government, its officers, or agents," are statutorily excluded from the State's "coastal uses or resources." If, however, the proposed federal activity affects coastal uses or resources beyond the boundaries of the federal property (i.e., has spillover effects), the CZMA Section 307 federal consistency requirement applies. As a federal agency, the Navy is required to determine whether its proposed activities would affect the coastal zone. This takes the form of a consistency determination, a negative determination, or a determination that no further action is necessary. The Navy has determined that construction and operations associated with the Proposed Action have the potential to affect the coastal zone outside of the federal property boundary. Therefore, a coastal consistency determination would be required for the Action Alternative (refer to Section 3.6.3.2).

3.6.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under land use at NAS Whiting Field.

3.6.2.1 Land Use Compatibility

Noise Zones

Noise zones are critical for the establishment of land use compatibility as some land uses are normally not recommended at levels ≥65 dB DNL. Through the AICUZ program, the Navy coordinates with local communities and makes a recommendation for land use controls based on the following noise zones.

- **Noise Zone 1 (<65 dB DNL)** is generally considered compatible for most uses.
- **Noise Zone 2 (65 to <75 dB DNL)** is an area where some land use controls are recommended.
- **Noise Zone 3 (≥75 dB DNL)** requires the greatest degree of land use controls.

NAS Whiting Field

NAS Whiting Field is located in central Santa Rosa County, Florida, approximately 7 miles north of the City of Milton. NAS Whiting Field comprises Whiting Field North and Whiting Field South, with all support facilities located between them. Whiting Field North is used for fixed-wing training, while Whiting Field South is used for rotary-wing training. It includes 287 single-family housing units; 95 Navy Gateway Inns & Suites Units; 30 Unaccompanied Housing Rooms; 100 acres of airfield pavement; and 92 miles of fence line.

Broad land use categories for NAS Whiting Field were determined based on the dominant active use of the land. NAS Whiting Field encompasses approximately 4,000 acres, and the dominant land use category is air operations/air training (Naval Facilities Engineering Command, Southeast, 2017a). Natural resource management areas and outdoor recreation also represent a large portion of the on-station land uses.

Built-up areas of the base, which include facilities such as station administration and other community support facilities (i.e., medical and dental family services and recreational facilities), are centrally located and considered the station core. Training facilities, housing areas, and dining facilities are located close to the existing airfields. Most industrial land uses, such as supply and Base Operating Services, are located adjacent to the airfields.

NAS Whiting Field manages natural resources on approximately 920 acres with programs including land management, fish and wildlife management, forest management, and outdoor recreation in an ecosystem management context. Primary management methods include prescribed burning for species and habitat development, forest thinnings, and recreation trails. Management is guided by the INRMP and coordinated by the NAS Whiting Field natural resources staff.

While the current level of aeronautical encroachment is not at critical levels, the area is experiencing all the growth characteristics of Florida, both in population numbers (Santa Rosa County experienced a 44.3 percent population increase in the 1990s) and changing demographics. Milton is likely to see continued growth, which will increase demand for infrastructure and services. As a result, unconstrained use of Navy aviation facilities is challenged.

Existing land uses surrounding NAS Whiting Field contain various local zoning classifications based on the predominant activity occurring within the geographic area. These land use and zoning classifications surrounding the installation include agricultural, residential uses to the southeast, commercial, and industrial uses to the east. The majority of these land uses are low density and low intensity, which are compatible with airfield and installation operations. Activities at NAS Whiting Field have been protected by proactive encroachment management by NAS Whiting Field that include substantial partnering efforts with Santa Rosa County. Additionally, development north of NAS Whiting Field has been limited due to the land acquisition efforts of the Navy in partnership with local and state government agencies. Conditions that have also limited growth north of NAS Whiting Field include the area's distance from the City of Milton, reduced accessibility, and absence of centralized utility systems. There have been a few small residential subdivisions developed in recent years. It should be noted that no small or large scale rezoning applications have been approved for areas north of NAS Whiting Field in recent years.

Whiting Field South has experienced more development pressure outside the fence line because of the availability of municipal utilities and its proximity to the City of Milton. Residential rezoning applications were approved south and southwest of NAS Whiting Field to develop residential development opportunities along State Road 87, south of the installation. The establishment of these new zoning regulations and this residential area has spurred additional commercial development along the corridor. The City of Milton has also expanded utility services to the north and east of NAS Whiting Field, which will facilitate additional development south and east of NAS Whiting Field (NAS Whiting Field, 2013). Figure 3.6-1 shows the existing land uses near Whiting Field South affected by noise levels ≥65 dB DNL. Table 3.6-1 provides land use acreages within noise zones for areas near Whiting Field South.

Table 3.6-1 Whiting Field South Land Use Acreage Affected by Noise Levels ≥65 dB DNL for Baseline

Land Use	*Noise Zone 2*		*Noise Zone 3*			*Totals*
	65 to <70 dB DNL	*70 to <75 dB DNL*	*75 to <80 dB DNL*	*80 to <85 dB DNL*	*≥85 dB DNL*	
Military	178	90	79	2	2	351
Total	**178**	**90**	**79**	**2**	**2**	**351**

Note: All land within the installation boundary is considered military land use.

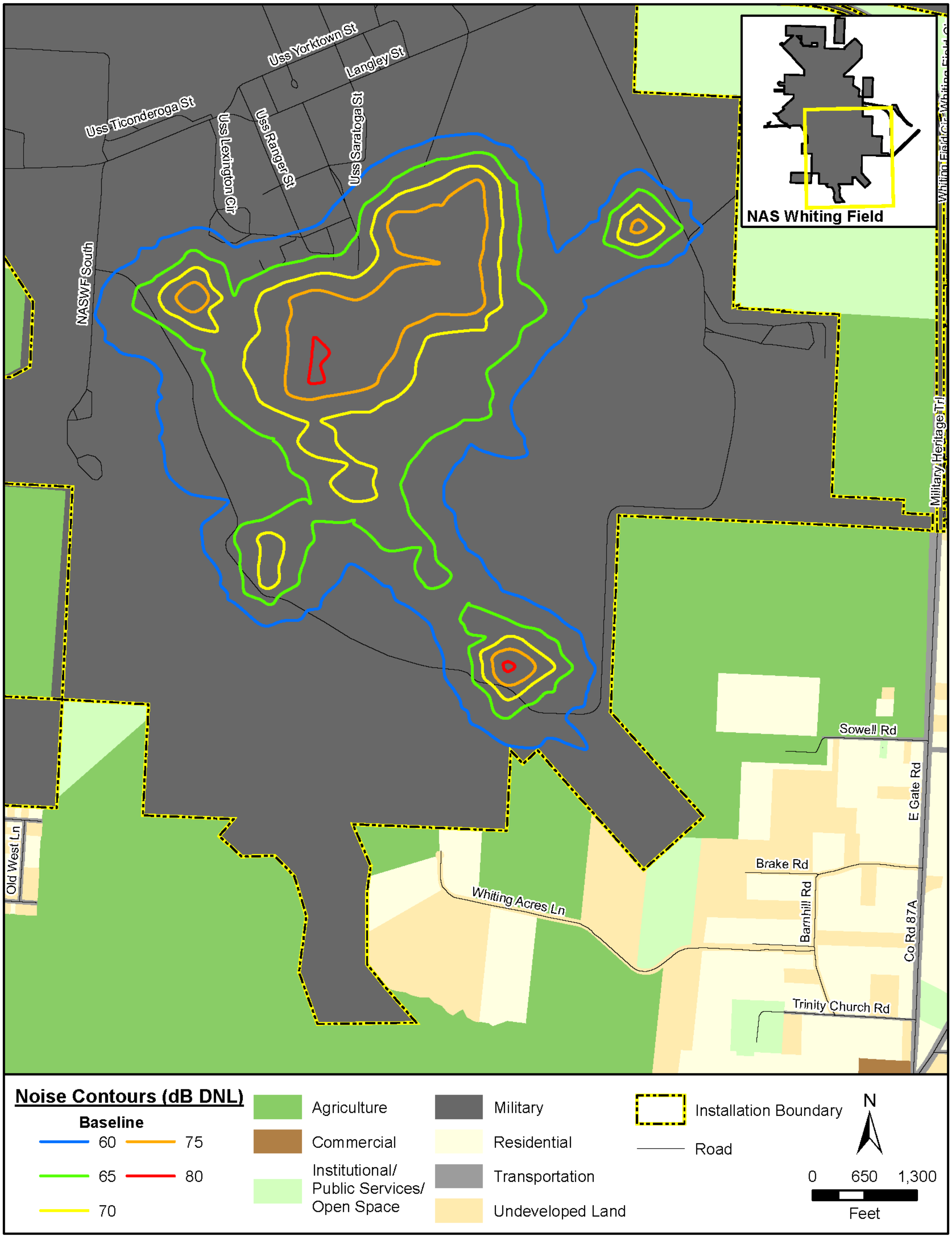


Figure 3.6-1 Land Use near Whiting Field South Affected by Noise Levels ≥65 dB DNL for Baseline

NOLF Spencer

Existing land uses in proximity to NOLF Spencer are primarily single-family residential, mobile homes, and agricultural. NOLF Spencer is in a high growth area that has seen many rezoning applications being approved. Additionally, several new subdivisions and multi-family developments that are being planned between Milton and Pensacola along U.S. 90 are near the airfield. Most parcels near NOLF Spencer are privately owned. No known major land acquisitions are in the vicinity of NOLF Spencer (NAS Whiting Field, 2013). Course rules for NOLF Spencer overfly the City of Milton (Commander, Training Air Wing Five, 2019). Table 3.6-2 provides land use acreages within noise zones for areas near NOLF Spencer. Figure 3.6-2 shows the existing land uses near NOLF Spencer affected by noise levels ≥65 dB DNL.

Table 3.6-2 NOLF Spencer Land Use Acreage Affected by Noise Levels ≥65 dB DNL for Baseline

Land Use	***Noise Zone 2***		***Noise Zone 3***			***Totals***
	65 to <70 dB DNL	***70 to <75 dB DNL***	***75 to <80 dB DNL***	***80 to <85 dB DNL***	***≥85 dB DNL***	
Residential	0.7	0	0	0	0	1
Transportation/Utilities	0.2	0	0	0	0	0
Agriculture	0.7	0	0	0	0	1
Military	120.6	51.5	18	0	0	190
Undeveloped Land	0.1	0	0	0	0	0
Total	**122**	**52**	**18**	**0**	**0**	**192**

Notes: All land within the installation boundary is considered military land use.

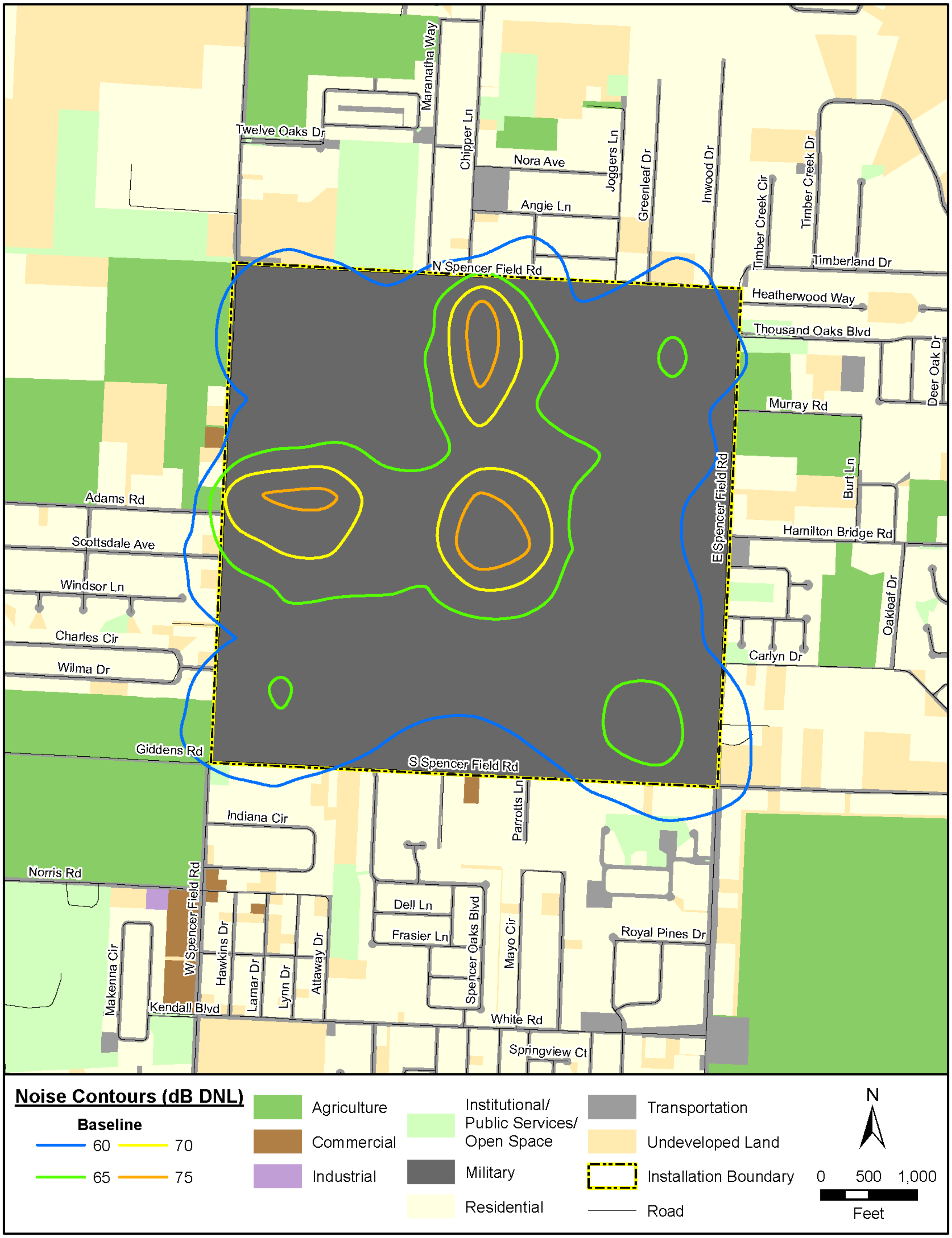


Figure 3.6-2 Land Use near NOLF Spencer Affected by Noise Levels ≥65 dB DNL for Baseline

NOLF Pace

The predominant existing land use surrounding NOLF Pace is agricultural. There is residential development along State Highway 191 and a county recreation facility immediately east of NOLF Pace. The land area between NOLFs Pace and Spencer and NAS Whiting Field is experiencing rapid growth as commercial development in Milton grows toward the west. South of NOLF Pace are several Planned Unit Developments, and recent residential rezoning approvals include the development of 1,844 new lots and a L.E.A.D. Academy, which is a pre-kindergarten through twelfth grade private school. Development directly north and east of NOLF Pace has been limited due to the land acquisition efforts of the Navy in partnership with local and state government agencies. There is little development pressure to the north and west of NOLF Pace (NAS Whiting Field, 2013). Course rules for NOLF Pace overfly the City of Milton (Commander, Training Air Wing Five, 2019). Table 3.6-3 provides land use acreages within noise zones for areas near NOLF Pace. Figure 3.6-3 shows the existing land uses near NOLF Pace affected by noise levels ≥65 dB DNL.

Table 3.6-3 NOLF Pace Land Use Acreage Affected by Noise Levels ≥65 dB DNL for Baseline

Land Use	*Noise Zone 2*		*Noise Zone 3*			*Totals*
	65 to <70 dB DNL	*70 to <75 dB DNL*	*75 to <80 dB DNL*	*80 to <85 dB DNL*	*≥85 dB DNL*	
Agriculture	0.9	0	0	0	0	1
Military	60.2	31.3	1.4	0	0	93
Total	**61**	**31**	**1**	**0**	**0**	**94**

Note: All land within the installation boundary is considered military land use.

Figure 3.6-3 Land Use near NOLF Pace Affected by Noise Levels ≥65 dB DNL for Baseline

NOLF Site X

NOLF Site X is located in northern Santa Rosa County, Florida. Surrounding property land uses include silviculture, agriculture, and rural residential. Course rules for NOLF Site X overfly the Escambia River State Wildlife Management Area (Commander, Training Air Wing Five, 2019). Since NOLF Site X became operational in January 2019, it did not exist during the years when baseline operations data were collected, from 2014 through 2018. As a result, baseline noise levels for NOLF Site X were not modeled and no land use table is provided in this section. Figure 3.6-4 shows existing land uses near NOLF Site X.

NOLF Harold

Land uses outside NOLF Harold include residential and recreational. Outside the fence line are scattered residential properties to the southeast and state owned recreational lands. The State of Florida recently acquired the Yellow River Ravines project area. With this purchase, only a small triangle shaped area of land adjacent to the NOLF remains privately owned. There is development pressure for residential uses in the eastern part of Milton, along U.S. 90 and Interstate 10 (I-10). Growth is currently occurring south of NOLF Harold and is likely to continue east and west along these corridors (NAS Whiting Field, 2013). Course rules for NOLF Harold overfly the Blackwater River State Park (Commander, Training Air Wing Five, 2019). Figure 3.6-5 shows the existing land uses near NOLF Harold. No land use table is provided in this section because there are no noise levels $\geq$ 65 dB DNL at or near NOLF Harold.

Figure 3.6-4 Land Use near NOLF Site X for Baseline

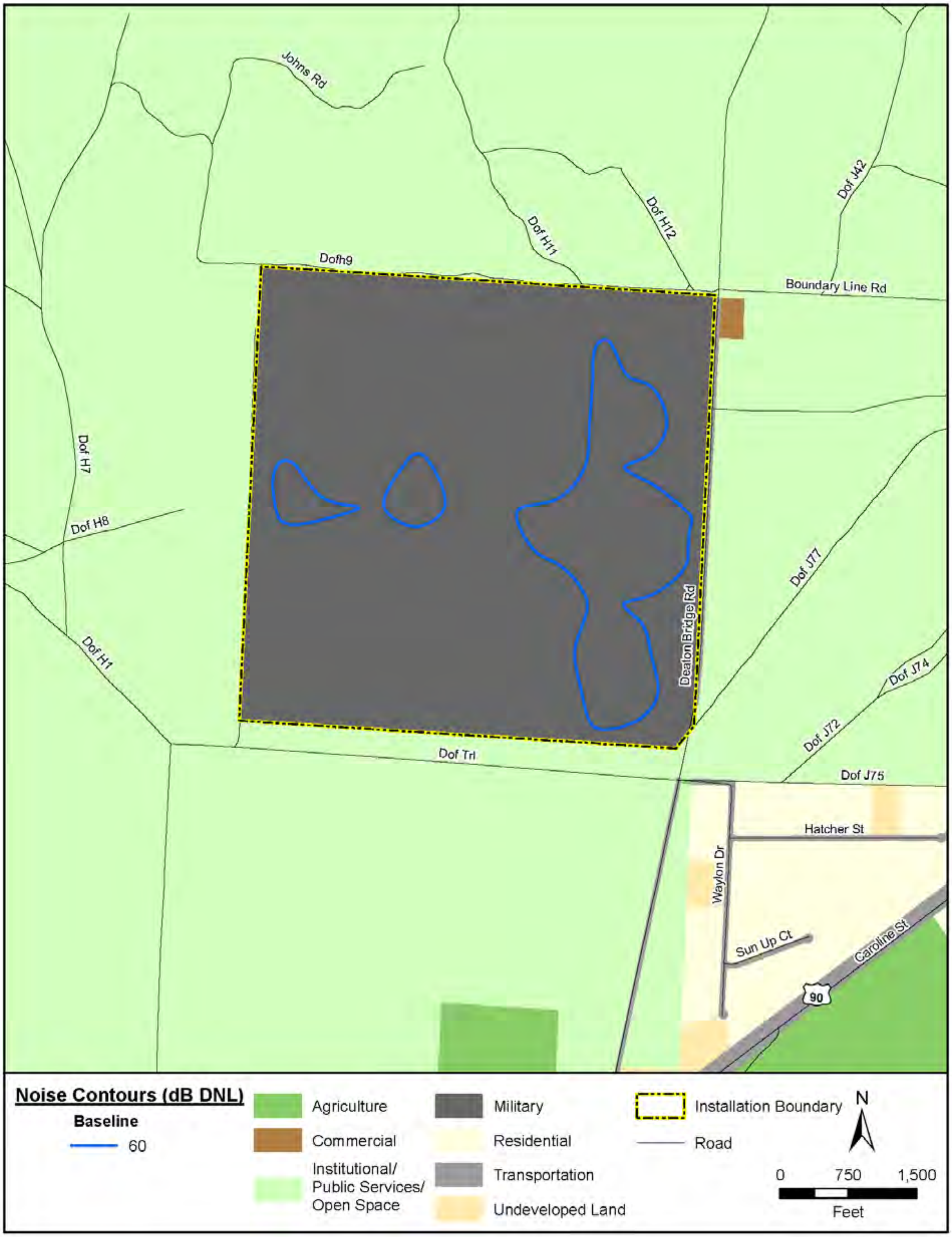


Figure 3.6-5 Land Use near NOLF Harold for Baseline

NOLF Santa Rosa

Existing land uses include residential mobile homes and agricultural, institutional, and industrial uses. The development pattern is scattered and includes a number of small, single-family dwellings and mobile homes. Development in the East Milton area is increasing, which places pressure on this NOLF. Accessibility to the area east of Milton is very good with the close proximity of I-10 and the State Route (S.R.) 87 interchange. Commercial development around the I-10 and S.R. 87 interchange is underway in conjunction with the S.R. 87 widening project. Residential development east of Milton, such as the 250 lot White Oak Plantation subdivision continues to bring more housing near the airfield (NAS Whiting Field, 2013). Course rules for NOLF Santa Rosa overfly the Yellow River Wildlife Management Area, the Blackwater River State Park (Commander, Training Air Wing Five, 2019). Table 3.6-4 provides land use acreages within noise zones for areas near NOLF Santa Rosa. Figure 3.6-6 shows the existing land uses near NOLF Santa Rosa affected by noise levels ≥65 dB DNL.

Table 3.6-4 NOLF Santa Rosa Land Use Acreage Affected by Noise Levels ≥65 dB DNL for Baseline

Land Use	*Noise Zone 2*		*Noise Zone 3*			*Totals*
	65 to <70 dB DNL	*70 to <75 dB DNL*	*75 to <80 dB DNL*	*80 to <85 dB DNL*	*≥85 dB DNL*	
Residential	1.3	0	0	0	0	1
Industrial	0	0	0	0	0	1
Military	92.1	28	13.6	1.0	0	135
Undeveloped Land	1.1	0	0	0	0	1
Total	**95**	**28**	**14**	**1**	**0**	**138**

Note: All land within the installation boundary is considered military land use.

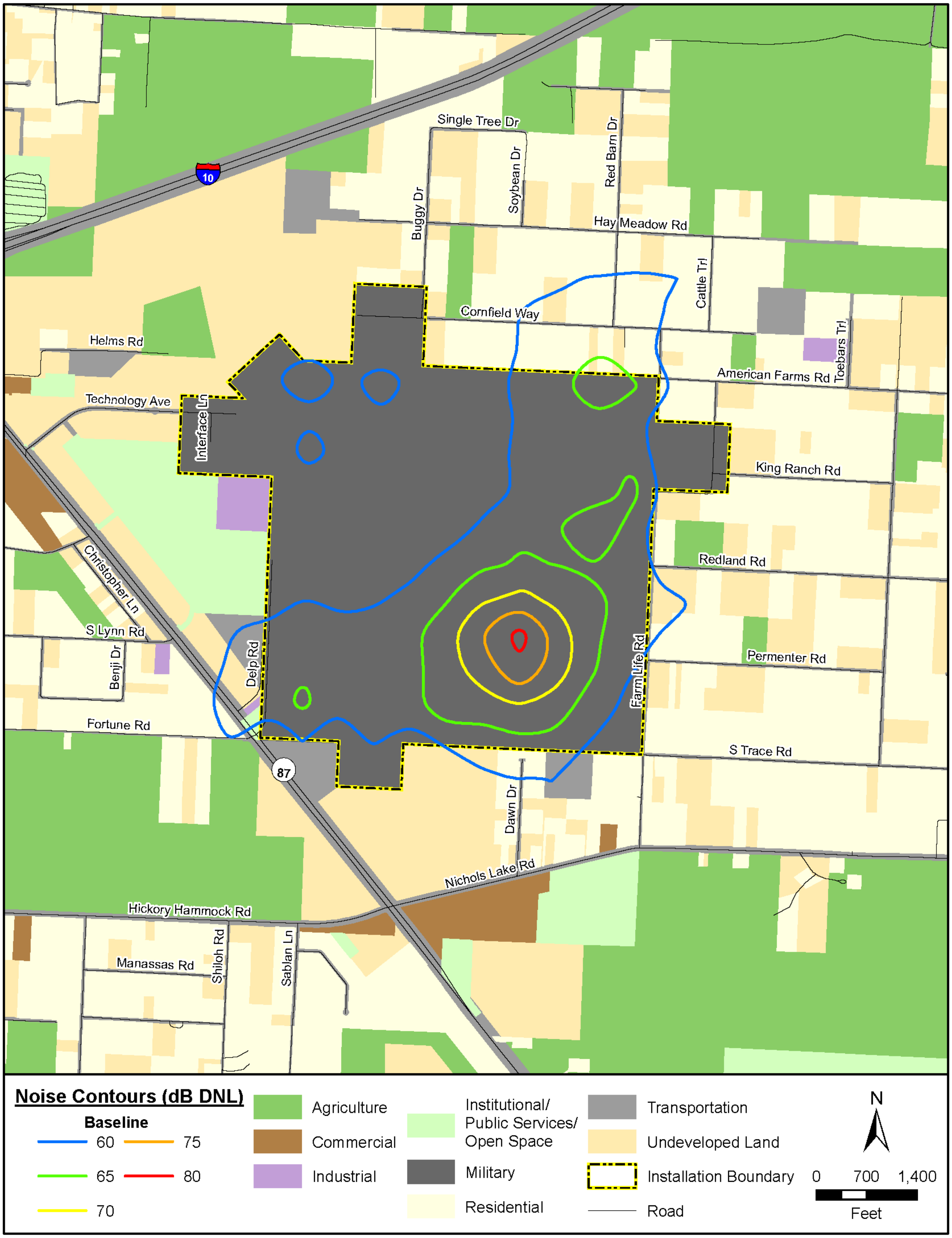
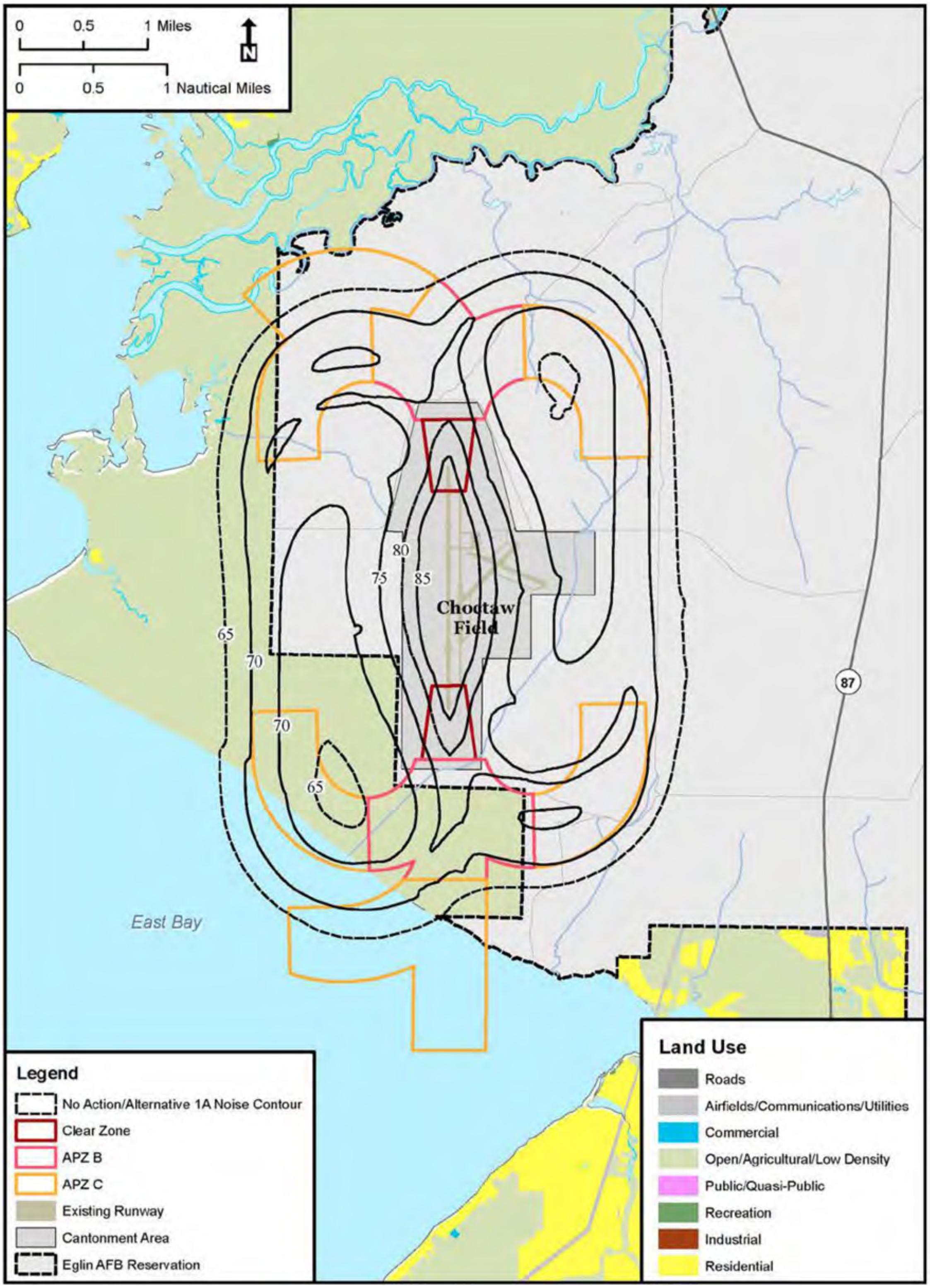


Figure 3.6-6 Land Use near NOLF Santa Rosa Affected by Noise Levels ≥65 dB DNL for Baseline

NOLF Choctaw

The land surrounding NOLF Choctaw airfield is owned and controlled by Eglin Air Force Base and is used for military training and exercises. Large parcels along the East Bay shoreline are generally undeveloped. Since NOLF Choctaw is on Eglin Air Force Base property, the AICUZ footprint extends beyond the boundary of Air Force property to the south and west. Where it does extend beyond the airfield footprint, existing land uses are compatible (NAS Whiting Field, 2013). Course rules for NOLF Choctaw overfly the Yellow River Marsh Aquatic Preserve Yellow River Wildlife Management Area, Yellow River Marsh State Preserve Park, and the Escribano Point Wildlife Management Area (Commander, Training Air Wing Five, 2019). Figure 3.6-7 shows the existing land uses near NOLF Choctaw affected by noise levels ≥65 dB DNL.

Unlike the previous NOLFs, military jets would continue to use NOLF Choctaw for pattern training. Given the large difference in noise levels between military jets and helicopters, the TH-57 helicopter noise contribution to the noise environment at NOLF Choctaw is negligible. Noise contours, incompatible development potential, and impacts for jet and helicopter operations at NOLF Choctaw were evaluated in the Record of Decision and Supplemental Environmental Impact Statement for F-35 Beddown at Eglin Air Force Base (U.S. Air Force, 2014). Thus, land use compatibility impacts will not be analyzed further in this section.



Source: Supplemental Environmental Impact Statement for F-35 Beddown at Eglin Air Force Base, Florida (U.S. Air Force, 2014)

Figure 3.6-7 Land Use near NOLF Choctaw Affected by Noise Levels ≥65 dB DNL for Baseline

3.6.2.2 Land Use Controls

The DoD has implemented an AICUZ program to assist local governments to foster compatible land use development around military airfields. The goals of the program are to enhance safety for both civil and military concerns and enable DoD to safely conduct its flight operations. Components of the AICUZ program include studies of aircraft noise, Accident Potential Zones (APZs), land use compatibility, operational procedures, and recommendations for compatible development in the vicinity of the airfields. The AICUZ program for NAS Whiting Field was last updated in 2017. APZs identify probable impact areas if an accident were to occur. However, they do not predict the probability of an accident occurring. The DoD defines an APZ as a planning tool for local planning agencies. The APZs follow departure, arrival, and flight pattern tracks from an airfield and are based upon historical accident data. The components of standard APZs for helicopters are defined as follows (adapted from Chief of Naval Operation Instruction 11010.36C, Air Installations Compatible Use Zones (AICUZ) Program):

- Clear Zone - The Takeoff Safety Zone for visual flight rules rotary-wing facilities is used as the Clear Zone. The Takeoff Safety Zone is the area under the visual flight rules approach/departure surface until that surface is 50 feet above the established landing area elevation.
- APZ-I - APZ-I is the area beyond the Clear Zone for the remainder of the approach/departure zone, which is defined as the area under the visual flight rules approach/departure surface until that surface is 150 feet above the established landing area elevation.
- APZ-II - APZ-II is generally not applied to helicopter flight paths unless the local accident history indicates the need for additional protection.

Figures 3.6-8 through 3.6-14 show the Clear Zones and APZs for Whiting Field South and the NOLFs Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw.

The State of Florida regulates development through the State's Growth Management Act, Chapter 163, Florida Statutes. Santa Rosa County also has a county-wide zoning ordinance (Comprehensive Plan). Airport zoning requires a variance for structures and obstructions whose height exceeds Federal Aviation Administration obstruction standards. The Plan addresses land use in the vicinity of all NOLFs in the county. Prior to construction in an area zoned for airport use, a permit must be received to ensure compliance with these use and height restrictions. In addition, the Santa Rosa County planning staff notifies NAS Whiting Field personnel of proposed zoning changes that would affect land adjacent to Navy property and all proposed tall structures in the vicinity of Navy airfields. The cities of Gulf Breeze and Milton have also adopted zoning restrictions (Santa Rosa County, 2016).

The Santa Rosa County Planning Department requires that a permit be obtained whenever land uses adjacent to base boundaries are expanded. The county reviews any encroachment issues and makes appropriate changes through an evaluation and appraisal process. These changes are sent to the West Florida Regional Planning Council for consistency review with the County Comprehensive Plan. In 2003, the County adopted a study entitled "A Phased Plan to Limit Encroachment at NAS Whiting Field, Florida, NOLF Pace, Florida, and NOLF Harold, Florida Through the Use of Real Estate Purchases, Agricultural Conservation Easements, and Zoning Mechanisms". This study suggested four categories of processes to protect the three Santa Rosa installations from future encroachment. These were: 1) Direct land purchase by the County; 2) Land purchase using Florida Forever or other public land trust for purchase; 3) Using agricultural or conservation easement; and 4) The use of zoning to control development densities and intensities (Santa Rosa County, 2016).

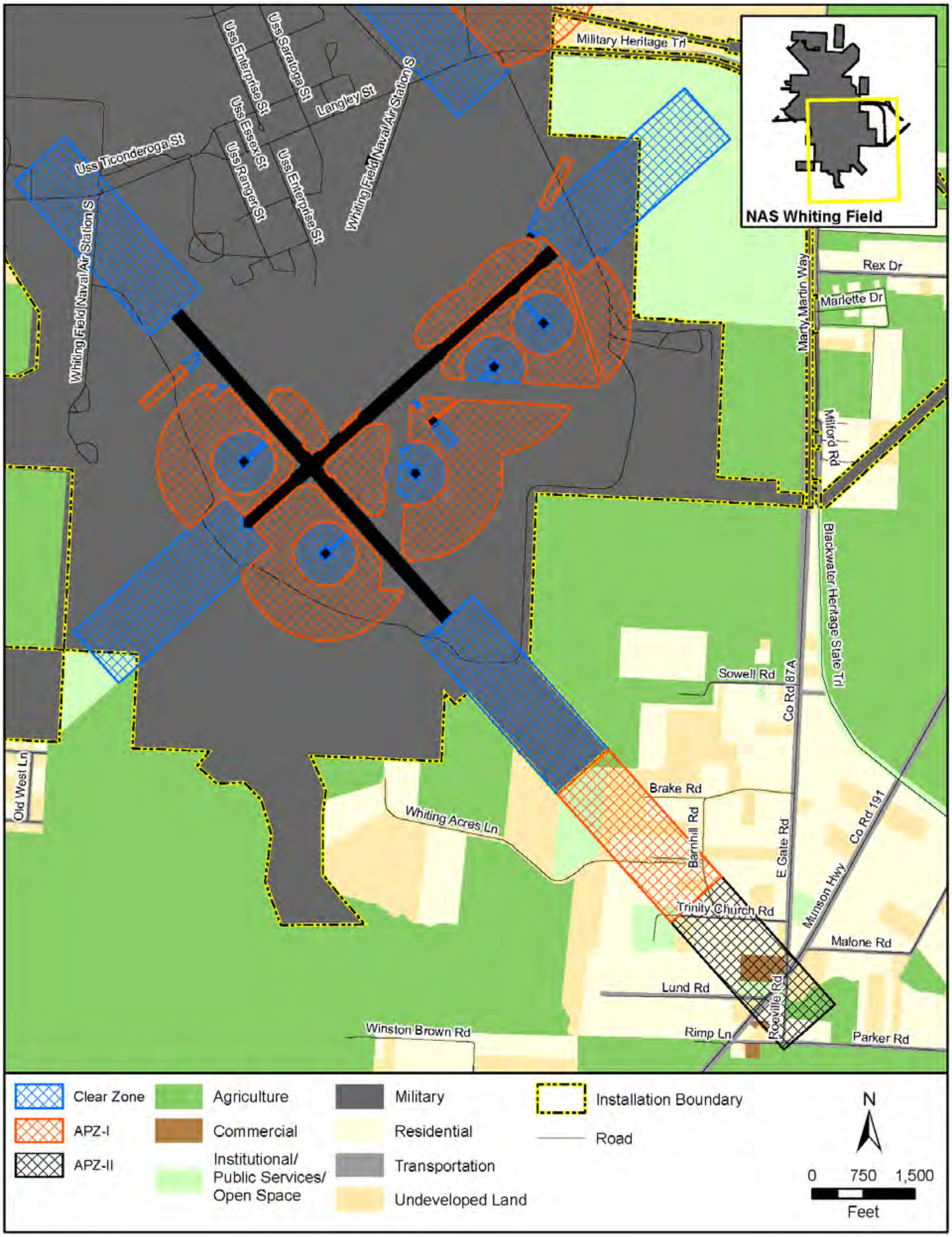


Figure 3.6-8 Land Use within Clear Zones and APZs near Whiting Field South

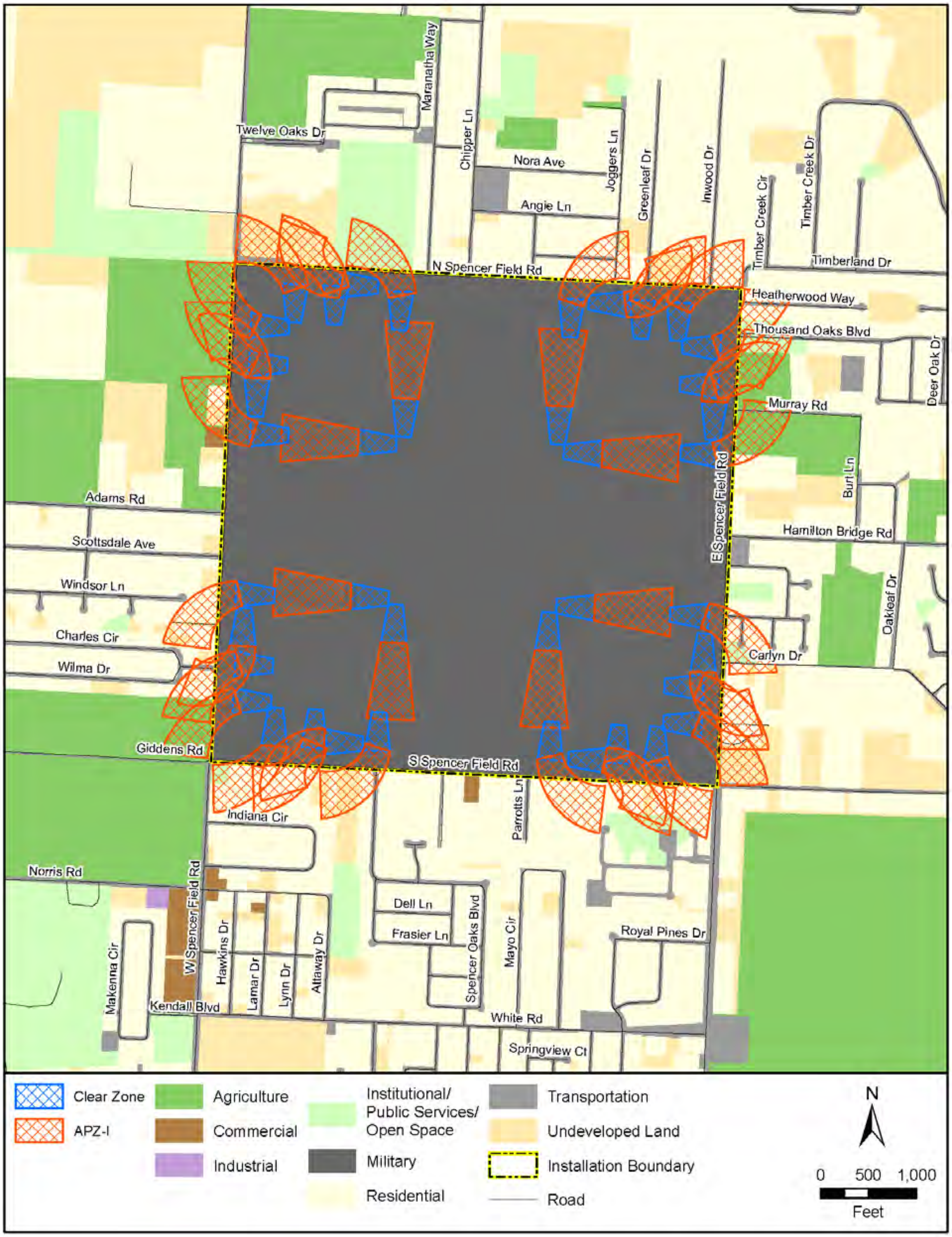


Figure 3.6-9 Land Use within Clear Zones and APZs near NOLF Spencer

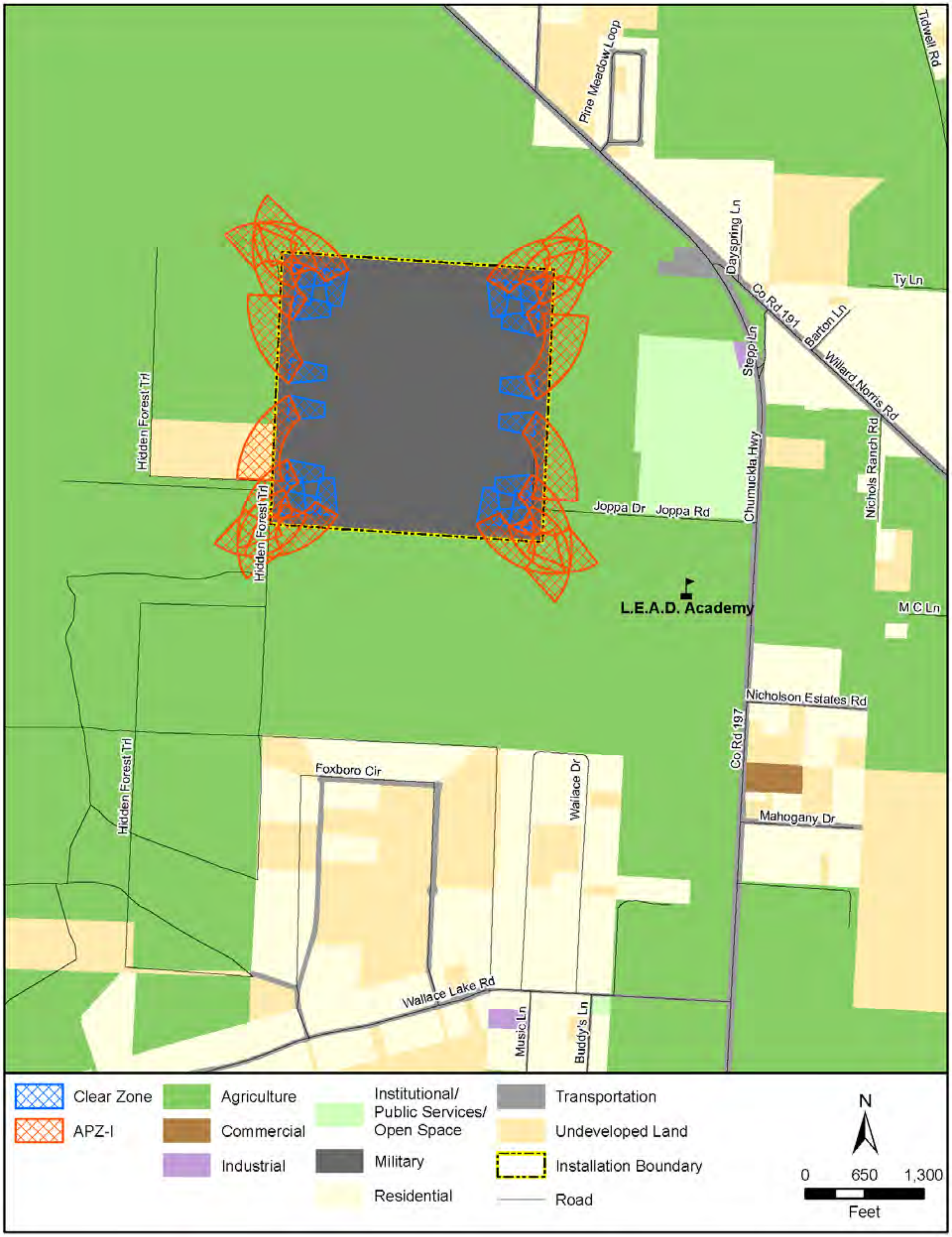
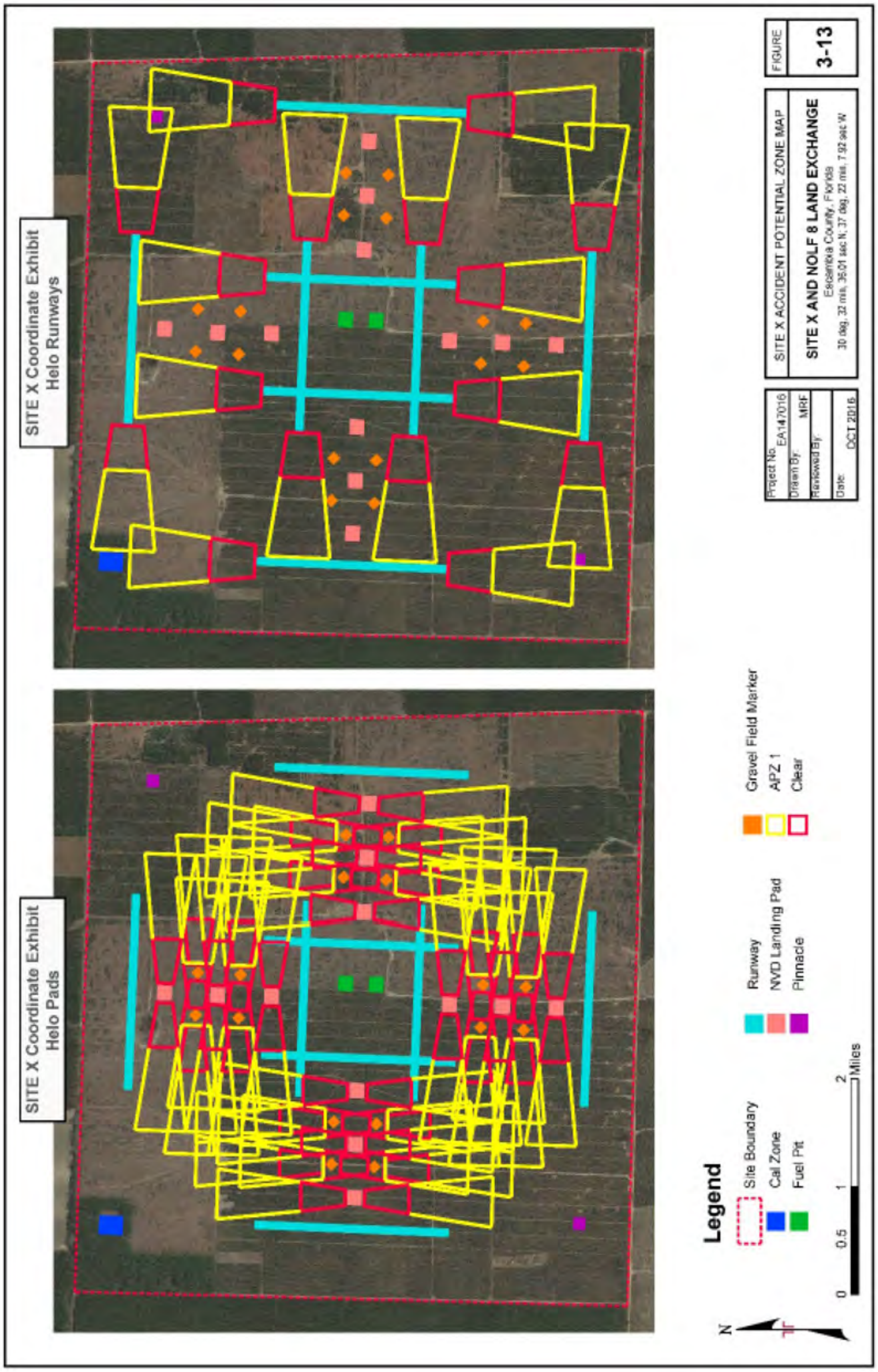


Figure 3.6-10 Land Use within Clear Zones and APZs near NOLF Pace



Source: EA for Land Exchange Involving NAS Whiting Field's NOLF Site 8 in Escambia County for Suitable Land and Improvements in Santa Rosa County, Florida. (Department of the Navy, 2018a)

Figure 3.6-11 Land Use within Clear Zones and APZs near NOLF Site X

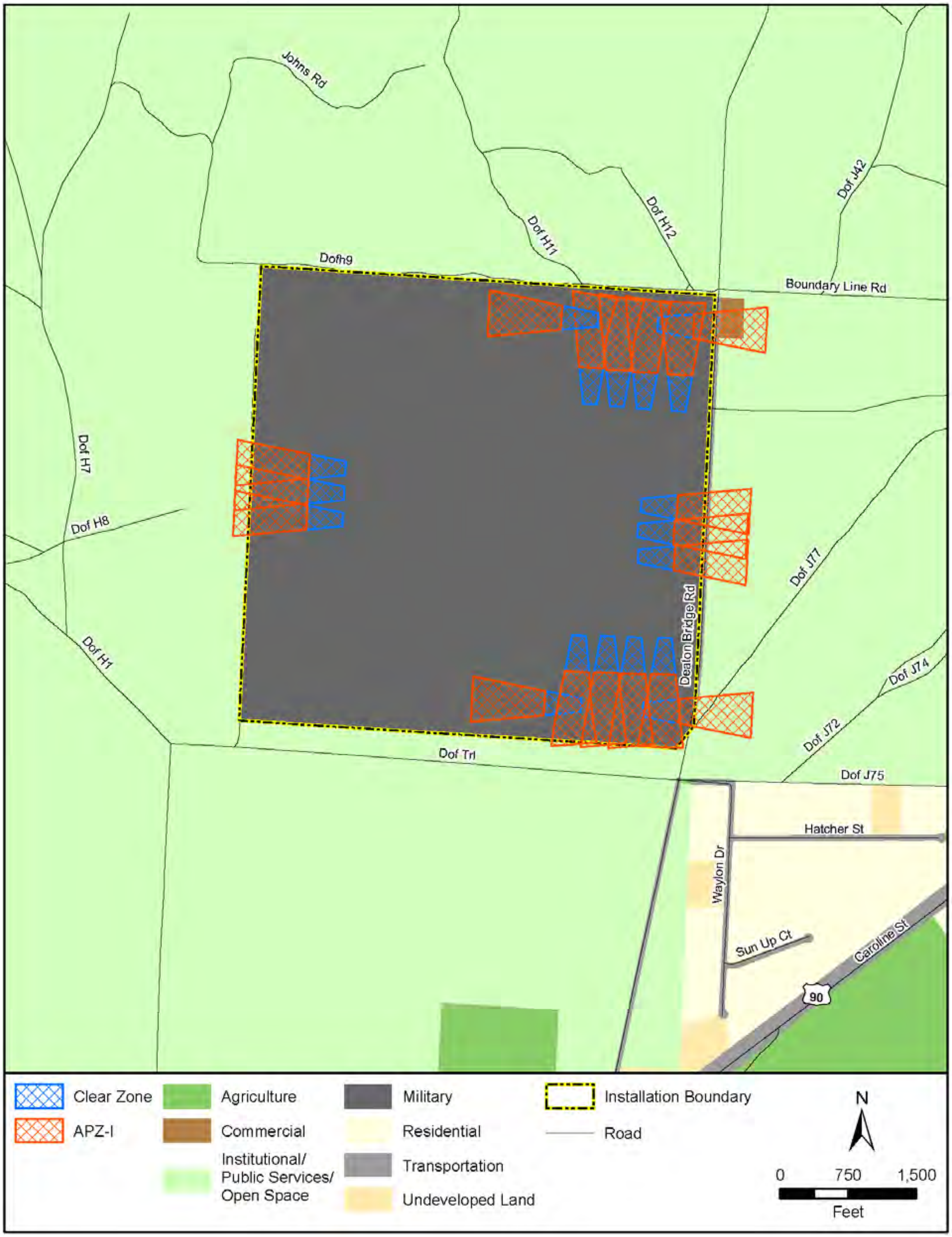


Figure 3.6-12 Land Use within Clear Zones and APZs near NOLF Harold

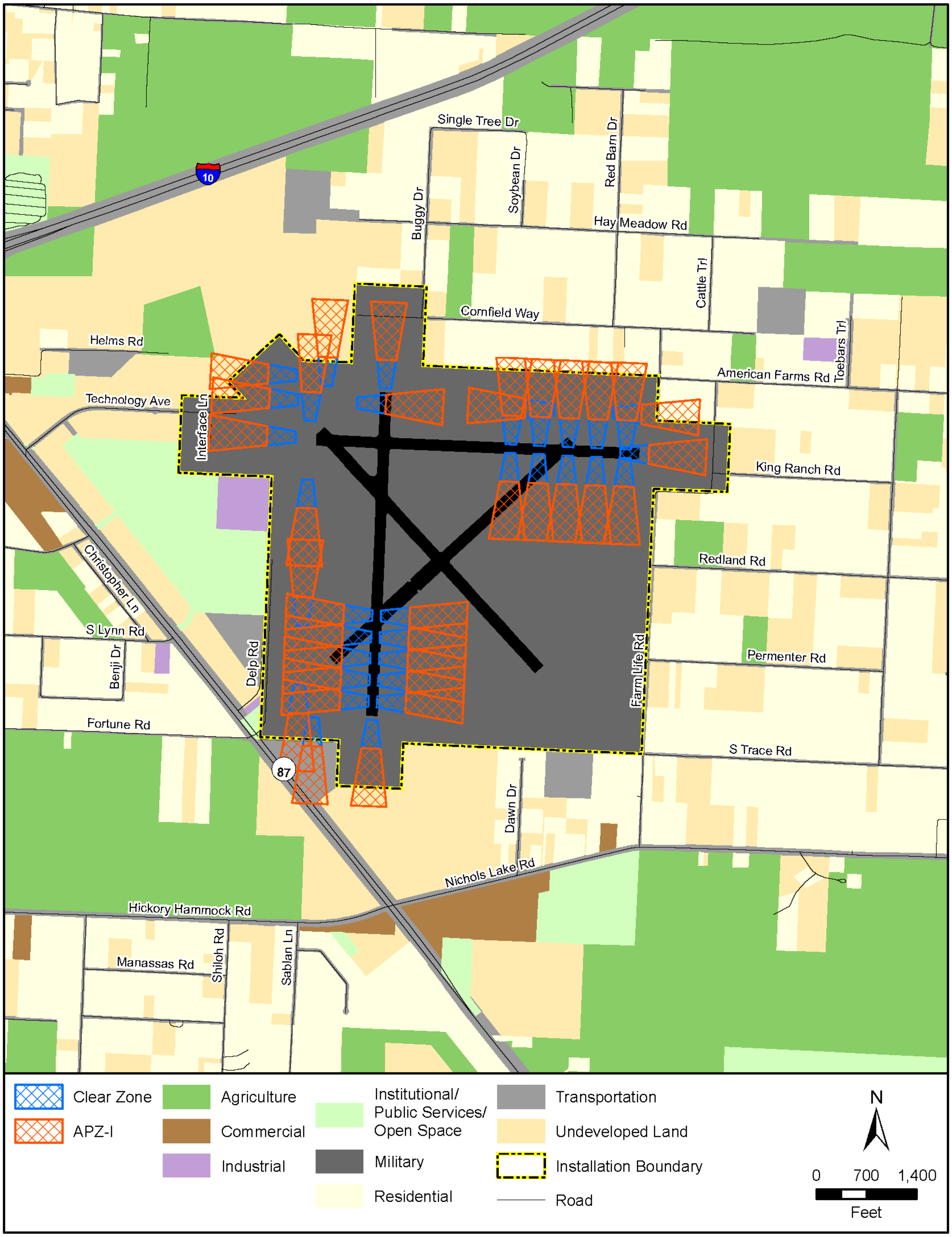


Figure 3.6-13 Land Use within Clear Zones and APZs near NOLF Santa Rosa

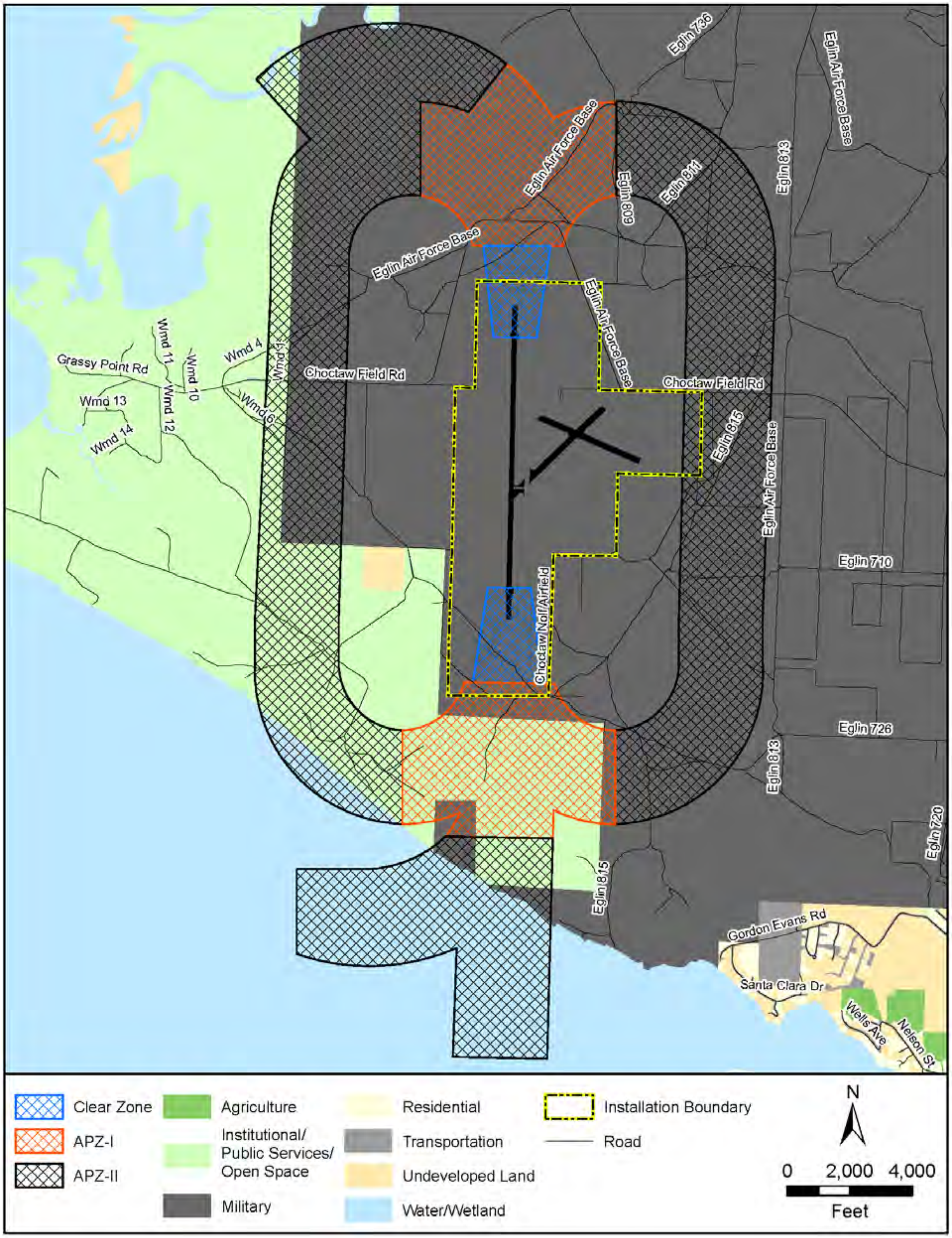


Figure 3.6-14 Land Use within Clear Zones and APZs near NOLF Choctaw

One of the main objectives of the Comprehensive Plan is to "…ensure that future development within adopted Military Airport Zones…will not negatively impact current and long-term viable use of the airfield, will promote health and welfare by limiting incompatible land uses, and allow compatible land uses within such areas." The Plan establishes clear boundaries for each of the installations within the county: "[f]or NAS Whiting Field North and South, and for NOLFs Spencer, Harold, Santa Rosa, Holley, Pace, and Site X, the Military Airport Zones boundaries extend approximately one half mile from the perimeter of each airfield and encompass all AICUZ study and noise zones. For NOLF Choctaw, Military Airport Zones boundaries encompass that area west of S.R. 87, north and east of East Bay, and south of the Yellow River" (Santa Rosa County, 2016).

In conjunction with the Comprehensive Plan, Santa Rosa County also makes use of the Santa Rosa County Joint Land Use Study. This study was adopted in 2004 and examines ways to curb the accelerated development pressures that could encroach upon NAS Whiting Field. The study developed a compatible land use plan and established development regulations for an area incorporating nine airfields: Peter Prince Field; NAS Whiting Field North and South; and the NOLFs Spencer, Harold, Santa Rosa, Choctaw, Holley, and Pace. The study boundary encompasses those areas specifically designated as part of APZs or noise contours within the existing AICUZ surrounding these installations (Santa Rosa County & NAS Whiting Field, 2003).

Santa Rosa County has incorporated NOLF Site X into its county-wide ordinance (Article Eleven). Per Article Eleven of the Santa Rosa County Land Development Code, no structure will be constructed within the Clear Zones and there will be a height restriction of 35 feet for single-family residential and non-residential structures within APZ-I. Article Eleven also states that any contract for the sale of residential property that is located in whole or partly within a Military Airport Notification Zone, shall include, as an attachment to the contract of sale, a Military Airport Disclosure Notice, in a form approved by Santa Rosa County. The Santa Rosa County Planning Department notifies the NAS Whiting Field Community Planning Liaison Officer when reviewing and approving building permits and development proposals that may impact parcels within the AICUZ footprint (Department of the Navy, 2018a).

Lastly, the City of Milton Comprehensive Plan, adopted in 2014, contains goals, objectives, and policies for future land use, transportation, potable water, sanitary sewer, solid waste and stormwater management, potable water and natural groundwater conservation, recreation and open space, intergovernmental coordination, and capital improvements for the City of Milton. Policy 1.1.2 within the plan encourages the community to work with other agencies to provide efficient and effective delivery of services and reduce conflicts arising from land development decisions. NAS Whiting Field is part of the City of Milton Interlocal Action Committee, which is charged with coordinating Comprehensive Plans and providing information regarding proposed development (City of Milton Department of Planning and Development, 2014).

3.6.2.3 Coastal Zone Management Act

In response to the enactment of the CZMA, the State of Florida developed the Florida Coastal Management Program, which was approved by the National Oceanic and Atmospheric Administration in 1981. The Florida Coastal Management Program consists of a network of 24 Florida statutes, administered by multiple state agencies and water management districts. The Florida Department of Environmental Protection is the state's lead coastal agency responsible for coordinating the consistency review process under the Florida Coastal Management Program.

NAS Whiting Field is located within the state of Florida's coastal zone, although the installation and NOLFs are statutorily excluded from the CZMA's definition of the coastal zone because it is federal land (16 U.S.C. § 1453 [1]). However, the construction activities proposed at NAS Whiting Field and operations associated with the Proposed Action have the potential to indirectly affect coastal zone resources.

Land Use Potential Impacts:

- No Action: Noise levels would decrease slightly from baseline levels; therefore, no significant impacts to land use or land use compatibility would occur.
- Action Alternative: No significant impacts to local or regional land use would occur. Acres of lands exposed to incompatible noise levels greater than 65 DNL would increase in some areas adjacent to the NOLFs; however, these incompatibilities are not considered significantly different from the affected environment. There would be no change to Clear Zones and APZs. All local and regional land use controls would continue to be implemented. The Action Alternative would be consistent, to the maximum extent practicable, with the enforceable policies of the Florida Coastal Management Program.

3.6.3 Environmental Consequences

The location and extent of a proposed action needs to be evaluated for its potential effects on a project site and adjacent land uses. Factors affecting a proposed action in terms of land use include its compatibility with on-site and adjacent land uses, restrictions on public access to land, or change in an existing land use that is valued by the community. Other considerations are given to proximity to a proposed action, the duration of a proposed activity, and its permanence.

3.6.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and the AHTS would not be implemented. There would be no change to the total number of annual TH-57 operations. However, the proportion of TH-57 operations occurring at each NOLF would change as some TH-57 flight operations would be redistributed to NOLF Site X. Other NOLFs would see small reductions in annual operations as portions of their operations would be redistributed to NOLF Site X.

For land use compatibility, the analysis compares the land uses affected by noise levels of the No Action Alternative to those under the baseline at NOLFs Spencer, Pace, Site X, Harold, Santa Rosa, and the surrounding areas (Figures 3.6-15 and 3.6-19). For NOLF Site X, only the No Action Alternative noise contours are presented because it did not exist during the years when baseline operations data were collected. No Action Alternative noise levels at Whiting Field South are the same as the baseline. NOLF Choctaw was not modeled for the No Action Alternative because helicopter operations would not significantly affect the noise environment at NOLF Choctaw, which is dominated by military jets, and there would be a negligible difference in noise exposure at NOLF Choctaw due to the No Action Alternative. Land use acreages affected by No Action Alternative noise levels ≥65 dB DNL for areas near the helicopter training NOLFs are presented and compared to the baseline in Table 3.6-5. NOLFs Site X and Harold are not included in this table because there would be no off-base noise impacts to land use. The shape of the noise zones changes between the No Action Alternative and baseline, so that some land uses would experience reduced noise exposure and others would experience increased noise levels, with overall decreases in the acres affected. Under the No Action Alternative, there would be an overall decrease in the number of acres affected by noise levels ≥65 dB DNL, and land use compatibility would remain similar to the baseline conditions. Therefore, the No Action Alternative would not result in significant impacts to land use compatibility.

For land use controls, the Clear Zones and APZs would remain unchanged under the No Action Alternative, with conditions similar to those found under the affected environment. As a result, there would be no changes to land use compatibility within Clear Zones and APZs. Additionally, all local and regional land use controls discussed in Section 3.6.2.2 *Land Use Controls* would continue to be implemented.

Under the No Action Alternative, there would be slight decreases in noise exposure at Whiting Field South and NOLFs Spencer, Pace, Harold, and Santa Rosa. At NOLF Site X, noise levels 65 dB DNL and above would be completely within the airfield boundary and there would be no off-base impacts to land use. At NOLF Choctaw, there would be a negligible difference in noise exposure. Therefore, the No Action Alternative would not result in significant impacts to land use.

Table 3.6-5 Land Use Acreages for Affected by Noise Levels ≥65 dB DNL for No Action Alternative

Land Use	***Noise Zone 2***						***Noise Zone 3***						***Total Change***
	65 to <70 dB DNL			***70 to <75 dB DNL***			***75 to <80 dB BNL***			***80 to <85 dB DNL***			
	Baseline	***No Action Alternative***	***Change***	***Baseline***	***No Action Alternative***	***Change***	***Baseline***	***No Action Alternative***	***Change***	***Baseline***	***No Action Alternative***	***Change***	
NOLF SPENCER													
Residential	0.7	0.5	-0.2	0	0	0	0	0	0	0	0	0	-0.2
Transportation/ Utilities	0.2	0.2	0	0	0	0	0	0	0	0	0	0	0
Agriculture	0.7	0.6	-0.1	0	0	0	0	0	0	0	0	0	-0.1
Military	120.6	106.5	-14.1	51.5	50.2	-1.3	18	15.7	-2.3	0	0	0	-17.7
Undeveloped Land	0.1	0.1	0	0	0	0	0	0	0	0	0	0	0
Total	**122**	**108**	**- 14**	**52**	**50**	**- 1**	**18**	**16**	**- 2**	**0**	**0**	**0**	**- 18**
NOLF PACE													
Agriculture	0.9	0.7	-0.2	0	0	0	0	0	0	0	0	0	-0.2
Military	60.2	58.6	-1.6	31.3	30.0	-1.3	1.4	1.6	0.2	0	0	0	-2.7
Total	**61**	**59**	**- 2**	**31**	**30**	**- 1**	**1**	**2**	**0**	**0**	**0**	**0**	**- 3**
NOLF SANTA ROSA													
Residential	1.3	1.31	0	0	0	0	0	0	0	0	0	0	0
Military	92.1	90.8	-1.2	28	27.8	-0.2	13.6	13.5	-0.1	1.0	0.9	-0.1	-1.6
Undeveloped Land	1.1	1.0	-0.1	0	0	0	0	0	0	0	0	0	-0.1
Total	**95**	**93**	**- 1**	**28**	**28**	**0**	**14**	**14**	**0**	**1**	**1**	**0**	**- 2**

Note: Whiting Field South is not included in table because noise levels for the No Action Alternative are the same as baseline presented in Table 3.6-1. NOLFs Site X and Harold are not included in this table because there would be no off-base impacts to land use. NOLF Choctaw is not included in this table as it was not modeled for the No Action Alternative because helicopter operations would not significantly affect the noise environment at NOLF Choctaw, which is dominated by military jets. Noise ≥85 dB DNL is not included as helicopter operations would not exceed these noise levels at these NOLFs.

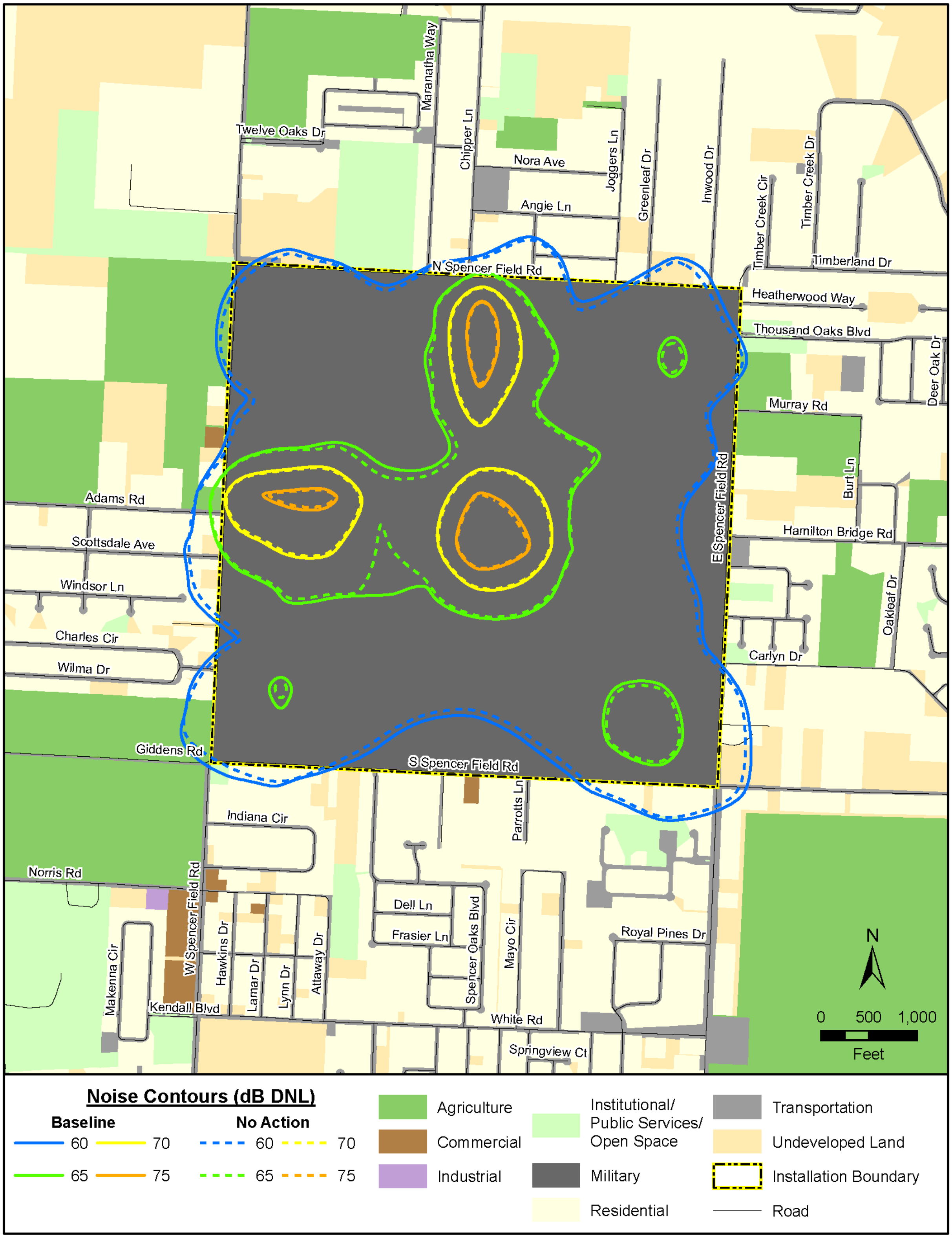


Figure 3.6-15 Land Use near NOLF Spencer Affected by Noise Levels ≥65 dB DNL for No Action Alternative

Figure 3.6-16 Land Use near NOLF Pace Affected by Noise Levels ≥65 dB DNL for No Action Alternative

Figure 3.6-17 Land Use near NOLF Site X Affected by Noise Levels ≥65 dB DNL for No Action Alternative

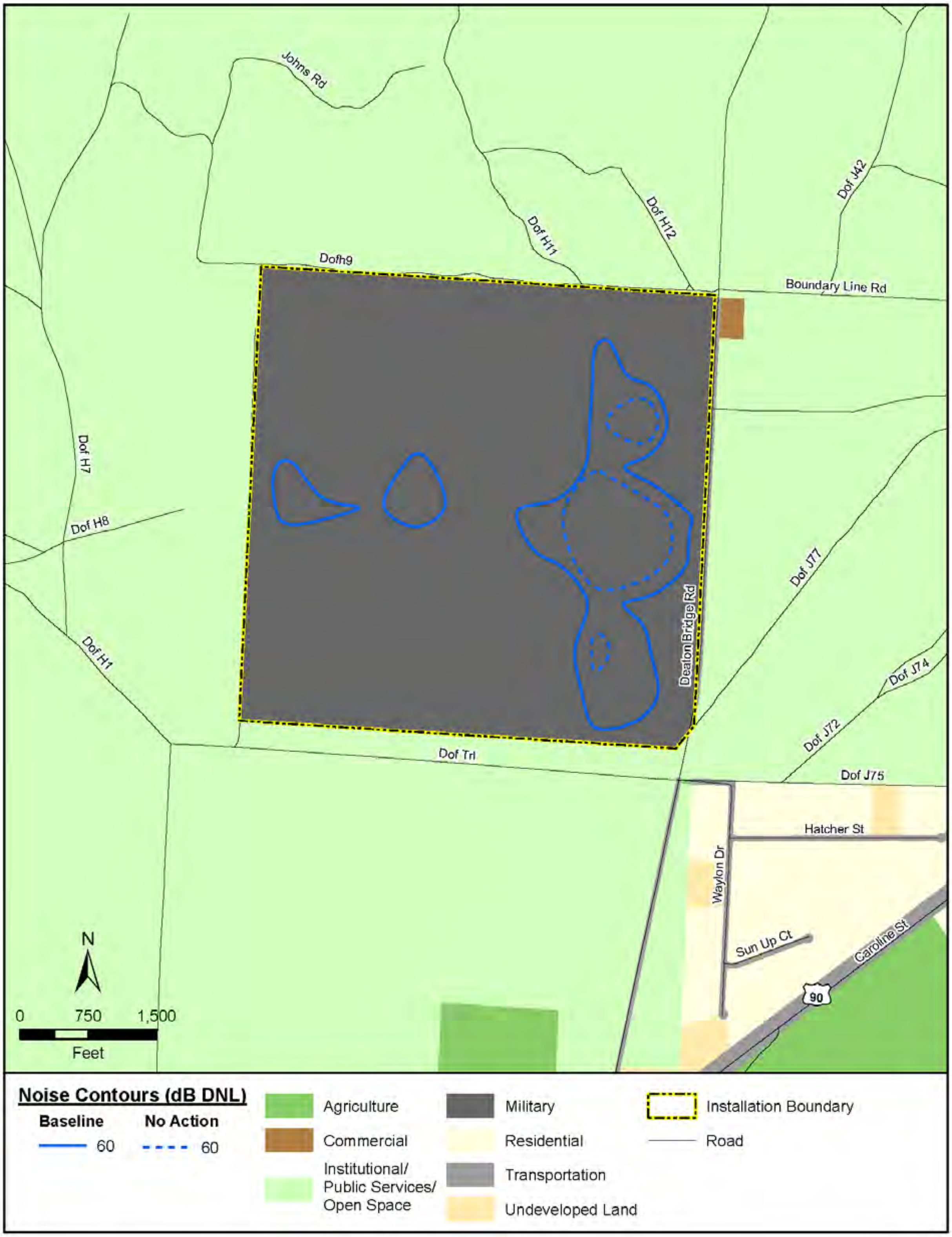


Figure 3.6-18 Land Use near NOLF Harold Affected by Noise Levels ≥65 dB DNL for No Action Alternative

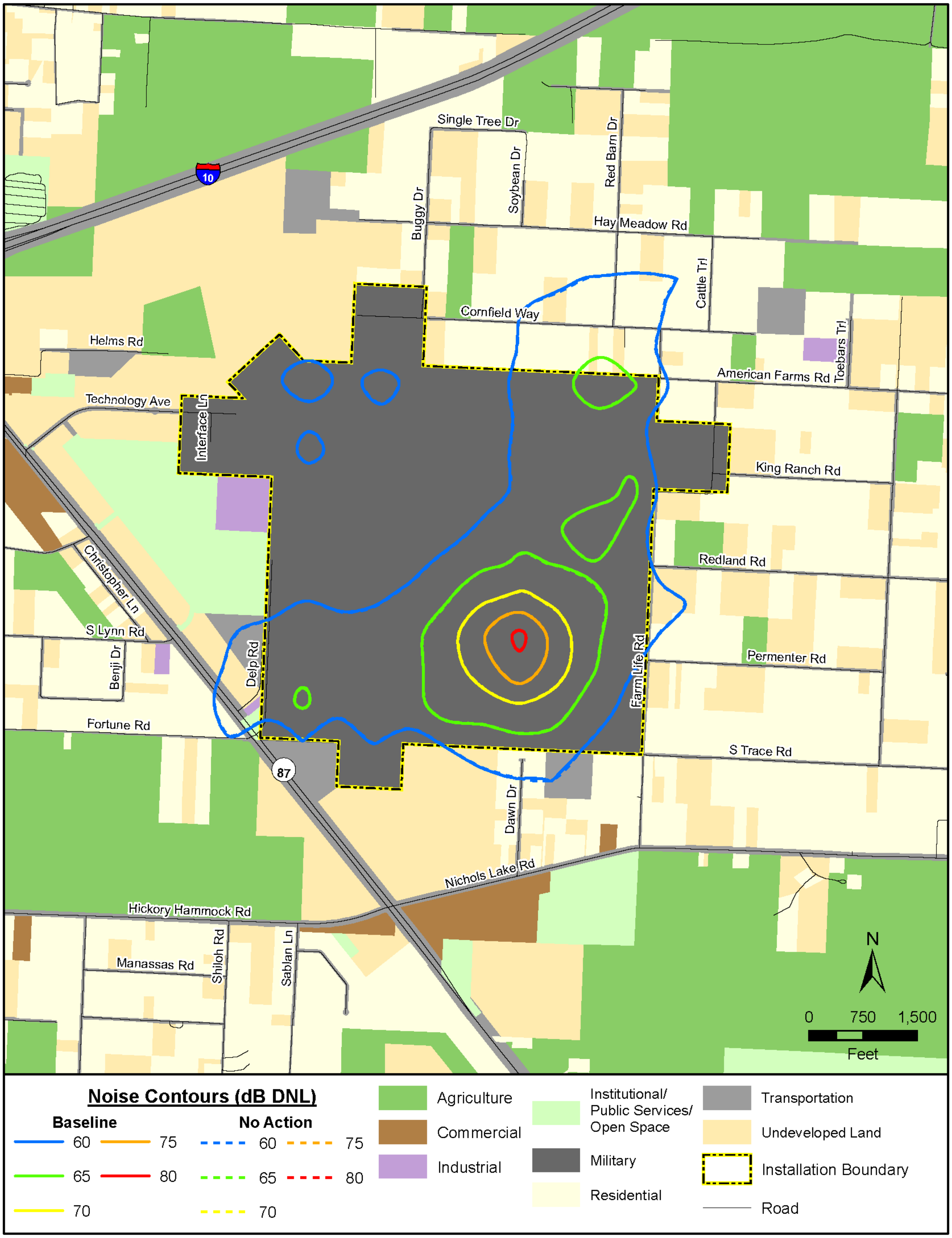


Figure 3.6-19 Land Use near NOLF Santa Rosa Affected by Noise Levels ≥65 dB DNL for No Action Alternative

3.6.3.2 Action Alternative (Preferred Alternative) Potential Impacts

The study area for the analysis of effects to land use associated with the Action Alternative is the area underlying modeled noise contours ≥65 dB DNL from helicopter operations under the Action Alternative. Proposed construction at NAS Whiting Field that would occur in the airfield operations area would be consistent with existing airfield operations and training activities land use. All project-related construction would occur within the boundaries of NAS Whiting Field and would not conflict with surrounding land uses off-base. The Action Alternative would not result in any indirect growth-induced development as there is only an increase of 33 personnel.

Land Use Compatibility

The land use compatibility analysis compares the land uses affected by noise levels of the Action Alternative to those under the No Action Alternative at Whiting Field South, NOLFs Spencer, Pace, Site X, Harold, Santa Rosa, and the surrounding areas (Figures 3.6-20 and 3.6-25). Land use acreages affected by Action Alternative noise levels ≥65 dB DNL for areas near Whiting Field South and the NOLFs are presented and compared to the No Action Alternative in Table 3.6-6. The shape of the noise zones changes between the No Action Alternative and Action Alternative, so that some land uses would experience reduced noise exposure and others would experience increased noise levels, with overall increases in the acres affected, primarily in the military land use category.

At NOLF Santa Rosa, approximately 38 more acres of off-base residential land would experience noise levels from 65 to <70 dB DNL, and 2 acres of off-base residential land would experience noise levels of 70 to <75 dB DNL as compared to the No Action Alternative. At NOLF Spencer, approximately 33 more acres of off-base residential land would experience noise levels from 65 to <75 dB DNL as compared to the No Action Alternative. At both of these NOLFs, the affected acres are within the Santa Rosa County Comprehensive Plan's Military Airport Zone discussed in Section 3.6.2.2 *Land Use Controls*, which limits incompatible land uses within these areas. At NOLF Santa Rosa, the majority of potential incompatible use would occur under an area of concern identified in the AICUZ as Area of Compatibility Concern 2, which extends over the northeast corner of the site. There are mobile homes, single-family residential dwellings, and vacant lots located within the APZ-I and Noise Zone 2 (NAS Whiting Field, 2013). At NOLF Spencer, the majority of potential incompatible use would occur under Areas of Compatibility Concern 2, 3, and 4, where existing residential uses within APZs are considered incompatible (NAS Whiting Field, 2013).

Under the Action Alternative, there would be an overall increase in the number of acres affected by noise levels ≥65 dB DNL. However, these potential noise increases would occur in areas considered incompatible in the current AICUZ, and land use compatibility would remain similar to the No Action Alternative conditions. Therefore, the Action Alternative would not result in significant impacts to land use compatibility.

Land Use Controls

The Clear Zones and APZs would remain unchanged under the Action Alternative, with conditions similar to those found under the No Action Alternative. As a result, there would be no changes to land use compatibility within Clear Zones and APZs. Additionally, all local and regional land use controls discussed in Section 3.6.2.2 *Land Use Controls,* would continue to be implemented. Installation Restoration Program Land Use Controls are discussed in Section 3.9.2.4. *Defense Environmental Restoration Program*.

Coastal Zone Management Act

After review of the Florida Coastal Management Program, the Navy determined policies that may be applicable to the Proposed Action and then conducted an "effects test" to determine whether the Proposed Action would have a reasonably foreseeable direct, indirect, or cumulative effect on the state's coastal uses or resources. After conducting an effects test, the Navy determined that the proposed action may result in reasonably foreseeable direct, indirect, or cumulative effects on Florida's coastal uses or resources. More specifically, the Navy determined that the proposed action operations would generate air emissions and noise with potential to affect coastal zone resources. The proposed facilities construction on the military installation has potential to indirectly affect coastal zone resources. Therefore, the Navy has prepared a Coastal Consistency Determination (*Appendix D, Coastal Consistency Determination*).

Under the Action Alternative, it was determined that implementing the action would be consistent, to the maximum extent practicable, with the enforceable policies of the Florida Coastal Management Program and a Federal Consistency Determination was sent to the Florida Department of Environmental Protection on June 3, 2019. A response from Florida Department of Environmental Protection was received on August 13, 2019, which concurred that the Navy's Action Alternative at NAS Whiting Field is consistent with the enforceable policies of the Florida Coastal Management Program (refer to *Appendix D, Coastal Consistency Determination*). Therefore, the Action Alternative would not result in significant impacts to the coastal zone.

Land Use Impact Conclusion

The Action Alternative would result in additional acreage requiring compatible land use considerations in potential development; however, these considerations are consistent with the No Action Alternative and land use planning processes already in place in Santa Rosa County. The Action Alternative would result in increased acres off-base of lands, including some designated residential, exposed to 65 to <70 dB DNL noise levels; however, these potential noise increases would occur in areas considered incompatible in the current AICUZ study and land use compatibility would remain similar to the No Action Alternative conditions. Clear Zones and APZs would remain unchanged under the Action Alternative. All local and regional land use controls would continue to be implemented. The Action Alternative is consistent, to the maximum extent practicable, with the enforceable policies of the Florida Coastal Management Program and therefore, would not introduce significant effects to coastal zone resources. Concurrence on the Coastal Consistency Determination from the Florida Department of Environmental Protection was received on August 13, 2019. Overall, implementation of the Action Alternative would not result in significant impacts to land use.

Table 3.6-6 Land Use Acreages for Affected by Noise Levels ≥65 dB DNL for Action Alternative

Land Use	*Noise Zone 2*						*Noise Zone 3*									*Total Change*
	65 to <70 dB DNL			*70 to <75 dB DNL*			*75 to <80 dB BNL*			*80 to <85 dB DNL*			*≥85 dB DNL*			
	No Action Alternative	*Action Alternative*	*Change*	*No Action Alternative*	*Action Alternative*	*Change*	*No Action Alternative*	*Action Alternative*	*Change*	*No Action Alternative*	*Action Alternative*	*Change*	*No Action Alternative*	*Action Alternative*	*Change*	
WHITING FIELD SOUTH																
Military	178	227.5	49.5	90	132.4	42.4	79	91.1	12.1	2	8.5	6.5	2	0	-2	108.5
Total	**178**	**228**	**50**	**90**	**132**	**42**	**79**	**91**	**12**	**2**	**9**	**7**	**2**	**0**	**- 2**	**109**
NOLF SPENCER																
Residential	0.5	33.8	33.3	0	0	0	0	0	0	0	0	0	0	0	0	33.3
Transportation/ Utilities	0.2	9.0	8.8	0	0	0	0	0	0	0	0	0	0	0	0	8.8
Agriculture	0.6	14.8	14.2	0	0.1	0.1	0	0	0	0	0	0	0	0	0	14.3
Institutional/ Public Services/ Open Space	0	3.5	3.5	0	0	0	0	0	0	0	0	0	0	0	0	3.5
Military	106.5	414.6	308.1	50.2	80.4	30.2	15.7	25.0	9.3	0	0	0	0	0	0	347.6
Undeveloped Land	0.1	12.9	12.8	0	0	0	0	0	0	0	0	0	0	0	0	12.8
Total	**108**	**489**	**381**	**50**	**81**	**30**	**16**	**25**	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**420**
NOLF PACE																
Agriculture	0.7	34.3	33.6	0	0	0	0	0	0	0	0	0	0	0	0	33.6
Military	58.6	130.5	71.9	30.0	49.4	19.4	1.6	11	9.4	0	0	0	0	0	0	100.7
Undeveloped Land	0	2.0	2.0	0	0	0	0	0	0	0	0	0	0	0	0	2.0
Total	**59**	**167**	**108**	**30**	**49**	**19**	**2**	**11**	**9**	**0**	**0**	**0**	**0**	**0**	**0**	**136**
NOLF SITE X																
Agriculture	0	9.1	0	0	0	0	0	0	0	0	0	0	0	0	0	9.1
Military	170.0	264.7	94.7	35.3	116.2	80.9	6.1	30.7	24.6	0.2	4.8	4.6	0	0	0	204.8
Total	**170**	**274**	**95**	**35**	**116**	**81**	**6**	**31**	**25**	**0**	**5**	**5**	**0**	**0**	**0**	**214**

Table 3.6-6 Land Use Acreages for Affected by Noise Levels ≥65 dB DNL for Action Alternative

Land Use	***Noise Zone 2***						***Noise Zone 3***									***Total Change***
	65 to <70 dB DNL			***70 to <75 dB DNL***			***75 to <80 dB BNL***			***80 to <85 dB DNL***			***≥85 dB DNL***			
	No Action Alternative	***Action Alternative***	***Change***	***No Action Alternative***	***Action Alternative***	***Change***	***No Action Alternative***	***Action Alternative***	***Change***	***No Action Alternative***	***Action Alternative***	***Change***	***No Action Alternative***	***Action Alternative***	***Change***	
NOLF HAROLD																
Transportation/ Utilities	0	0.5	0.5	0	0	0	0	0	0	0	0	0	0	0	0	0.8
Institutional/ Public Services/ Open Space	0	0.4	0.4	0	0	0	0	0	0	0	0	0	0	0	0	0.4
Military	0	43.7	43.7	0	0.9	0.9	0	0	0	0	0	0	0	0	0	44.6
Total	**0**	**44**	**44**	**0**	**1**	**1**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**46**
NOLF SANTA ROSA																
Residential	1.3	39.7	38.4	0	2.2	2.2	0	0	0	0	0	0	0	0	0	40.6
Industrial	0	0.7	0.7	0	0	0	0	0	0	0	0	0	0	0	0	0.7
Transportation/ Utilities	0	16.1	16.1	0	0	0	0	0	0	0	0	0	0	0	0	16.1
Military	90.8	238.7	147.9	27.8	74.3	46.5	13.5	18.3	4.8	0.9	4.7	3.8	0	0	0	203
Undeveloped Land	1.0	12.6	11.6	0	1.9	1.9	0	0	0	0	0	0	0	0	0	13.5
Total	**93**	**308**	**215**	**28**	**78**	**51**	**14**	**18**	**5**	**1**	**5**	**4**	**0**	**0**	**0**	**274**

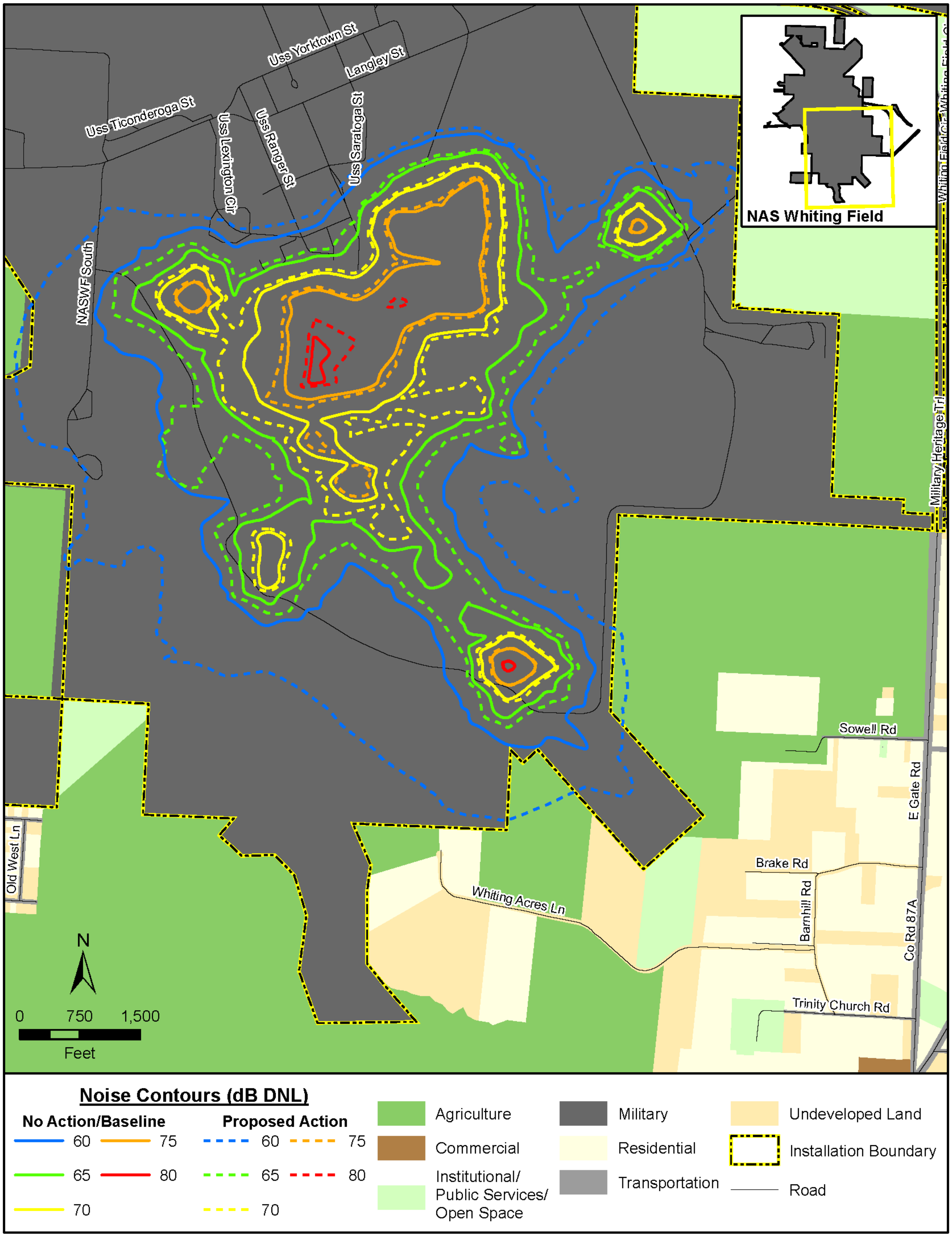


Figure 3.6-20 Land Use near Whiting Field South Affected by Noise Levels ≥65 dB DNL for Action Alternative

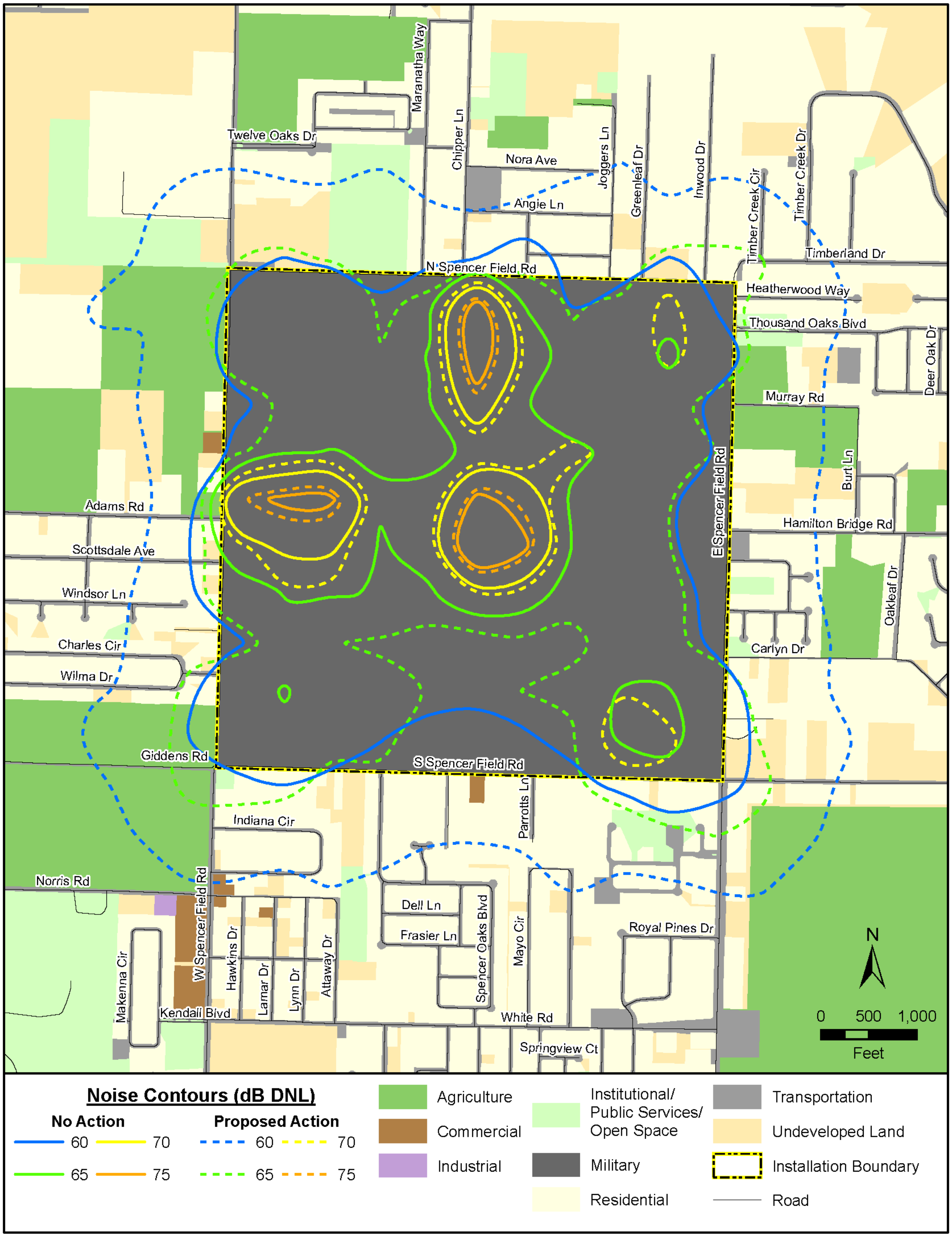


Figure 3.6-21 Land Use near NOLF Spencer Affected by Noise Levels ≥65 dB DNL for Action Alternative

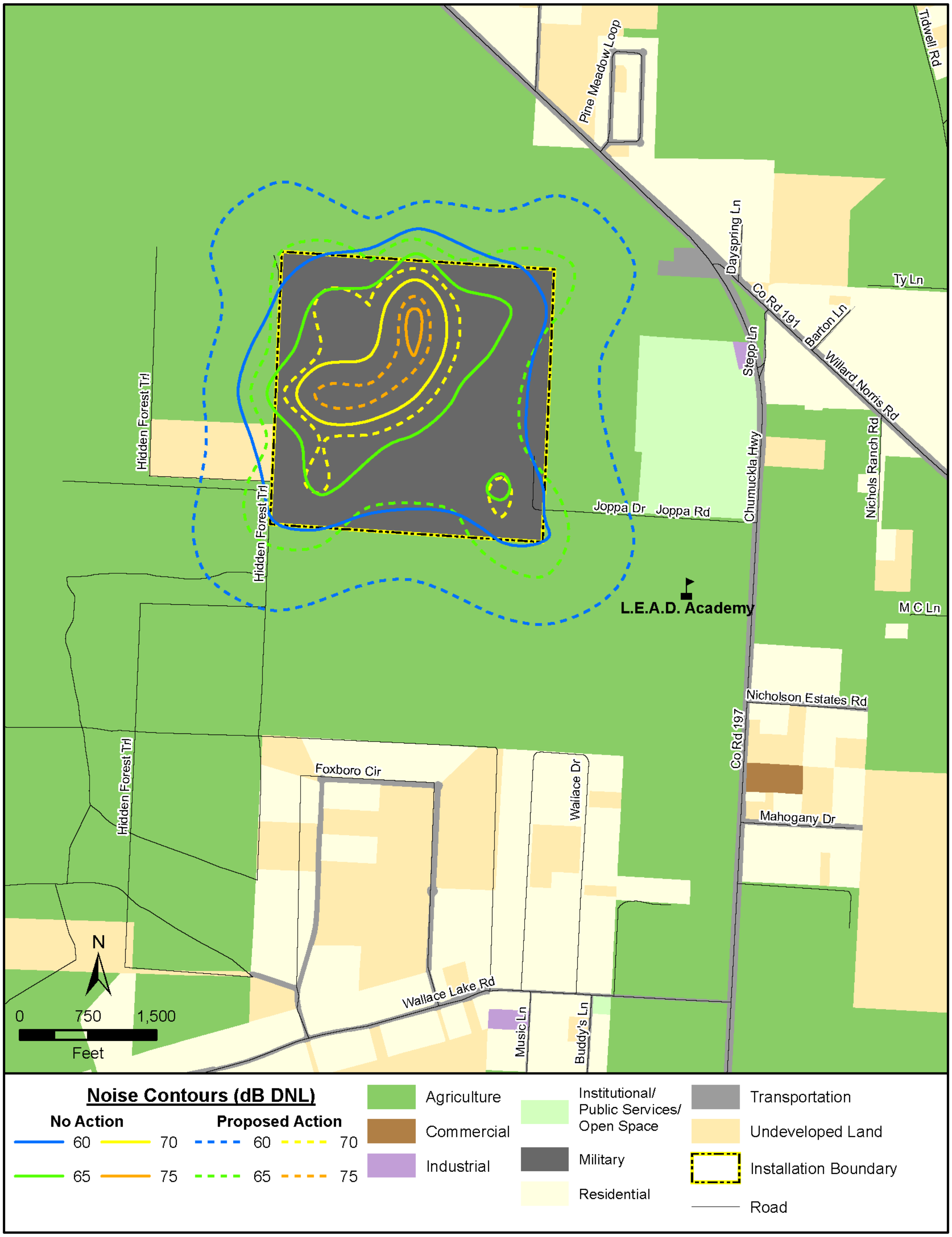


Figure 3.6-22 Land Use near NOLF Pace Affected by Noise Levels ≥65 dB DNL for Action Alternative

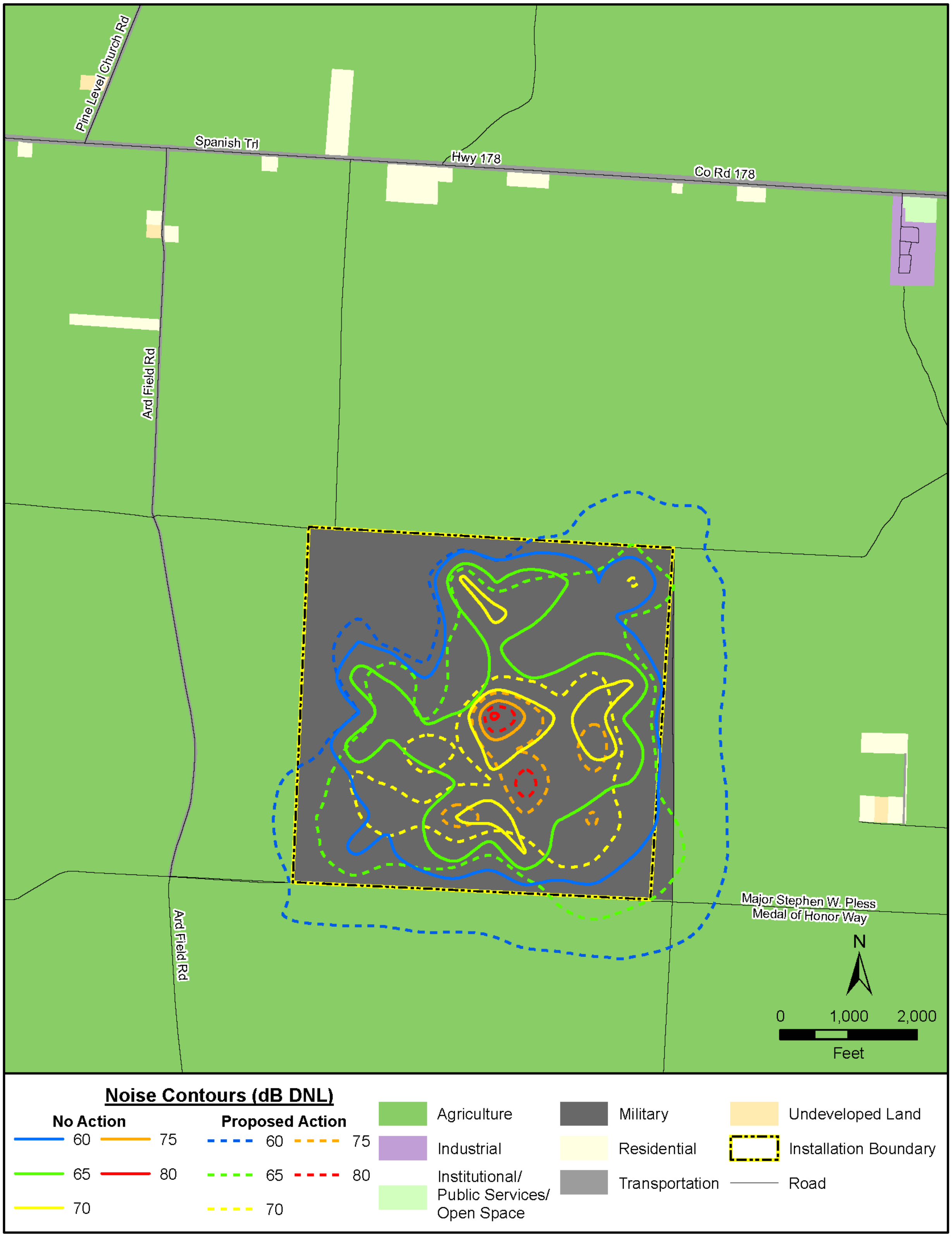


Figure 3.6-23 Land Use near NOLF Site X Affected by Noise Levels ≥65 dB DNL for Action Alternative

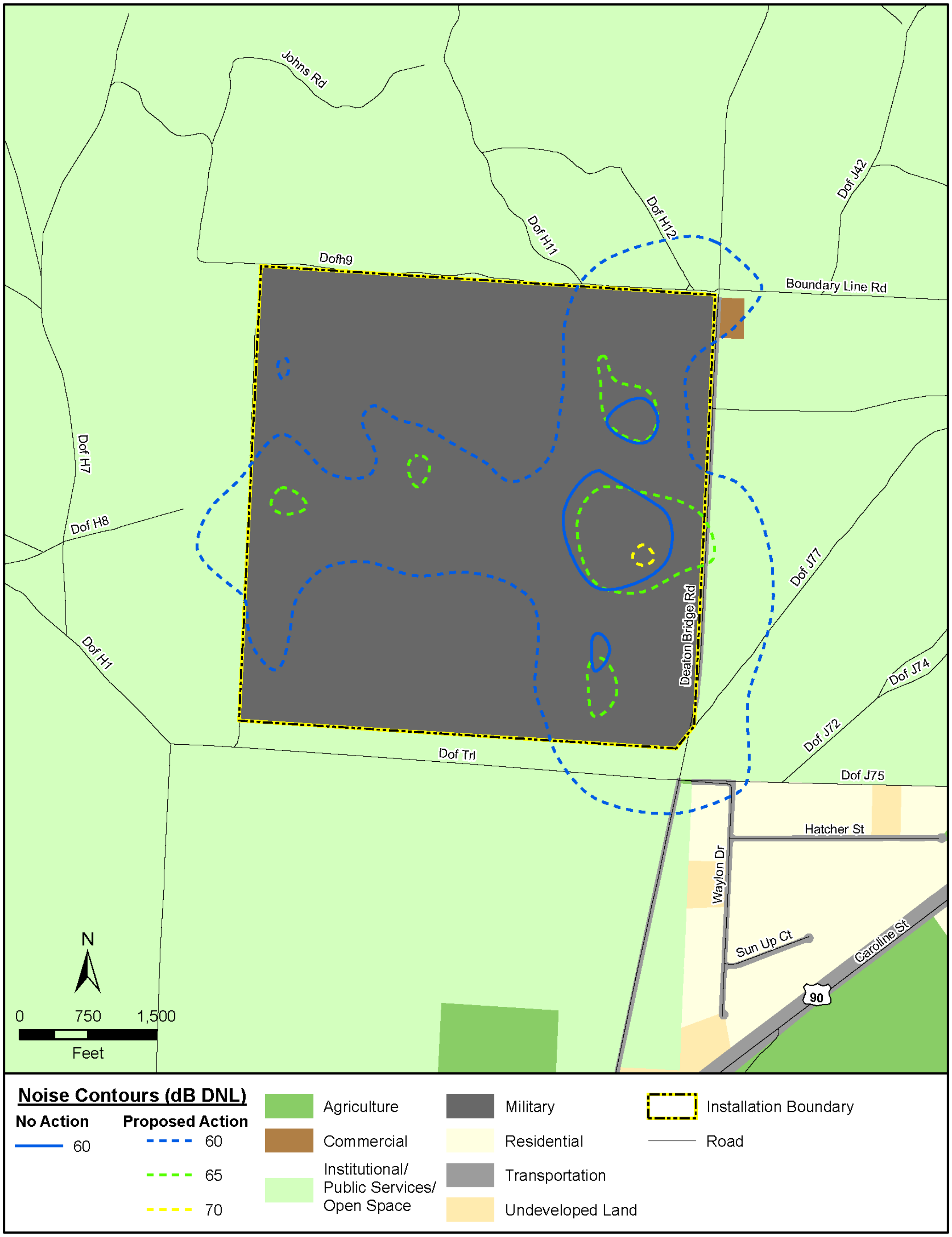


Figure 3.6-24 Land Use near NOLF Harold Affected by Noise Levels ≥65 dB DNL for Action Alternative

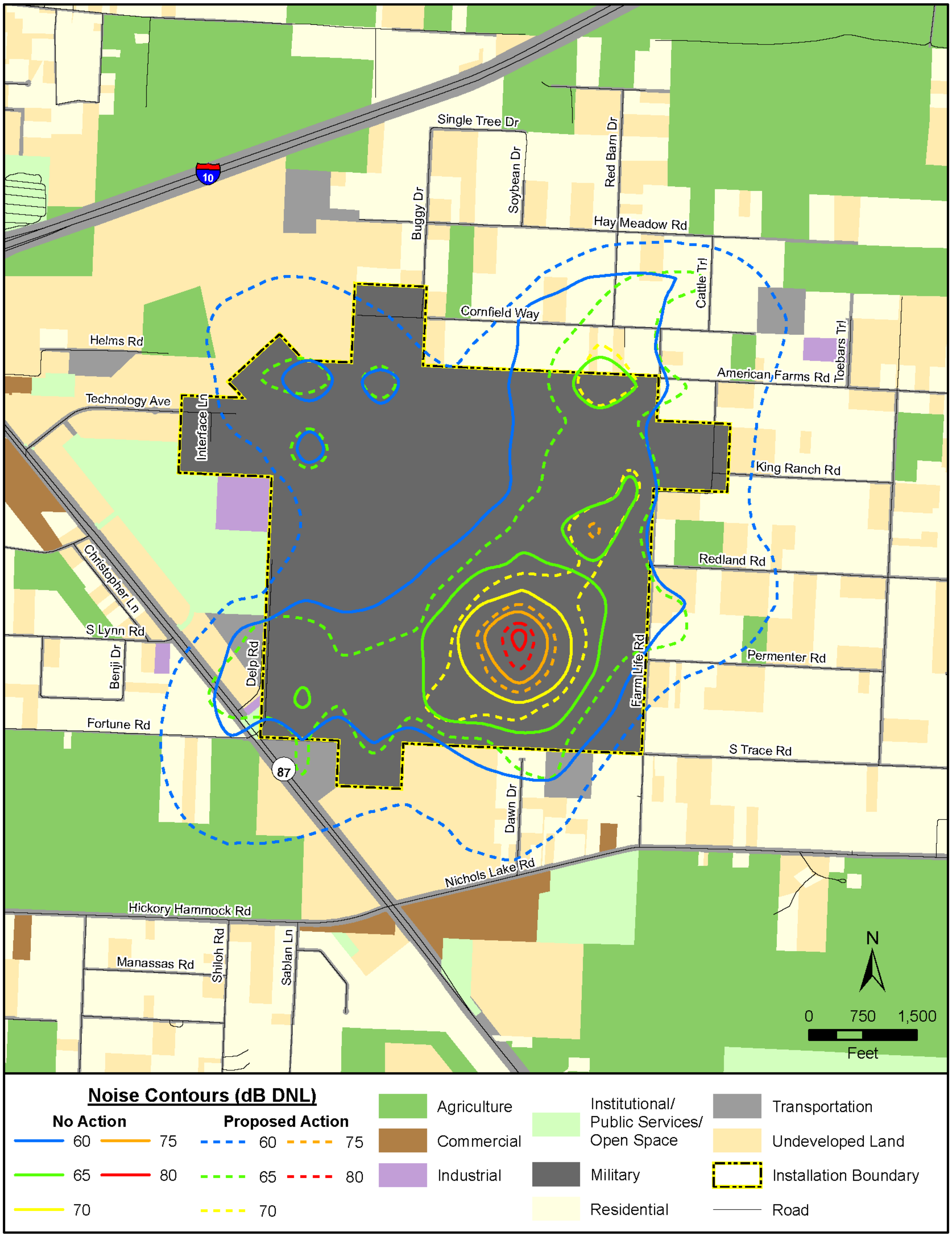


Figure 3.6-25 Land Use near NOLF Santa Rosa Affected by Noise Levels ≥65 dB DNL for Action Alternative

3.7 Infrastructure

This section discusses infrastructure such as utilities (including drinking water production, storage, and distribution; wastewater collection treatment and disposal; stormwater management, solid waste management, energy production, transmission, and distribution; and communications) and facilities (including airfields, buildings, ranges, training and testing areas, wharves, piers, housing, etc.).

3.7.1 Regulatory Setting

EO 13834, Efficient Federal Operations, requires that agencies meet statutory requirements in a manner that increases efficiency, optimizes performance, eliminates unnecessary use of resources, and protects the environment. In implementing this policy, each agency shall prioritize actions that reduce waste, cut costs, and enhance the resilience of federal infrastructure and operations. This EO also requires agencies to track and report on energy management activities, performance improvements, cost reductions, GHG emissions, energy and water savings, and other appropriate performance measures. EO 13834 requires federal agencies to meet goals associated with energy use, water use, building design and utilization, fleet vehicles, and procurement and acquisition decisions.

Chief of Naval Operation Instruction 4100.5E outlines the Secretary of the Navy's vision for shore energy management. The focus of this instruction is establishing the energy goals and implementing strategy to achieve energy efficiency.

3.7.2 Affected Environment

The following discussions provide a description of the existing conditions for each of the categories under infrastructure at NAS Whiting Field. There are no anticipated changes to the infrastructure or facilities at the NOLFs, therefore, they are not discussed further in this section.

3.7.2.1 Potable Water

Northwest Florida draws most of its potable water from one of three aquifers. The principal hydrologic zonation from top to bottom consists of the Sand-and-Gravel Aquifer, which forms the surficial system, the Upper Floridan Aquifer, which forms the Intermediate System regional confining unit, the Bucatunna Clay confining unit (where present), and the Lower Floridan Aquifer. The potable water for the installation is supplied from three separate Navy owned wells, identified in Table 3.7-1 (NAS Whiting Field, 2013). A Consumptive Use Permit, issued by the Northwest Florida Water Management District, allows for an annual withdrawal of 479,000 gallons per day. Each well is equipped with electric pumps rated at approximately 600 gallons per minute (Department of the Navy, 2000b).

Table 3.7-1 Potable Wells Located on NAS Whiting Field

Well Location	*Depth (ft)*	*Aquifer Type*
South Well	190	Sand-and-Gravel
North Well	210	Sand-and-Gravel
West Well	216	Sand-and-Gravel

Source: (NAS Whiting Field, 2013)

Water is carbon-filtered and treated by chemical injection with chlorine, caustic soda, and phosphate to control bacteria, adjust pH levels as needed, and reduce pipe corrosion before being pumped into four 100,000 gallon elevated storage tanks, supplying the installation with a flow of approximately 45 pounds per square inch. There are strategically located fire booster pumps at critical facilities such as hangars, medical/dental facility, bachelor enlisted quarters, bachelor officer's quarters, etc. There is no back up potable water source. The distribution system is the original cast iron system and dates from the early 1940s. Except for the golf course, the irrigation system is supplied with potable water from the distribution system (NAS Whiting Field, 2013).

3.7.2.2 Wastewater

The system is a gravity system served by one lift station at North Field. All flow collects at the southeast corner of the installation at the site of the old sewage treatment plant where it is pumped into the City of Milton's Municipal system (NAS Whiting Field, 2013). There is no pretreatment, but some of the wastewater goes through an oil/water separator before being discharged into the sanitary sewer system (Department of the Navy, 2000b).The Municipal pump station can handle a flow of 750 gallons per minute when all three pumps are operating simultaneously (NAS Whiting Field, 2013).

3.7.2.3 Stormwater

The stormwater system is a separate system from the sanitary system. There are two large ponds on the installation that collect stormwater after a rain event. The ponds are not permitted as stormwater features; however, they interconnect and discharge to a vegetated ravine where the water is gradually adsorbed into the ground. There is an extensive stormwater conveyance system that has seven discharges off the installation. There are no current stormwater capacity problems; however, all new projects require review by the Florida Department of Environmental Quality and specific mitigation measures may be required (NAS Whiting Field, 2013).

3.7.2.4 Solid Waste Management

Solid waste is collected and disposed of at the Santa Rosa County Central Landfill located in Milton, Florida. The Central Landfill has recently opened a new 15 acre cell that is expected to last for 8 to 9 years. This cell is the first part of an 88-acre expansion permitted through the Florida Department of Environmental Quality that will extend the current life of the landfill 40 to 50 years (Hixson, 2019).

3.7.2.5 Energy

The installation is serviced by Gulf Power from two feeds that enter the base on the east side where they connect to a dual bank substation. From there, the feeders go underground across the airfield to transformers in Building 1429. From this point, the service goes above ground to the individual users. The installation system is at 4,160 volts so multiple transformers are required. The most critical aspect of the electric system is that with only one connection to the grid, there is a single point of failure. There have been discussions with Gulf Power to provide another power connection on the west side of the installation; however, the demand to date has not been sufficient to warrant the investment by Gulf Power. The installation underwent a utility privatization study completed in 2012, which determined that it would be prohibitively expensive to privatize the utilities on the installation (NAS Whiting Field, 2013).

Natural gas is provided by Okaloosa Natural Gas. The gas line enters the installation from the west and connects to a central meter. Okaloosa Natural Gas owns and maintains the distribution lines on the installation that supply gas to individual facilities. The natural gas is used for domestic hot water and humidity control (NAS Whiting Field, 2013).

At NOLF Holley, the Navy, in cooperation with Gulf Power, has constructed a solar farm with more than 480,000 solar panels erected to help meet the Navy's green energy goals. The solar photovoltaic system has a capacity of 40 megawatts alternating current or 52 megawatts direct current, and can generate 77,367 megawatt hour alternating current of electricity per year to supply the Gulf Power's existing electrical grid (Department of the Navy, 2015a). Gulf Power retains control and ownership of the Renewable Energy Certificates associated with the project. Renewable Energy Certificates represent the environmental, social, and other non-power benefits of renewable electricity generation, and they can be sold separately from the physical generating systems. The renewable energy contributes to the Navy's goal of producing or procuring 50 percent of its own electricity from renewable energy sources by 2020, and to the Navy's goal of deploying 1 gigawatt of renewable energy by 2020. The renewable energy generated with implementation of the solar photovoltaic system also would increase statewide renewable energy generation. However, because the commercial power utility would retain control and ownership of the Renewable Energy Certificates associated with the project, the renewable energy generated would not apply to Energy Policy Act of 2005 goals (Department of the Navy, 2015a).

3.7.3 Environmental Consequences

This section analyzes the magnitude of anticipated increases or decreases in public works infrastructure demands considering historic levels, existing management practices, and storage capacity, and evaluates potential impacts to public works infrastructure associated with implementation of the alternatives. Impacts are evaluated by whether they would result in the use of a substantial proportion of the remaining system capacity, reach or exceed the current capacity of the system, or require development of facilities and sources beyond those existing or currently planned.

> Infrastructure Potential Impacts:
>
> - No Action: The Proposed Action would not be implemented and the affected environment would remain unchanged; therefore, no significant impacts.
> - Action Alternative: The Action Alternative would not result in significant impacts to infrastructure and utilities.

3.7.3.1 No Action Alternative

Under the No Action Alternative, the Action Alternative would not occur, and there would be no change to the existing infrastructure of NAS Whiting Field. Therefore, no significant impacts to infrastructure would occur with implementation of the No Action Alternative.

3.7.3.2 Action Alternative (Preferred Alternative) Potential Impacts

Under the Action Alternative, potential impacts to infrastructure and utilities could occur from the demolition of existing facilities, the construction and operation new facilities, and personnel changes. Potential impacts at NAS Whiting Field are discussed in the following sections. There are no anticipated impacts at the NOLFs since there would be no construction or demolition of facilities at the NOLFs.

Under the Action Alternative, there would be an increase of 33 personnel at NAS Whiting Field. For the range of infrastructure and utilities discussed below, the installation would plan and assess specific infrastructure and utility requirements prior to final design of facilities to ensure that the proposed functions and associated increases would be accommodated. The installation identifies infrastructure or utility needs within the scope of each corresponding project. If particular projects require additional infrastructure or utilities, they are incorporated as part of that project. This process ensures that any infrastructure or utility deficiencies are identified in the initial planning stages.

For the following analysis, it is assumed that population impacts from the increase of 73 people (33 personnel and 40 family members) would be incurred on and off the installation. Under the Action Alternative, 73 people would live off the installation (less than 1 percent of the total population increase). It is assumed that a majority of the new personnel and family members would reside within the City of Milton, with the remainder of personnel and family members residing in the outlying areas. It is likewise assumed that impacts to utilities in the outlying areas would be minimal as relatively fewer people would reside there. Therefore, this discussion focuses on impacts to the City of Milton. When discussing impacts regarding the installation, the increase in 33 personnel is used to assess impacts as if all personnel would be present on the installation during work hours.

Potable Water

Under the Action Alternative, water consumption would not be expected to significantly increase as a result of the increase in personnel. It is assumed that population impacts would be incurred on and off the installation. According to a 2015 water use report by the U.S. Geological Survey, the average total domestic per capita use of potable water is 82 gallons per day for the state of Florida (Dieter & Maupin, 2017). An increase in 73 people would increase potable water demand by a maximum of 5,986 gallons per day. Increased usage as a result of the Action Alternative is not significant; therefore, the existing water supply should be able to accommodate the increase.

The demand for water (e.g., if used as a BMP to control dust) could also increase during demolition and construction phases. However, this increase would be temporary and intermittent and would not be expected to impact the regional water supply. The existing water supply is anticipated to accommodate the increase in water consumption both on and off the installation.

As of August 2017, one on-base drinking water system and nine off-base public and private drinking water systems near NAS Whiting Field were tested for PFAS. Only one off-base system tested at 259 parts per trillion, which is above the USEPA lifetime health advisory limit of 70 parts per trillion. The residence has been provided with bottled water to address the current exposure (Sullivan, 2018). For a discussion of PFAS, see Section 3.9.2.3 *Special Hazards*.

Therefore, the Action Alternative would not result in significant impacts to potable water.

Wastewater

The existing capacity of the City of Milton wastewater treatment facility is permitted with a current flow rate of 2.5 million gallons per day (City of Milton, 2019). Under the Action Alternative, wastewater generation would not be expected to significantly increase as a result of the proposed construction and increase in personnel at NAS Whiting Field. According to the USEPA, estimated average per capita wastewater flow typical of residential dwellings is 70 gallons per day (USEPA, 2002). The increase of 73 personnel and family members would result in a maximum increase to the City of Milton municipal wastewater treatment facility of 5,110 gallons per day (0.005 million gallons per day). This small increase would not exceed the existing capacity. Persons residing outside the City of Milton in unincorporated areas of Santa Rosa County would utilize wells and septic systems and would not be connected to municipal sewer or potable water systems (City of Milton Department of Planning and Development, 2014). Therefore, the Action Alternative would not result in significant impacts to wastewater.

Stormwater

The proposed construction activities at NAS Whiting Field could temporarily affect the quality of stormwater runoff through potential increases in soil erosion. Under the Action Alternative, there would be approximately 47 acres of soil disturbed and the creation of approximately 6.5 acres of new impervious surfaces. These activities can expose soils and, during storm events, stormwater can pick up soil particles, thereby increasing sediment loading of the stormwater runoff. In accordance with the CWA Section 402 NPDES program, BMPs would be implemented during construction and demolition projects to minimize runoff. In addition, use of a site-specific SWPPP and associated BMPs for construction sites where one or more acres would be disturbed would be required.

In accordance with Unified Facilities Criteria 3-210-10, *Low Impact Development* (as amended, 2010), any increase in surface water runoff as a result of the proposed construction would be reduced through the use of temporary and/or permanent drainage management features such as the use of bioretention, filter strips, vegetated buffers, grassed swales, infiltration trenches, water harvesting, and other applicable BMPs. The integration of Low Impact Development design concepts incorporates site design and stormwater management to maintain the site's pre-development runoff rates and volumes to further minimize potential adverse impacts associated with increases in impervious surface area. The use of these features would also increase groundwater recharge through direct percolation offsetting the loss of pervious surface due to future construction. Therefore, the Action Alternative would not result in significant impacts to stormwater.

Solid Waste Management

Under the Action Alternative, proposed construction and demolition would generate debris requiring landfill disposal. Construction activities would begin in 2019 and the last project would end in the 2026 timeframe, resulting in approximately 285,586 SF of new construction. The estimated pounds of waste generated each year from new construction, as described in the Characterization of Building-Related Construction and Demolition Debris in the United States (USEPA, 1998) is:

(Total square footage of new construction per year) x (4.38 pounds/SF)* = X pounds of debris.

*4.38 pounds per SF is an estimate of debris generated during new construction based on sampling studies documented in Characterization of Building-Related Construction and Demolition Debris in the United States (USEPA, 1998).

Under the Action Alternative, proposed construction (285,586 SF) would generate 1,250,866.68 pounds (625 tons) of construction debris requiring landfill disposal. Also, 188,094 SF of facilities and infrastructure potentially would be demolished under the Action Alternative. Using the USEPA 115 pounds/SF debris generation rate associated with demolition, there would be approximately 24,909,575 pounds (12,455 tons) generated from proposed demolition activities. The combined 13,080 tons of solid waste generated by construction and demolition under the Action Alternative could result in impacts to solid waste management facilities in the area. Assuming conservatively that the construction and demolition debris would primarily consist of concrete, the 13,080 tons of construction debris that would be generated as a result of the Action Alternative would represent 6,449 cubic yards. The construction proposed under the Action Alternative would be phased over multiple years. As a result, impacts to the Central Landfill would not be expected to exceed the permitted throughput or reduce the remaining capacity significantly.

Off-installation contractors completing construction projects would be responsible for disposing of waste generated from construction activities. Contractors are required to comply with federal, state, local, and Navy regulations for the collection and disposal of municipal solid waste from the installation. Much of this material can be recycled or re-used, or otherwise diverted from landfills. All non-recyclable construction and demolition waste or other components not appropriate for a standard landfill would be collected in dumpsters and hauled away by the contractor to an appropriate landfill.

Construction and demolition waste contaminated with hazardous waste, asbestos-containing material, lead-based paint, or other undesirable components would be removed by licensed contractors and disposed of in a local hazardous waste-permitted landfill in accordance with Navy, federal, state, and local laws and regulations (see also Section 3.9, *Hazardous Materials and Waste*).

Under the Action Alternative non-hazardous municipal solid waste would be generated by personnel and their family members both on- and off-installation (for the following analysis, it is assumed a population increase of 73 people, 33 personnel and 40 family members). According to USEPA, the average non-hazardous municipal waste generated for a household is 4.43 pounds/person/day. Non-hazardous municipal waste generated by personnel and family members off-base would result in 323 pounds per day. Additionally, CalRecycle identifies solid waste generated by government agencies at 0.59 tons/employee/year. Therefore, it is anticipated that in the course of their work day, personnel would generate 19.47 tons of non-hazardous municipal waste per year. Total non-hazardous municipal waste generated by the Action Alternative is anticipated to be 59 tons per year or 0.16 tons per day. According to the USEPA's estimated conversion, a cubic yard of municipal solid waste is equivalent to approximately 0.625 tons (landfill density) (USEPA, 1997). Based on the current permitted capacity of 1,548,800 cubic yards for the new landfill cell, an additional 0.16 tons per day, or 0.26 cubic yards per day, would not result in impacts to the landfill (Hixson, 2019).

Therefore, the Action Alternative would not result in significant impacts to solid waste management.

Energy

Under the Action Alternative, electricity demand would be expected to increase as a result of the proposed infrastructure and increase in personnel at NAS Whiting Field. Additionally, the proposed facilities that support the AHTS would require additional electricity. However, new facilities associated with the Action Alternative would be implemented with more energy efficient design standards and utility systems than are currently in place. Construction projects would incorporate Leadership in Energy and Environmental Design and sustainable development concepts to achieve optimum resource efficiency, sustainability, and energy conservation. Therefore, average energy consumption per facility for new buildings would be expected to remain consistent or decrease compared to energy consumption associated with existing facilities of similar size.

According to the U.S. Department of Energy State Energy Consumption Estimates, the average annual electricity consumption for a U.S. residential home in 2008 was 11,040 kilowatt-hours (U.S. Department of Energy, 2010). Assuming each personnel member constitutes one household, an increase of 33 personnel would increase electricity use by approximately 364,320 kilowatt-hours (364 megawatt-hours) per year. This increase in energy consumption is minimal and would not be expected to impact energy service to the area.

Construction activity associated with the Action Alternative would result in some temporary interruption of utility services during construction periods. These impacts would be short-term, occurring briefly during active construction periods. In addition, the demand for energy (primarily electricity) could increase slightly during demolition and construction phases. The energy supply at the installation and in the region is adequate and would not be affected by this temporary increase in demand.

Under the Action Alternative, natural gas consumption would not be expected to significantly increase as a result of the proposed increase in personnel at NAS Whiting Field. Average residential consumption of natural gas within the United States in 2008 was 75,000 cubic feet per household (Energy Information Administration, 2010). Assuming each personnel member constitutes one household, an increase of 33 personnel would increase natural gas use by approximately 2,475 million cubic feet. Okaloosa Natural Gas infrastructure currently spans the area surrounding NAS Whiting Field and the City of Milton and services approximately 45,000 residential, commercial, military, and industrial customers within its territory (Okaloosa Gas, 2019). It is anticipated that Okaloosa Gas would have sufficient capacity to accommodate the addition of 73 people to the area (less than a 0.16 percent increase).

The new solar farm installed at NOLF Holley Field would help to offset any increased demands in energy as a result of the Action Alternative. Therefore, the Action Alternative would not result in significant impacts to energy.

Infrastructure Impact Conclusion

The Action Alternative would result in increased quantity, consumption, or demand for water, wastewater, stormwater, solid waste management, and energy from a small increase in population that would be spread throughout Santa Rosa County. New facilities would also result in increased demand for infrastructure resources. Based on existing and future capacity and projected demand, Navy and local infrastructure systems are expected to have sufficient capacity to accommodate the increase in population and facility requirements. Overall, implementation of the Action Alternative would not result in significant impacts to infrastructure.

3.8 Public Health and Safety

This discussion of public health and safety includes consideration for any activities, occurrences, or operations that have the potential to affect the safety, well-being, or health of members of the public. A safe environment is one in which there is no, or optimally reduced, potential for death, serious bodily injury or illness, or property damage. The primary goal is to identify and prevent potential accidents or impacts on the general public. Public health and safety within this EA discusses information pertaining to community emergency services, construction activities, operations, and environmental health and safety risks to children.

Community emergency services are organizations which ensure public safety and health by addressing different emergencies. The three main emergency service functions include police, fire and rescue service, and emergency medical service.

Public health and safety during construction and demolition activities is generally associated with construction traffic, as well as the safety of personnel within or adjacent to the construction zones.

Operational safety may refer to the actual use of the facility or built-out proposed project, or training or testing activities and potential risks to inhabitants or users of adjacent or nearby land and water parcels. Safety measures are often implemented through designated safety zones, warning areas, or other types of designations.

The AICUZ program, which is discussed in the Section 3.6 *Land Use*, delineates APZs, which are areas around an airfield where an aircraft mishap is most likely to happen. APZs are not predictors of accidents nor do they reflect accident probability. The DoD defines an APZ as a planning tool for local planning agencies. The APZs follow departure, arrival, and flight pattern tracks from an airfield and are based upon historical accident data.

Environmental health and safety risks to children are defined as those that are attributable to products or substances a child is likely to come into contact with or ingest, such as air, food, water, soil, and products that children use or to which they are exposed.

3.8.1 Regulatory Setting

Aircraft safety is based on the physical risks associated with aircraft flight. Military aircraft fly in accordance with Federal Aviation Regulations Part 91, *General Operating and Flight Rules*, which govern such things as operating near other aircraft, right-of-way rules, aircraft speed, and minimum safe altitudes. These rules include the use of tactical training and maintenance test flight areas, arrival and departure routes, and airspace restrictions as appropriate to help control air operations. In addition, Naval aviators must also adhere to the flight rules, air traffic control, and safety procedures provided in Navy guidance.

EO 13045, *Protection of Children from Environmental Health Risks and Safety Risks*, requires federal agencies to “make it a high priority to identify and assess environmental health and safety risks that may disproportionately affect children and shall ensure that its policies, programs, activities, and standards address disproportionate risks to children that result from environmental health risks or safety risks.”

3.8.2 Affected Environment

The affected environment for public health and safety encompasses NAS Whiting Field, the six NOLFs associated with helicopter training: Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw, and associated airspace. The primary focus of the safety analysis is:

- the potential for aircraft mishaps;
- the potential for accidents to civilian aircraft;
- the potential for accidents to the public, including environmental health and safety risks to children; and,
- the ability of the surrounding community to respond to potential aircraft and airfield mishaps.

Existing safety measures include designated safety zones, warning areas, or other types of designations. Aircraft safety clearances and APZs are depicted on maps of military airfields under the AICUZ program, as components of an AICUZ Study, for compatible land use planning. The APZs for NAS Whiting Field and the NOLFs depicted in the 2017 NAS Whiting Field AICUZ Study, extend off the installation. In most instances the APZs that extend off-installation are located on agricultural, military, or undeveloped land. However, APZs at NOLF Spencer and NOLF Santa Rosa extend over residential areas. As a result, safety of the public must also be maintained during travel between landing fields.

Community emergency services are organizations which ensure public safety and health by addressing different emergencies. The three main emergency service functions include police, fire and rescue service, and emergency medical service. NAS Whiting Field’s Emergency Management program is designed to mitigate, prepare for, respond to, and recover from all hazards either natural or man-made that threaten the installation and the operations of the tenant commands located here. The NAS Whiting Field Emergency Management program works closely with the Santa Rosa County Emergency

Management Agency by developing, implementing, and sustaining a comprehensive Emergency Management plan that supports an all-hazards approach to planning that addresses preparedness, response, and recovery phases of Emergency Management for its personnel and surrounding communities. This plan applies to all Navy personnel, visitors, and guests (MARCOA, 2019). Public health and safety during construction, demolition, and renovation activities is generally associated with construction traffic, as well as the safety of personnel within or adjacent to the construction zones.

A Public Health Assessment was conducted in 1999 at NAS Whiting Field to assess health risks associated with Installation Restoration (IR) sites and groundwater and drinking water. The Agency for Toxic Substances and Disease Registry collected information about how people on and off the installation might be exposed to environmental contamination and to obtain environmental sampling results. As groundwater is the source of drinking water both on and off NAS Whiting Field, the Agency for Toxic Substances and Disease Registry determined that it is the most widespread potential pathway for exposure. It was also noted that recreational users of Clear Creek and its floodplain may also come into contact with contaminated surface water, sediment, and fish. The Agency for Toxic Substances and Disease Registry concluded that any exposure to water from the NAS Whiting Field water distribution system poses no public health hazard (Department of Health and Human Services, 2000).

The Navy has used legacy aqueous film-forming foam made with PFAS for fire/emergency response and training activities. The USEPA has classified PFAS as an unregulated or "emerging" contaminant. In May 2016, the USEPA determined that PFAS, at certain levels of concentration, are potentially toxic to humans and damaging to the environment and issued total lifetime health advisory levels for PFAS chemicals at 70 parts per trillion (Department of the Navy Office of Information, 2018). USEPA lifetime health advisory levels are only guidance under the Safe Drinking Water Act and are not required or enforceable drinking water standards. Lifetime health advisory information is used to determine risk in the cleanup of water under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA, aka Superfund) (Sullivan, 2018). The Navy has since initiated efforts to test and remediate possible PFAS contamination in potable water wells on installations and in surrounding communities (Department of the Navy Office of Information, 2018). The Navy is currently evaluating the need to test drinking water wells of private property owners in proximity to NAS Whiting Field. The Navy is conducting proactive sampling to ensure that neighboring drinking water wells have not been impacted by the Navy's use of aqueous film-forming foam during firefighting operations at NAS Whiting Field (CNIC, 2019). As of August 2017, one on-base drinking water system and nine off-base public and private drinking water systems near NAS Whiting Field were tested for PFAS. Only one off-base system tested at 259 parts per trillion, which is above the USEPA lifetime health advisory of 70 parts per trillion. The residence has been provided with bottled water to address the current exposure (Sullivan, 2018).

The Navy, under the current comprehensive strategy to manage and address PFAS issues, is conducting installation-wide assessments to identify all potential PFAS release sites and will prioritize future site investigations and remediation based on potential risk to drinking water sources. Additionally, the Navy is in the process of identifying all legacy PFAS containing aqueous film-forming foam for removal and destruction. The Navy is testing current aqueous film-forming foam formulations to determine whether there are trace levels of PFAS in these formulations, and once PFAS-free formulations are identified, these will replace existing stocks (Department of the Navy, No Date)

3.8.2.1 Flight Safety

The Federal Aviation Administration is responsible for ensuring safe and efficient use of U.S. airspace by military and civilian aircraft and for supporting national defense requirements. To fulfill these requirements, the Federal Aviation Administration has established safety regulations, airspace management guidelines, a common civil-military system, and cooperative activities with the DoD.

Notwithstanding Federal Aviation Administration and DoD established procedures for the safe and efficient use of U.S. airspace by civilian and military aircraft, there is always the potential for aircraft mishaps to occur. DoD classifies mishaps as A, B, C, or D, based on fatalities and/or the extent of property damage. Class A mishaps are the most severe with total property damage of $2 million or greater, total aircraft loss, or a fatality and/or permanent total disability. For comparison, Class D mishaps are the least severe with property damage between $20,000 and $50,000, and any recorded injury or illness not falling in the more severe classes (Naval Safety Center, 2019a). The Naval Safety Center records include 92 Class A mishaps Navy-wide from Fiscal Year 2009 to April 2019 (Naval Safety Center, 2019b). For the TH-57, only two Class A mishaps have been recorded within the NAS Whiting Field Training Complex during this ten year time period: one at NOLF Spencer and one at NOLF Santa Rosa. NAS Whiting Field provides crash and rescue services at the main airfields and NOLFs. In this EA, potential impacts to flight safety at NAS Whiting Field and its NOLFs are analyzed by considering the possible changes to mishap rates due to proposed TH-XX operations.

Detailed response plans are maintained in the event of an aircraft mishap, should one occur. These plans assign agency responsibilities and prescribe functional activities necessary to react to major mishaps, whether on- or off-base. The Gulf Coast Regional Fire Department is located at NAS Whiting Field. NAS Pensacola provides crash and rescue services for NOLF Choctaw. In addition, Fire & Emergency Services Gulf Coast provides fire suppression, fire prevention, advanced and basic life support medical treatment and transport services, technical rescue, and other special operations response for the NAS Whiting Field, NOLFs, and the surrounding communities. Strategically located fire stations, staffed by Navy personnel, are always available to respond.

Navy flight training includes the extensive use of state-of-the-art simulators. Flight simulators allow for realistic training in all phases of flight operations, but especially in simulating emergency procedures, which then minimizes the risk of aircraft mishaps due to pilot error. Additionally, highly trained maintenance crews perform routine inspections on each aircraft in accordance with Navy regulations, and maintenance activities are monitored by senior technicians to ensure the aircraft are equipped to withstand the rigors of training events safely.

3.8.2.2 Bird/Animal Aircraft Strike Hazard (BASH)

Bird/animal aircraft strikes constitute a safety concern because they can result in damage to aircraft or injury to aircrews or local human populations if an aircraft mishap occurs. Aircraft may encounter birds at altitudes up to 30,000 feet mean sea-level or higher. However, most birds fly closer to the ground. More than 96 percent of reported bird strikes occur below 3,000 feet above ground level (U.S. Air Force Safety Center, 2019).

Birds, in particular, are drawn to the open, grassy areas and warm pavement of an airfield. Although most bird/animal aircraft strikes do not result in crashes, they may cause structural and mechanical damage to aircraft. Due to the speed of the aircraft, collisions with birds or other animals can happen with considerable force. BASH plans are developed for military airfields to reduce the potential for collisions between aircraft and birds or other animals through wildlife assessments, habitat management, and by accounting for seasonal migration patterns where risks to aircraft can increase.

At NAS Whiting Field and its NOLFs, mammal and bird populations in the vicinity of airfields pose threats to aviation (NAS Whiting Field, 2018). BASH incidents at Whiting Field South and NOLFs Spencer, Pace, Harold, and Santa Rosa from 2008-2018 are summarized in Table 3.8-1. Safety is a priority for the Navy, and a BASH Program has been developed for and is implemented at NAS Whiting Field and its NOLFs in accordance with the Naval Air Station Whiting Field Instruction 3751.B. The BASH Program contains detailed procedures designed to minimize BASH potential and to monitor and react to heightened risk of potential bird/animal strikes. The BASH Plan includes facility requirements such as fencing, lighting, and vegetation management; standard operating procedures for the use of wildlife deterrents (e.g., pyrotechnics) under the BASH Program; as well as monitoring and reporting requirements (Department of the Navy Office of Information, 2018); (NASWF 3751.1B). NAS Whiting Field actively manages the wildlife hazards within its airfields in accordance with its BASH Program. As a result, BASH incidents are very low (e.g., the incident rate at Whiting Field South is approximately 0.0008 percent).

Table 3.8-1 BASH Incident Rate at NAS Whiting Field and NOLFs

Location	*Number of Annual Operations Baseline*	*Number of Reported BASH Incidents (2008-2018)*	*BASH Incident Rate*
Whiting Field South	76,500	59	1 per 13,000 operations
NOLF Spencer	269,400	22	1 per 122,000 operations
NOLF Pace	130,000	15	1 per 87,000 operations
NOLF Harold	88,200	6	1 per 147,000 operations
NOLF Santa Rosa	204,800	15	1 per 137,000 operations

Note: NOLF Site X was not in existence during the years when BASH incidents were reported. BASH incident data was not available for NOLF Choctaw.

3.8.3 Environmental Consequences

The safety and environmental health analysis contained in the respective sections addresses issues related to the health and well-being of the population living in the vicinity of NAS Whiting Field and its NOLFs. Specifically, this section provides information on hazards associated with airspace and airfield safety. Additionally, this section addresses the environmental health and safety risks to children.

> Public Health and Safety Potential Impacts:
>
> - No Action: The Proposed Action would not be implemented and the affected environment would remain unchanged; no change to Clear Zones or APZs; the distribution of flight training operations at the NOLFs would change, but would not result in significant impacts.
> - Action Alternative: No significant public health and safety impacts, including those related to flight safety and BASH risk, would occur. There would be no change to airfields, Clear Zones, or APZs; construction BMPs would be implemented.

3.8.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not be implemented, and the affected environment would remain unchanged. Noise levels would decrease slightly from baseline noise levels. Although the distribution of flights at the NOLFs would change from the baseline to the No Action Alternative, the overall number of annual flight operations would not change. The Clear Zones and APZs associated with NAS Whiting Field and the NOLFs would remain as they are under existing conditions. The redistribution of flights would not result in environmental health risks and safety risks that may disproportionally affect children or the general public. The majority of the NOLFs are located in largely unpopulated areas. Those NOLFs with adjacent residential areas, NOLFs Spencer and Santa Rosa, do not have schools, parks, churches, daycare centers, or other places children congregate located with their respective Clear Zones or APZs, or within noise levels above 65 dB DNL. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

3.8.3.2 Action Alternative (Preferred Alternative) Potential Impacts

There is no generally recognized threshold of air safety that defines acceptable or unacceptable conditions. Instead, the focus of airfield managers is to reduce risks through a number of measures. These include, but are not limited to, providing and disseminating information to users, setting appropriate standards for equipment performance and maintenance, defining rules governing the use of airfields/airspace, and assigning appropriate and well-defined responsibilities to the users and managers of the airfields/airspace. When these safety measures are implemented, risks are minimized, even though they can never be eliminated. To complement airspace management measures, all student pilots use state-of-the-art simulators. Simulator training includes flight operations and comprehensive emergency procedures, which minimizes risk associated with pilot error.

The Action Alternative would have no effect on the existing Clear Zones or APZs at NAS Whiting Field and its NOLFs, nor require changes to existing airspace as shown in in Figure 2.3-1. No new on-base activities or construction would occur in the current APZs as a result of the Action Alternative. The existing airfields are compliant with all airfield safety and planning criteria and the new AHTS would not require the orientation be reconfigured to retain optimal safety and efficiency of the airfields. The Action Alternative would not result in changes to community emergency services.

Construction

Four facilities projects, two permanent and two temporary, would be constructed. During construction, BMPs and minimization measures will be implemented by the contractor to ensure all required safety measures are adhered to during construction of the facilities associated with the Action Alternative.

There would be no impacts to public health and safety from construction and demolition activities. NAS Whiting Field is a secure facility that is not accessible to the general public. Construction and demolition sites would be secured to prohibit unauthorized entry and would not be accessible by the general public. If present in the structures proposed for demolition, the removal of hazardous substances from these structures during demolition or renovation would provide a beneficial impact to public health and safety. During construction, BMPs and minimization measures would be implemented by the contractor to ensure all required safety measures are adhered to during construction of the facilities associated with the Action Alternative. Therefore, the construction activities under the Action Alternative would not result in significant impacts to public health and safety.

Operations

Flight Safety

All TH-XX flight operations would be conducted at existing airfields and within airspace currently utilized by Training Air Wing Five, using all existing standard operating procedures, Naval Air Training and Operating Procedures Standardization (Chief of Naval Operations Instruction 3710.7), instructor supervision, and the training syllabus, all of which are designed to safely execute flight training operations. The new aircraft are similar in function to existing aircraft and would not result in a change to predominant flight paths. Flight patterns, altitudes, and airspeeds for training operations with the TH-XX would remain similar to those currently conducted with the TH-57.

Highly trained maintenance crews would perform inspections on each TH-XX in accordance with Navy regulations, and maintenance activities are monitored to ensure that aircraft are equipped to withstand the rigors of training events safely.

Bird/Animal Aircraft Strike Hazard

The risk of BASH under the Action Alternative would increase slightly due to the increase in annual operations (Table 3.8-2); however, no aspect of the Action Alternative would increase concentrations of birds/wildlife on or near the airfields. Navy personnel would continue to follow applicable procedures outlined in the NAS Whiting Field BASH Program to mitigate potential impacts. As a result, impacts would not be significant.

Table 3.8-2 Estimated BASH Incidents at NAS Whiting Field and NOLFs for Action Alternative

Location	*Change between the No Action Alternative and Action Alternative Number of Annual Operations*	*BASH Incident Rate*	*Estimated BASH Incidents for Action Alternative*
Whiting Field South	16,900	1 per 13,000 operations	1
NOLF Spencer	55,300	1 per 122,000 operations	Less than 1 (0.5)
NOLF Pace	27,700	1 per 87,000 operations	Less than 1 (0.3)
NOLF Harold	13,700	1 per 147,000 operations	Less than 1 (0.1)
NOLF Santa Rosa	44,500	1 per 137,000 operations	Less than 1 (0.3)

Note: NOLF Site X was not in existence during the years when BASH incidents were reported. BASH incident data was not available for NOLF Choctaw.

The changes associated with the implementation of the AHTS do not pose a significant threat to public health and safety or aviation safety. TH-XX operations would be phased in over time and are generally similar to those TH-57 operations already conducted at NAS Whiting Field and its NOLFs. Therefore, flight training operations under the Action Alternative would not result in significant impacts to public health and safety.

Protection of Children

Children are more sensitive than the adult population to certain environmental conditions, such as airborne asbestos and lead paint exposures from demolition, safety with regard to equipment, accidents within structures under demolition, and noise. Activities occurring near areas that tend to have a higher concentration of children than the typical residential area during any given time, such as schools, churches, and community childcare facilities, may further intensify potential impacts on children.

At Whiting Field South, the Action Alternative would not result in any off-base noise impacts above 65 dB DNL, but would extend into the industrial areas of the facility. No school or daycare centers are located in these areas. Therefore, there would be no disproportionate impacts on children.

Adjacent land uses near NOLFs Pace, Site X, Harold, and Choctaw are largely undeveloped or agricultural land. Therefore, increases in training operations and noise levels under the Action Alternative at these NOLFs would not disproportionately affect children.

At NOLFs Spencer and Santa Rosa, increased noise beyond the airfield boundaries from 65 to <70 dB DNL would affect residential areas presumed to include children. The comparison group for the analysis of disproportionate high and adverse impacts to children is the percent of children present in block groups (Table 3.8-3). Within each block group, the percentage of children affected by noise from 65 to <70 dB DNL is lower than the percentage of children present. Therefore, noise impacts under the affected environment do not result in a disproportionately high and adverse impact to children. Additionally, two churches, Trinity by the Fields and Peace Community Church, and one park, Benny Russell Park, are located adjacent to NOLF Spencer. The 65 dB DNL noise contour would not extend to these receptors. No churches or schools are located adjacent to NOLF Santa Rosa.

Table 3.8-3 Populations Less than 18 Years Affected by Noise Levels 65 to <70 dB DNL for Action Alternative

Tract-Block Group	*Total Population Affected by Noise 65 to <70 dB DNL*	*Total Population <Age 18 Affected by Noise 65 to <70 dB DNL*	*Percent Population <Age 18 Affected by Noise 65 to <70 dB DNL*	*Community of Comparison/Percent Children Present in Tract/Block Group*
NOLF SPENCER TRACT-BLOCK GROUP				
NOLF Spencer/ 107.08-3	64	9	14.1	37.0
NOLF Spencer/ 107.08-2	27	2	7.4	24.4
NOLF Spencer/ 107.04-1	26	2	7.7	20.8
NOLF Spencer/ 103-3	37	4	10.8	25.5
NOLF Spencer Total	154	17	11.0	26.4
NOLF SANTA ROSA TRACT-BLOCK GROUP				
NOLF Santa Rosa/ 108.08-2	61	6	9.8	25.2
NOLF Santa Rosa/ 108.09-3	6	0	0	22.8
NOLF Santa Rosa Total	67	6	9.0	24.1

Sources: (U.S. Census Bureau, 2017a); (U.S. Census Bureau, 2017b)

There would be no impacts to children from construction and demolition activities. NAS Whiting Field is a secure facility that is not accessible to the general public. Construction and demolition sites are not located near any facilities where children would congregate, would be secured to prohibit unauthorized entry, and would not be accessible to children. Therefore, the Action Alternative would not result in environmental health risks or safety risks that may disproportionately affect children, or cause significant impacts to children.

Public Health and Safety Impact Conclusion

The Action Alternative would not result in changes to community emergency services. There would be no impacts to public health and safety from construction and demolition activities. There would be no change to the Clear Zones or APZs under the Action Alternative. The changes associated with the implementation of the AHTS do not pose a significant threat to public health and safety or aviation safety. The risk of BASH would increase slightly due to the increase in annual operations but, no aspect of the Action Alternative would increase concentrations of birds/wildlife on or near the airfields. The Navy has determined that there are no environmental health and safety risks associated with the Proposed Action that would disproportionately affect children or the general public. Overall, implementation of the Action Alternative would not result in significant impacts to public health and safety.

3.9 Hazardous Materials and Wastes

This section discusses hazardous materials, hazardous waste, toxic substances, and contaminated sites.

3.9.1 Regulatory Setting

Hazardous materials are defined by 49 CFR section 171.8 as "hazardous substances, hazardous wastes, marine pollutants, elevated temperature materials, materials designated as hazardous in the Hazardous Materials Table, and materials that meet the defining criteria for hazard classes and divisions in 49 CFR part 173." Transportation of hazardous materials is regulated by the U.S. Department of Transportation regulations.

Hazardous wastes are defined by the Resource Conservation and Recovery Act, as amended by the Hazardous and Solid Waste Amendments, as: "a solid waste, or combination of solid wastes, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may (A) cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness; or (B) pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, or disposed of, or otherwise managed." 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. Four types of waste are currently covered under the universal wastes regulations: hazardous waste batteries, hazardous waste pesticides that are either recalled or collected in waste pesticide collection programs, hazardous waste thermostats, and hazardous waste lamps, such as fluorescent light bulbs.

Special hazards are those substances that might pose a risk to human health and are addressed separately from other hazardous substances. Special hazards include asbestos-containing material, polychlorinated biphenyls, and lead-based paint. USEPA has authority to regulate special hazard substances by the Toxic Substances Control Act. Asbestos is also regulated by USEPA under the Clean Air Act, and the Comprehensive Environmental Response, Compensation, and Liability Act.

The DoD established the Defense Environmental Restoration Program to facilitate thorough investigation and cleanup of contaminated sites on military installations (active installations, installations subject to Base Realignment and Closure, and formerly used defense sites). The Installation Restoration Program (IRP) is a component of the Defense Environmental Restoration Program. The IRP requires each DoD installation to identify, investigate, and clean up the release of hazardous wastes or substances. The Environmental Restoration Program is the Navy's initiative to address the Defense Environmental Restoration Program.

3.9.2 Affected Environment

The Navy has implemented a strict Hazardous Material Control and Management Program and a Hazardous Waste Minimization Program for all activities. These programs are governed Navy-wide by applicable Chief of Naval Operations instructions and at the installation by specific instructions issued by the Base Commander. The Navy continuously monitors its operations to find ways to minimize the use of hazardous materials and to reduce the generation of hazardous wastes.

3.9.2.1 Hazardous Materials

The mission of NAS Whiting Field requires the use, storage, and disposal of hazardous materials, including paint, solvents, degreasers, waste oil, and fuels (Department of the Navy, 2000a).

NAS Whiting Field uses the Navy's Consolidated Hazardous Material Reutilization and Inventory Management Program as a fundamental element of life-cycle control and management of hazardous materials. The Consolidated Hazardous Material Reutilization and Inventory Management Program promotes compliance with the broad range of federal, state, and local environmental rules and regulations. It mandates procedures to control, track, and reduce the variety and quantity of hazardous materials in use. It is the policy of the NAS Whiting Field to support the Consolidated Hazardous Material

Reutilization and Inventory Management Program in an effort to reduce the quantities of hazardous materials purchased, stored, and used in the performance of its mission. It is also the policy of the NAS Whiting Field to support the requirements of the environmental and occupational health communities to identify the use of hazardous materials and minimize their impact on the user and the environment by reducing and controlling the quantities of hazardous materials stored on the installation.

Hazardous materials such as paints, adhesives, oils, and solvents, are stored in Building 1454 (NAS Whiting Field, 2019b). Large quantities of fuel are stored at the refueling facilities at NOLF Spencer and NOLF Site X.

3.9.2.2 Hazardous Waste

NAS Whiting Field is classified as a large-quantity generator of hazardous waste under USEPA identification number FL2170023244 (Department of the Navy, 2000a). NAS Whiting Field does not have a treatment, storage, and disposal facility; however, it operates several satellite accumulation areas and a 90-day hazardous waste accumulation site at Building 3156 (Naval Facilities Engineering Command, 2018a). Hazardous wastes generated include combustible waste liquids, paint-related wastes, used petroleum oil, hazardous solids, phosphoric acid, organic solvents, rags containing hazardous chemicals used or generated during aircraft maintenance, universal waste batteries, petroleum distillates, sodium hydroxide, nitric acid, and miscellaneous petroleum hydrocarbons (Department of the Navy, 2000a). According to USEPA biennial reports, hazardous waste generation at NAS Whiting Field is variable and fluctuates from year-to-year depending of facility operations and activities. In 2017, NAS Whiting Field generated 19.5 tons of hazardous waste and disposed of (i.e., shipped) 18.3 tons of hazardous waste (USEPA, 2019).

Everyone (contractor/tenant/command) is responsible for managing waste at NAS Whiting Field in accordance with the approved NAS Whiting Field Hazardous Waste Management Plan and appropriate federal, state, and Navy regulations. Contractors, tenants, commands, and others are responsible and liable for controlling their areas (e.g., designated dumpsters, work centers, parking lots, etc.) as well as any waste that is generated and/or stored in those areas. To achieve goals established in EO 13834, Efficient Federal Operations, NAS Whiting Field's hazardous waste minimization efforts restrict the volume and toxicity of hazardous materials utilized aboard the installation, ultimately reducing the quantity of hazardous waste generated and minimizing potential threats to human health and the environment (Naval Facilities Engineering Command, 2018a).

3.9.2.3 Special Hazards

Asbestos was a common constituent of building materials manufactured prior to 1978 when a Federal ban on its use in building materials became effective. Lead was a common constituent of paint manufactured prior to 1980 when a Federal ban on lead paint became fully effective. Polychlorinated biphenyls were common constituents of oils used as dielectric fluids or coolants in electrical equipment manufactured prior to 1979 when a Federal ban of the manufacture of polychlorinated biphenyls became effective. Building 1406 and Building 1454 were constructed in 1943 and Building 2946 was constructed in 1968. Due to the age of these structures, asbestos-containing materials, lead-based paints, and polychlorinated biphenyls are assumed to be present. Building 3005 was constructed in 1981 and is unlikely to contain these substances.

Polychlorinated biphenyls are managed at NAS Whiting Field on a case-by-case basis. When polychlorinated biphenyls are encountered, they are removed and disposed of by licensed contractors in accordance with applicable regulations and instructions. To date, there have been no notifications regarding polychlorinated biphenyls being present in any of the buildings associated with the Action Alternative (NAS Whiting Field, 2019c).

The Navy has used legacy aqueous film-forming foam, which contains PFAS for fire/emergency response and training activities. These substances are discussed in detail in Section 3.8 *Public Health and Safety*. As stated in Section 3.8.2, the Navy, under the current comprehensive strategy to manage and address PFAS issues, is conducting installation-wide assessments to identify all potential PFAS release sites and will prioritize future site investigations and remediation based on potential risk to drinking water sources. The Navy is currently evaluating the need to test drinking water wells of private property owners near NAS Whiting Field and is conducting proactive sampling to ensure that neighboring drinking water wells have not been impacted by the Navy's use of aqueous film-forming foam during firefighting operations at NAS Whiting Field (CNIC, 2019). As of August 2017, one on-base drinking water system and nine off-base public and private drinking water systems near NAS Whiting Field were tested for PFAS. Only one off-base system tested at 259 parts per trillion, which is above the USEPA lifetime health advisory of 70 parts per trillion. The residence has been provided with bottled water to address the current exposure (Sullivan, 2018).

The Navy is in the process of identifying all legacy PFAS containing aqueous film-forming foam for removal and destruction and is testing current aqueous film-forming foam formulations to determine whether there are trace levels of PFAS in these formulations. Once PFAS-free formulations are identified, these will replace existing stocks (Department of the Navy, No Date).

3.9.2.4 Defense Environmental Restoration Program

The USEPA placed NAS Whiting Field on the Superfund program's National Priorities List of contaminated sites in 1994, and the Navy began cleanup activities at NAS Whiting Field in 1999. There are no Installation Restoration Program (IRP) sites at the NOLFs. The Navy has completed remedial investigations and feasibility studies for 26 of the site's 28 operable units. The Navy and USEPA have issued a series of cleanup plans (Records of Decision) for 26 operable units. No Action and No Further Action Records of Decision have been issued for eight operable units: operable unit-3, Site 3; operable unit-5, Site 5; operable unit-6, Site 06; operable unit-8, Site 9; operable unit-11, Site 12; operable unit-13, Site 14; operable unit-23, Site 38; and operable unit-26, Site 29. For areas of the site that cannot support residential uses because of remaining soil contamination, the Navy has put in place Land Use Controls that specify allowable land uses (USEPA, 2018d).

The Proposed Action has the potential to disturb site soils at IR sites 33, 30, and 29 as part of demolition and construction activities. The groundwater at NAS Whiting Field is part of base-wide IRP Site 40. Therefore, any excavation has the potential to disturb IRP Site 40 if groundwater is encountered (Figure 3.9-1).

Building 1454 is located on IR Site 33 and adjacent to IRP Site 05A. IRP Site 33 includes Building 1454 and the former location of the waste oil underground storage tank north of Building 1454 in the industrial area at NAS Whiting Field. Site 33 and the corresponding land use control area cover approximately 2.6 acres characterized by a large building, concrete and asphalt surfaces, small areas of mowed turfgrass, and heavy human and aircraft activity. Final Remedial Investigation, Feasibility Study, and Feasibility Study Addendum documents were submitted for Site 33 in September 1999, March 2001, and September 2004, respectively. The Record of Decision stipulated the implementation of Land Use

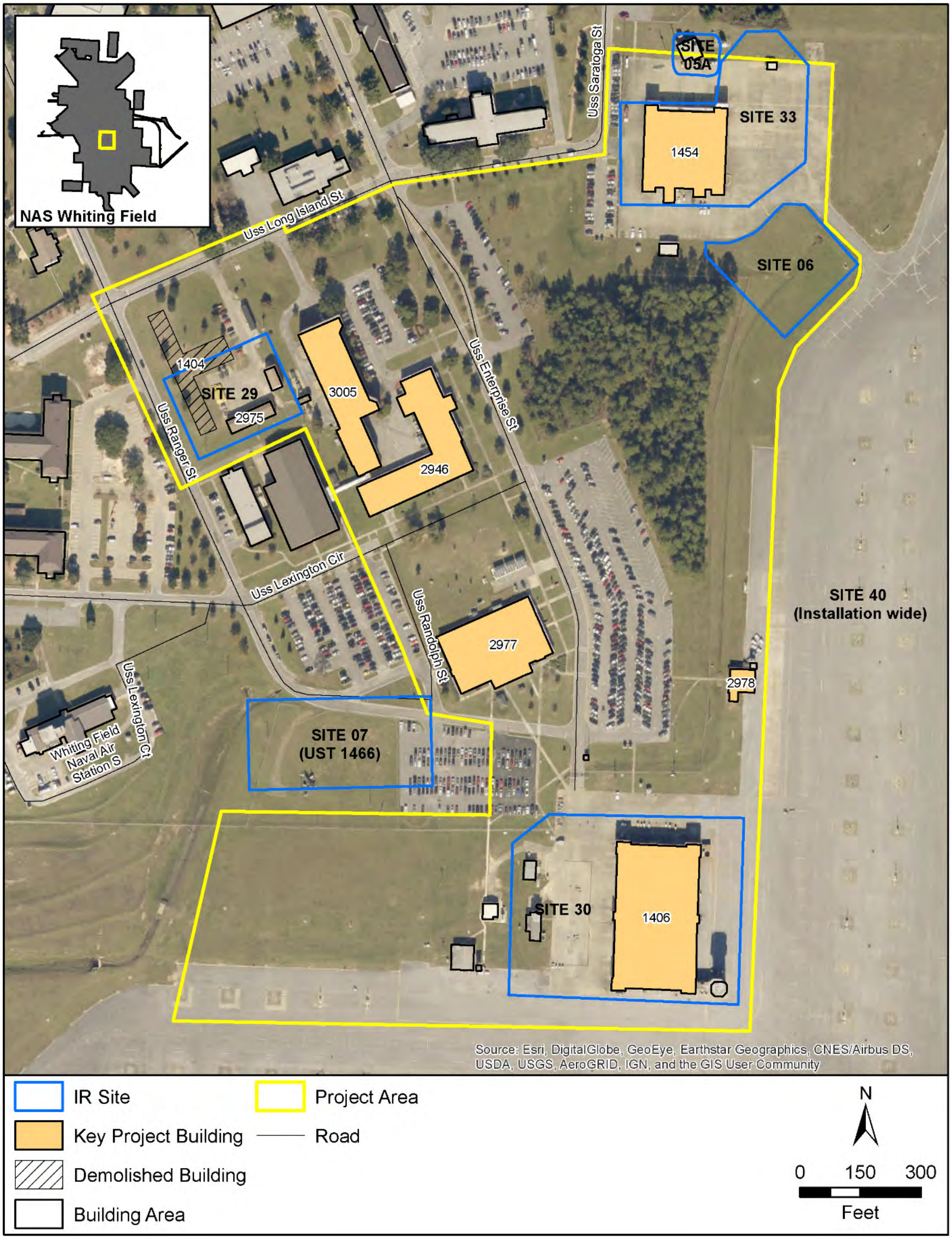


Figure 3.9-1 Project Area IR Sites

Controls to prevent exposure to and use of contaminated soils and prohibit future residential development at Site 33. Land Use Controls for Site 33 prohibit:

- digging into or disturbing existing concrete or asphalt covered areas;
- excavation of surface and subsurface soils from the Site unless prior written approval is obtained from the Navy, USEPA, and Florida Department of Environmental Quality;
- disturbance of the concrete/asphalt barriers in areas with contaminated surface and subsurface soils; and,
- residential, recreational, or agricultural reuse of the Site unless prior written approval is obtained from the Navy, USEPA, and Florida Department of Environmental Quality.

The expected duration of the Land Use Controls at Site 33 are in perpetuity for both surface and subsurface soils; or until contaminant concentrations allow for unrestricted use and unlimited exposure (Tetra Tech NUS, 2005a).

IRP Site 05A: Battery Acid Seepage Pit contains Building 1478, which was the site of battery waste acid and electrolyte solution disposal from 1967 until 1984. Waste solutions were poured into the drain and discharged to a dry well west of the building. The drain was disconnected from the dry well in 1984 and connected to the sanitary sewer. An estimated 180 gallons of battery waste electrolyte solution was discharged to the dry well annually during the period of operation. Subsequent site investigations identified pesticides, polychlorinated biphenyls, and metals in surface soils. Three contaminants of potential concern were identified; however, no contaminants of concern or human health risks were identified in the risk assessment for exposure to surface and subsurface soils at Site 5A under a residential use scenario. The results of the ecological risk indicated that potential ecological risks at the site are acceptable, and further ecological study is unwarranted because the site is heavily industrialized and severely limited in the quantity and quality of habitat. Therefore, the selected remedy for Site 5A is No Action for surface and subsurface soils and no Land Use Controls have been established (Tetra Tech NUS, 2005b).

IRP Site 06: South Transformer Oil Disposal Area is a parcel of land approximately 1.1 acres in size located southeast of Building 1454. From the 1940s until 1964, transformer fluids were reportedly drained into the grassed ditch located on this site. Subsequent investigations at Site 06 identified seven semi-volatile organic compounds, one polychlorinated biphenyl, five inorganic analytes, and total recoverable petroleum hydrocarbons in site soils that exceeded State of Florida (Florida Department of Environmental Protection, 1999) or USEPA (USEPA, 2004) risk-based screening values for residential land use. Approximately 37 cubic yards of soils were removed from the site in 2002. Subsequent testing did not identify any constituents exceeding the Florida Department of Environmental Protection or USEPA risk-based screening values for residential land use. No constituents of potential concern were identified and no human health risks were identified for exposure to surface and subsurface soils at Site 06. As a result, No Further Action is required for the site and a Record of Decision was issued on September 3, 2004.

P-288 – AHTS Temporary Maintenance Hangar would be located on IRP Site 30 and P-286 – AHTS Aircraft Maintenance Hangar would be located adjacent to IRP Site 30. IRP Site 30 includes Building 1406, the adjacent wash rack area, and the location of four former waste oil/kerosene underground storage tanks west of Building 1406 in the industrial area at NAS Whiting Field. Site 30 and the corresponding Land Use Control area cover approximately 2.4 acres and are characterized by concrete, asphalt, buildings, small areas of mowed turfgrass, and heavy human and aircraft activities. Final

Remedial Investigation, Feasibility Study, and Feasibility Study Addendum documents were submitted for Site 30 in September 1999, March 2001 and May 2004, respectively. The Record of Decision for Site 30 stipulated the implementation of Land Use Controls to prevent exposure to and use of contaminated soils and prohibit future residential development at Site 30. Land Use Controls for Site 30 prohibit:

- digging into or disturbing existing concrete or asphalt covered areas;
- excavation of surface and subsurface soils from the Site unless prior written approval is obtained from the Navy, USEPA, and Florida Department of Environmental Quality;
- disturbance of the concrete/asphalt barriers in areas with contaminated surface and subsurface soils; and,
- residential, recreational, or agricultural reuse of the Site unless prior written approval is obtained from the Navy, USEPA, and Florida Department of Environmental Quality.

The proposed temporary Ground Based Training System would be located on or adjacent to IR Site 29; Auto Hobby Shop. Site 29 is located in the area surrounding Building 2975 the former location of Building 1404 (Figure 3.9-1). Building 2975 formerly contained an underground storage tank for storage of waste motor oil generated from vehicle maintenance operations conducted at the Auto Hobby Shop. The tank was installed in the 1940s and was removed from the site in 1998. Similarly, Building 1404 had a heating oil underground storage tank that was installed in the 1940s and was removed in 1998. Subsequent site investigations detected contaminants in surface soil at Site 29 including VOCs, metals, and petroleum; however, no contaminants of concern were identified in the associated risk assessments. Therefore, no human health risks were identified for exposure to surface and subsurface soils at Site 29 under a residential land use scenario. Risks to ecological receptors were determined to be acceptable and no further action is required (Tetra Tech NUS, 2005c).

IRP Site 7 overlaps the proposed Project area boundary. Site 7 was utilized as the Whiting Field South's Fuel Farm, which included six underground steel aviation fuel tanks and two aviation lubrication oil tanks. From 1943 to 1968, the nine tanks were cleaned out approximately every 4 years; the bottom sludge was removed from the tanks and buried at shallow depths adjacent to the tanks. Navy personnel estimate disposal of 1,000 to 2,000 gallons of sludge at the Site. Petroleum contamination was observed during the removal of the underground storage tanks. Several soil removal actions were performed on the site, and a soil vapor extraction system was installed to remediate VOC and petroleum contamination. Remedial activities are ongoing at this site.

IRP Site 30: South Field Maintenance Hangar is approximately 4.3 acres in size and is located at the South Field Industrial Area. The site includes Building 1406, the adjacent wash rack area, and the locations of four former waste oil/kerosene underground storage tanks, west of Building 1406. Waste oil from fixed-wing aircraft and helicopter maintenance was reportedly poured into the underground storage tanks located adjacent to the wash rack. The four steel waste oil/kerosene underground storage tanks, ranging in size from approximately 850 to 1,850 gallons, were located on the site until their removal in August 2000. A Remedial Investigation was completed for Site 30 in 1999. Constituents detected in soil at Site 30 included VOCs, semi-volatile organic compounds, total recoverable petroleum hydrocarbons, pesticides, and inorganic analytes. The Navy and USEPA, with the concurrence of the Florida Department of Environmental Protection, co-selected Engineering controls and Land Use Controls as the remedy for Site 30, as documented in the September 2004 Record of Decision. The Engineering Controls require contaminated surface and subsurface soils to be covered with concrete or asphalt; thereby, preventing exposure to contaminated soil. The Land Use Controls selected for Site 30 restrict land use to non-residential activities involving less than full-time human contact with surface and subsurface soils. Additionally, the Record of Decision requires an annual inspection to confirm conformance with this land use restriction. Every five years, the effectiveness of the remedy at Site 30 is evaluated as part of a base-wide Five Year Review process (Naval Facilities Engineering Command, 2019). The expected duration of the Land Use Controls at IRP Site 30 are in perpetuity for both surface and subsurface soils, or until contaminant concentrations allow for unrestricted use and unlimited exposure (Tetra Tech NUS, 2005d).

IRP Site 40: Base-wide Groundwater was established to address groundwater contamination from VOCs at NAS Whiting Field. The Navy is currently evaluating technologies for a pilot study of groundwater plume treatment based on groundwater plume characteristics. IRP Site 40 groundwater investigations indicate an aerobic aquifer with elevated dissolved oxygen levels that suit oxidative treatment methods, and several options are being considered that are suitable for IRP Site 40 geochemistry (Naval Facilities Engineering Command, 2018b).

3.9.3 Environmental Consequences

The hazardous materials and wastes analysis contained in the respective sections addresses issues related to the use and management of hazardous materials and wastes as well as the presence and management of specific cleanup sites at NAS Whiting Field.

3.9.3.1 No Action Alternative

Under the No Action Alternative, the Proposed Action would not occur and there would be no change associated with hazardous materials and wastes. Therefore, no significant impacts would occur with implementation of the No Action Alternative.

3.9.3.2 Action Alternative (Preferred Alternative) Potential Impacts

The study area for the Action Alternative is the proposed project area as shown in Figure 2.3-2. Demolition and construction activities associated with the Action Alternative would require the use of hazardous materials that would cease at the completion of the proposed project. The majority of the hazardous materials expected to be used are common to demolition and construction activities and would include: diesel fuel, gasoline, and propane to fuel equipment; hydraulic fluids, oils and lubricants; welding and cutting gases; paints; solvents; adhesives; and batteries. Hazardous materials used during demolition and construction would be used in accordance with applicable Federal and State regulations as well as the Navy's Consolidated Hazardous Material Reutilization and Inventory Management Program.

Hazardous Material and Waste Potential Impacts:

- No Action: The Proposed Action would not be implemented and the affected environment would remain unchanged; therefore, no significant impacts.
- Action Alternative: No significant impacts to hazardous materials and wastes would occur. Minor increases in hazardous materials use and hazardous waste generation would be managed in accordance with current regulations and procedures and would not exceed facility capacities; beneficial impacts from the removal of special hazards from building demolitions and renovations; disturbance of IRP sites would be conducted in accordance with the requirements of the selected remedy and in coordination with Florida Department of Environmental Protection and USEPA.

Hazardous Materials

Conveyance of hazardous materials to and from the project areas would be conducted within the secure boundary of the installation; however, transport of these materials to the installation would use public transportation routes. Transportation of hazardous materials would be conducted in compliance with Department of Transportation regulations.

Increased flight training operations (22 percent) at the new facilities at NAS Whiting Field would result in small increases in the volume of hazardous wastes used to maintain aircraft, but no new hazardous materials are anticipated to be required to support aircraft maintenance activities. Maintenance facilities and hangars would be equipped with hazardous materials storage areas, as appropriate, that would support operations within the new facility. Hazardous materials would be managed in compliance with applicable Federal and State regulations and the Navy Consolidated Hazardous Material Reutilization and Inventory Management Program.

Compliance with Federal and State regulations and Navy procedures for working with and managing hazardous materials would minimize the use of hazardous materials, as well as reduce the potential for accidental releases. Therefore, temporary increases in hazardous materials use resulting from the Action Alternative would not result in significant impacts.

Hazardous Waste

Hazardous wastes generated by demolition and construction activities would include spent solvents, adhesives, lubricants, corrosive liquids, batteries, and aerosols. Demolition, renovation, and construction contractors would be required to comply with applicable Federal and State requirements concerning handling of demolition, renovation, and construction related hazardous wastes. Hazardous wastes generated by demolition and construction activities would be managed in a manner that would prevent these materials from leaking, spilling, and potentially polluting soils or ground and surface waters, and in accordance with applicable Federal, State, and Local regulations.

Increases in operations at the proposed new facilities would have no long-term significant impacts on hazardous wastes. Similar to hazardous materials, increases in aircraft operations are anticipated to result in small increases in the generation of hazardous wastes associated with aircraft maintenance; however, no new hazardous waste streams would be generated. Increases in hazardous waste generation are not anticipated to exceed existing hazardous waste management capacities at the installation, or, alter its Resource Conservation and Recovery Act generator status. Hazardous wastes would be managed in a manner that would prevent these materials from leaking, spilling, and potentially polluting soils, groundwater, and surface water and in accordance with applicable federal, state, and local regulations and the installation's Hazardous Waste Management Plan.

Public transportation routes would be utilized for the conveyance of hazardous wastes from the project areas to licensed treatment, storage, and disposal facilities. Transportation of all materials would be conducted in compliance with Department of Transportation regulations. Therefore, increases in hazardous waste generation resulting from the Proposed Action would not result insignificant impacts.

Special Hazards

Demolition and construction activities would encounter materials with special hazards such as lead-based paint, asbestos-containing material, and polychlorinated biphenyls. Buildings proposed for demolition would be surveyed for the presence of asbestos-containing material, lead-based paint, and polychlorinated biphenyls prior to demolition. Additionally, utility piping would also be inspected for asbestos-containing material and lead-based paint prior to being drilled or cut to tie in to any new facilities.

Detected asbestos concentrations greater than 1 percent would be abated. Management of asbestos-containing material would be conducted in accordance with Federal and State requirements to ensure that human health and the environment are protected. Asbestos-containing material would be removed by a licensed contractor and would be transported and disposed of as asbestos waste at an approved facility. Therefore, any impacts associated with the removal and management of asbestos-containing material would be beneficial in nature. Demolition work that would disturb painted surfaces must meet the worker protection requirements outlined in 29 CFR 1926. Painted materials containing lead-based paint would not be sanded, scraped, drilled, or otherwise altered unless proper engineering controls are utilized to prevent migration of fugitive metal-containing dust from the work area. Any demolition or renovation would be performed in accordance with Occupational Safety and Health Administration regulations. Prior to disposal, painted surfaces would be analyzed in accordance with USEPA Toxicity Characteristic Leaching Procedure methodology. Based on this federal testing methodology, the painted material would be considered hazardous if lead is detected at concentrations greater than 5 milligrams per liter. If lead were detected at hazardous concentrations on the painted waste material, these materials would be removed and managed as hazardous waste in accordance with applicable Federal and State regulations. Therefore, any impacts associated with the removal and management of lead-based paint would be beneficial in nature.

Polychlorinated biphenyls, if encountered, would be handled on a case-by-case basis in accordance with current practices. If suspected polychlorinated biphenyls containing equipment is encountered, the construction contractor would notify the facility hazardous waste manager, and the material would be managed in accordance with current regulations and instructions.

The increase in operations at NAS Whiting Field would result in an increased risk of aircraft mishaps that would require the use of aqueous film-forming foam. The Navy's revised military specification for aqueous film-forming foam would continue to reduce the volume of PFAS containing aqueous film-forming foam at NAS Whiting Field. Additionally, the Navy's continued monitoring of PFAS in drinking water would be protective of human health and the environment. As a result, the Action Alternative would not result in significant impacts to special hazards.

Defense Environmental Restoration Program Sites

Demolition and construction activities would disturb two Defense Environmental Restoration Program sites: IR Site 30, Whiting Field South Maintenance Hangar and IR Site 33, Midfield Maintenance Hangar. Building 1409 is located within the boundary of IR Site 30 and Building 1454 is located within the boundary of IR Site 33. The proposed demolition of these buildings would require the disturbance of soil within the respective IRP sites and could potentially encounter groundwater associated with IR Site 40 (Base-wide Groundwater). Additionally, the construction of the temporary simulator facility may disturb IR Site 29, Auto Hobby Shop. The temporary facility would be sited to avoid disturbing this site to the extent practicable.

Any excavation within an IRP Site is required to follow very specific protocol for excavation, stockpiling, and disposal of soils. Digging within an IRP Site with Land Use Controls requires adherence to the existing remedial design and Commander Navy Region Mid-Atlantic Instruction 5090.2. The USEPA and Florida Department of Environmental Quality would also be notified. All soils excavated from IRP sites are assumed to be hazardous until testing proves otherwise. Excavated IR soils cannot be re-used on-site under any circumstances. Soil removal within designated IRP areas will be subject to a Navy approved site-specific Health and Safety Plan prepared by the contractor performing the work. All excavated excess soils will be tested in accordance with the disposal location's requirements for characterization. Excavated soils (both IRP and non-IRP) removed from the site would be disposed of at a licensed solid waste disposal facility approved by the Station. Inert materials (e.g., concrete, brick, asphalt, rock, etc.) would be cleaned to remove soil prior to removal from the project site. These materials do not require testing prior to disposal. Following completion of construction activities, the IRP would adjust the Land Use Control boundary at each IRP Site, as appropriate. As a result, the Action Alternative would have no significant impacts with regard to Defense Environmental Restoration Program sites.

If suspected hazardous materials are encountered during demolition and construction activities (e.g., from observations of buried debris, stained soils, or odors), all work would stop within 50 feet of the discovery, the find would be clearly flagged and secured, and the construction supervisor would immediately notify the Navy Project Manager of the discovery. Following notification, a qualified environmental professional, as defined by American Society for Testing and Materials E1527-13 and 40 CFR §312.10(b), would make a preliminary assessment of the find to determine the nature of the potential hazard. Field characterization methods may be employed using instrumentation such as photoionization detectors, explosive meters, pH meters, water quality meters and others, as applicable. If the qualified environmental professional determines the discovery is potentially hazardous, the qualified environmental professional would notify the Navy Project Manager, who would formulate appropriate work area and schedule changes so that work could continue in other areas. The qualified environmental professional would then collect samples to characterize the material. If the discovery is determined via chemical analysis to be hazardous, applicable regulatory agencies would be notified and appropriate remedial actions would be implemented. The Action Alternative would not result in significant impacts to Defense Environmental Restoration Program sites.

Hazardous Materials and Wastes Impact Conclusion

The Action Alternative would result in an increased volume of hazardous wastes used for helicopter maintenance, but no new hazardous materials are anticipated to be required to support maintenance activities. All hazardous wastes would be managed in accordance with applicable federal, state, and local regulations and the installation's Hazardous Waste Management Plan. Any special hazards encountered would be removed and managed in accordance with applicable Federal and State regulations. Defense Environmental Restoration Program sites would be avoided to the extent practicable, or any excavation within an IRP Site would follow specific protocols and all regulations. Overall, implementation of the Action Alternative would not result in significant impacts to hazardous materials and wastes.

3.10 Environmental Justice

USEPA defines Environmental Justice as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (USEPA, 2011).

3.10.1 Regulatory Setting

Consistent with EO 12898, *Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations* (February 11, 1994), the Navy's policy is to identify and address any disproportionately high and adverse human health or environmental effects of its actions on minority and low-income populations.

3.10.1.1 Methodology – Identifying Environmental Justice Communities

In order to assess the impacts to minority and low-income communities, the Navy first identifies whether there are any areas of minority and low-income populations that may experience disproportionately high and adverse impacts from its actions. These environmental justice communities are determined by analyzing the demographic and economic characteristics of the affected area and comparing those to the characteristics of the larger community as a whole. This larger community is known as the community of comparison.

For the purposes of this environmental justice analysis, Santa Rosa County was selected as the community of comparison because it is the smallest geographic unit that incorporates the affected population within the entire affected environment noise zones. All of the people impacted by the affected environment dB DNL noise zones reside within the county border.

Potential environmental justice communities that may be impacted by the Navy's actions were identified using population and demographic data from the U.S. Census Bureau, specifically, census block group data. A block group is the smallest geographical unit for which the Census publishes sample data (i.e., data that are collected from a percentage of households). Block groups typically have a population of about 600 to 3,000 people. Data were collected on all block groups exposed to noise levels ≥65 dB DNL.

Data from the U.S. Census Bureau 2013-2017 American Community Survey 5-Year Estimates were utilized throughout the analysis to characterize minority populations and identify low-income populations. Low-income populations are characterized using the percent of all individuals for whom poverty status has been determined, as defined by the U.S. Census Bureau, for each specific geographic area. The U.S. Census Bureau 2013-2017 data represent the best available data at this time that can be analyzed to determine potential impacts to minority and low-income populations using GIS software. Utilizing U.S. Census Bureau data also ensured that the demographic and poverty statistics used in the environmental justice analysis were consistent with the population data at the census block level that were used in the noise analysis.

CEQ defines a minority population as either: 1) the minority population of the affected area exceeds 50 percent, or 2) the minority population percentage of the affected area is meaningfully greater than the minority population percentage in the appropriate community of comparison (CEQ, 1997a).

The Federal Interagency Working Group on Environmental Justice *Promising Practices for EJ Methodologies in NEPA Reviews* indicates that the "meaningfully greater" analysis requires the use of a reasonable, subjective threshold (e.g., ten or twenty percent greater than the reference community). What constitutes "meaningfully greater" can vary depending upon location, project details, and estimated minority population size (Federal Interagency Working Group on Environmental Justice, 2016). In accordance with this guidance, this analysis uses 15 percent as the meaningfully greater threshold in order to ensure the analysis captures any small minority populations that may be present.

Low-income environmental justice communities are identified by comparing the percentage of the population living below the poverty level to the larger community as a whole (CEQ, 1997a). If the percentage of residents with incomes below the poverty level in the block group is greater than (or equal to) the percentage of residents in the community of comparison who have incomes below the poverty level, then there is a low-income environmental justice community.

To identify environmental justice communities affected by noise levels ≥65 dB DNL, this analysis estimated the number of minority and low-income residents affected by each of the DNL noise zones. The number of houses affected in each block group was determined through the use of aerial imagery. The number of houses was then multiplied by the average number of persons per household to determine the population within noise levels ≥65 dB DNL.

Once the presence or absence of environmental justice communities was determined, impacts were assessed and a determination made whether these impacts would have a disproportionately high and adverse effect on minority and low-income populations. This analysis involves comparing the impacts on the identified environmental justice communities to an appropriate comparison group within the affected environment (e.g., noise contours, aircraft APZs). In determining whether potential disproportionately high and adverse impacts exist, the significance of the impacts under NEPA is also considered.

A disproportionate effect is defined as an adverse effect that either is predominately borne by a minority population and/or low-income population or is an effect that will be suffered by the minority and/or low-income population and is appreciably more severe or greater in magnitude than the adverse effect that will be suffered by the non-minority population and/or low-income population (CEQ, 1997a). The comparison group for the environmental justice analysis of disproportionate high and adverse impacts is the general population affected by noise impacts within the same noise zone. The comparison group is distinct from the reference community of comparison, which was used to identify the existence of minority and low-income populations (Federal Interagency Working Group on Environmental Justice, 2016).

3.10.2 Affected Environment

The affected environment for the environmental justice is defined as the census block groups with residential land use that are either fully or partially within noise contours ≥65 dB DNL as shown on Figures 3.6-1 through 3.6-7. These block groups also encompass the extent of the aircraft APZs, which are shown in Figures 3.6-8 through 3.6-14 and, as described in Section 3.6.2.2 *Land Use Controls*, areas of higher risk of incidents based on historical mishap data. No significant public health and safety impacts, including those related to flight safety and BASH risk, would occur (refer to Section 3.8.3.2). There would be no change to airfields or APZs. Therefore, the safety of minority and low-income populations would not be affected and are not analyzed further.

All of the NOLFs are in the affected environment except for NOLF Choctaw, where the noise would not change. Noise was not modeled at NOLF Choctaw because helicopter operations would not significantly affect the noise environment at NOLF Choctaw, which is dominated by military jets. Noise contours, incompatible development potential, environmental justice, and impacts for jet and helicopter operations at NOLF Choctaw were evaluated in the Record of Decision and Supplemental Environmental Impact Statement for F-35 Beddown at Eglin Air Force Base (U.S. Air Force, 2014), in which it was determined that there would be no adverse effects on residential populations. Thus, NOLF Choctaw is not analyzed further in this section. Therefore, there would not be disproportionally high and adverse impacts on an environmental justice population at NOLF Choctaw.

As stated above, environmental justice communities of concern are identified by comparing population characteristics from all the study area block groups with the reference community of comparison, Santa Rosa County.

Table 3.10-1 shows the proportion of the population that is minority and low-income in the study area block groups, county, state, and nation for comparison. U.S. Census block groups at Whiting Field South, NOLF Spencer, NOLF Site X, and NOLF Harold have higher minority populations than Santa Rosa County (Table 3.10-1).

Table 3.10-1 Population of Concern Statistics (2017)

Location / Track-Block Group	*Total Population*	*Percent Minority[1,3]*	*Percent Low-income[2,3]*
Whiting Field South/ 104-2	904	22.5	15.6
NOLF Spencer/ 107.08-3	2454	18.5	8.8
NOLF Spencer/ 107.08-2	2154	7.6	3.3
NOLF Spencer/ 107.04-1	3166	13.8	7.1
NOLF Spencer/ 103-3	4956	10.4	5.5
NOLF Pace/ 103-1	6618	6.8	7.4
NOLF Site X/ 102-4	527	22.8	3.8
NOLF Harold/ 108.08-3	3,355	49.2	4.4
NOLF Santa Rosa/ 108.08-2	2394	7.5	27.1
NOLF Santa Rosa/ 108.09-3	1789	6.7	26.4
Santa Rosa County	**166,778**	**14.2**	**8.4**
State of Florida	20,278,447	24.3	11.1
United States	321,004,407	27	10.5

Sources: (U.S. Census Bureau, 2017a); (U.S. Census Bureau, 2017b)

Notes: Areas in the table that are shaded identify locations where an environmental justice community may potentially exist.

1) Minority is defined as individuals who are members of the following population groups: Black or African American, American Indian and Alaska Native, Asian, and Native Hawaiian and Other Pacific Islander, and Hispanic or Latino (non-white).
2) Includes all individuals for whom poverty status was determined.
3) Threshold value for minority is 15 percentage points greater than comparison community (Santa Rosa County 14.2 percent); threshold value for low-income is equal to or greater than comparison community (Santa Rosa County 8.4 percent).

In 2017, the median household income in Santa Rosa County was approximately $62,731, with 8.4 percent of the population living below poverty (U.S. Census Bureau, 2017b). The State of Florida had a median household income of $50,883, with 11.1 percent of the population living below poverty (U.S. Census Bureau, 2017b).

Table 3.10-1 shows that the percentage of population living below poverty in block groups at Whiting Field South, NOLF Spencer (107.08-3), and NOLF Santa Rosa (108.08-2 and 108.09-3) is higher than in Santa Rosa County, and these block groups are considered low-income populations (U.S. Census Bureau, 2017b).

3.10.3 Environmental Consequences

Environmental Justice:

- No Action: the Proposed Action would not be implemented and the affected environment would remain unchanged; therefore, no significant impacts.
- Action Alternative: noise impacts, but no disproportionately high and adverse human health or environmental effects on minority and low-income populations, and impacts would not be significant.

This analysis focuses on the potential for a disproportionate and adverse exposure of specific off-base population groups to the projected adverse consequences discussed in the previous sections of this chapter.

3.10.3.1 No Action Alternative

Under the No Action Alternative, the population at NAS Whiting Field and all the NOLFs within APZs and noise contours ≥65 dB DNL would not change from the baseline. The population affected by the noise contours ≥65 dB DNL, compared with the baseline is listed in Table 3.10-2. Although minor modifications to the flight operations would occur under the No Action Alternative when compared to the baseline, the total number of flights would remain unchanged, and this change would be experienced equally by all populations. Therefore, there would not be disproportionally high and adverse impacts on an environmental justice population. Under the No Action Alternative, no significant impacts would occur to environmental justice populations.

Table 3.10-2 Population Affected by Noise Levels ≥65 DNL for Baseline and No Action Alternative

Location / Track-Block Group[(1)]	*Total Population*	*Baseline Population ≥65 dB DNL*	*No Action Alternative Population ≥65 dB DNL*
Whiting Field South/ 104-2	904	0	0
NOLF Spencer/ 107.08-3	2454	6	6
NOLF Spencer/ 107.08-2	2154	0	0
NOLF Spencer/ 107.04-1	3166	0	0
NOLF Spencer/ 103-3	4956	0	0
NOLF Pace/ 103-1	6618	0	0
NOLF Site X/ 102-4	527	--[(2)]	0
NOLF Harold/ 108.08-3	3,355	0	0
NOLF Santa Rosa/ 108.08-2	2394	0	0
NOLF Santa Rosa/ 108.09-3	1789	0	0

Sources: (U.S. Census Bureau, 2017a); (U.S. Census Bureau, 2017b)

Notes: 1) Areas in the table that are shaded identify locations where an environmental justice community may potentially exist.

2) NOLF Site X was not in existence during the years when baseline operations were collected.

3.10.3.2 Action Alternative (Preferred Alternative) Potential Impacts

The study area for environmental justice analysis for the Action Alternative is defined as the census block groups that are either fully or partially within APZs and noise contours ≥65 dB DNL, as listed in Table 3.10-1 and as shown on Figures 3.10-1 through 3.10-6. There are no other environmental consequences with potential to impact environmental justice populations.

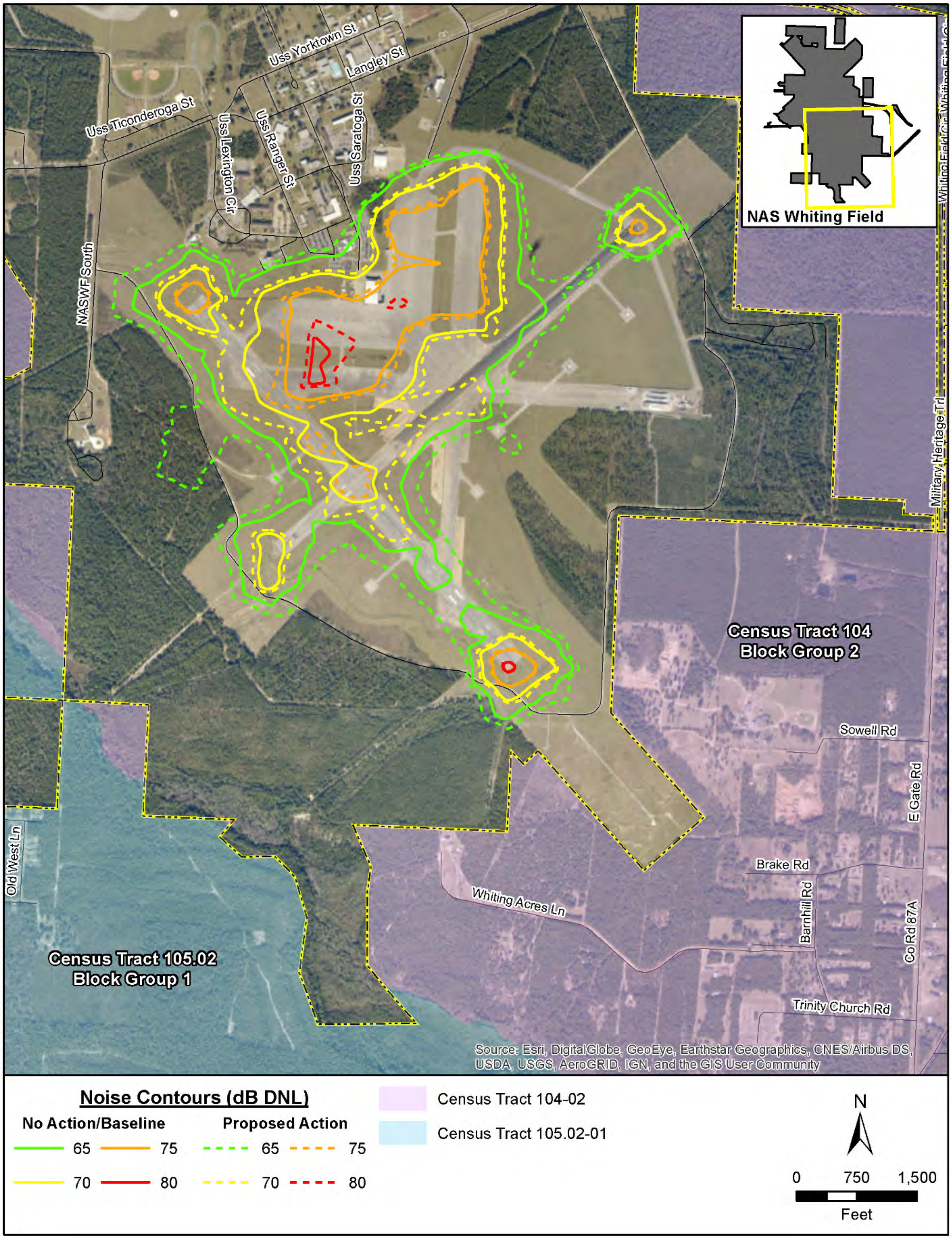


Figure 3.10-1 Whiting Field South Census Block Groups

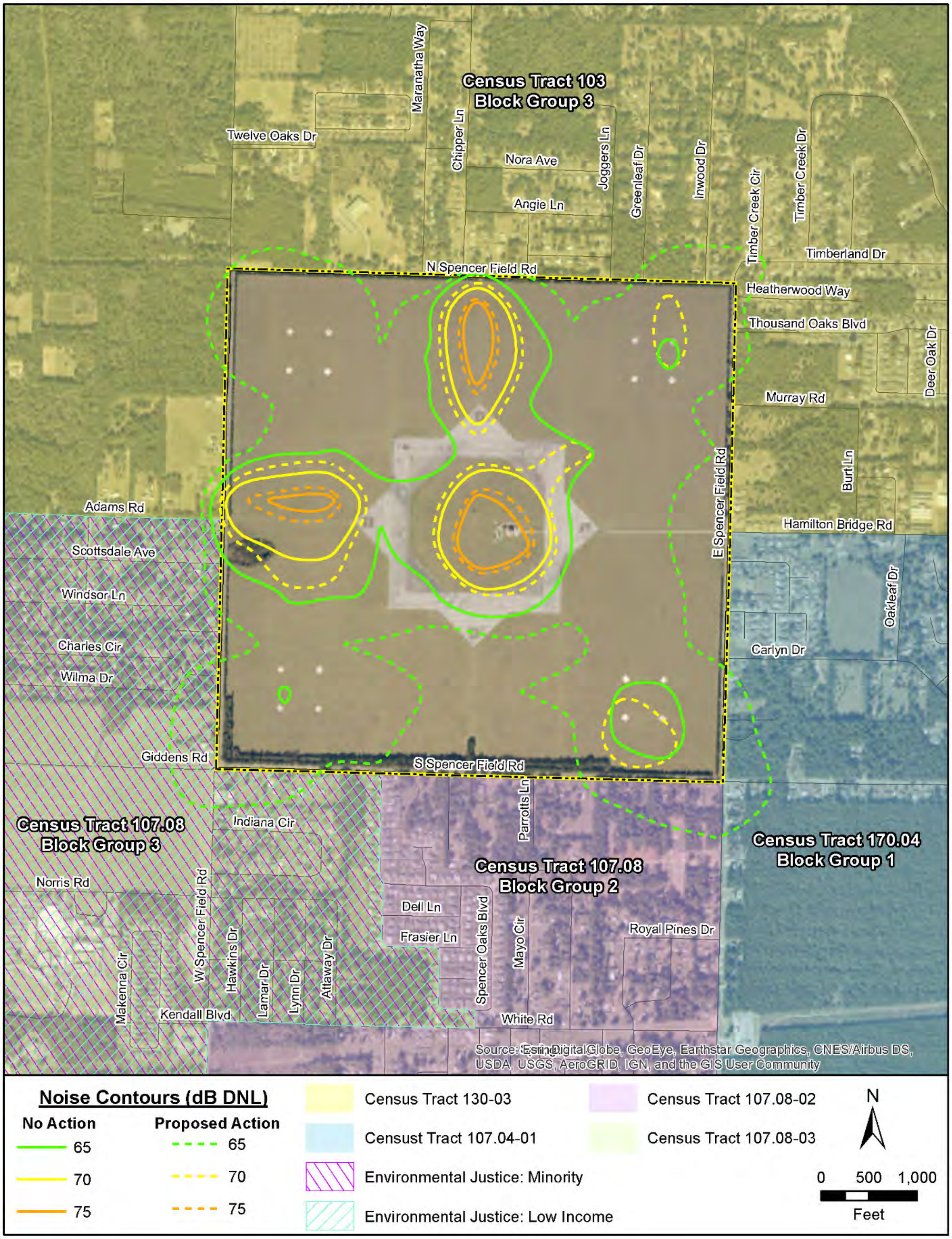


Figure 3.10-2 NOLF Spencer Census Block Groups

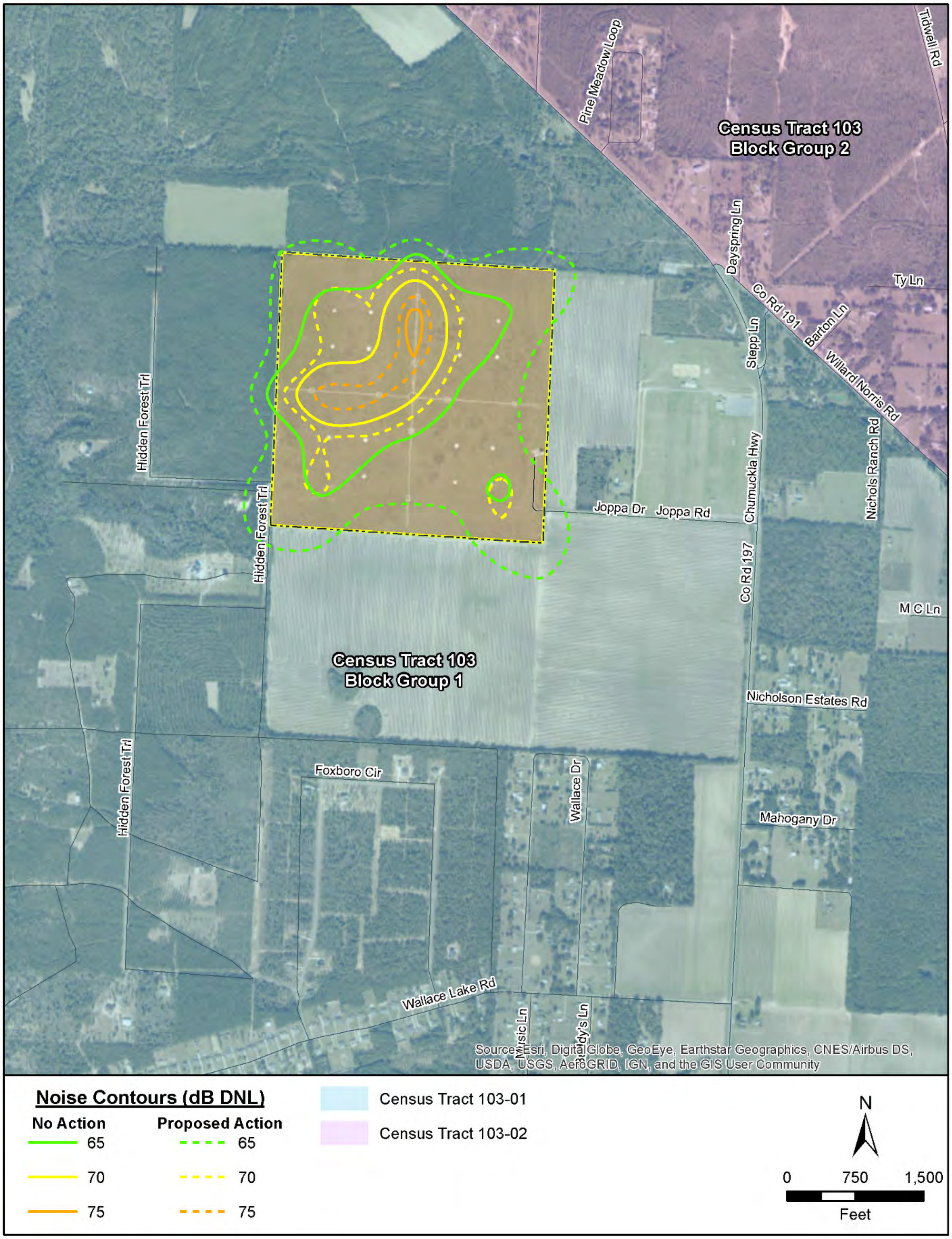


Figure 3.10-3 NOLF Pace Census Block Groups

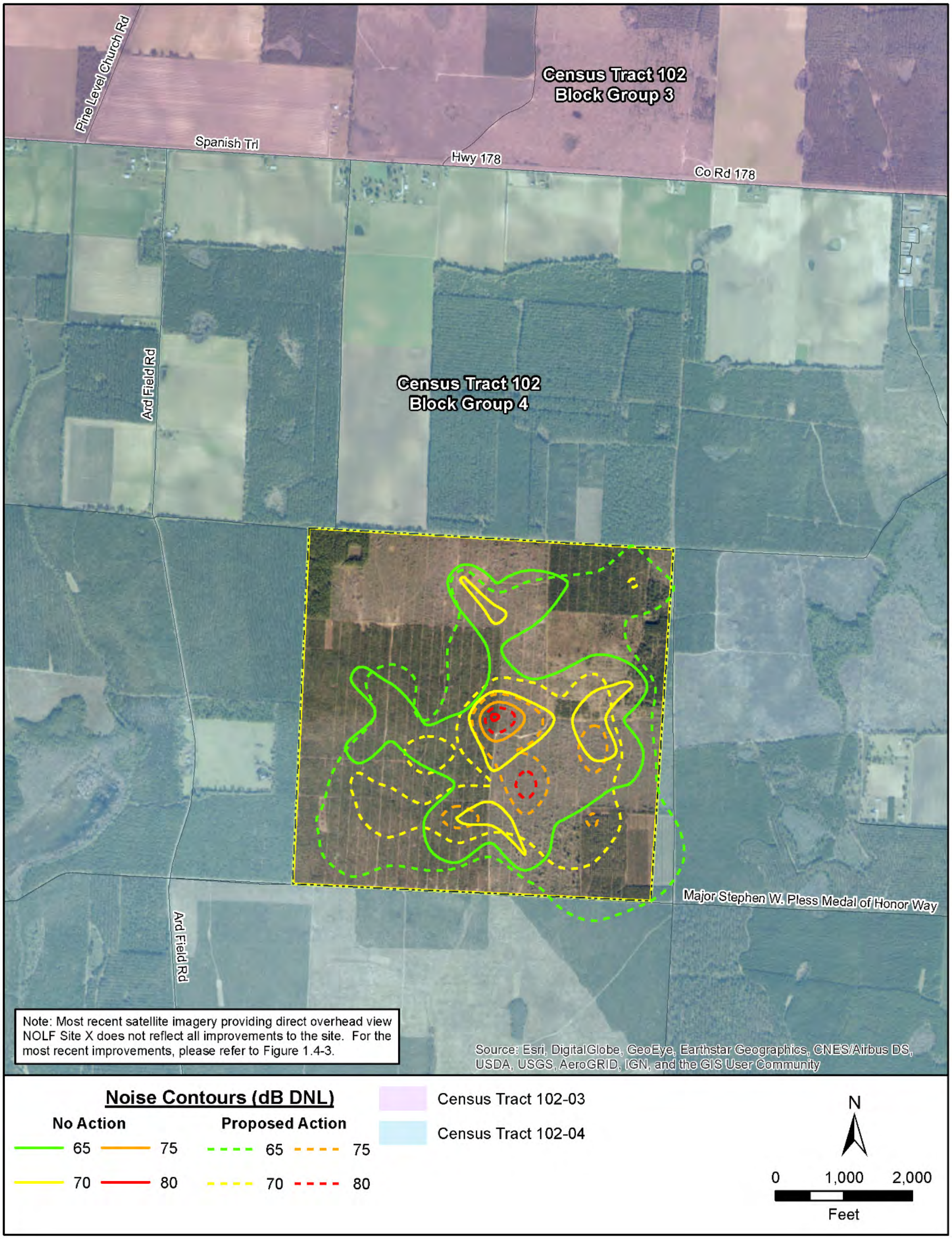


Figure 3.10-4 NOLF Site X Census Block Groups

Figure 3.10-5 NOLF Harold Census Block Groups

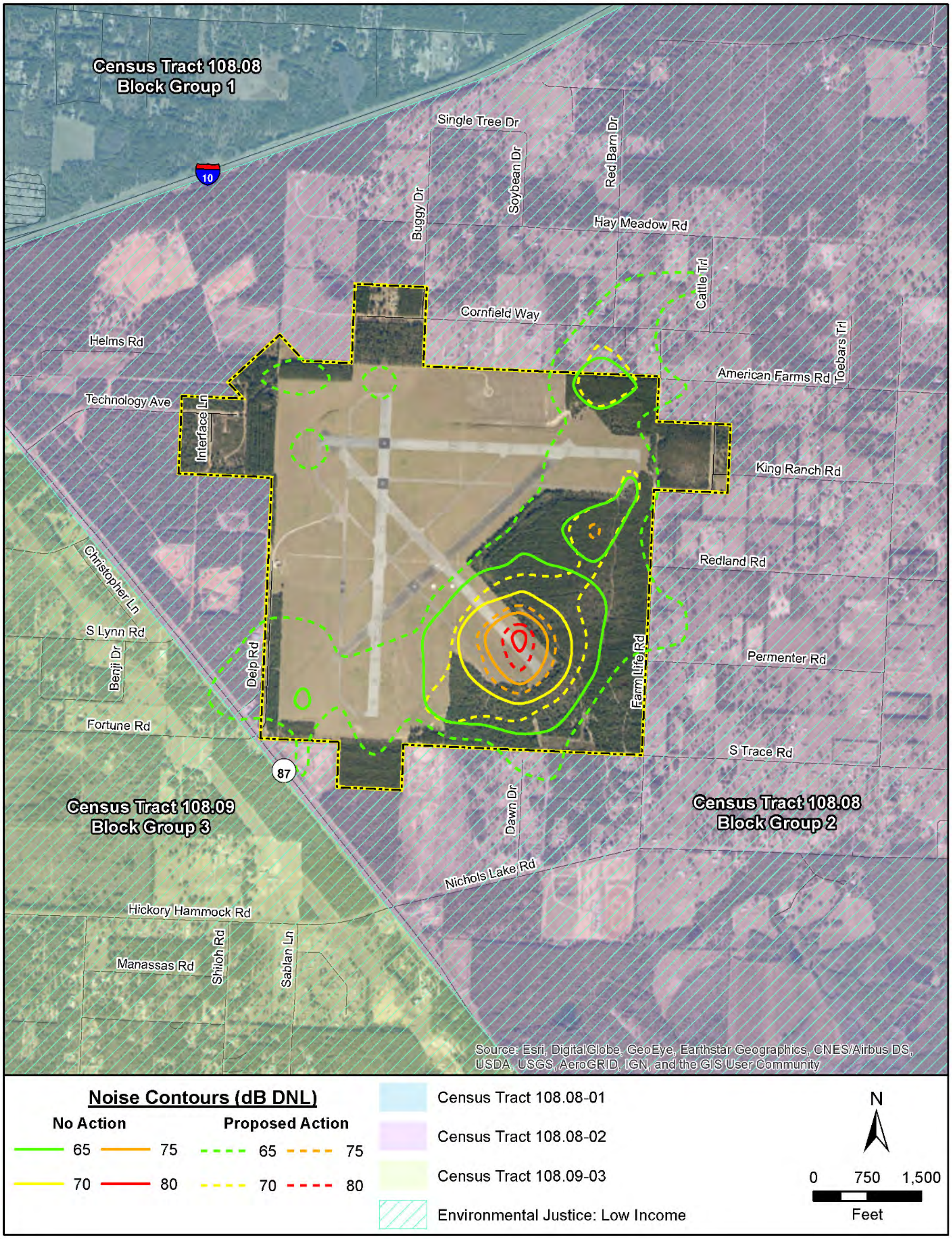


Figure 3.10-6 NOLF Santa Rosa Census Block Groups

Clear Zones and APZs would not change under the Action Alternative as compared to the No Action Alternative. Populations of concern for environmental justice may be present in the areas surrounding Whiting Field South and all of the NOLFs, except NOLF Pace (refer to Table 3.10-1). Following is a description of potential impacts based on the methods for calculating noise impacts to population presented in Section 3.5.7 *Noise,* Environmental Consequences; methodology presented in Section 3.10-1, and population numbers listed in Table 3-10-1. The percentages of the minority and low-income population within noise contours ≥65 dB DNL under the Action Alternative and the No Action Alternative compared with the percentage of the general population within ≥65 dB DNL noise contours for each airfield are shown in Tables 3.10-3 and 3.10-4. Because only NOLFs Spencer and Santa Rosa would have an increase in population within ≥65 dB DNL noise contours (refer to Table 3.5-15), only these two NOLFs are included in the tables.

Table 3.10-3 Minority Populations Affected by Noise Levels ≥65 dB DNL for Action Alternative

Noise Zone (65 to 70 dB DNL)	*Population*			*Minority Population*		
	No Action	*Action Alternative*	*Change*	*No Action*	*Action Alternative*	*Change*
NOLF SPENCER TRACT-BLOCK GROUP						
107.04-1	0	26	+26	0	0	0
107.08-2	0	27	+27	0	0	0
107.08-3	6	64	+58	6	64	+58
103-3	0	37	+37	0	0	0
NOLF Spencer Total	6	154	+148	6	64	+58
NOLF SANTA ROSA TRACT-BLOCK GROUP						
108.08-2	0	61	+61	0	0	0
108.09-3	0	6	+6	0	0	0
NOLF Santa Rosa Total	0	67	+67	0	0	0

Note: Areas in the table that are shaded identify locations where an environmental justice community may potentially exist.

Table 3.10-4 Low-income Populations Affected by Noise Levels ≥65 dB DNL for Action Alternative

Noise Zone (65 to 70 dB DNL)	*Population*			*Low-income Population*		
	No Action	*Action Alternative*	*Change*	*No Action*	*Action Alternative*	*Change*
NOLF SPENCER TRACT-BLOCK GROUP						
107.04-1	0	26	+26	0	0	0
107.08-2	0	27	+27	0	0	0
107.08-3	6	64	+58	6	64	+58
103-3	0	37	+37	0	0	0
NOLF Spencer Total	6	154	+148	6	64	+58
NOLF SANTA ROSA TRACT-BLOCK GROUP						
108.08-2	0	61	+61	0	61	+61
108.09-3	0	6	+6	0	6	+6
NOLF Santa Rosa Total	0	67	+67	0	67	+67

Note: Areas in the table that are shaded identify locations where an environmental justice community may potentially exist.

Whiting Field South. The Action Alternative would not increase the population experiencing the noise levels represented by the noise contours. The noise contours are contained within the installation boundaries, and there would not be any noise impacts on residential populations, including environmental justice populations (Figure 3.10-1).

NOLF Spencer. The Action Alternative would increase the population experiencing noise from 65 to <70 dB DNL at NOLF Spencer (Tables 3.10-3 and 3.10-4). NOLF Spencer is located in the most densely populated urban area of the study area. As identified in Section 3.10.2, only NOLF Spencer block group 107.08-3 is considered to be minority and low-income. The other three block groups affected by the increase (107.08-2, 107.04-1, and 103-3) do not have populations considered minority or low-income. Of the additional 148 people that would be affected by increased noise under the Action Alternative, 58 are located in block group 107.08-3, which is approximately 39 percent of those affected at NOLF Spencer. The increase in noise impacts of the Action Alternative compared with the No Action Alternative would be experienced by a lower proportion of the affected population identified as minority and low-income (39 percent) than people not considered minority or low-income (61 percent). Under the No Action Alternative, 100 percent of the block group population experiencing noise are low-income and minority, and under the Action Alternative 39 percent are low-income and minority. Therefore, these impacts would not be disproportionally high and adverse on an environmental justice population.

NOLF Pace. The Action Alternative would not increase the population experiencing noise ≥65 dB DNL, because no houses are present in areas of increased noise levels in the block group at NOLF Pace. The land surrounding NOLF Pace is agricultural and sparsely populated, and as shown in Table 3.10-1, the block group is not considered minority or low-income. Therefore, there would not be disproportionally high and adverse impacts on an environmental justice population.

NOLF Site X. The Action Alternative would not increase the population experiencing noise ≥65 dB DNL, because no houses are present in areas of increased noise levels in the block group at NOLF Site X (Table 3.10-2). Therefore, there would not be disproportionally high and adverse impacts on an environmental justice population.

NOLF Harold. The Action Alternative would not increase the population experiencing noise ≥65 dB DNL, because there are no houses present within the noise contours representing ≥65 dB DNL at NOLF Harold (Table 3.10-2). Therefore, there would not be disproportionally high and adverse impacts on an environmental justice population.

NOLF Santa Rosa. The Action Alternative would increase the population experiencing noise with an estimated 67 people present within the noise levels from 65 to <70 dB DNL at NOLF Santa Rosa (refer to Table 3.10-3). As both U.S. Census block groups surrounding NOLF Santa Rosa (108.08-2 and 108.09-3) are considered low-income (Table 3.10-1), the 65 to <70 dB DNL noise level would impact low-income communities (100 percent of the affected area). Because all the population affected by surrounding NOLF Santa Rosa is considered low-income, the impact would not be disproportionate in the context of the comparison group. The increase in overall noise impacts of the Action Alternative compared with the No Action Alternative would be experienced equally by all populations at NOLF Santa Rosa identified as low-income. The average increase of 5 dB DNL noise levels would likely be noticeable at NOLF Santa Rosa, which is currently exposed to regular helicopter traffic, but would not constitute a dramatic change to the intensity of noise in the local environment. As determined in Section 3.5.7 *Noise,* Environmental Consequences, the noise impacts would not be significant. Therefore, these impacts would not be disproportionally high and adverse on an environmental justice population.

Environmental Justice Impact Conclusion

In summary, the Action Alternative compared with the No Action Alternative would impact population census block groups that are either fully or partially within noise contours from 65 to <70 dB DNL surrounding NOLFs Spencer and Santa Rosa, and would not impact populations at the other airfields. The intensity of noise levels between 65 and 70 dB DNL would be experienced equally by both populations identified as minority and low-income and populations not considered minority or low-income. Noise modeling results indicate an average increase of 5 dB DNL noise levels would likely be noticeable at NOLFs Spencer and Santa Rosa, which are currently exposed to regular helicopter traffic, but would not constitute a dramatic change to the intensity of noise in the local environment. As determined in Section 3.5.7 *Noise,* Environmental Consequences, the noise impacts would not be significant, and use of the UH-72 for analysis provides a conservative (i.e., higher) estimate of noise levels associated with flight training operations under the Action Alternative. Therefore, these impacts would not be disproportionally high and adverse on an environmental justice population, and implementation of the Action Alternative would not result in significant impacts to environmental justice.

4 Cumulative Impacts

This section (1) defines cumulative impacts, (2) describes past, present, and reasonably foreseeable future actions relevant to cumulative impacts, (3) analyzes the incremental interaction the proposed action may have with other actions, and (4) evaluates cumulative impacts potentially resulting from these interactions.

4.1 Definition of Cumulative Impacts

The approach taken in the analysis of cumulative impacts follows the objectives of the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ) regulations, and CEQ guidance. Cumulative impacts are defined in 40 Code of Federal Regulations (CFR) section 1508.7 as "the impact on the environment that results from the incremental impact of the action when added to the other past, present, and reasonably foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time."

To determine the scope of environmental impact analyses, agencies shall consider cumulative actions, which when viewed with other proposed actions have cumulatively significant impacts and should therefore be discussed in the same impact analysis document.

In addition, CEQ and the U.S. Environmental Protection Agency (USEPA) have published guidance addressing implementation of cumulative impact analyses—*Guidance on the Consideration of Past Actions in Cumulative Effects Analysis* (CEQ, 2005) and *Consideration of Cumulative Impacts in EPA Review of NEPA Documents* (USEPA, 1999). CEQ guidance entitled *Considering Cumulative Impacts Under NEPA* (1997b) states that cumulative impact analyses should

"…determine the magnitude and significance of the environmental consequences of the proposed action in the context of the cumulative impacts of other past, present, and future actions...identify significant cumulative impacts…[and]…focus on truly meaningful impacts."

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

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

4.2 Scope of Cumulative Impacts Analysis

The scope of the cumulative impacts analysis involves both the geographic extent of the effects and the time frame in which the effects could be expected to occur. For this Environmental Assessment (EA), the study area delimits the geographic extent of the cumulative impacts analysis. In general, the study area will include those areas previously identified in Chapter 4 for the respective resource areas. The time frame for cumulative impacts centers on the timing of the proposed action.

Another factor influencing the scope of cumulative impacts analysis involves identifying other actions to consider. Beyond determining that the geographic scope and time frame for the actions interrelate to the proposed action, the analysis employs the measure of "reasonably foreseeable" to include or exclude other actions. For the purposes of this analysis, public documents prepared by federal, state, and local government agencies, and phone interviews with local agencies such as the Florida Department of Transportation and the Santa Rosa County Planning and Zoning Commission, form the primary sources of information regarding reasonably foreseeable actions. Documents used to identify other actions include notices of intent for Environmental Impact Statements and Environmental Assessments, management plans, land use plans, and other planning related studies.

4.3 Past, Present, and Reasonably Foreseeable Actions

This section will focus on past, present, and reasonably foreseeable future projects at and near the Proposed Action locale. In determining which projects to include in the cumulative impacts analysis, a preliminary determination was made regarding the past, present, or reasonably foreseeable action. Specifically, using the first fundamental question included in Section 4.1, it was determined if a relationship exists such that the affected resource areas of the Proposed Action (included in this EA) might interact with the affected resource area of a past, present, or reasonably foreseeable action. If no such potential relationship exists, the project was not carried forward into the cumulative impacts analysis. In accordance with CEQ guidance (CEQ, 2005), these actions considered but excluded from further cumulative effects analysis are not catalogued here as the intent is to focus the analysis on the meaningful actions relevant to informed decision-making. Projects included in this cumulative impacts analysis are listed in Table 4.3-1 and briefly described in the following subsections.

Table 4.3-1 Cumulative Action Evaluation

Action	*Level of NEPA Analysis Completed*
Past Actions	
F-35 Beddown at Eglin Air Force Base, Florida	Supplemental Environmental Impact Statement
Land Exchange Involving Naval Air Station (NAS) Whiting Field's Naval Outlying Landing Field (NOLF) Site 8 in Escambia County for Suitable Land and Improvements in Santa Rosa County, Florida	Environmental Assessment
Providing T-6 Joint Primary Aircraft Training System Solo Capability at Navy Outlying Landing Fields Naval Air Station Whiting Field, Florida	Environmental Assessment
Replacement of the T-34C Training Aircraft with the Joint Primary Aircraft Training System Aircraft at Naval Air Station Whiting Field, Florida	Environmental Assessment

Table 4.3-1 Cumulative Action Evaluation

Action	*Level of NEPA Analysis Completed*
Present and Reasonably Foreseeable Future Actions	
State Route 87 from 2 miles South of Yellow River to County Road 184	Environmental Assessment
U.S. 90 (S.R. 10) Project Development & Environmental Study from Escambia County to Glover Lane	Categorical Exclusion
U.S. 90 Project Development & Environmental Study from Glover Lane to State Route 87S in Santa Rosa County	Environmental Assessment/Finding of No Significant Impact/Section 4(f) Individual Evaluation
Plantation Woods Phase V	N/A
Pace Mill Creek Phase IV	N/A
Hawk's Landing Phase II	N/A
Woodlands 2nd Addition Phase I	N/A
P-285 South Field Paraloft	Categorical Exclusion
P-253 North Field Air Traffic Control Tower	Categorical Exclusion
P-265 Helicopter Squadrons Applied Instruction Facility	Categorical Exclusion
P-279 Child Development Center	Categorical Exclusion
State Route 87 Connector Project Development and Environmental Study, Santa Rosa County, Florida	Environmental Impact Statement/Record of Decision/ Final Section 4(f) Evaluation

Note: N/A = not applicable

4.3.1 Past Actions

The following past actions are relevant to the cumulative impact analysis in the vicinity of NAS Whiting Field and NOLFs associated with the Proposed Action.

- **F-35 Beddown at Eglin Air Force Base, Florida, January 2014** (U.S. Air Force, 2014) - This Final Supplemental Environmental Impact Statement reevaluated F-35 aircraft flight training operations not only at Eglin Air Force Base, but also other auxiliary fields, one of which was NOLF Choctaw. The proposed action of the Supplemental Environmental Impact Statement was to beddown the F-35 aircraft associated with three squadrons. The Record of Decision for this Final Supplemental Environmental Impact Statement implementing the No Action Alternative was signed June 2014. The No Action Alternative allows for the limited operation of the 59 F-35 aircraft as established by the February 2009 Record of Decision of the original Environmental Impact Statement.
- **Land Exchange Involving Naval Air Station (NAS) Whiting Field's Naval Outlying Landing Field (NOLF) Site 8 in Escambia County for Suitable Land and Improvements in Santa Rosa County, Florida** (Department of the Navy, 2018a) - The proposed action was to carry out a land exchange between the Navy and Escambia County, Florida. Through the exchange, the Navy would convey NAS Whiting Field's NOLF Site 8 for suitable land and improvements located in Santa Rosa County, Florida (Site X). NOLF Site 8 is an approximate 640-acre property located within Sections 4 and 5, Township 1 South, Range 31 West in Escambia County, Florida. NOLF Site X is an approximate 601-acre property located within Section 32, Township 4 North, Range 29 West of Santa Rosa County, Florida. The proposed action involved the replacement of helicopter operations at NOLF Site 8 with operations at Site X. A Finding of No Significant Impact was

signed on June 12, 2018. The land exchange is complete and Site X opened for operations in January 2019.

- **Providing T-6 Joint Primary Aircraft Training System Solo Capability at Navy Outlying Landing Fields Naval Air Station Whiting Field, Florida** (Department of the Navy, 2011) – The proposed action consisted of the acquisition of approximately 2,013 acres of private land around NOLFs Barin and Summerdale in Alabama, along with the modification and construction of runways at both NOLFs to accommodate T-6 operations. Additional actions related to the proposed action involved increased additional landings and approaches to NOLFs Wolf, Silverhill, Holley and Choctaw to avoid mixing T-34 and T-6 training traffic at the same NOLF during construction at NOLFs Barin and Summerdale. Both runways at NOLF Barin were extended to 5,000 feet with 3,000-foot long Clear Zones to accommodate T-6 solo operations. At NOLF Summerdale, runways 4-22 and 1028 were extended to 4,000 feet with 3,000-foot long Clear Zones to accommodate T-6 dual operations. Existing runway lighting at NOLF Barin were expanded to include the additional runway length. Civilian structures, including approximately 22 residences, located within the runway extensions and Clear Zones were removed, and Doc McDuffie Road and Lassiter Farm Road were relocated outside of the Clear Zones at NOLFs Barin and Summerdale. Mitigation for impacts on a total of 0.34 acres of wetlands were necessary and implemented in accordance with the wetland permit issued by the U.S. Army Corps of Engineers, Mobile District. There were no major impacts resulting from the proposed action. A Finding of No Significant Impact was signed on 28 February 2011.
- **Replacement of the T-34C Training Aircraft with the Joint Primary Aircraft Training System Aircraft at Naval Air Station Whiting Field, Florida** (Department of the Navy, 2000b) – The proposed action consisted of replacing the T-34C with the T-6, including the Joint Primary Aircraft Training System. The Joint Primary Aircraft Training System consists of the turbo prop T-6 aircraft, a Training Integration Management System, logistic support, and ground based flight simulators. The EA evaluated the impacts of new construction to accommodate 162 T-6 aircraft, the addition of flight simulators at NAS Whiting Field, extension of runway 12/30 by 934 feet to a total length of 5,000 feet at NOLF Brewton, acquisition of approximately 45 acres to extend the Clear Zone land off of runway ends at NOLF Barin, and performing flight operations with the T-6 aircraft at NAS Whiting Field and five NOLFs: Barin, Brewton, Evergreen (Alabama), Saufley, and Choctaw (Florida). The EA anticipated long-term, minor impacts to air quality, land use and noise levels due to the operation of the T-6. A Finding of No Significant Impact was signed on May 3, 2000.

4.3.2 Present and Reasonably Foreseeable Actions

The following present and reasonably foreseeable actions are relevant to the cumulative impact analysis in the vicinity of NAS Whiting Field.

- **State Route 87 from 2 miles South of Yellow River to County Road 184** (Federal Highway Administration, 2016a) - State Route (S.R.) 87 improvement project in Santa Rosa County includes constructing a new two-lane roadway, adjacent to the existing roadway, from the Eglin Air Force Base boundary and NOLF Choctaw north to County Road 184 (Hickory Hammock Road). The proposed action also included in the 9.6-mile project is roadway resurfacing, new roadway striping, signage improvements, constructing stormwater retention ponds, and drainage upgrades. In addition, crews will construct a new S.R. 87 northbound bridge across the

Yellow River. Work began in October 2015 with land clearing and tree removal efforts on the southern end of the project. Clearing efforts on the northern portion began in January 2016. The area adjacent to S.R 87 is home to the Florida National Scenic Trail, Yellow River Canoe Trail and the nearby Weaver Creek Trail. The construction of a new northbound bridge across Yellow River will require access to the boat ramp, parking and trailhead located on the east side of S.R. 87, just south of the Yellow River (Garner's Landing), closed in January 2016 and continue throughout construction. This proposed project may have impacts to rare, threatened or endangered species, and five archaeological sites designated as components of the Broxson Resource Group were also identified. Other resources impacted include floodplains and wetlands (49.2 acres of the proposed action is planned in the 100-year floodplain of the Yellow and Dead Rivers and 32.4 acres of jurisdictional wetlands would be impacted). A Finding of No Significant Impact was signed September 9, 2014. Although the entire corridor was slated for completion during the fall of 2018, construction is ongoing and is expected to conclude at the end of April or early May 2019.

- **U.S. 90 from Escambia County to Glover Lane** (Federal Highway Administration, 2019a)- This project proposes the widening of S.R. 10 (U.S. 90) from four to six lanes in order to provide additional east-west capacity alternatives to Interstate 10 (I-10). S.R. 10 (U.S. 90) serves as a connecting link between the City of Pensacola, the community of Pace and the City of Milton. The western segment directly connects with I-10 and is in close proximity to the main University of West Florida campus entrance at Campus Drive. The eastern segment connects with S.R. 281 (Avalon Boulevard), which connects to I-10, and also connects with S.R. 87 and S.R. 89, both of which extend north into Alabama. This portion of U.S. 90 is the main roadway used to access NOLF Spencer. Additional roadway capacity is needed to strengthen S.R. 10 (U.S. 90) as an east-west corridor alternative to I-10 that will accommodate the projected future roadway volumes for motorists traveling between Escambia and Santa Rosa Counties and for emergency evacuation purposes. The total project length is approximately 10 miles. The project anticipates no significant impacts and overall enhancement to the mobility in the area. A Categorical Exclusion was signed on February 5, 2019 and pre-construction is underway. Construction is funded for widening and replacement of a pair of sister bridges over the Simpson River. No other segments are funded within 5 years.
- **U.S. 90 Project Development & Environmental Study from Glover Lane to S.R. 87S in Santa Rosa County** (Federal Highway Administration, 2019b) – This project proposes improvements to U.S. 90 that address system linkage, multi-modal deficiencies and improve safety. The proposed improvements include widening to a 6-lane urban divided typical section, including 7-foot buffered bicycle lanes and pedestrian features. From S.R. 87N to the Blackwater River Bridge, a 4-lane urban divided typical section with 7-foot buffered bicycle lanes and sidewalks would be provided. The Blackwater River to Ward Basin Road would include widening to a similar urban 4-lane divided roadway, with bicycle and pedestrian features. The final segment, from Ward Basin Road to S.R. 87S is proposed to be widened to a 4-lane suburban typical section with supporting bicycle and pedestrian features. Although the proposed U.S. 90 improvements associated with this project begin at the Glover Lane/U.S. 90 intersection, the U.S. 90 segment from Glover Lane to the S.R. 87N intersection has been prioritized by the Florida-Alabama Transportation Planning Organization to be widened to six lanes as a result of a previous study completed in 1995 by the Florida Department of Transportation. From S.R. 87N eastward to S.R. 87S, a continuous four lane facility would be provided. The project anticipates unavoidable adverse effects to historic

and Section 4(f) properties (the Milton Historic District, the Fisher Hamilton Building and the Santa Rosa Courthouse, all contributing resources to the National Register). Construction may result in temporary short-term impacts to travel patterns, however business access will be maintained throughout construction. A Finding of No Significant Impact was signed on March 2019. Right-of-way needs are being determined for certain segments. No funding for construction has been acquired.

- **Plantation Woods Phase V** (Santa Rosa County Planning and Zoning, 2018a) - Plantation Woods Phase V is a 69 lot subdivision that is located in the City of Milton. It was approved on March 22, 2018. It is zoned R1M (Mixed Residential Subdivision). It is located approximately 1 mile north of NOLF Santa Rosa.
- **Pace Mill Creek Phase IV** (Santa Rosa County Planning and Zoning, 2018b) - Pace Mill Creek Phase 4 is a 21 lot subdivision located in the town of Pace. It was approved on April 26, 2018. It is zoned R1 (Single-Family Residential). It was rezoned in 1993 from AG-RR (Agriculture-Rural Residential) to R1 (Single-Family Residential). It is located approximately 0.6 miles northwest of NOLF Spencer.
- **Hawk's Landing Phase II** (Santa Rosa County Planning and Zoning, 2018c) - Hawk's Landing Phase II is a 47 lot subdivision located in the town of Pace. It was approved on September 27, 2018. It is zoned R1A (Single-Family Residential). This property was rezoned in 2014 from AG-RR (Agriculture-Rural Residential) to R1A (Single-Family Residential) with a Future Land Use Map Amendment. It is located approximately 1 mile west of NOLF Spencer.
- **Woodlands 2nd Addition Phase I** (Santa Rosa County Planning and Zoning, 2019) - Woodlands 2nd Addition Phase I is a 77 lot subdivision located in the town of Pace. It was approved on January 10, 2019. It is zoned R2 (Medium Density Residential). The property was rezoned in 2002 from AG-RR (Agriculture -Rural Residential) to R1 (Single-Family Residential), then in 2007 was rezoned to R2 (Medium Density Residential). The Future Land Use is Single-Family Residential. It is located approximately 2.6 miles southeast of NOLF Spencer.
- **P-285 South Field Paraloft** (Department of the Navy, 2018b) – This NAS Whiting Field facility project is located within the current project area. The proposed action would construct a single-story concrete block structure with brick facing to provide the support space for the new Aviation Life Support System shop and flight crew equipment storage. Construction would include state-of-the-art aviation life support systems shop and 850 pilot flight gear storage lockers, test benches and repair/inspection tables, storage, maintenance areas, night vision goggles clean room, personal support spaces and toilet facilities. It is expected the project would start construction in Fiscal Year 2020.
- **P-253 North Field Air Traffic Control Tower** (Department of the Navy, 2017) – This NAS Whiting Field facility project is not located within the current project area. This project would provide a new freestanding air traffic control tower. The air traffic control tower would include a ground floor with intermediate floors and a new standard major activity cab. The new construction would provide an elevator, an exterior catwalk with handrails, interior stairwells, communication antenna platforms, handrails around the roof edge, emergency ladders, concrete pile foundations, and associated electrical, plumbing (water and sanitary sewer), mechanical (heating, ventilation, and air conditioning), fire detection and protection. This

project would include the demolition of Building 1424T. There is known contamination at the selected site. It is expected the project would start construction in Fiscal Year 2021.

- **P-265 Helicopter Squadrons Applied Instruction Facility** (Department of the Navy, 2015b) – This NAS Whiting Field facility project is located within the current project area. The proposed action would construct an applied instruction training operations facility to consolidate three helicopter squadrons in close proximity to the South Field flight line. The facility would provide requisite advanced mission planning to fully exploit the Advanced Helicopter Training System (AHTS) avionics and data recording capabilities, support night vision goggle testing and provide a Helicopter Instructor Training Unit. The project would provide functional spaces to include state-of-the-art ready rooms featuring class flow initiatives, E-brief spaces, safety, scheduling, programming, training aid storage, publications, aviation life support systems, maintenance control, reproduction areas, learning centers and all required administrative support spaces. First floor lecture rooms shall have tiered seating and wiring conduit to support future video teleconference capability. Student activity space shall have a small food storage/preparation area. The new construction architectural style would be consistent with the 2013 Installation Appearance Plan. Construction would include the demolition of Building 2977, a single-story, 28,080 square foot applied instruction building erected in 1971 and Building 2994 a single-story, 8,050 SF applied instruction building erected in 1975. Due to the age of these buildings, consultation under Section 106 would be required. It is expected the project would start construction in Fiscal Year 2021.
- **P-279 Child Development Center** (Department of the Navy, 2015c) – This NAS Whiting Field facility project is not located within the current project area. The proposed action would construct a one-story child development center for 150 children. The facility would be American with Disabilities Act compliant. The construction provides child activity rooms for infants, pre-toddlers, toddlers, and preschoolers and includes administration space, training rooms, isolation room, kitchen, laundry and storage. The facility would include a closed circuit TV system, intrusion detection, public address system, fire protection and heating, ventilation, and air conditioning. Playground areas would be improved with appropriate equipment, surfaces and shade structures. Construction includes the creation of parking and driveway designed to provide a safe covered drop-off/pickup area and a driveway long enough for cars waiting for drop-off/pickup to prevent congestion on the street. A beam barrier controlled by card access would secure the drop-off/pickup and parking area. Construction would include the demolition of the current child development center (Building 36), an approximately 11,453 SF facility. It is expected the project would start construction in Fiscal Year 2022.
- **S.R. 87 Connector Project Development and Environment Study, Santa Rosa County, Florida** (Federal Highway Administration, 2016b) - The Federal Highway Administration Florida Division, in coordination with the Florida Department of Transportation proposes the construction of the S.R. 87 Connector, a new roadway facility that would directly link S.R. 87S with S.R. 87N. The selected alternative is a four lane facility extending north from the U.S. 90/S.R. 87S intersection crossing the Blackwater River in the proximity of the existing eastern power easement crossing. Once across the river, it runs parallel or adjacent to the power easement, then veers north and runs adjacent to the Clear Creek environmental lands, where it proceeds west to connect with S.R. 87N in the proximity of the northern split of S.R. 87N and S.R. 89. New bridge construction is required over the Blackwater River and over Clear Creek. The bridging over the Blackwater River

and its wetlands and floodway would consist of two parallel bridges approximately 25 feet apart. The bridges would each have two 12-foot travel lanes, 6-foot inside shoulders, and 10-foot outside shoulders. The western bridge (southbound) would also include a 12-foot multi-use trail. The bridges would extend over 5,571 feet crossing the Blackwater River, Pat Brown Road, and the Blackwater Heritage State Trail. Utilizing a series of ramps, the western bridge would connect the multi-use trail with the Blackwater Heritage State Trail below it. This would effectively complete the trail connection between the Blackwater Heritage State Trail and the Historic S.R. 1 Trail. The EA identified substantial potential impacts to floodplains, water resources, wildlife and habitat, wetlands, recreation areas, and secondary and cumulative impacts. A Record of Decision was signed on October 20, 2016. Right-of-way needs are being determined for certain segments. Construction is not anticipated to begin until 2040 or sooner depending on funding.

4.4 Cumulative Impact Analysis

Where feasible, the cumulative impacts were assessed using quantifiable data; however, for many of the resources included for analysis, quantifiable data is 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 regarding cumulative impacts related to this EA where possible. The analytical methodology presented in Chapter 3, which was used to determine potential impacts to the various resources analyzed in this document, was also used to determine cumulative impacts.

4.4.1 Air Quality

4.4.1.1 Description of Geographic Study Area

The Region of Influence (ROI) is Santa Rosa County, which is in attainment for all criteria pollutants.

4.4.1.2 Relevant Past, Present, and Future Actions

All the present and reasonably foreseeable future actions have the potential to interact with the Action Alternative and affect air quality.

4.4.1.3 Cumulative Impact Analysis

The construction on S.R. 87 is currently ongoing but may be completed before construction begins at NAS Whiting Field. Many of the other projects are either very small or have no schedule. Several of the projects involve road construction to accommodate growing traffic, so there is a long-term implication of increased transportation emissions. However, air emissions from construction of both temporary and permanent structures would occur over an eight-year period, then would cease. Based on the project descriptions, the impacts of these construction projects in conjunction with the implementation of the Action Alternative would not likely have a significant impact on air quality in Santa Rosa County.

While the greenhouse gas (GHG) emissions generated from the proposed AHTS construction activities and flight training operations alone would not be enough to cause climate change, in combination with past and future emissions from all other sources they would contribute incrementally to climate change. The state of Florida has established GHG reduction targets to reduce overall emissions, and increases in GHG emissions could affect the state's overall efforts to meet these targets. As described in Section 3.1

Air Quality, the Department of Defense (DoD) and Navy have implemented many policies and programs to reduce GHG emissions. In the 2010 Navy Energy Vision, the Secretary of the Navy set goals to reduce the reliance on petroleum by increasing the energy efficiency and the use of alternative energy, which will reduce GHG emissions (Department of the Navy, 2010). Maintenance hangars and training system facilities that would be constructed as part of the Action Alternative would meet energy efficiency standards and incorporate renewable energy sources, in keeping with Navy goals. Therefore, implementation of the Action Alternative combined with the past, present, and reasonably foreseeable future projects, would not result in significant cumulative air quality impacts.

4.4.2 Water Resources

4.4.2.1 Description of Geographic Study Area

The study area for water resources cumulative impacts includes the Perdido-Escambia River basin. The past, present, and reasonably foreseeable future actions that have a potential to interact with the Action Alternative and cumulatively impact water resources are limited to those projects with soil disturbance or the potential for water contamination within the same watershed as the Action Alternative.

4.4.2.2 Relevant Past, Present, and Future Actions

All the reasonably present and reasonably foreseeable future actions have the potential to interact with the Action Alternative and affect water resources.

4.4.2.3 Cumulative Impact Analysis

Short-term impacts to water quality could occur as a result of construction activities; however, Best Management Practices (BMPs) would be utilized to minimize erosion and sedimentation that would result in degraded water quality. The project does not propose to use groundwater or affect groundwater as a result of construction activities. Impacts to water resources do not have the potential to be significant. The Action Alternative would increase impervious surfaces at NAS Whiting Field which would result in increased stormwater runoff. This additional stormwater would be managed through detention or retention basins where pollutants and sediment could be filtered out prior to discharge into an adjacent irrigation channel. The increase in impervious surface is not anticipated to have a significant impact to groundwater recharge. Construction activities are expected to have short-term impacts to water quality as a result of erosion and sedimentation. These impacts would be managed using BMPs to reduce impacts to surface water quality. Construction activities and water usage is not expected to impact groundwater.

When all past, present, and reasonably foreseeable future actions are examined together, there is the potential for impacts to water resources. Many of the proposed development projects have identified improvements that, if implemented, would reduce impacts to water resources. The proposed projects, if implemented, would include identified improvements. The Action Alternative would not have impacts to water resources; therefore, the Action Alternative would not contribute to cumulative impacts to water resources. Therefore, implementation of the Action Alternative combined with the past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts to water resources within the ROI.

4.4.3 Cultural Resources

4.4.3.1 Description of Geographic Study Area

The ROI for cumulative impacts includes the areas underlying modeled noise contours ≥65 decibel (dB) day-night average sound level (DNL), where noise from aircraft operations under the Action Alternative may affect historic properties. At NAS Whiting Field, the ROI also includes the project area associated with the facility and infrastructure development for AHTS maintenance hangars and supporting ground based training systems.

4.4.3.2 Relevant Past, Present, and Future Actions

There are no National Register of Historic Places (NRHP)-eligible resources in the ROI, therefore there are no past, present, or reasonably foreseeable actions that might interact with the affected resource areas of the Action Alternative.

4.4.3.3 Cumulative Impact Analysis

Cumulative impacts to cultural resources would not occur with implementation of the alternatives because there are no NRHP-eligible resources in the ROI. Therefore, implementation of the alternatives combined with the past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts to cultural resources within the ROI.

4.4.4 Biological Resources

4.4.4.1 Description of Geographic Study Area

The ROI for cumulative impacts includes the airspace and lands underlying modeled noise contours ≥65 dB DNL, where noise from aircraft operations under the Action Alternative may affect wildlife species.

4.4.4.2 Relevant Past, Present, and Future Actions

All of the projects listed in Table 4.3-1 have impacted, or will or would have the potential to impact, biological resources within the ROI.

4.4.4.3 Cumulative Impact Analysis

Projects with potential direct and indirect impacts on biological resources include those that would result in the loss of native plant communities, permanent loss of sensitive plant populations, species losses that affect population viability, and the reduction in adjacent habitat quality from temporary actions including the addition of noise and dust during construction to permanent effects such as the addition of lighting. For native plant and wildlife communities, other impacts could include habitat fragmentation or the permanent loss of contiguous (interconnecting) native habitats such as migration or movement corridors. The cumulative effect of past, present, and reasonably foreseeable actions in Table 4.3-1 is the loss of plant and wildlife habitat, increased aircraft traffic and noise, and increased construction noise impacts to wildlife.

Construction activities, noise, and bird/animal aircraft strike hazard (BASH) have the potential for cumulative biological resource impacts when considering the Action Alternative with past, present, and reasonably foreseeable projects. The Action Alternative would not result the loss of habitat, so no cumulative impacts to the availability of habitat would occur. No cumulative impact is anticipated for the reticulated flatwoods salamander and gopher tortoise because neither is not expected to occur within the developed areas where construction would occur, and the gopher tortoise is already exposed to ongoing flight training operations at NAS Whiting Field and its associated NOLFs. Noise generated during construction would be localized, short-term, and not long in duration. Therefore, would not introduce significant effects to wildlife when considered with past, present, and reasonably foreseeable projects. In terms of long-term noise effects, increases in noise levels associated with the Action Alternative flight training operations would not adversely impact wildlife. Noise from fixed-wing aircraft at NOLF Choctaw, as related to the F-35 Beddown at Eglin Air Force Base, dominate the noise environment at NOLF Choctaw; the Action Alternative would not cumulatively contribute to the noise environment or result in adverse cumulative impacts to wildlife. The spatial and temporal extents of impacts on biological resources from other cumulative projects are expected to be limited due to implementation of BMPs, conservation measures, and any other permit conditions. Cumulative biological resource impacts from past, present, and future actions within the study area would be less than significant because noise exposure and BASH potential would not result in significant additive noise disturbances that could affect terrestrial wildlife. Neither special-status species nor migratory birds would be impacted by Action Alternative noise levels when considered with other past, present, and reasonably foreseeable projects. As a result, the Action Alternative, combined with other cumulative projects, would not result in significant cumulative impacts on biological resources.

4.4.5 Noise

4.4.5.1 Description of Geographic Study Area

The ROI for the analysis of effects to noise associated with the Action Alternative is the area underlying modeled noise contours ≥65 dB DNL from helicopter operations under the Action Alternative.

4.4.5.2 Relevant Past, Present, and Future Actions

All the present and reasonably foreseeable future actions have the potential to interact with the Action Alternative and affect noise.

4.4.5.3 Cumulative Impact Analysis

Proposed construction at NAS Whiting Field that would occur in the airfield operations area would generate temporary, short-term impacts. Aircraft noise would be at a much greater sound level and would mask any construction noise. However, noise from construction of both temporary and permanent structures would occur over an eight-year period, then would cease, and remain within the boundaries of the installation. Thus, construction noise is not considered a significant contributor to cumulative impacts (Thalheimer, 2000). In addition, none of the projects mentioned above will cumulatively contribute to the military noise from aircraft operations. Locations in the vicinity of the NOLFs would experience an increase in noise levels. The change in noise exposure would likely be noticeable but the areas are currently exposed to regular helicopter traffic. Therefore, implementation of the Action Alternative combined with the past, present, and reasonably foreseeable future projects, would not result in significant cumulative noise impacts within the ROI.

4.4.6 Land Use

4.4.6.1 Description of Geographic Study Area

The ROI for or the analysis of effects to land use associated with the Action Alternative is the area underlying modeled noise contours ≥65 dB DNL from helicopter operations under the Action Alternative.

4.4.6.2 Relevant Past, Present, and Future Actions

Four relevant past, present, or future actions have been identified as having potential cumulative impacts to land use. These four actions are the proposed construction projects within the NAS Whiting Field installation boundary: the P-285 South Field Paraloft, the P-253 North Field Air Traffic Control Tower, the P-265 Helicopter Squadrons Applied Instruction Facility, and the P-279 Child Development Center.

4.4.6.3 Cumulative Impact Analysis

Proposed construction at NAS Whiting Field that would occur in the airfield operations area would be consistent with existing airfield operations and training activities land use. All project-related construction would occur within the boundaries of NAS Whiting Field and would not conflict with surrounding land uses off station. The land use at NOLF Site X changed to military when it was acquired by the Navy and placed into operations use in January 2019. Several of the housing subdivision projects are located in areas that were rezoned from agricultural/rural residential to single-family residential, or medium density residential. The other projects would not result in changes to land use. No adverse land use incompatibilities would be introduced when the Action Alternative is considered along with the past, present, and reasonably foreseeable future projects. The past and present actions were included in the affected environment. The Action Alternative introduced negligible impacts to land use compatibilities. In terms of Clear Zones and Accident Potential Zones (APZs), none of the past, present, or reasonably foreseeable actions would require changes to these zones. Therefore, no land use incompatibilities would occur in terms of Clear Zones and APZs. Therefore, implementation of the Action Alternative combined with the past, present, and reasonably foreseeable future projects, would not result in significant cumulative land use impacts within the ROI.

4.4.7 Infrastructure

4.4.7.1 Description of Geographic Study Area

For the purposes of cumulative impacts analysis, the ROI for infrastructure encompasses the NAS Whiting Field installation boundary, and Santa Rosa County.

4.4.7.2 Relevant Past, Present, and Future Actions

Seven relevant past, present, or future actions have been identified as having potential cumulative impacts to infrastructure. These seven actions are the three housing developments: the Plantation Woods Phase V, the Pace Mill Creek Phase IV, the Hawk’s Landing Phase II, and the four proposed construction projects within the installation boundary: the P-285 South Field Paraloft, the P-253 North Field Air Traffic Control Tower, the P-265 Helicopter Squadrons Applied Instruction Facility, and the P-279 Child Development Center.

4.4.7.3 Cumulative Impact Analysis

Although there would be a temporary surge in demand of electricity, water, and waste services during construction, these demands would be phased over multiple years. As a result, impacts to the local utilities would not be expected to be significant. The increase of 73 people to the area (33 total personnel and 40 total family members) would not create an unnecessary burden to the infrastructure of Santa Rosa County, and the proposed developments would serve to accommodate the influx of people to the county.

The proposed projects within the installation boundary, when combined with the projects proposed for the AHTS, may place an increased demand on the utilities that service NAS Whiting Field. However, based on improvements planned for these utilities, it is anticipated that electricity, natural gas, wastewater, telecommunications, and cable service would continue to expand and be upgraded as needed to accommodate the future growth and development of the region. Many of the future projects have proposed infrastructure improvements including upgrades to existing facilities or package plants constructed within the developments to offset the additional demand.

Therefore, implementation of the Action Alternative combined with the past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts to infrastructure within the ROI.

4.4.8 Public Health and Safety

4.4.8.1 Description of Geographic Study Area

For the purposes of cumulative impacts analysis, the ROI for public health and safety encompasses the NAS Whiting Field installation boundary, the six NOLFs associated with helicopter training: Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw, and associated airspace.

4.4.8.2 Relevant Past, Present, and Future Actions

Only two projects were identified as having the potential for cumulative impacts to public health and safety: Land Exchange Involving Naval Air Station (NAS) Whiting Field’s NOLF Site 8 in Escambia County for Suitable Land and Improvements in Santa Rosa County, Florida and P-253 North Field Air Traffic Control Tower. The remaining past and future Navy projects are internal to NAS Whiting Field and NOLFs and would not result in health and safety impacts to the surrounding communities. The present and reasonably foreseeable road improvement and housing projects identified in Table 4.3-1 would have no cumulative impacts with regards public health and safety when considered with the Action Alternative because these projects would occur outside of the ROI for cumulative impacts.

4.4.8.3 Cumulative Impact Analysis

The assessment of the Action Alternative includes proposed TH-XX flight training operations at NOLF Site X in the evaluation of impacts to public health and safety; NOLF Site X is also addressed in the Land Exchange Involving NAS Whiting Field’s NOLF Site 8 in Escambia County for Suitable Land and Improvements in Santa Rosa County, Florida. Aircraft operations at NOLF Choctaw, as related to the F-35 Beddown at Eglin Air Force Base, would not result in adverse cumulative impacts to public health and safety. The increased operations under the Action Alternative would be conducted under existing safety procedures and protocols to minimize potential impacts to the surrounding communities and would not result in adverse cumulative impacts to public health and safety. Highly trained maintenance crews would continue to perform inspections on each aircraft in accordance with Navy regulations, and maintenance activities would be monitored to ensure that aircraft are equipped to withstand the rigors of training events safely. Construction of the North Field Air Traffic Control Tower would have beneficial impacts to public health and safety as it provides state-of-the-art facilities with which to manage air traffic and would improve operational safety. Therefore, implementation of the Action Alternative combined with the past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts to public health and safety within the ROI.

4.4.9 Hazardous Materials and Wastes

4.4.9.1 Description of Geographic Study Area

The ROI for hazardous materials and wastes is the proposed project areas at NAS Whiting Field and the associated NOLFs.

4.4.9.2 Relevant Past, Present, and Future Actions

The projects identified in Table 4.3-1 are anticipated to have short-term increases in the use and generation of hazardous materials and wastes during demolition, renovation and/or construction. Past projects at NAS Whiting Field would not have cumulative impacts with regards to hazardous waste when considered with the proposed projects as these projects have been completed and would have no further impacts with regards to hazardous materials and wastes. The present and reasonably foreseeable road improvement projects identified in Table 4.3-1 would have no cumulative impacts with regards to hazardous materials and wastes when considered with the Action Alternative because these projects would occur outside of the ROI for cumulative impacts.

Operational increases associated with the replacement of T-34C aircraft with the T-6 Joint Primary Aircraft Training System would be considered as the operational baseline for the Action Alternative.

4.4.9.3 Cumulative Impact Analysis

The construction activities associated with the Action Alternative, along with the Navy construction projects identified in Table 4.3-1, would result in short-term increases in the use and generation of hazardous materials and wastes that would cease at the completion of demolition, renovation, and/or construction. The majority of hazardous materials are anticipated to be used up during these activities. Any unused hazardous materials would be managed in accordance with Federal and State regulations and Navy procedures for working with hazardous materials. Hazardous wastes generated by these projects could include special hazards such as asbestos, lead paints, polychlorinated biphenyl and mercury-containing equipment as well as contaminated soil and sediment from Environmental Restoration Program sites. The removal and proper disposal of these substances would be managed in accordance with Federal and State requirements and would have a beneficial cumulative impact.

Increased flight training operations would result in small increases in the volume of hazardous wastes used to maintain aircraft but no new hazardous materials are anticipated to be required to support aircraft maintenance activities. Maintenance facilities and hangars would be equipped with hazardous materials storage areas, as appropriate, that would support operations within the new facility. Hazardous materials would be managed in compliance with applicable Federal and State regulations and the Navy Consolidated Hazardous Material Reutilization and Inventory Management Program.

The Navy is in the process of identifying legacy aqueous film-forming foam systems at installations and removing this aqueous film-forming foam for proper disposal/destruction. The Navy has tested the newest formulations of aqueous film-forming foam, and updated the aqueous film-forming foam military specification setting low limits for perfluorooctane sulfonate and perfluorooctanoic acid (Department of the Navy Office of Information, 2018).

Therefore, implementation of the Action Alternative combined with the past, present, and reasonably foreseeable future projects, would not result in significant cumulative impacts to hazardous materials and wastes within the ROI.

4.4.10 Environmental Justice

4.4.10.1 Description of Geographic Study Area

The ROI for the analysis of effects to noise associated with the Action Alternative is the area underlying APZs and modeled noise contours ≥65 dB DNL from helicopter operations under the Action Alternative.

4.4.10.2 Relevant Past, Present, and Future Actions

All the present and reasonably foreseeable future actions have the potential to interact with the Action Alternative and affect environmental justice.

4.4.10.3 Cumulative Impact Analysis

There would be no change to the Clear Zones or APZs under the Action Alternative. Noise would represent the only potential cumulative environmental justice impact when considering the Action Alternative with past, present, and reasonably foreseeable projects. The cumulative noise impacts from the proposed construction would have a marginal short-term increase in overall noise levels in the study area due to construction. However, these construction projects are within NAS Whiting Field and would not impact environmental justice communities outside of the installation boundary.

Past, present, and reasonably foreseeable projects would not generate noise in the vicinity of the NOLFs; therefore, when considered with noise impacts on environmental justice communities from the Action Alternative, no cumulative effects would occur.

Therefore, implementation of the Action Alternative combined with the past, present, and reasonably foreseeable future projects, would not result in cumulative disproportionately high and adverse impacts to low-income or minority populations, or significant cumulative impacts to environmental justice populations within the ROI.

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5 Other Considerations Required by NEPA

5.1 Consistency with Other Federal, State, and Local Laws, Plans, Policies, and Regulations

In accordance with 40 Code of Federal Regulations (CFR) section 1502.16(c), analysis of environmental consequences shall include discussion of possible conflicts between the Action Alternative and the objectives of federal, regional, state, and local land use plans, policies, and controls. Table 5.1-1 identifies the principal Federal and State laws and regulations that are applicable to the Action Alternative, and describes briefly how compliance with these laws and regulations would be accomplished.

Table 5.1-1 Principal Federal and State Laws Applicable to the Proposed Action

Federal, State, Local, and Regional Land Use Plans, Policies, and Controls	***Status of Compliance***
National Environmental Policy Act (NEPA); Council on Environmental Quality (CEQ) NEPA implementing regulations; Navy procedures for implementing NEPA	This Environmental Assessment (EA) has been prepared in accordance with the CEQ regulations implementing NEPA, and Navy NEPA procedures. Appropriate public participation and review are being conducted in compliance with NEPA.
Clean Air Act	The applicable regulatory setting and impact analysis is discussed in Section 3.1, *Air Quality*. The air quality analysis concludes that under the Action Alternative's proposed emissions: (1) would not create a major regional source of air pollutants or affect the current attainment status at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida, and (2) would comply with all applicable state and regional air agency rules and regulations.
Clean Water Act	The applicable regulatory setting and impact analysis is discussed in Section 3.2, *Water Resources*. There would be an increase of 6.5 acres of impervious surfaces at NAS Whiting Field as a result of the Action Alternative; however, proper post-construction stormwater management features would be incorporated into the project planning and site design to offset potential increases in runoff, to maintain the pre-project hydrology. When completed, the Action Alternative would not result in a net increase in stormwater volume and sediment or nutrient loading to area water bodies.
Coastal Zone Management Act	The applicable regulatory setting is discussed in Section 3.6.2.3., *Land Use.* Implementing the Action Alternative (construction and operations) would be consistent, to the maximum extent practicable, with the enforceable policies of the Florida Coastal Management Program. A copy of the Coastal Consistency Determination is provided in *Appendix D, Coastal Consistency Determination*. On August 13, 2019 Florida Department of Environmental Protection concurred that the Navy's Action Alternative at NAS Whiting Field is consistent with the enforceable policies of the Florida Coastal Management Program.

Table 5.1-1 Principal Federal and State Laws Applicable to the Proposed Action

Federal, State, Local, and Regional Land Use Plans, Policies, and Controls	***Status of Compliance***
National Historic Preservation Act	The applicable regulatory setting is discussed in Section 3.3, *Cultural Resources*. Because of the previous disturbance, and the lack of previously identified archaeological resources in the Area of Potential Effects (APE), it is unlikely that the Action Alternative would have significant impacts to archaeological resources from ground disturbance associated with Advanced Helicopter Training System (AHTS) facility development. The five buildings that involve potential demolition (Buildings 1406, 1454, 2977, 2978, and 3005) and the one building proposed for renovation (Building 2946) were determined not eligible for listing in the National Register of Historic Places (NRHP). The Navy consulted with Florida Division of Historical Resources, and received concurrence on August 20, 2019 with the extent of the APE and the determination of No Historic Properties Affected. The Action Alternative would be in compliance with Section 106 of the National Historic Preservation Act (NHPA).
Endangered Species Act	The applicable regulatory setting is discussed in Section 3.4, *Biological Resources*. Pursuant to the Endangered Species Act, no effects to threatened and endangered species would occur; therefore, consultation with U.S. Fish and Wildlife Service is not required.
Migratory Bird Treaty Act	The applicable regulatory setting is discussed in Section 3.4, *Biological Resources*. Impacts to Migratory Bird Treaty Act-protected species and their active nests would be avoided during construction. The Navy has determined that the Proposed Action would not be likely to result in the take of migratory birds through aircraft strikes at NAS Whiting Field and its NOLFs. In the event a migratory bird strike were to occur, that take would not result in significant adverse effects on a population of a migratory bird species. The increase in flight training operations as part of the Proposed Action is a military readiness activity; therefore, any takes are in compliance with the Migratory Bird Treaty Act and the regulations authorizing incidental take of migratory birds from military readiness activities.
Bald and Golden Eagle Protection Act	The applicable regulatory section is discussed in Section 3.4, *Biological Resources*. Bald eagles have been observed at NAS Whiting Field and its associated NOLFs. The Action Alternative would not result in take of bald eagles under the Bald and Golden Eagle Protection Act, as injury or mortality to birds are not anticipated given the implementation of measures in the Bird/Animal Aircraft Strike Hazard (BASH) Plan. Additionally, bald eagles would not be disturbed to the point that would significantly interfere with the eagle's normal breeding, feeding, or sheltering behavior, nor would it result in nest abandonment.
Resource Conservation and Recovery Act	The applicable regulatory setting is discussed in Section 3.9, *Hazardous Materials and Wastes*. Management of any hazardous wastes would be conducted in accordance with the Resource Conservation and Recovery Act.
Toxic Substances Control Act	The applicable regulatory setting is discussed in Section 3.9, *Hazardous Materials and Wastes*. Management of any listed chemicals would be conducted in accordance with the Toxic Substances Control Act.

Table 5.1-1 Principal Federal and State Laws Applicable to the Proposed Action

Federal, State, Local, and Regional Land Use Plans, Policies, and Controls	*Status of Compliance*
Executive Order (EO) 11988, Floodplain Management	The applicable regulatory setting is discussed in Sections 3.2.1, *Water Resources*. No 100-year floodplains are located within the boundary of the project area.
EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations	The applicable regulatory setting is discussed in Section 3.10, *Environmental Justice*. The Proposed Action would have no disproportionately high and adverse human health or environmental effects on minority populations and low-income populations.
EO 13045, Protection of Children from Environmental Health Risks and Safety Risks	The applicable regulatory setting is discussed in Sections 3.8, *Public Health and Safety*. The Proposed Action would not result in environmental health risks or safety risks that may disproportionately affect children.
EO 13175, Consultation and Coordination with Indian Tribal Governments	The applicable regulatory setting is discussed in Sections 3.3, *Cultural Resources*. The Navy consults with federally recognized Indian tribes on actions with the potential to significantly affect protected tribal resources, tribal treaty rights, or Indian lands. No Tribe(s) with Usual and Accustomed grounds and stations have been identified at NAS Whiting Field or the associated NOLFs.
EO 13834, Efficient Federal Operations	Facility development would be required to comply with EO 13834, *Efficient Federal Operations*, for increasing efficiency, optimizing performance, eliminating unnecessary use of resources, and protecting the environment.

5.2 Irreversible or Irretrievable Commitments of Resources

Resources that are irreversibly or irretrievably committed to a project are those that are used on a long-term or permanent basis. This includes the use of non-renewable resources such as metal and fuel, and natural or cultural resources. These resources are irretrievable in that they would be used for this project when they could have been used for other purposes. Human labor is also considered an irretrievable resource. Another impact that falls under this category is the unavoidable destruction of natural resources that could limit the range of potential uses of that particular environment.

Implementation of the Proposed Action would involve human labor; the consumption of fuel, oil, and lubricants for construction vehicles. Implementing the Proposed Action would not result in significant irreversible or irretrievable commitment of resources.

5.3 Unavoidable Adverse Impacts

This EA has determined that the No Action and the Preferred Alternative would not result in any significant impacts. Implementing the Preferred Alternative would result in the following unavoidable, yet not adverse, environmental impacts: impacts with 6.5 acres of impervious surface added.

5.4 Relationship Between Short-Term Use of the Environment and Long-Term Productivity

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

In the short-term, effects to the human environment with implementation of the Proposed Action would primarily relate to the construction activity itself. Air quality and noise would be impacted in the short-term. In the long-term, the 22 percent increase in operations would result in additional air emissions. The construction of the facility and operations would not significantly impact the long-term natural resource productivity of the area. The Proposed Action would not result in any impacts that would significantly reduce environmental productivity or permanently narrow the range of beneficial uses of the environment.

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Appendix A: Air Quality Calculations

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CONSTRUCTION EMISSIONS

Clearing		1	Acres							
Off-road Equipment	**Hours of Operation**	**Engine HP**	**Load Factor**	**VOC**	**CO**	**NOx**	**SO_2**	**PM10**	**PM2.5**	**CO_2**
				g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr	g/hp-hr
Dozer	12	145	0.58	0.38	1.41	4.17	0.12	0.30	0.29	536
Loader/Backhoe	12	87	0.21	1.43	7.35	6.35	0.15	1.06	1.03	692
Small Backhoe	12	55	0.21	1.43	7.35	6.35	0.15	1.06	1.03	692
				VOC	**CO**	**NOx**	**SO2**	**PM10**	**PM2.5**	**CO_2**
				lb	lb	lb	lb	lb	lb	lb
			Dozer	0.81	3.04	8.98	0.25	0.64	0.62	1,152.14
			Loader w/ integral Backhoe	0.67	3.43	2.97	0.07	0.50	0.48	323.17
			Small backhoe	0.42	2.17	1.88	0.04	0.31	0.30	204.30
On-road Equipment	**Hours of Operation**	**Engine HP**	**Speed (mph)**	**VOC**	**CO**	**NOx**	**SO_2**	**PM10**	**PM2.5**	**CO_2**
				lb/mile	lb/mile	lb/mile	lb/mile	lb/mile	lb/mile	lb/mile
Dump Truck	5	230	45	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
				VOC	**CO**	**NOx**	**SO2**	**PM**	**PM2.5**	**CO_2**
				lb	lb	lb	lb	lb	lb	lb
			Dump Truck	0.36	1.92	8.62	0.00	0.36	0.35	822
			Subtotal in lbs	2	11	22	0	2	2	2501
			Clearing Grand Total in Tons	**0.00**	**0.01**	**0.01**	**0.00**	**0.00**	**0.00**	**1.3**
			Clearing Grand Total in Metric Tons							**1.1**

Site Prep - Excavate/Fill - Trenching - Grading										
Site Prep - Excavate/Fill (CY)	24,293	CY								
Trenching (LF)	2,233	LF		248	CY					
Grading (SY)	39,037	SY			Assume compact 0.5 feet (0.166 yards)			6,480	CY compacted	
Off-road Equipment	**Hours**	**Engine HP**	**Load Factor**	**VOC** g/hp-hr	**CO** g/hp-hr	**NOx** g/hp-hr	**SO_2** g/hp-hr	**PM10** g/hp-hr	**PM2.5** g/hp-hr	**CO_2** g/hp-hr
Excavator	81	243	0.59	0.34	1.21	4.03	0.12	0.22	0.22	536
Skid Steer Loader	97	160	0.23	0.38	1.47	4.34	0.12	0.31	0.30	536
Dozer (Rubber Tired)	88	145	0.59	0.38	1.41	4.17	0.12	0.30	0.29	536
Compactor	30	103	0.58	0.40	1.57	4.57	0.12	0.32	0.31	536
Grader	14	285	0.58	0.34	1.21	4.07	0.12	0.23	0.22	536
Backhoe/Loader	4	87	0.59	0.35	1.25	4.23	0.12	0.24	0.23	536
				VOC	**CO**	**NOx**	**SO2**	**PM**	**PM2.5**	**CO_2**
				lb	lb	lb	lb	lb	lb	lb
			Excavator	8.80	30.95	103.14	2.95	5.70	5.53	13,713.51
			Skid Steer Loader	3.02	11.59	34.20	0.91	2.41	2.34	4,223.02
			Dozer (Rubber Tired)	6.25	23.48	69.28	1.91	4.91	4.77	8,892.87
			Compactor	1.56	6.20	18.04	0.46	1.26	1.22	2,116.41
			Grader	1.74	6.10	20.56	0.58	1.14	1.11	2,706.74
			Backhoe/loader	0.14	0.50	1.70	0.05	0.10	0.09	214.90
On-road Equipment	**# trips**	**Engine HP**	**ave RT distance (mi)**	**VOC** lb/mile	**CO** lb/mile	**NOx** lb/mile	**SO2** lb/mile	**PM** lb/mile	**PM2.5** lb/mile	**CO_2** lb/mile
Dump Truck	2,024	265	60	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
				VOC	**CO**	**NOx**	**SO2**	**PM**	**PM2.5**	**CO_2**
				lb	lb	lb	lb	lb	lb	lb
			Delivery Truck	184.79	976.81	4381.20	2.19	182.74	177.06	417657.28
			Subtotal (lbs):	**188**	**206**	**1056**	**4628**	**9**	**198**	**192**
			Site Prep Work Grand Total in Tons	**0.09**	**0.10**	**0.53**	**2.31**	**0.00**	**0.10**	
			Site Prep Work Grand Total in Metric Tons							**0.09**

Gravel Work	9,349	CY								
Off-road Equipment	Hours	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM_{10} g/hp-hr	$PM_{2.5}$ g/hp-hr	CO_2 g/hp-hr
Dozer	88	185	0.59	0.34	1.21	4.08	0.12	0.23	0.22	536
Wheel Loader for Sprea	110	87	0.59	0.35	1.25	4.23	0.12	0.24	0.23	536
Compactor	244	103	0.43	0.36	1.34	4.45	0.12	0.26	0.25	536
				VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
			Dozer	7.31	25.67	86.76	2.45	4.81	4.66	11,394
			Wheel Loader for Spreading	4.36	15.60	52.92	1.44	2.98	2.89	6,697
			Compactor	8.56	31.86	105.94	2.74	6.12	5.93	12,749
On-road Equipment	# trips	Engine HP	ave RT distance (mi)	VOC lb/mile	CO lb/mile	NOx lb/mile	SO2 lb/mile	PM lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck	675	265	60	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
				VOC lb	CO lb	NOx lb	SO2 lb	PM lb	PM2.5 lb	CO_2 lb
			Delivery Truck	61.60	325.60	1460.40	0.73	60.91	59.02	139219.09
			Subtotal (lbs):	**82**	**83**	**401**	**1715**	**8**	**75**	**73**
	Gravel Work Grand Total in Tons			**0.04**	**0.04**	**0.20**	**0.86**	**0.00**	**0.04**	
	Gravel Work Grand Total in Metric Tons									**0.03**

Concrete Work - Foundation and Sidewalks										
	Total	14,098	CY	Note: Assume all excavated soil is accounted for in Excavate/Fill and Trenching						
				Emission Factors						
Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Concrete Mixer	298	3.5	0.43	0.69	3.04	6.17	0.13	0.54	0.52	588
Concrete Truck	269	300	0.43	0.38	1.75	6.18	0.11	0.27	0.26	530
				Annual Emissions						
				VOC lb	CO lb	NOx lb	SO2 lb	PM lb	PM2.5 lb	CO_2 lb
			Concrete Mixer	0.68	3.01	6.10	0.13	0.53	0.52	581.57
			Concrete Truck	29.08	133.77	473.73	8.73	20.59	19.97	40,603.01
			Subtotal (lbs):	**30**	**137**	**480**	**9**	**21**	**20**	**41,185**
	Concrete Work Grand Total in Tons			**0.01**	**0.07**	**0.24**	**0.00**	**0.01**	**0.01**	21
	Concrete Work Grand Total in Metric Tons									**19**

Flight Simulator Facility

52,052 SF

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
				Emission Factors						
Crane	260	330	0.58	0.25	1.22	5.26	0.11	0.21	0.20	530
Diesel Generator	260	40	0.43	0.26	1.41	3.51	0.11	0.23	0.22	536
Telehandler	208	99	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Scissors Lift	521	83	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
Skid Steer Loader	416	67	0.59	1.69	7.97	6.70	0.15	1.19	1.15	691
Pile Driver	260	260	0.43	0.46	1.55	5.90	0.11	0.31	0.30	530
All Terrain Forklift	10	84	0.59	0.51	3.94	4.93	0.13	0.52	0.51	595
				Annual Emissions						
				VOC	**CO**	**NOx**	**SO2**	**PM**	**PM2.5**	**CO_2**
				lb	lb	lb	lb	lb	lb	lb
			Crane	26.98	133.93	577.64	12.53	22.81	22.13	58,238
			Diesel Generator	2.59	13.90	34.62	1.07	2.29	2.22	5,292
			Telehandler	13.66	105.63	132.15	3.43	13.97	13.55	15,942
			Scissors Lift	28.63	221.40	276.99	7.19	29.28	28.41	33,415
			Skid Steer Loader	61.42	289.15	243.07	5.39	43.15	41.86	25,072
			Pile Driver	29.77	99.55	378.60	7.31	20.13	19.53	33,975
			All Terrain Forklift	0.56	4.30	5.39	0.14	0.57	0.55	650
			Subtotal (lbs):	**262**	**1389**	**3986**	**38**	**230**	**223**	**395,401**
			Building Construction Grand Total in Tons	**0.13**	**0.69**	**1.99**	**0.02**	**0.11**	**0.11**	
			Building Construction Grand Total in Metric Tons							**179**

Hangar Construction

165,628 SF

Off-road Equipment	Cumulative Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM10 g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Crane	994	330	0.58	0.2457015	1.219507	5.259786	0.11407306	0.207722	0.20149	530.2987216
Diesel Generator	5,320	40	0.43	0.4286042	1.939074	4.940145	0.12671328	0.46087	0.447044	589.0709388
Telehandler	1,656	99	0.59	0.5095397	3.939734	4.928977	0.127904404	0.52112	0.505486	594.613562
Scissors Lift	1,325	83	0.59	0.5095397	3.939734	4.928977	0.127904404	0.52112	0.505486	594.613562
Skid steer loader	828	67	0.59	1.6923812	7.967689	6.697903	0.148593624	1.189147	1.153472	690.8722008
pile driver	818	260	0.43	0.4640382	1.551822	5.901968	0.113927487	0.313865	0.304449	529.6372363
all terrain forklift	818	84	0.59	0.5095397	3.939734	4.928977	0.127904404	0.52112	0.505486	594.613562
On-road Equipment	**# trips**	**Engine HP**	**distance (mi)**	**VOC lb/mile**	**CO lb/mile**	**NOx lb/mile**	**SO2 lb/mile**	**PM lb/mile**	**PM2.5 lb/mile**	**CO_2 lb/mile**
Concrete truck	1,194	300	60	1.66E-03	8.58E-03	3.92E-02	0	1.69E-03	1.64E-03	3
				VOC	**CO**	**NOx**	**SO2**	**PM**	**PM2.5**	**CO_2**
				lb	lb	lb	lb	lb	lb	lb
			Crane	103.03	511.38	2205.62	47.84	87.11	84.49	222,374
			Diesel Generator	86.47	391.20	996.65	25.56	92.98	90.19	118,842
			Telehandler	108.68	840.28	1051.27	27.28	111.15	107.81	126821.33
			Scissors Lift	72.89	563.58	705.09	18.30	74.55	72.31	85059.96
			Skid steer loader	122.14	575.04	483.40	10.72	85.82	83.25	49861.44
			pile driver	93.55	312.84	1189.83	22.97	63.27	61.38	106774.01
			all terrain forklift	45.54	352.08	440.49	11.43	46.57	45.17	53138.75
				VOC	**CO**	**NOx**	**SO2**	**PM**	**PM2.5**	**CO_2**
				lb	lb	lb	lb	lb	lb	lb
			Concrete truck	78.66	406.64	1858.97	0.86	80.15	77.83	160,321
			Subtotal (lbs):	**710.95**	**3953.06**	**8931.32**	**164.96**	**641.60**	**622.44**	**923,192**
			Building Construction Grand Total in Tons	**0.36**	**1.98**	**4.47**	**0.08**	**0.32**	**0.31**	
			Building Construction Grand Total in Metric Tons							**419**

Material Deliveries

On-road Equipment	# trips	Engine HP	ave RT distance (mi)	VOC lb/mile	CO lb/mile	NOx lb/mile	SO2 lb/mile	PM lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Delivery Truck	1,080	265	60	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
				VOC lb	CO lb	NOx lb	SO2 lb	PM lb	PM2.5 lb	CO_2 lb
			Delivery Truck	98.58	521.12	2337.34	1.17	97.49	94.46	222,817
			Building Construction Grand Total in Tons	**0.05**	**0.26**	**1.17**	**0.00**	**0.05**	**0.05**	
			Building Construction Grand Total in Metric Tons							**101**

Building Demolition

153,024 SF — 7,651 Estimated CY of debris based on 20 SF/CY

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	Emission Factors VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO_2 g/hp-hr	PM_{10} g/hp-hr	$PM_{2.5}$ g/hp-hr	CO_2 g/hp-hr
Hydraulic excavator	1,275	86	0.59	0.23	2.57	2.68	0.11	0.40	0.39	595.46
Loader /Backhoe	1,275	87	0.23	1.07	6.13	5.02	0.14	0.95	0.92	692.77
air compressor	1,275	49	0.59	0.26	1.41	3.51	0.11	0.23	0.22	536.20
				Annual Emissions VOC lb	CO lb	NOx lb	SO_2 lb	PM_{10} lb	$PM_{2.5}$ lb	CO_2 lb
			Hydraulic excavator	32.66	366.59	382.30	16.21	57.47	55.75	84,928.29
			Loader /Backhoe	60.01	344.66	282.43	7.96	53.37	51.77	38,965.57
			air compressor	21.33	114.49	285.09	8.77	18.84	18.28	43,573.07
			Subtotal (lbs):	114.00	825.74	949.83	32.94	129.68	125.79	167466.93

On-road Equipment	# trips	Engine HP	ave RT distance (mi)	VOC lb/mile	CO lb/mile	NOx lb/mile	SO2 lb/mile	PM lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck	638	265	60	0.0015	0.0080	0.0361	0.0000	0.0015	0.0015	3.4385
				VOC lb	CO lb	NOx lb	SO2 lb	PM lb	PM2.5 lb	CO_2 lb
			Delivery Truck	58.20	307.65	1379.90	0.69	57.56	55.77	131544.82
			Subtotal (lbs):	172.20	1,133.40	2,329.72	33.63	187.24	181.56	299,011.76
			Building Demo Grand Total in Tons	**0.086**	**0.567**	**1.165**	**0.017**	**0.094**	**0.091**	
			Building Demo Grand Total in Metric Tons							**135.63**

Paving Surface and Paving HMA

Pavement - Surface Area	59,681	SF	2,503	CY
Paving - HMA	67,575	CF		

Off-road Equipment	Hours of Operation	Engine HP	Load Factor	VOC g/hp-hr	CO g/hp-hr	NOx g/hp-hr	SO2 g/hp-hr	PM g/hp-hr	PM2.5 g/hp-hr	CO_2 g/hp-hr
Grader	183	145	0.59	0.38	1.41	4.16	0.12	0.30	0.29	536
Roller	274	401	0.59	0.34	2.46	5.53	0.12	0.34	0.33	536
Paving Machine	366	164	0.59	0.38	1.44	4.25	0.12	0.30	0.29	536
Asphalt Curbing Machine	37	130	0.59	0.40	1.57	4.57	0.12	0.32	0.31	536
				VOC lb	**CO lb**	**NOx lb**	**SO2 lb**	**PM lb**	**PM2.5 lb**	**CO_2 lb**
			Grader	12.97	48.68	143.45	3.97	10.19	9.89	18,466
			Roller	48.81	352.18	791.49	16.48	48.43	46.98	76,619
			Paving Machine	29.63	112.48	331.57	8.99	23.39	22.69	41,771
			Asphalt Curbing Machine	2.44	9.71	28.22	0.71	1.97	1.91	3,311

On-road Equipment	# trips	Engine HP	distance (mi)	VOC lb/mile	CO lb/mile	NOx lb/mile	SO2 lb/mile	PM lb/mile	PM2.5 lb/mile	CO_2 lb/mile
Dump Truck	1,117	230	60	0.001521	0.008042	0.036070	1.80E-05	0.001504	0.001458	3.438541
				VOC lb	**CO lb**	**NOx lb**	**SO2 lb**	**PM lb**	**PM2.5 lb**	**CO_2 lb**
			Dump Truck	101.99	539.15	2,418.19	1.21	100.86	97.73	230,525

Hot Mix Asphalt (HMA)	Volume of HMA (ft^3)	Weight of HMA (tons)	VOC lb/ton	VOC lb	CO lb	NOx lb	SO2 lb	PM10 lb	PM2.5 lb	CO_2 lb
Standard Hot Mix Asphalt	67,575	4,899	0.04	195.96	-	-	-	-	-	-
			Subtotal (lbs):	**392**	**1,062**	**3,713**	**31**	**185**	**179**	**370,693**
			Paving Grand Total in Tons	**0.20**	**0.53**	**1.86**	**0.02**	**0.09**	**0.09**	
			Paving Grand Total in Metric Tons							**168**

Fugitive Dust Emissions:

PM 10 tons/acre/mo	acres	days of disturbance	PM 10 Total	PM 2.5/PM 10 Ratio	PM 2.5 Total
0.42	2	90	3	0.1	0.3

Construction Worker POV emissions

	# vehicles	# days	mi/day	VOC lb/mi	CO lb/mi	NOx lb/mi	SO2 lb/mi	PM10 lb/mi	PM2.5 lb/mi	CO_2 lb/mi
annually	30	350	60	0.000547	0.00472	0.00044	1.07216E-05	0.000095	6.3E-05	1.10
				VOC lb	**CO lb**	**NOx lb**	**SO2 lb**	**PM10 lb**	**PM2.5 lb**	**CO_2 lb**
				344	2972	275	7	60	39	696,125
			POV Grand Total in Tons	**0.17**	**1.49**	**0.14**	**0.00**	**0.03**	**0.02**	
			POV Total in Metric Tons							**316**

Annual Emission Totals:

VOC T/yr	CO T/yr	NOx T/yr	SO2 T/yr	PM 10 T/yr	PM 2.5 T/yr	CO_2 MT/yr
1.1	5.7	11.8	3.3	3.6	1.1	1,339

Construction Emission Assumptions for NAS Whiting Field								
	453.59	grams per pound						
2019-2025								
Temp Maintenance Hangar		52,534	sf concrete pad		11	months construction		
Jan - Nov 2020		5,000	sf parking apron					
		3,196	cy excavation		266	trucks of dirt hauled out		
		2,131	cy concrete		237	concrete trucks		
		1,065	cy gravel		89	trucks of gravel hauled in		
		6,393	SY grading		220	Material Deliveries		
		1,100	LF sidewalk					
		1,833	ft trenching					
Temp GBTS Structure		16,440	sf concrete pads		2	months construction		
Oct 2019 - May 2021		32,880	cf excavation		40	Material Deliveries		
		1,218	cy excavation		101	trucks of dirt hauled out		
		812	cy concrete		90	concrete trucks		
		406	cy gravel		34	trucks of gravel hauled in		
		1,827	SY grading					
Maintenance Hangar		165,628	sf bldg		30	months construction duration		
Oct 2022 - May 2025		331,256	cf excavation		600	Material Deliveries		
		12,269	cy excavation		1,022	trucks of dirt hauled out		
		8,179	cy concrete		909	concrete trucks		
		4,090	cy gravel		341	trucks of gravel hauled in		
		300	ft trenching					
		1	acre land clearing					
		841	piles		53	truckloads at 16 2-ft wide/load		
		18,403	SY grading					
Apron, Towway		23,681	sf asphalt		6	months construction duration		
Oct 2022 - May 2025		100	ft trenching		60	Material Deliveries		
		1,754	cy excavation		146	trucks of dirt hauled out		
		1,169	cy asphalt		97	asphalt trucks		
		585	cy gravel		49	trucks of gravel hauled in		
		2,631	SY grading					
Construct flight simulator facility		52,052	sf		10	months construction		
Oct 2024 - Aug 2025		3,856	cy excavation		321	trucks of dirt hauled out		
		2,570	cy concrete		286	concrete trucks		
		1,285	cy gravel		107	trucks of gravel hauled in		
		100	ft trenching		200	Material Deliveries		
		5,784	SY grading					
Construct parking lot		36,000	sf asphalt		4	months construction duration		
Oct 2024 - Aug 2025		4,000	sy grading					
		2,000	cy excavation		167	trucks of dirt hauled out		
		1,333	CY asphalt		111	trucks of asphalt brought in		
		667	cy gravel		56	trucks of gravel hauled in		
Demo 2977, 2978, 1454 & 1406		118,248	sf bldg		2	month demolition		
Assume 1 CY construction debris per 20 SF of building								
		5,912	CY demolition debris		493	Truck loads demolition debris		
Demolish 3005		34,776	sf bldg		1	month demolition		
Assume 1 CY construction debris per 20 SF of building								
		1,739	CY demolition debris		145	Truck loads demolition debris		
					average passenger vehicle			
					404	grams of CO2 per mile		
					0.89	lb of CO2 per mile		
CO2 emissions	2,877		6,464,704	miles				
			562	cars driving 11,500 miles per year				
	3563		8,006,167	miles				
			696	cars driving 11,500 miles per year				

Total Truck Trips					
			parking for	150	
Dirt	2,024		sidewalks	344	sf
Concrete	613		piles	25219	ft
Gravel	675				
Asphalt	1,117				
Demo Debris	638		5,513		
Materials Delivery	1,120		Excavation	24,293	cy
Grand Total Truck Trips	6,187				
Ave # Truck Trip/Day	25				

CY material brought in	CY material taken out
25,578	31,944
Trenching area SF	3,350
Material removed	93
Total new Bldg SF	217,680
area to be graded SF	351,335
area to be graded SY	39,037
excavation CY	23,626
bldg demo CY	7,651
bldg demo SF	153,024
Paving area	59,681

				average passenger vehicle	
				404	grams of CO2 per mile
				0.89	lb of CO2 per mile
CO2 emissions	1,339		3,007,960	miles	
			262	cars driving 11,500 miles per year	

AIRCRAFT EMISSIONS

Aircraft Emissions

UH-1N Operations	UH-1N Emissions (in lbs/op unless noted in left column)					
	Fuel Used	THC	CO	NOx	PM2.5[1]	CO_2
	From AESO LTO Report 9904C					
LTO Cycle	280.4	0.672	3.316	1.280	1.178	893.3
Cruise (lbs/hr)	692.4	0.090	0.699	4.009	2.908	2220.7
Maintenance Test (lb/yr)	5218.7	21.742	99.858	20.864	21.918	16542.2
	From AESO MO Report 9962B					
Rocks & Block	137.7	0.028	0.391	0.714	0.578	441.3
Stop & Go	52.7	0.017	0.249	0.251	0.221	168.6
Touch & Go	37.7	0.007	0.125	0.188	0.158	120.7
Ground Controlled Approach Box	106.0	0.020	0.365	0.518	0.445	339.7
Insertion and Extraction Rig	73.1	0.012	0.151	0.395	0.307	234.2
Pad Landing	49.3	0.008	0.130	0.255	0.207	157.9
Mountain Pad	65.2	0.014	0.231	0.324	0.274	208.9
Auto Rotation	39.6	0.041	0.236	0.197	0.166	126.7
Hoist/Rappel	101.6	0.019	0.250	0.541	0.427	325.8
Search and Rescue	101.6	0.019	0.250	0.541	0.427	325.8
Field Carrier Landing Pract	52.7	0.017	0.249	0.251	0.221	168.6

[1] PM2.5 = PM10

[1]Touch and goes = Standard Pattern, Tactical Low Altitude, Tactical High-Speed, Tail Rotor/Boost Off

[2]Autorotation = 90° and 180° auto-rotation [3]Special Personnel Insertion= Confined Air Landing (CAL)

[4]Host/Rappel= External Load [5]Mountain Pad= Pinnacle

Aircraft Emissions

UH-1N Operations	Scaling Factor from UH-1N data, Normalized by LTO Emissions					
	Fuel Used	THC	CO	NOx	PM2.5 [1]	CO_2
LTO Cycle	1.00	1.00	1.00	1.00	1.00	1.00
Cruise (lbs/hr)	2.47	0.13	0.21	3.13	2.47	2.49
Maintenance Test (lb/yr)	18.61	32.37	30.12	16.30	18.61	18.52
Rocks & Block	0.49	0.04	0.12	0.56	0.49	0.49
Stop & Go	0.19	0.03	0.07	0.20	0.19	0.19
Touch & Go	0.13	0.01	0.04	0.15	0.13	0.14
Ground Controlled Approach Box	0.38	0.03	0.11	0.40	0.38	0.38
Insertion and Extraction Rig	0.26	0.02	0.05	0.31	0.26	0.26
Pad Landing	0.18	0.01	0.04	0.20	0.18	0.18
Mountain Pad	0.23	0.02	0.07	0.25	0.23	0.23
Auto Rotation	0.14	0.06	0.07	0.15	0.14	0.14
Hoist/Rappel	0.36	0.03	0.08	0.42	0.36	0.36
Search and Rescue	0.36	0.03	0.08	0.42	0.36	0.36
Field Carrier Landing Pract	0.19	0.03	0.07	0.20	0.19	0.19

Aircraft Emissions

UH-1N Operations	Derived³ TH-57 Emissions (in lbs/op unless noted in left column)					
	Fuel Used²	VOC	CO	NOx	PM2.5 ¹	CO_2
LTO Cycle	44.5	1.665	2.185	0.134	0.006	140.1
Cruise (lbs/hr)	109.8	0.223	0.461	0.420	0.015	348.3
Maintenance Test (lb/yr)	827.3	53.878	65.816	2.188	0.111	2594.6
Rocks & Block	21.8	0.069	0.257	0.075	0.003	69.2
Stop & Go	8.3	0.042	0.164	0.026	0.001	26.4
Touch & Go	6.0	0.018	0.082	0.020	0.001	18.9
Ground Controlled Approach Box	16.8	0.051	0.240	0.054	0.002	53.3
Insertion and Extraction Rig	11.6	0.030	0.100	0.041	0.002	36.7
Pad Landing	7.8	0.021	0.086	0.027	0.001	24.8
Mountain Pad	10.3	0.036	0.152	0.034	0.001	32.8
Auto Rotation	6.3	0.102	0.156	0.021	0.001	19.9
Hoist/Rappel	16.1	0.046	0.165	0.057	0.002	51.1
Search and Rescue	16.1	0.046	0.165	0.057	0.002	51.1
Field Carrier Landing Pract	8.3	0.042	0.164	0.026	0.001	26.4

Aircraft Emissions

UH-1N Operations	Derived³ UH-72 Emissions (in lbs unless noted in left column)					
	Fuel Used²	VOC	CO	NOx	PM2.5 ¹	CO_2
LTO Cycle	100.0	3.331	4.368	0.365	0.015	315.3
Cruise (lbs/hr)	247.0	0.446	0.921	1.143	0.036	783.8
Maintenance Test (lb/yr)	1861.7	107.803	131.541	5.948	0.271	5838.7
Rocks & Block	49.1	0.137	0.515	0.204	0.007	155.8
Stop & Go	18.8	0.084	0.327	0.071	0.003	59.5
Touch & Go	13.4	0.036	0.165	0.054	0.002	42.6
Ground Controlled Approach Box	37.8	0.101	0.480	0.148	0.005	119.9
Insertion and Extraction Rig	26.1	0.061	0.199	0.113	0.004	82.7
Pad Landing	17.6	0.041	0.171	0.073	0.003	55.7
Mountain Pad	23.3	0.071	0.304	0.092	0.003	73.7
Auto Rotation	14.1	0.205	0.311	0.056	0.002	44.7
Hoist/Rappel	36.3	0.093	0.330	0.154	0.005	115.0
Search and Rescue	36.3	0.093	0.330	0.154	0.005	115.0
Field Carrier Landing Pract	18.8	0.084	0.327	0.071	0.003	59.5

Baseline Operations – TH-57

Whiting Field South

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	32349	53,850	70,697	4,344	192	4,532,290	3,192
Touch & Go[1]	11835	212	976	234	9	224,035	157
Annual Subtotal in lbs		54,062	71,673	4,578	202	4,756,325	3,349
Annual Total in Tons		27.0	35.8	2.3	0.1	2,378.2	2

NOLF Harold

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	2,829	4,709	6,183	380	17	396,360	279
Cruise	2,829	132	272	248	9	205,638	144
Touch & Go[1]	8,509	153	702	168	7	161,074	113
Auto Rotation[2]	13,090	1,339	2,036	270	11	260,110	182
Spec. Personnel Insertion[3]	2,269	69	226	94	4	83,359	58
Hoist/Rappel[4]	2,269	105	374	129	5	115,944	81
Pad Landing[6]	54,176	1,118	4,645	1,448	57	1,342,068	939
Mountain Pad[5]	2,269	81	345	77	3	74,330	52
Annual Subtotal in lbs		7,706	14,784	2,814	111	2,638,884	1,849
Annual Total in Tons		**3.9**	**7.4**	**1.4**	**0.1**	**1319.4**	**0.9**

NOLF Pace

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	3,094	5,150	6,762	415	18	433,488	305
Cruise	3,094	198	409	373	13	309,239	216
Touch & Go[1]	6,188	111	510	122	5	117,138	82
Pad Landing[6]	92,819	1,916	7,958	2,481	97	2,299,347	1,609
Auto Rotation[2]	24,752	2,533	3,851	511	21	491,845	345
Annual Subtotal in lbs		9,908	19,490	3,903	154	3,651,057	2,558
Annual Total in Tons		**5.0**	**9.7**	**2.0**	**0.1**	**1,825.5**	**1.3**

NOLF Santa Rosa

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	5,039	8,388	11,012	677	30	705,942	497
Cruise	5,039	235	485	442	15	366,255	256
Touch & Go[1]	31,393	563	2,589	620	25	594,264	416
Pad Landing[6]	128,199	2,646	10,991	3,426	134	3,175,800	2,223
Auto Rotation[2]	35,154	3,597	5,469	725	30	698,552	490
Annual Subtotal in lbs		15,429	30,546	5,891	234	5,540,814	3,882
Annual Total in Tons		**7.7**	**15.3**	**2.9**	**0.1**	**2,770.4**	**1.9**

NOLF Spencer

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	6,413	10,675	14,015	861	38	898,500	633
Cruise	6,413	336	694	633	22	524,426	367
Touch & Go[1]	51,304	921	4,232	1,014	41	971,176	680
Pad Landing[6]	153,915	3,177	13,196	4,114	161	3,812,841	2,669
Auto Rotation[2]	51,304	5,250	7,982	1,059	43	1,019,457	715
Annual Subtotal in lbs		20,359	40,118	7,680	305	7,226,401	5,064
Annual Total in Tons		**10.2**	**20.1**	**3.8**	**0.2**	**3613.2**	**2.5**

Baseline Operations – TH-57

NOLF Site 8

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	3,408	5,673	7,447	458	20	477,439	336
Cruise	3,408	476	983	897	31	743,110	520
Touch & Go[1]	10,008	180	825	198	8	189,458	133
Spec. Personnel Insertion[3]	2,129	65	212	88	3	78,225	55
Pad Landing[6]	32,798	677	2,812	877	34	812,487	569
Auto Rotation[2]	9,371	959	1,458	193	8	186,201	131
Annual Subtotal in lbs		8,029	13,738	2,711	105	2,486,920	1,743
Annual Total in Tons		**4.0**	**6.9**	**1.4**	**0.1**	**1,243**	**0.9**

NOLF Choctaw

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	617	1,026	1,348	83	4	86,392	61
Cruise	617	50	104	95	3	78,438	47
Pad Landing[6]	7,395	153	634	198	8	183,186	98
Annual Subtotal in lbs		1,229	2,085	375	15	348,015	206
Annual Total in Tons		**0.6**	**1.0**	**0.2**	**0.0**	**174**	**0.1**

Baseline Annual Emission Totals

Location	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
Whiting Field South	27.0	35.8	2.3	0.1	2,378	1.7
NOLF Harold	3.9	7.4	1.4	0.1	1,319	0.9
NOLF Pace	5.0	9.7	2.0	0.1	1,826	1.3
NOLF Santa Rosa	7.7	15.3	2.9	0.1	2,770	1.9
NOLF Spencer	10.2	20.1	3.8	0.2	3,613	2.5
NOLF Site 8	4.0	6.9	1.4	0.1	1,243	0.9
NOLF Choctaw	0.6	1.0	0.2	0.0	174	0.1
Total	**58**	**96**	**14**	**1**	**13,324**	**9**

No Action Alternative Operations – TH-57

Whiting Field

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	32349	53,850	70,697	4,344	192	4,532,290	3,192
Touch & Go[1]	11834	212	976	234	9	224,035	157
Annual Subtotal in lbs		54,062	71,673	4,578	202	4,756,325	3,349
Annual Total in Tons		**27.0**	**35.8**	**2.3**	**0.1**	**2,378.2**	**2**

NOLF Harold

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	1,994	3,319	4,358	268	12	279,371	197
Cruise	1,994	93	192	175	6	144,943	101
Touch & Go[1]	6,000	108	495	119	5	113,579	80
Auto Rotation[2]	9,230	944	1,436	190	8	183,409	129
Spec. Personnel Insertion[3]	1,600	49	159	66	2	58,781	41
Hoist/Rappel[4]	1,600	74	264	91	3	81,759	57
Pad Landing[6]	38,203	33	137	43	2	39,636	662
Mountain Pad[5]	1,600	57	243	54	2	52,414	37
Annual Subtotal in lbs		4,677	7,285	1,006	40	953,892	1,304
Annual Total in Tons		**2.3**	**3.6**	**0.5**	**0.0**	**476.9**	**0.7**

NOLF Pace

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	2,991	4,979	6,537	402	18	419,057	295
Cruise	2,991	191	396	361	13	298,944	209
Touch & Go[1]	5,981	107	493	118	5	113,219	79
Pad Landing[6]	89,722	123	513	160	6	148,164	1,556
Auto Rotation[2]	23,926	2,448	3,722	494	20	475,432	334
Annual Subtotal in lbs		7,849	11,661	1,534	61	1,454,816	2,473
Annual Total in Tons		**3.9**	**5.8**	**0.8**	**0.0**	**727.4**	**1.2**

NOLF Santa Rosa

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	4,982	8,293	10,887	669	30	697,956	492
Cruise	4,982	232	479	437	15	362,111	253
Touch & Go[1]	31,032	557	2,560	613	25	587,431	411
Pad Landing[6]	126,726	2,616	10,865	3,387	132	3,139,311	2,197
Auto Rotation[2]	34,750	3,556	5,406	717	29	690,524	484
Annual Subtotal in lbs		15,253	30,197	5,823	231	5,477,333	3,838
Annual Total in Tons		**7.6**	**15.1**	**2.9**	**0.1**	**2,738.7**	**1.9**

NOLF Spencer

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	5,981	9,956	13,071	803	36	837,974	590
Cruise	5,981	313	647	590	21	489,099	342
Touch & Go[1]	47,852	859	3,947	946	38	905,831	634
Pad Landing[6]	143,555	2,963	12,308	3,837	150	3,556,199	2,489
Auto Rotation[2]	47,852	4,896	7,444	987	40	950,863	667
Annual Subtotal in lbs		18,988	37,418	7,163	284	6,739,966	4,723
Annual Total in Tons		**9.5**	**18.7**	**3.6**	**0.1**	**3370.0**	**2.4**

No Action Alternative Operations – TH-57

NOLF Site X

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	3,589	5,974	7,844	482	21	502,841	354
Cruise	3,589	251	518	472	16	391,323	274
Touch & Go[1]	23,255	417	1,918	460	19	440,213	308
Auto Rotation[2]	15,788	1,615	2,456	326	13	313,722	220
Spec. Personnel Insertion[3]	4,096	124	408	170	6	150,480	105
Hoist/Rappel[4]	205	10	34	12	0	10,475	7
Pad Landing[6]	56975	1,176	4,885	1,523	59	1,411,406	988
Mountain Pad[5]	4,096	145	623	139	6	134,181	94
Annual Subtotal in lbs		9,713	18,686	3,583	142	3,354,641	2,351
Annual Total in Tons		**4.9**	**9.3**	**1.8**	**0.1**	**1,677**	**1.2**

NOLF Choctaw

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	399	664	872	54	2	55,902	39
Cruise	399	33	67	61	2	50,755	36
Pad Landing[6]	4,785	99	410	128	5	118,536	83
Annual Subtotal in lbs		795	1,349	243	10	225,193	158
Annual Total in Tons		**0.4**	**0.7**	**0.1**	**0.0**	**113**	**0.1**

No Action Alternative Annual Emission Totals

Location	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
Whiting Field South	27.0	35.8	2.3	0.1	2,378	1.7
NOLF Harold	2.3	3.6	0.5	0.0	477	0.7
NOLF Pace	3.9	5.8	0.8	0.0	727	1.2
NOLF Santa Rosa	7.6	15.1	2.9	0.1	2,739	1.9
NOLF Spencer	9.5	18.7	3.6	0.1	3,370	2.4
NOLF Site X	4.9	9.3	1.8	0.1	1,677	1.2
NOLF Choctaw	0.4	0.7	0.1	0.0	113	0.1
Total	**56**	**89**	**12**	**0**	**11,481**	**9**

Proposed Action - AHTS (UH-72 used as surrogate)

Whiting Field South

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	39465	131,449	172,379	14,403	574	12,442,862	8,764
Touch & Go[1]	14438	518	6,506	2,120	77	1,681,165	431
Annual Subtotal in lbs		131,967	178,885	16,523	651	14,124,026	9,195
Annual Total in Tons		**66.0**	**89.4**	**8.3**	**0.3**	**7,062.0**	**5**

NOLF Harold

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	2,433	8,104	10,627	888	35	767,097	540
Cruise	2,433	113	234	214	7	176,853	124
Touch & Go[1]	7,320	263	1,207	393	14	311,824	218
Auto Rotation[2]	11,262	2,306	3,502	632	23	503,599	353
Spec. Personnel Insertion[3]	1,952	119	389	220	7	161,380	113
Hoist/Rappel[4]	1,952	181	644	301	10	224,463	157
Mountain Pad[5]	1,952	139	594	180	7	143,900	101
Pad Landing[6]	46,609	1,925	7,987	3,386	119	2,598,297	1,819
Annual Subtotal in lbs		11,224	17,196	2,827	105	2,289,116	1,606
Annual Total in Tons		**5.6**	**8.6**	**1.4**	**0.1**	**1144.6**	**0.8**

NOLF Pace

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	3,649	12,154	15,938	1,332	53	1,150,488	810
Cruise	3,649	234	483	440	15	364,710	255
Touch & Go[1]	7,298	262	1,203	392	14	310,887	218
Auto Rotation[2]	29,190	5,976	9,076	1,637	60	1,305,279	916
Pad Landing[6]	109,464	4,521	18,757	7,951	280	6,102,254	4,271
Annual Subtotal in lbs		23,147	45,458	11,753	422	9,233,617	6,470
Annual Total in Tons		**11.6**	**22.7**	**5.9**	**0.2**	**4,616.8**	**3.2**

NOLF Santa Rosa

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	6,081	20,254	26,561	2,219	88	1,917,270	1,350
Cruise	6,081	283	585	534	19	442,024	309
Touch & Go[1]	37,887	1,360	6,246	2,035	74	1,613,944	1,130
Auto Rotation[2]	42,426	8,686	13,192	2,379	87	1,897,148	1,331
Pad Landing[6]	154,714	6,390	26,511	11,238	395	8,624,792	6,037
Annual Subtotal in lbs		36,974	73,094	18,406	663	14,495,177	10,157
Annual Total in Tons		**18.5**	**36.5**	**9.2**	**0.3**	**7,247.6**	**5.1**

NOLF Spencer

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	7,298	24,308	31,877	2,663	106	2,300,976	1,621
Cruise	7,298	382	790	720	25	596,798	418
Touch & Go[1]	58,380	2,096	9,624	3,136	114	2,486,922	1,741
Auto Rotation[2]	58,380	11,952	18,152	3,274	120	2,610,558	1,831
Pad Landing[6]	175,140	7,234	30,011	12,722	447	9,763,473	6,834
Annual Subtotal in lbs		45,973	90,454	22,516	812	17,758,727	12,444
Annual Total in Tons		**23.0**	**45.2**	**11.3**	**0.4**	**8879.4**	**6.2**

Proposed Action - AHTS (UH-72 used as surrogate)

NOLF Site X

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	4,380	14,589	19,131	1,598	64	1,380,964	973
Cruise	4,380	306	632	577	20	477,569	334
Touch & Go[1]	28,371	1,019	4,677	1,524	55	1,208,573	846
Spec. Personnel Insertion[3]	4,998	303	996	563	19	413,205	289
Auto Rotation[2]	19,260	3,943	5,989	1,080	40	861,243	604
Hoist/Rappel[4]	250	23	82	39	1	28,748	20
Mountain Pad[5]	4,998	355	1,520	461	17	368,450	258
Pad Landing[6]	69,510	2,871	11,911	5,049	178	3,874,952	2,712
Annual Subtotal in lbs		23,409	44,937	10,891	393	8,613,702	6,037
Annual Total in Tons		**11.7**	**22.5**	**5.4**	**0.2**	**4,307**	**3.0**

NOLF Choctaw

Operation	# ops	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
LTO	487	1,622	2,127	178	7	153,546	108
Cruise	487	40	82	75	3	61,949	43
Pad Landing[6]	5,837	241	1,000	424	15	325,393	228
Annual Subtotal in lbs		1,903	3,209	677	25	540,888	379
Annual Total in Tons		**1.0**	**1.6**	**0.3**	**0.0**	**270**	**0.2**

Location	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
Whiting Field South	66.0	89.4	8.3	0.3	7062.0	4.6
NOLF Harold	5.6	8.6	1.4	0.1	1144.6	0.8
NOLF Pace	11.6	22.7	5.9	0.2	4616.8	3.2
NOLF Santa Rosa	18.5	36.5	9.2	0.3	7247.6	5.1
NOLF Spencer	23.0	45.2	11.3	0.4	8879.4	6.2
NOLF Site X	11.7	22.5	5.4	0.2	4306.9	3.0
NOLF Choctaw	1.0	1.6	0.3	0.0	270.4	0.2
Total	**137**	**227**	**42**	**2**	**33,528**	**23**

Engine Maintenance Testing at Whiting Field South

Action	# tests/yr	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
Baseline	3,818	103	126	4	0	4,953	4
No Action	3,818	103	126	4	0	4,953	4
Proposed Action	4,668	252	307	14	1	13,623	10

Additional Personnel (with family = 1.2 people on average)

	# vehicles	# days	mi/day	VOC lb/mi	CO lb/mi	NOx lb/mi	SO2 lb/mi	PM10 lb/mi	PM2.5 lb/mi	CO_2 lb/mi
annually	40	350	60	0.0005465	0.004718	0.000437157	1.072E-05	#######	6.3E-05	1.10
				VOC lb	**CO** lb	**NOx** lb	**SO2** lb	**PM10** lb	**PM2.5** lb	**CO_2** lb
				455	3924	364	9	79	52	918,886
			POV Grand Total in Tons	**0.23**	**1.96**	**0.18**	**0.00**	**0.04**	**0.03**	
			POV Total in Metric Tons							**417**

Action	VOC	CO	NOx	PM10/ PM2.5	CO2	SO2
Baseline	160	220	17	1	17,163	12
No Action Alternative	158	214	15	1	15,565	12
Preferred Alternative	388	534	55	2	46,097	32
Comparative Threshold	100	100	100	100	NA	100
Net Change from Baseline	228	314	38	1	28,933	20
Exceed Comparable Threshold	Yes	Yes	No	No	NA	No
Net Change from No Action	231	321	39	1	30532	20
Exceed Comparable Threshold	Yes	Yes	No	No	NA	No

				average passenger vehicle	
				404	grams of CO2 per mile
				0.89	lb of CO2 per mile
CO2 emissions	30,532		68,605,431	miles	
			5,966	cars driving 11,500 miles per year	

Appendix B: National Historic Preservation Act Section 106 Documentation

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From: Winter, Leonard E CIV USN NAVFAC SE JAX FL (USA) [mailto:len.winter@navy.mil]
Sent: Wednesday, June 19, 2019 12:39 PM
To: Edwards, Scott <Scott.Edwards@DOS.MyFlorida.com>
Subject: Advanced Helicopter Training System - NAS WHITING FIELD

The attachments/links in this message have been scanned by Proofpoint.

Scott,

The Navy is preparing to consult Florida SHPO in re to the establishment of the Advanced Helicopter Training System (AHTS) at NAS Whiting Field and associated Navy Outlying Landing Fields (NOLF) Spencer and Harold.

Cardno is the cultural resources and NEPA contractor and they have provided draft-letter text on the potential acoustic effects on six small utility buildings which are located in the respective APEs.

These properties, with photos attached, are described in brief with my summary recommendation re NRHP eligibility:

1) NASWF/BLDG 3090: a brick steam/heat building constructed in 1995; infrastructure not eligible as a Criteria Consideration G resource.
2) NASWF/BLDG 3149: a metal storage building erected in 2007; infrastructure not eligible as a Criteria Consideration G resource.
3) NASWF/BLDG 2938: a stuccoed airfield lighting vault constructed in 1965; infrastructure not eligible under standard NRHP criteria A, B, C, or D.
4) NOLF Spencer/BLDG 2240A: a metal emergency vehicle garage erected in 1987; infrastructure not eligible as a Criteria Consideration G resource.
5) NOLF Spencer/BLDG 2240B: a metal fire station storage shed erected in 2000; infrastructure not eligible as a Criteria Consideration G resource.
6) NOLF Harold/BLDG 3019: a block fire and rescue station constructed in 1981; infrastructure not eligible as a Criteria Consideration G resource.

I hope you concur that NONE of these properties is eligible to the NRHP and that NONE warrant the issue of a Florida Master Site File number. Your concurrence will enable me to streamline the Cardno letter and represent the fact that there will be NO acoustic effects on historic properties.

Thanks,

Len

Len Winter
Historic Preservation Officer
Cultural Resources Section Head
NAVFAC SE
BOX 30/BLDG 135N
NAS Jacksonville
Jacksonville, FL 32212
COMM: 904-542-6861

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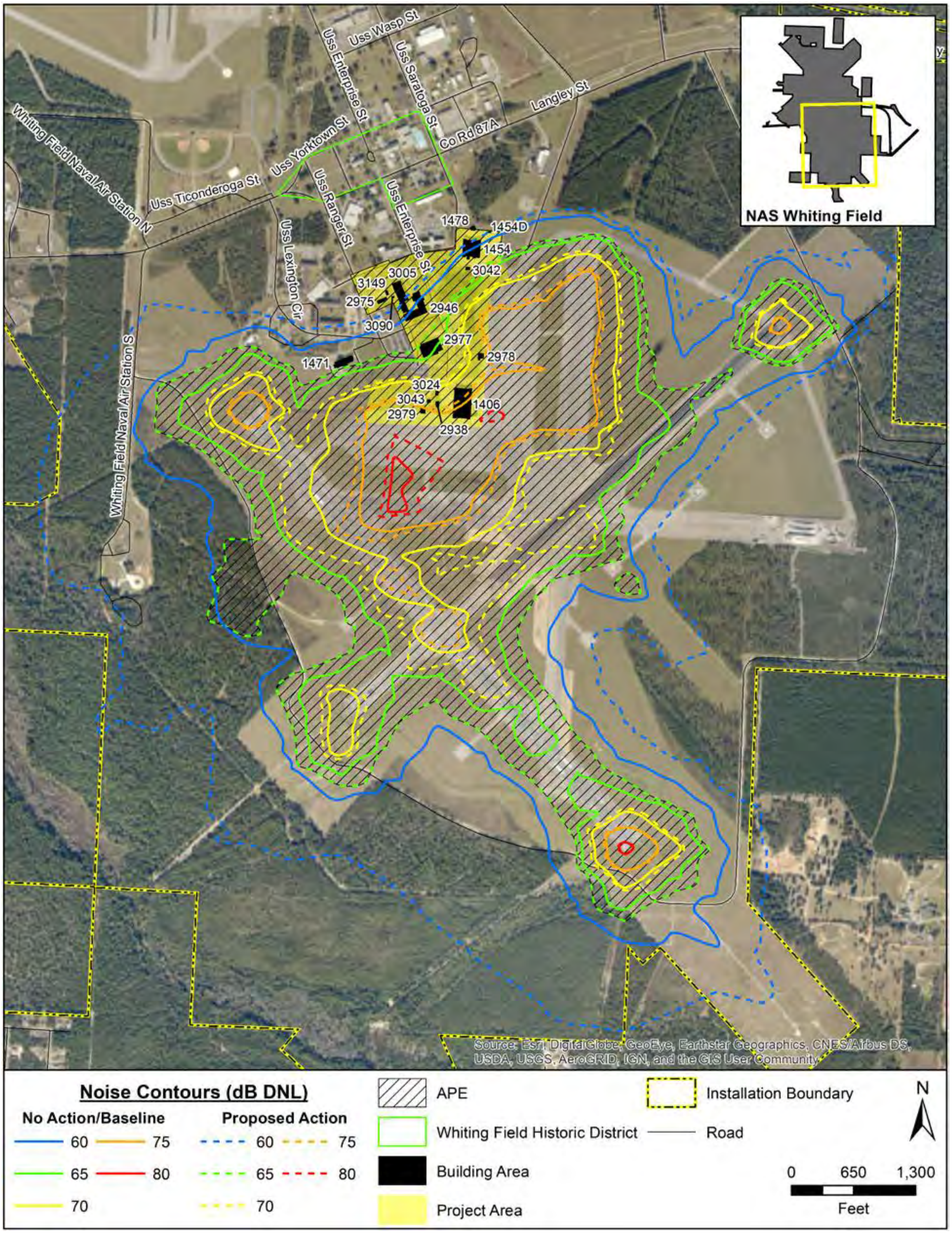
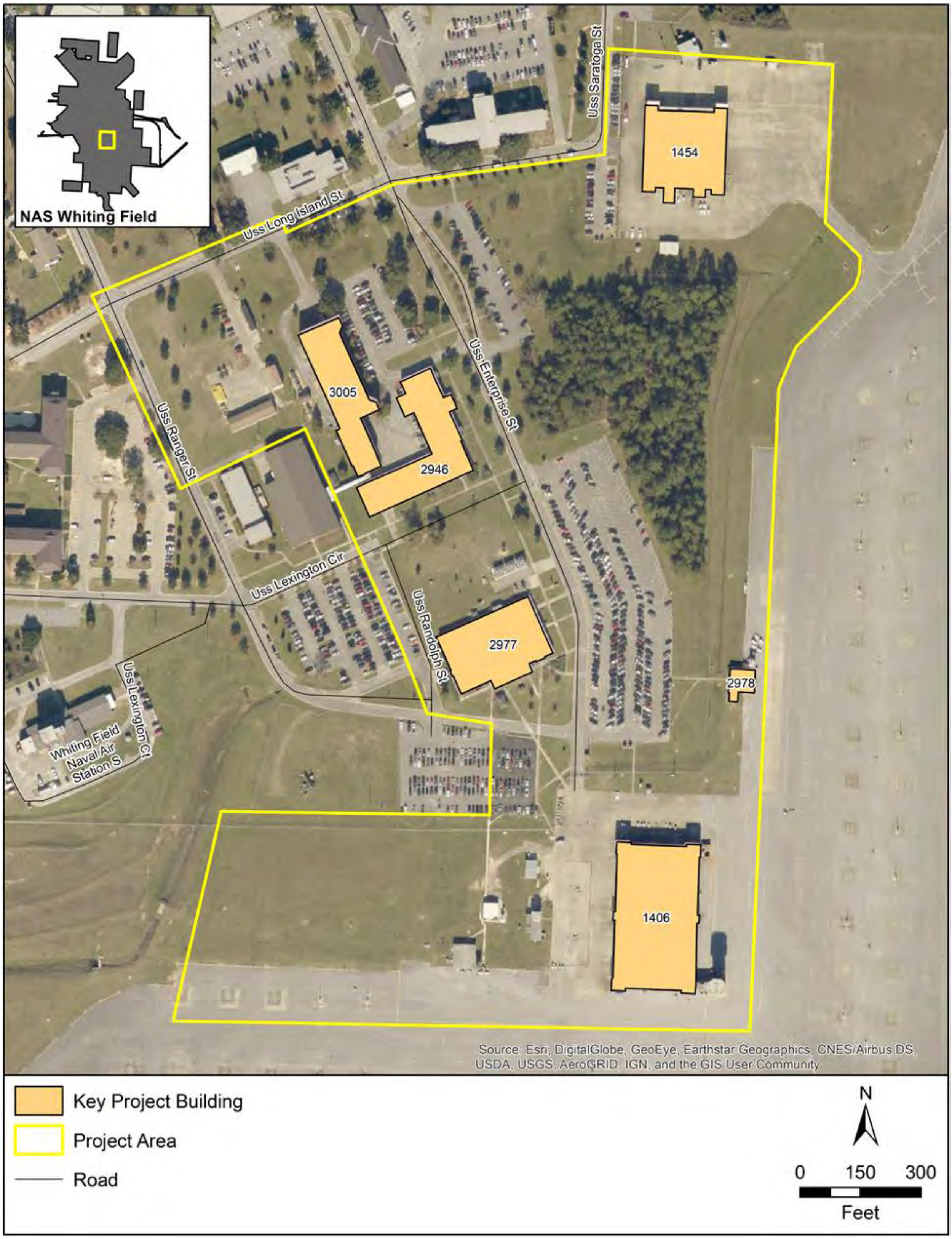


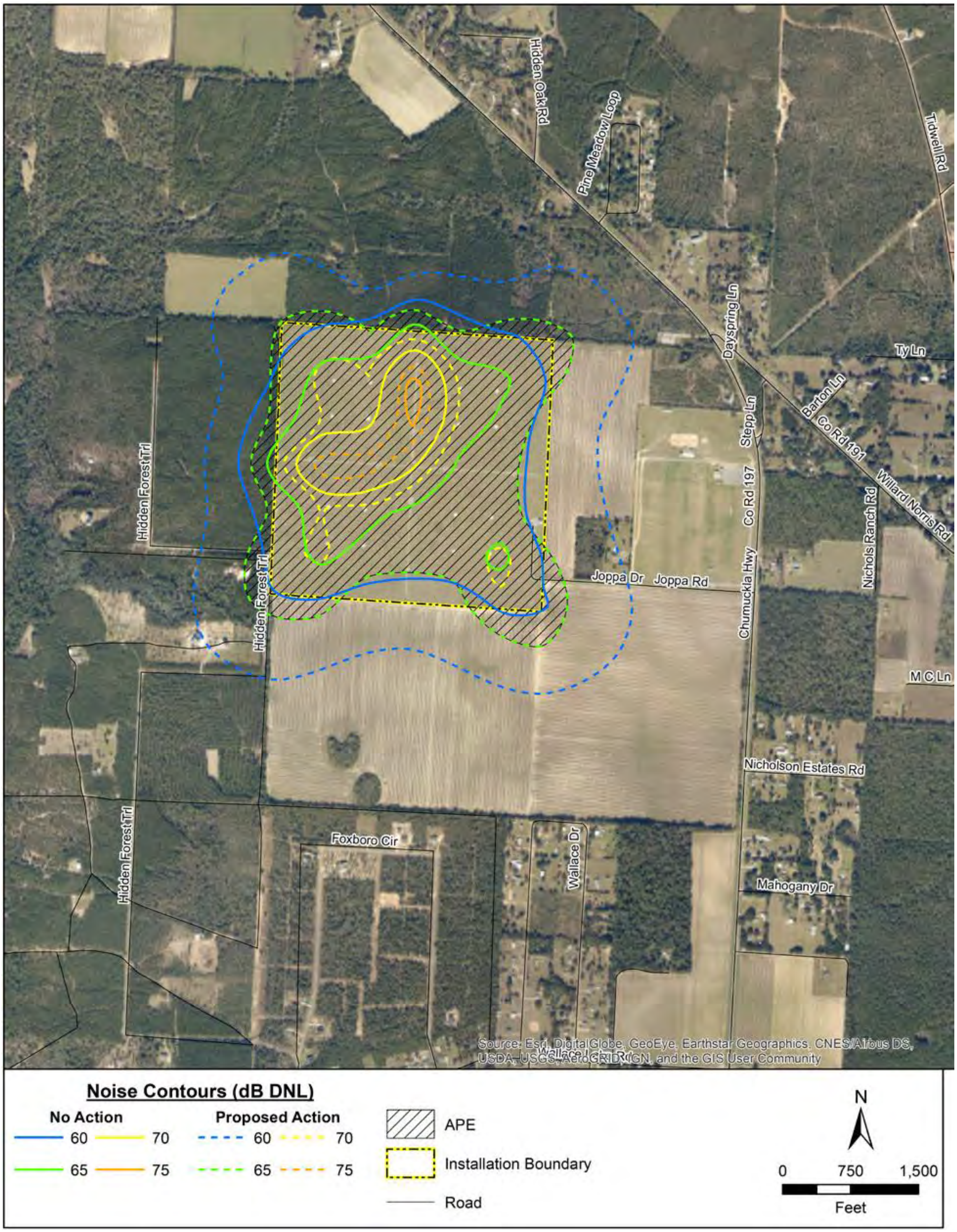
Map 1. NAS Whiting Field APE with No Action and Proposed Action Noise Contours



Map 2. NAS Whiting Field Project Area with Key Project Buildings

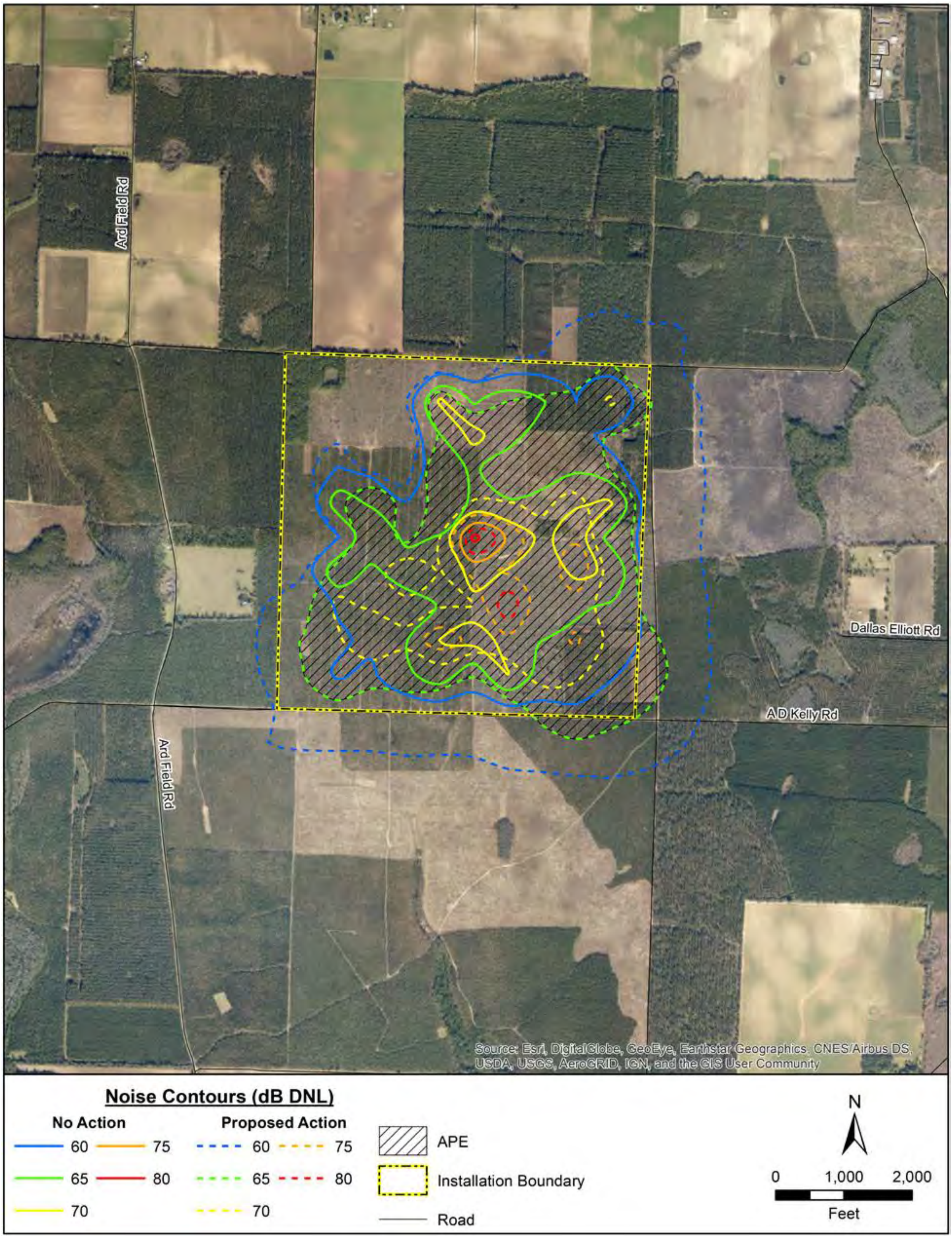
Map 3. NOLF Choctaw APE

Map 4. NOLF Harold APE with No Action and Proposed Action Noise Contours

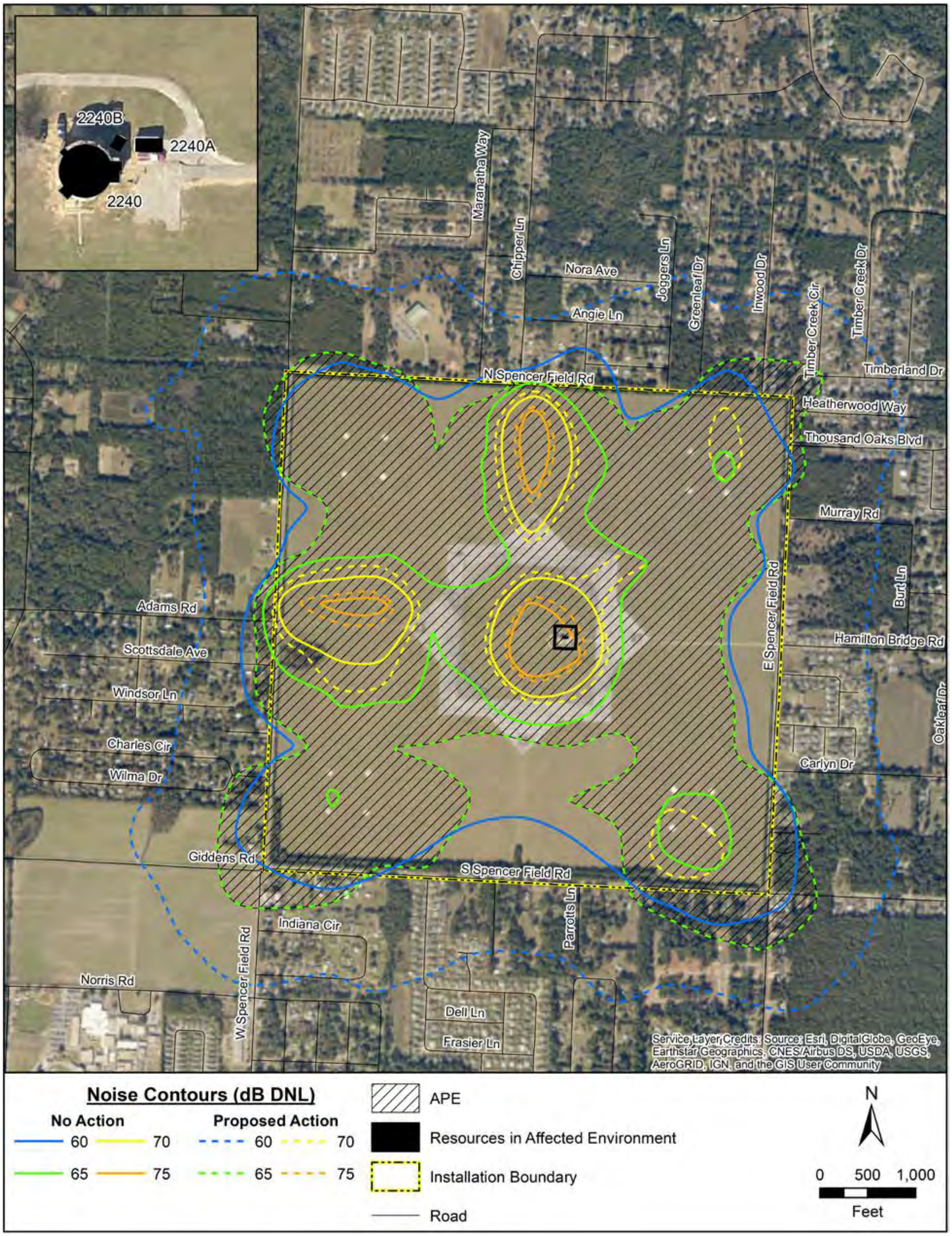


Map 5. NOLF Pace APE with No Action and Proposed Action Noise Contours

Map 6. NOLF Santa Rosa APE with No Action and Proposed Action Noise Contours



Map 7. NOLF Site X APE with No Action and Proposed Action Noise Contours



Map 8. NOLF Spencer APE with No Action and Proposed Action Noise Contours

FLORIDA DEPARTMENT *of* STATE

RON DESANTIS
Governor

LAUREL M. LEE
Secretary of State

Mr. Len Winter
Historic Preservation Officer
Naval Facilities and Engineering Command Southwest
Box 30 / Building 135N
NAS Jacksonville
Jacksonville, FL 32212

June 21, 2019

RE: DHR Project File No.: 2019-3520, Received by DHR: June 19, 2019
Advanced Helicopter Training System (AHTS) at NAS Whiting Field and associated Navy Outlying Landing Fields (NOLF) Spencer and Harold – Potential Acoustic Effects on Six Utility Buildings
Naval Air Station Whiting Field, Santa Rosa County

Dear Mr. Winter:

The Florida State Historic Preservation Officer reviewed the referenced project for possible effects on historic properties listed, or eligible for listing, on the *National Register of Historic Places.* The review was conducted in accordance with Section 106 of the *National Historic Preservation Act of 1966*, as amended, and its implementing regulations in *36 CFR Part 800: Protection of Historic Properties.*

Based on the information provided, this office concurs that buildings 2240A, 2240B, 2938, 3019, 3090, and 3139 do not appear to meet the criteria for listing on the *National Register*. Therefore, we concur with your finding that the referenced buildings will not be affected by this undertaking.

If you have any questions, please contact Scott Edwards, Historic Preservationist, by electronic mail *scott.edwards@dos.myflorida.com*, or at 850.245.6333 or 800.847.7278.

Sincerely,

Jason Aldridge
For

Timothy A. Parsons, Ph.D.
Director, Division of Historical Resources
and State Historic Preservation Officer

FLORIDA DEPARTMENT *of* STATE

RON DESANTIS
Governor

LAUREL M. LEE
Secretary of State

Mr. Len Winter
Historic Preservation Officer
Naval Facilities and Engineering Command Southwest
Box 30 / Building 135N
NAS Jacksonville
Jacksonville, FL 32212

June 26, 2019

RE: DHR Project File No.: 2019-3601, Received by DHR: June 24, 2019
Advanced Helicopter Training System (AHTS) at NAS Whiting Field and associated Navy Outlying Landing Fields (NOLF) Pace and Santa Rosa – Potential Acoustic Effects on Six Buildings
Naval Air Station Whiting Field, Santa Rosa County

Dear Mr. Winter:

The Florida State Historic Preservation Officer reviewed the referenced project for possible effects on historic properties listed, or eligible for listing, on the *National Register of Historic Places.* The review was conducted in accordance with Section 106 of the *National Historic Preservation Act of 1966*, as amended, and its implementing regulations in *36 CFR Part 800: Protection of Historic Properties.*

Based on the information provided, this office concurs that buildings at NOLF Pace 3016, 3016A, and 3077 and NOLF Santa Rosa 3006, 3007, and 3031 do not appear to meet the criteria for listing on the *National Register*. Therefore, we concur with your finding that the referenced buildings will not be affected by this undertaking.

If you have any questions, please contact Scott Edwards, Historic Preservationist, by electronic mail *scott.edwards@dos.myflorida.com*, or at 850.245.6333 or 800.847.7278.

Sincerely,

Jason Aldridge
For

Timothy A. Parsons, Ph.D.
Director, Division of Historical Resources
and State Historic Preservation Officer

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8506
July 17, 2019

Jason Aldridge
Supervisor Compliance and Review
Florida Division of Historical Resources
R.A. Gray Building
500 S. Bronough Street, Room 423
Tallahassee, FL 32399-0250

Dear Mr. Aldridge:

The United States Navy (Navy) is initiating consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with implementing the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below. Due to the high-priority status of the project, the Navy respectfully requests your office's cooperation in expediting this consultation in accordance with 36 CFR §800.3(g).

Proposed Undertaking Description

The Navy proposes to modernize the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing FIVE located at NAS Whiting Field and six of its 13 associated NOLFs (Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw), by implementing the AHTS. The AHTS would involve the replacement of TH-57 Sea Ranger training helicopters, replacement of existing ground based training systems (i.e., simulators), an increase in operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities, and an increase in personnel. The TH 57 would be replaced with a yet-to-be-determined commercially available helicopter, referred to as the TH-XX. A conservative representative surrogate helicopter, the Eurocopter UH-72 Lakota, is used to analyze the potential impacts from the TH-XX because the Navy has not yet selected the specific helicopter that will replace the TH-57. The Proposed Undertaking would provide a replacement of approximately 113 TH-57 helicopters with 130 TH-XX helicopters for Training Air Wing FIVE at NAS Whiting Field. Although 140 TH-57 helicopters were initially all operating at NAS Whiting Field, the number currently in operation is approximately 113 due to airframe attrition over the life of the TH-57 program. All TH-XX flight operations would be conducted at existing airfields and within airspace currently utilized by Training Air Wing FIVE.

Facility development at NAS Whiting Field would be needed for TH-XX maintenance hangars and supporting ground-based training systems. The TH-XX and flight simulators would arrive before permanent facilities would be constructed. As a result, in order to meet the transition timeline, temporary facilities would be constructed. There are four facilities projects, two permanent and two temporary. The estimated construction period for temporary facilities would begin as soon as late 2019/early 2020 and extend through 2021. The estimated construction period of permanent facilities would begin in 2023 and continue through 2026. Two types of facilities would be required for the AHTS: TH-XX maintenance hangars and training facilities (Enclosure 1).

Definition of APE

The APE for this undertaking is defined as the areas underlying modeled noise contours ≥65 decibel (dB) day night average sound level (DNL), where noise from aircraft operations under the Proposed Undertaking may affect historic properties (Enclosure 2). At NAS Whiting Field, the APE also includes the project area associated with the facility and infrastructure development for AHTS maintenance hangars and supporting ground-based training systems, where existing facilities would be demolished or renovated and new ones would be constructed. For archaeological resources, potential effects would be limited to those areas within the APE at NAS Whiting Field where new project construction and ground disturbance would occur. These areas encompass approximately 47 acres.

Identification of Historic Properties - Built Environment

NAS Whiting Field has fourteen buildings located within the APE that have been determined ineligible for listing in the National Register of Historic Places (NRHP). These include buildings 1406 [SR1569], 1454 [SR1587], 1454D [SR1607], 1471 [SR1592], 1478 [SR1594], 2946 [SR1623], 2975 [SR1628], 2977 [SR1629], 2978 [SR1630], 2979 [SR1631], 3005 [SR1643], 3024 [SR02264], 3042 [SR02271] and 3043 [SR02272]). Three buildings in the APE at NAS Whiting Field had not been evaluated for NRHP eligibility. Building 3090 is a brick steam-heat building constructed in 1995; Building 3149 is a small metal storage building erected in 2007; and Building 2938 is a stuccoed airfield lighting vault constructed in 1965(NAS Whiting Field 2014). The SHPO has recently concurred that modern buildings 3090 and 3149 do not qualify for inclusion in the NRHP as Criteria Consideration G resources and that utility Building 2938 does not qualify for the NRHP under standard criteria A - D for facilities that exceed 50 years of age.

The APE at NOLF Choctaw has four architectural resources determined ineligible for listing in the NRHP (Buildings 2253 [SR02279], 2254 [SR02280], 2255 [SR02281] and 202834 [SR02282]).

An architectural survey at NOLF Spencer determined that Building 2240 [SR02286] located within the APE was ineligible for listing in the NRHP. Two buildings in the APE at NOLF Spencer had not been previously evaluated for NRHP eligibility. Building 2240A is a metal emergency vehicle garage that was erected in 1987 and Building 2240B is a metal fire station storage shed that was erected in 2000. The SHPO has recently concurred that modern buildings 2240A and 2240B do not qualify for inclusion in the NRHP as Criteria Consideration G resources.

At NOLF Harold, there is one architectural resource within the APE that had not been surveyed. Building 3019 is a fire and rescue station constructed in 1981. The SHPO has recently concurred that modern building 3019 does not qualify for inclusion in the NRHP as a Criteria Consideration G resource.

At NOLF Pace, there are three architectural resources within the APE that had not been previously surveyed. Building 3016 is a fire and rescue station constructed in 1981; Building 3016A is a small associated metal storage shed erected in 2000; and Building 3077 is a similar metal storage shed erected in 1993. The SHPO has recently concurred that modern buildings 3016, 3016A and 3077 do not qualify for inclusion in the NRHP as Criteria Consideration G resources.

At NOLF Santa Rosa, there are three architectural resources within the APE that had not been previously surveyed. Building 3031 is a fire and rescue station constructed in 1986; Building 3006 is an airfield lighting vault constructed in 1977; and Building 3007 is an observation tower erected in 1977. The SHPO has recently concurred that modern buildings 3031, 3006 and 3007 do not qualify for inclusion in the NRHP as Criteria Consideration G resources.

Site X, which was recently obtained by the Navy as part of a land exchange with Escambia County, has not yet been surveyed. A review of the Florida Master Site Files (FMSF) indicates that there are no historic properties currently identified within the APE. NAVFAC SE has determined that the few post-1990 resources on the property do not qualify for inclusion in the NRHP as Criteria Consideration G resources.

Identification of Historic Properties – Archaeological Sites

A search of the FMSF concluded that no archaeological survey has been conducted within the project APE at NAS Whiting Field where new construction will be undertaken. According to the Integrated Cultural Resources Management Plan (ICRMP), the development of NAS Whiting Field over the past 75 years has incurred significant ground impacts and the discovery of intact archaeological resources in the course of AHTS project construction is not anticipated.

Determination of Effects

Projected DNL contours under the Proposed Undertaking and the No Action Alternative are shown in the figures in Enclosure 2. Under the No Action Alternative, the Navy would not implement the AHTS at NAS Whiting Field and its associated NOLFs. However, the No Action Alternative reflects the recent completion (January 2019) of the land exchange for Site X. As a result, the No Action Alternative includes changes in the distribution of training operations (the total number of annual operations would remain the same as are currently conducted) to account for the new use of NOLF Site X for helicopter operations.

The Proposed Undertaking at NAS Whiting Field would potentially involve the demolition of buildings 1406, 1454, 2977, 2978 and 3005, and the partial renovation of Building 2946. All six buildings have been determined ineligible for listing in the NRHP. As a result, demolition or alteration of these facilities will not incur effects on historic properties.

The 19 buildings previously found ineligible to the NRHP, as well as the 12 modern buildings that were recently determined ineligible to the NRHP, will be used and maintained in the course of the AHTS program. Current and projected AHTS acoustic levels will not exceed 75dB DNL and will not incur effects on these facilities.

Summary

In summary, there are no historic property buildings within the APE at NAS Whiting Field and NOLFs Pace, Site X, Santa Rosa, Choctaw, Harold and Spencer. All of the buildings currently located at the NOLFs will be maintained and used during the AHTS program. The noise levels at the NOLFs would remain within the range of current noise contours and not exceed 75 dB DNL.

Because of ground disturbance associated with installation development over the past 75 years, it is unlikely that intact archaeological deposits are located within the project APE at NAS Whiting Field. As a safeguard, NAS Whiting Field will implement the inadvertent discovery response plan stipulated in the ICRMP in the unlikely event that archaeological resources are identified in the course of construction. This process includes stopping work and evaluating the discovery for NRHP eligibility in consultation with the SHPO and other interested parties pursuant to the requirements of Section 106 of the National Historic Preservation Act of 1966, as amended. In similar regard, NAS Whiting Field will respond pursuant to regulations found at 43 CFR 10 supporting the Native American Graves Protection and Repatriation Act of 1990 in the unlikely event that "cultural items" are discovered in the course of construction.

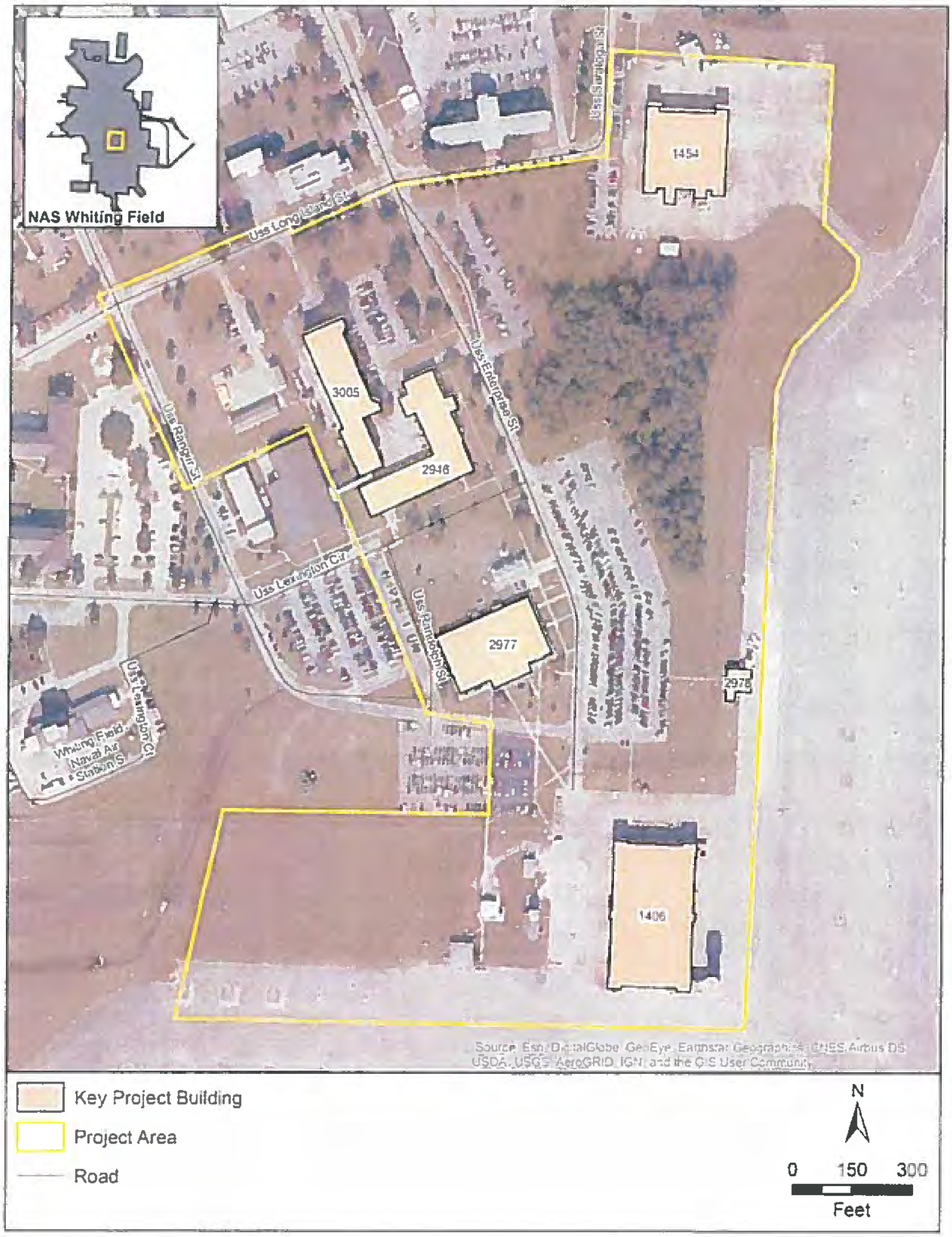
The Navy has concluded that the AHTS program at NAS Whiting Field and NOLFs Spencer, Pace, Harold, Santa Rosa, Choctaw and Site X warrants a finding of No Historic Properties Affected. We request your comment and/or concurrence on this finding. If we do not receive your comments and/or concurrence within the required 30 days, we will assume concurrence and proceed with the undertaking as described.

Please contact Dr. John Calabrese at john.calabrese@navy.mil or at (904) 542-6985 if you have any questions.

Sincerely,

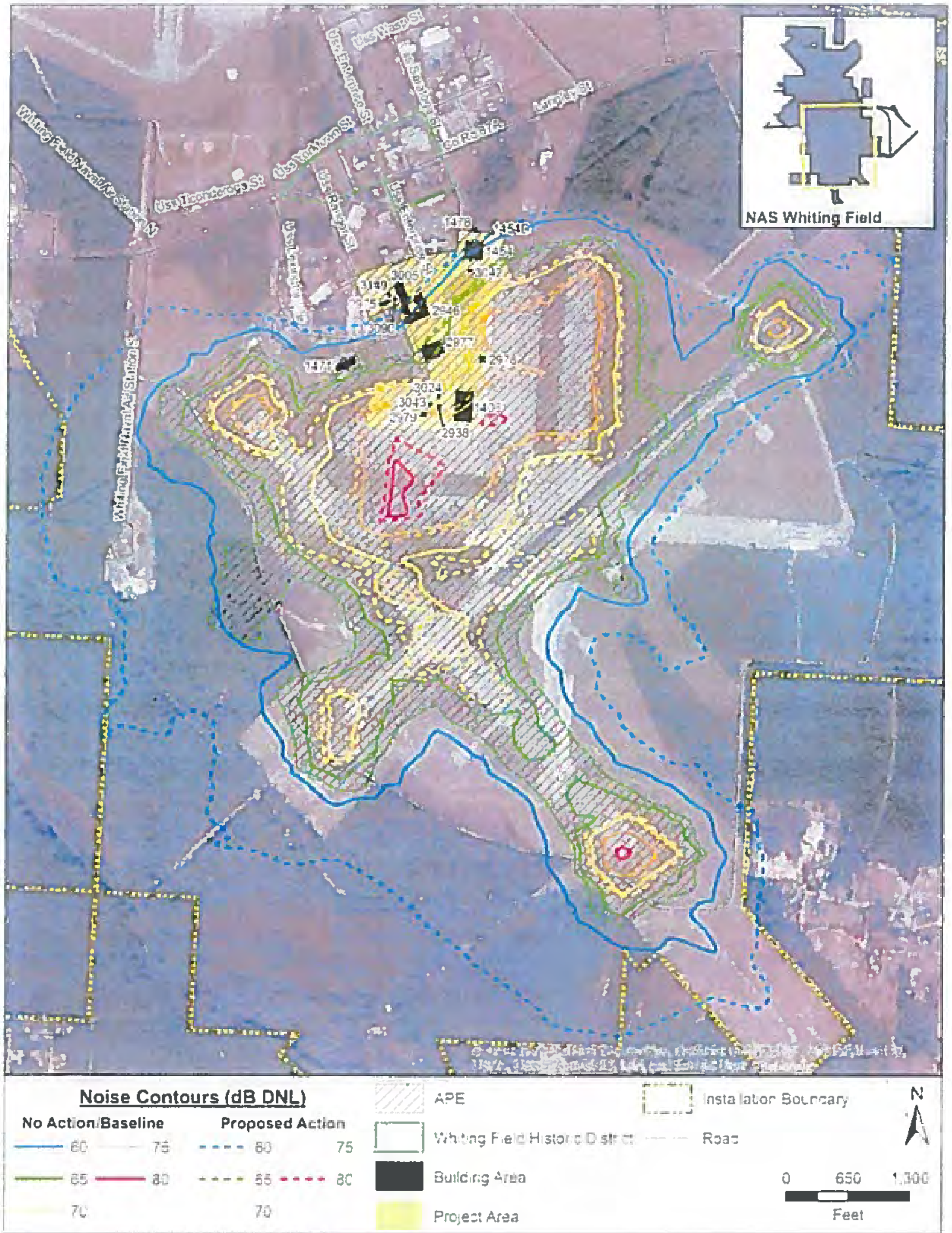
PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

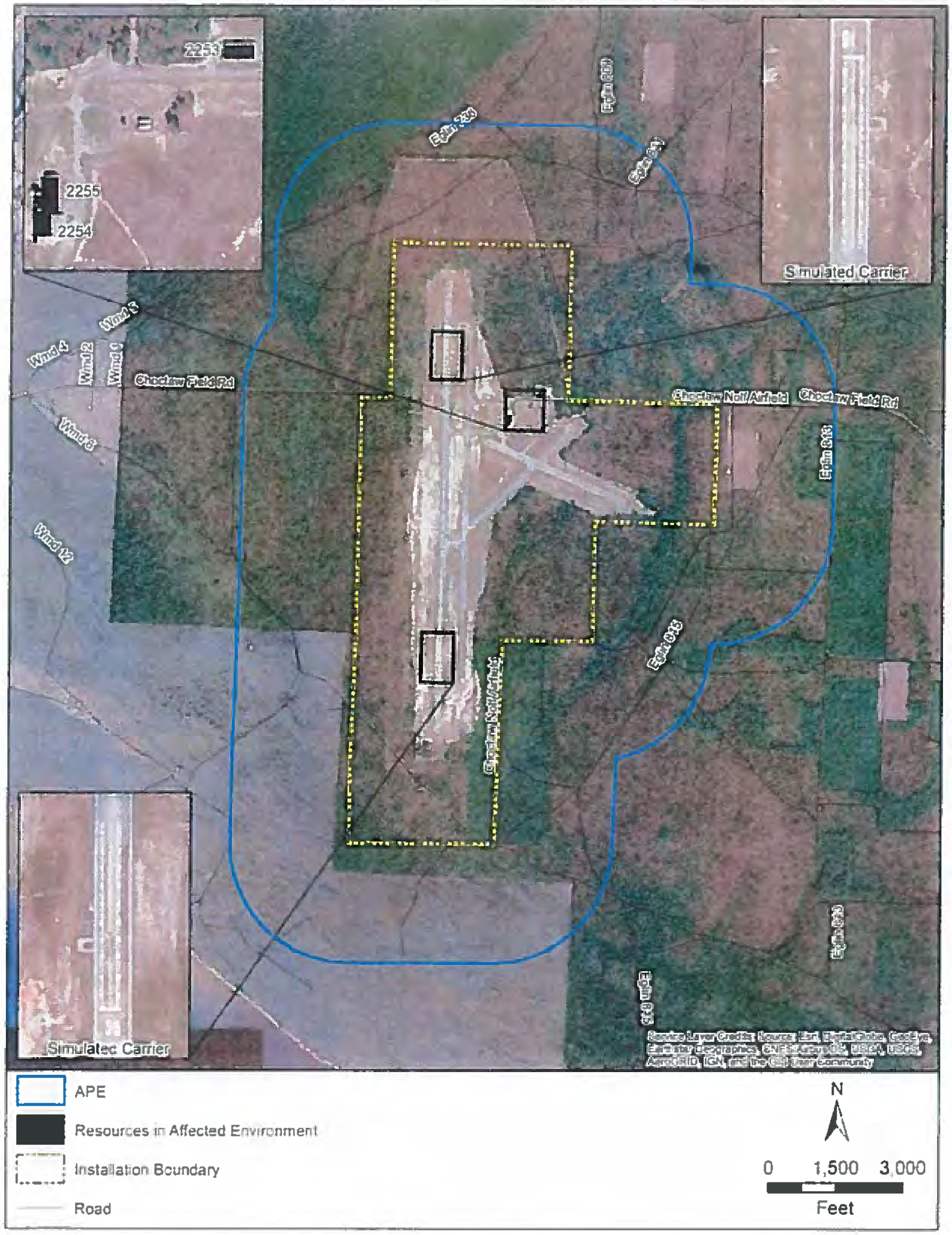


Map 2. NAS Whiting Field Project Area with Key Project Buildings

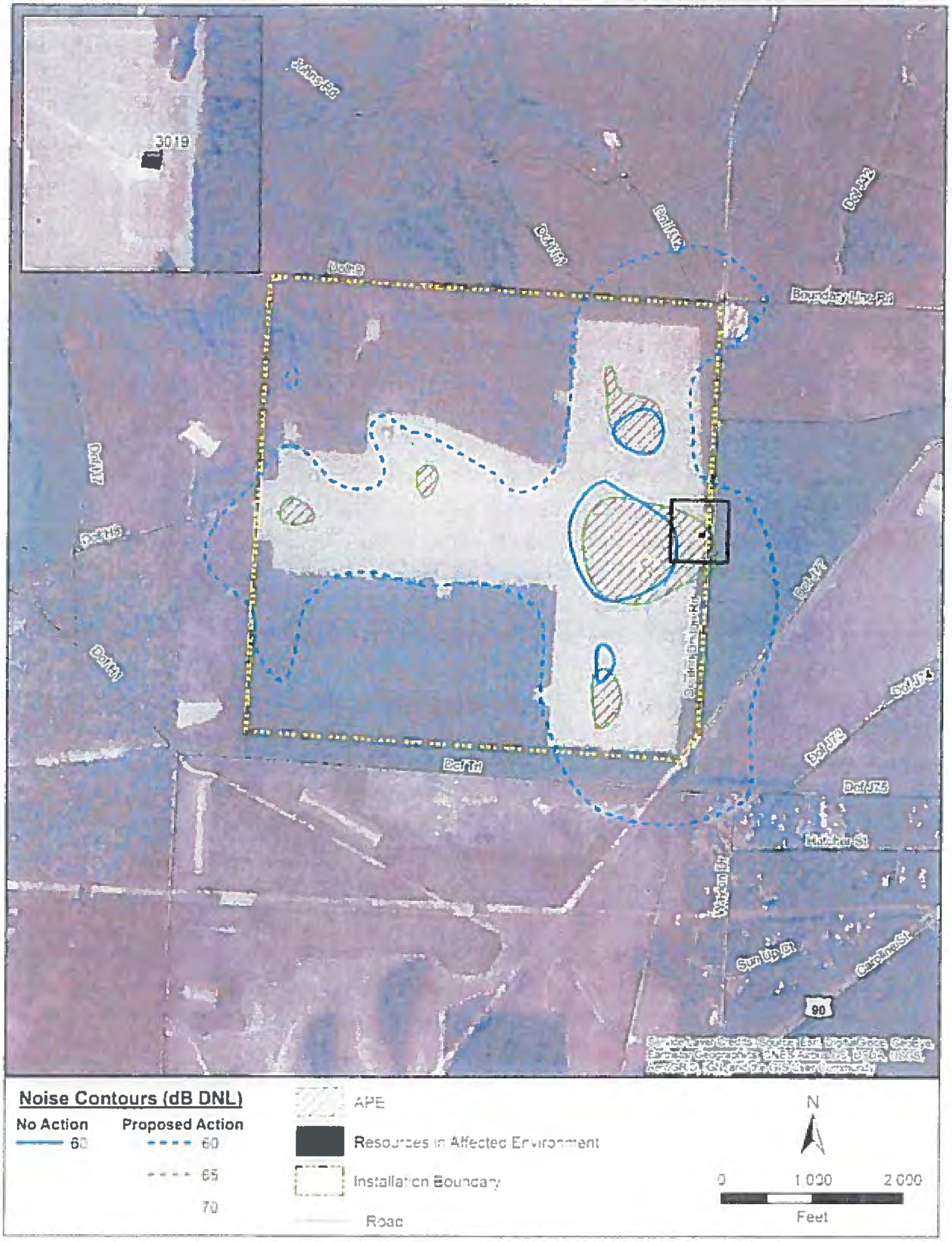
Enclosure (1)



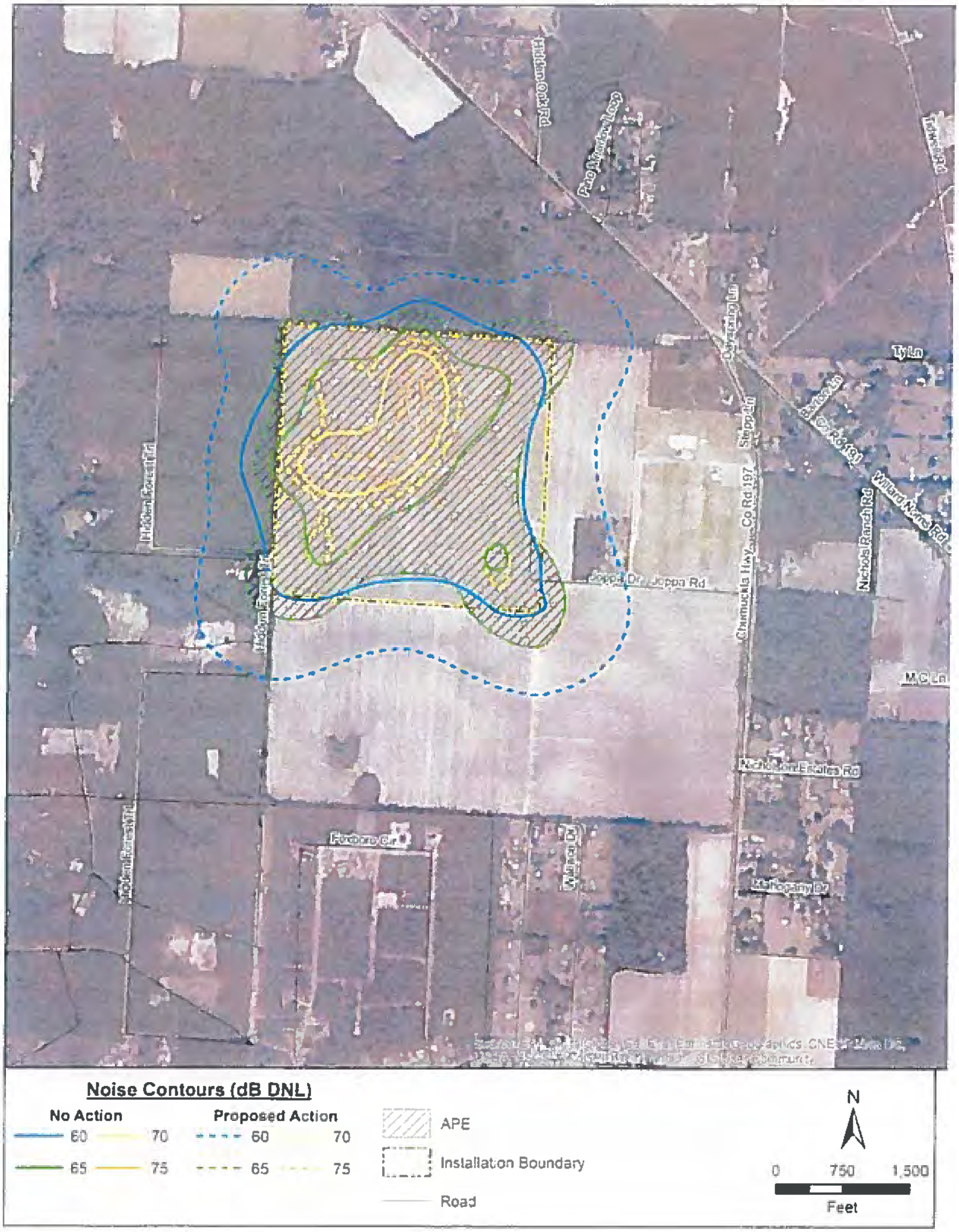
Map 1. NAS Whiting Field APE with No Action and Proposed Action Noise Contours



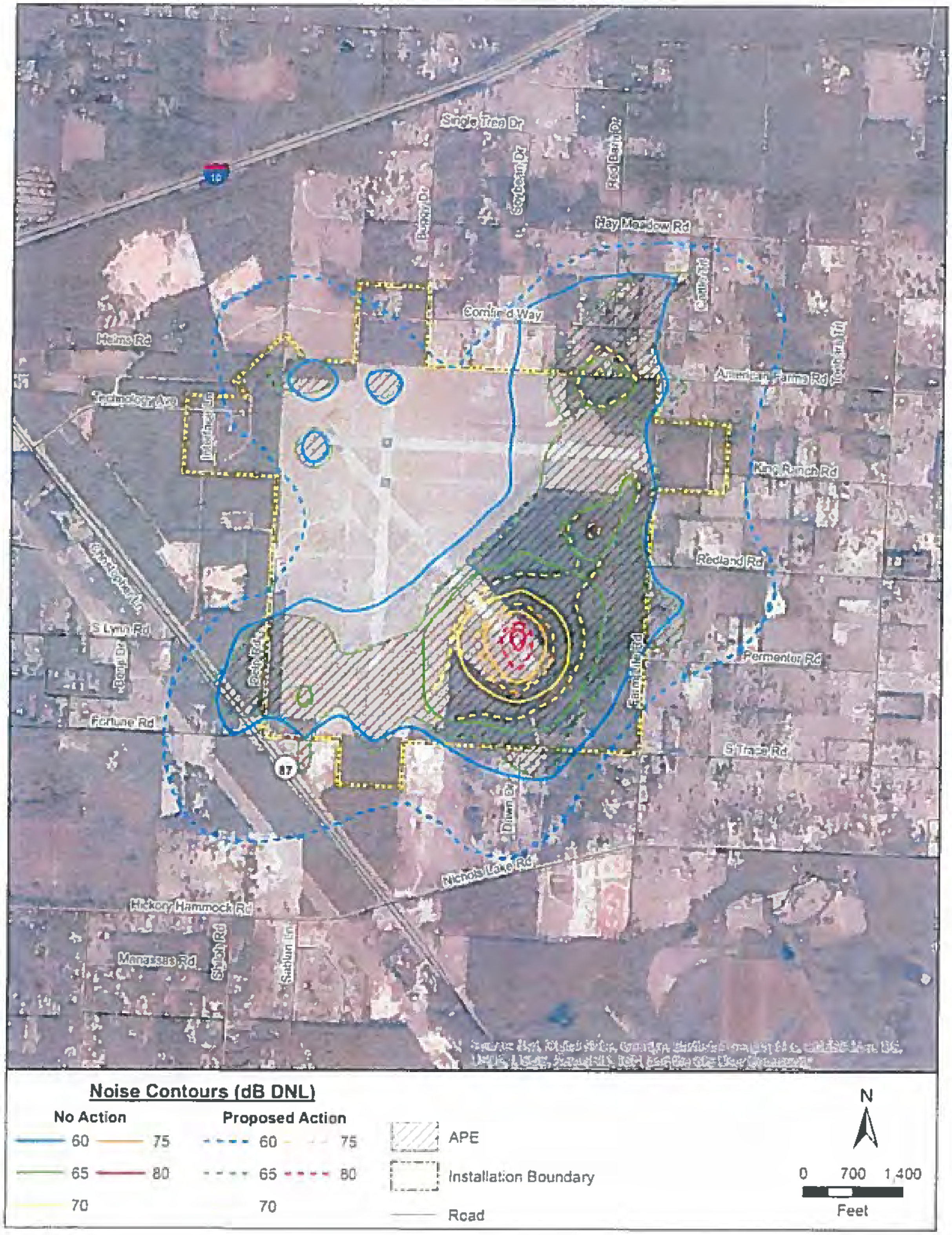
Map 3. NOLF Choctaw APE



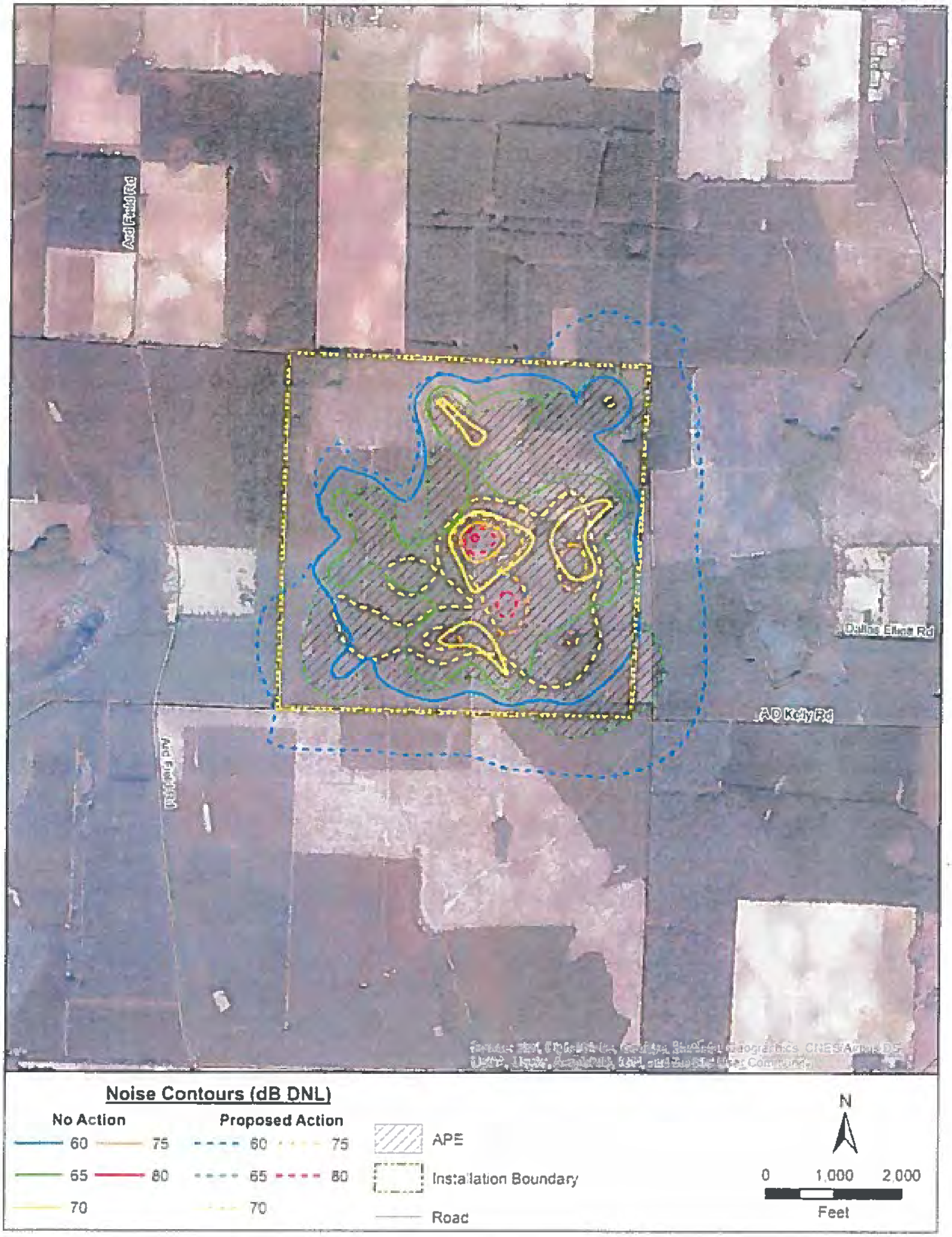
Map 4. NOLF Harold APE with No Action and Proposed Action Noise Contours



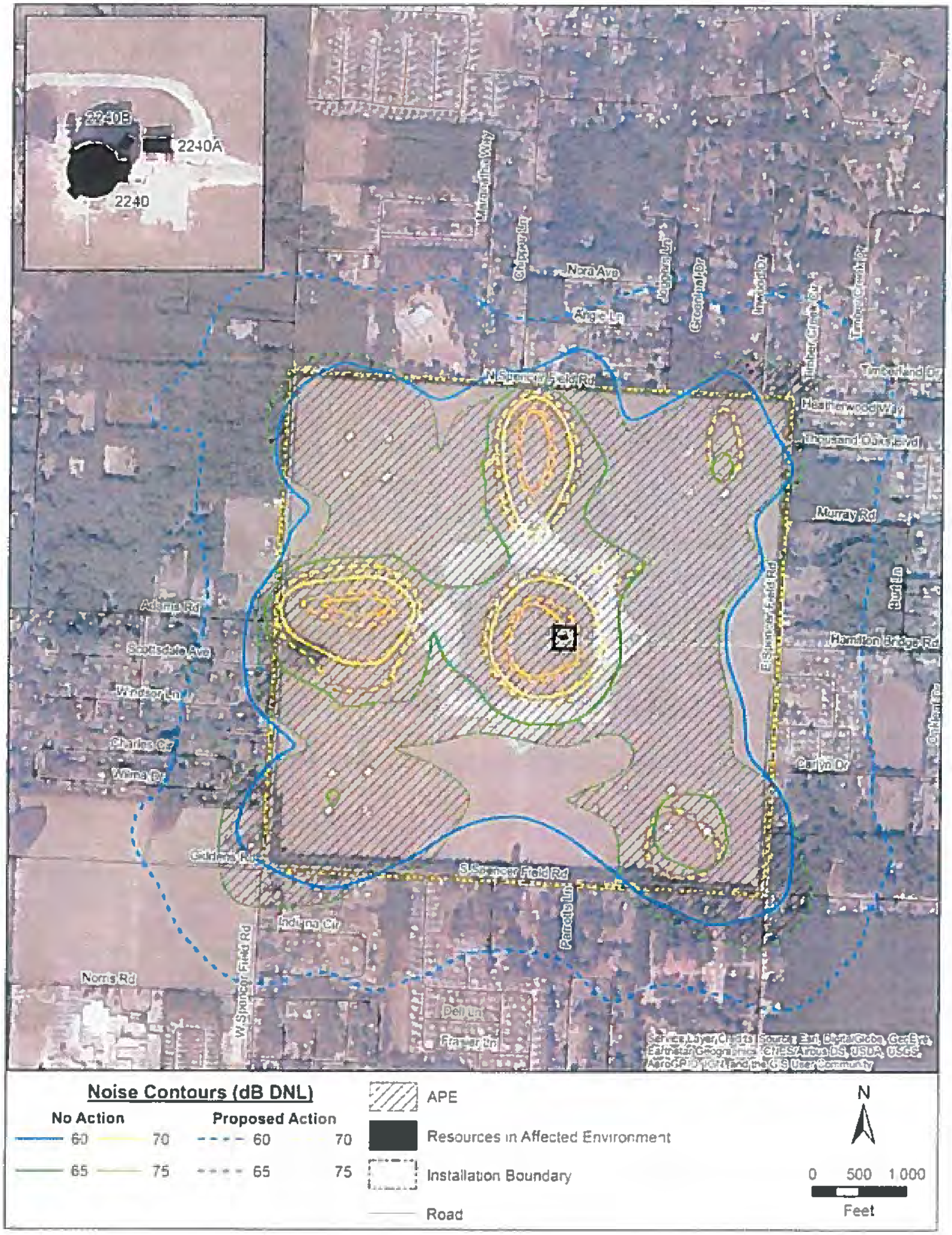
Map 5. NOLF Pace APE with No Action and Proposed Action Noise Contours



Map 6. NOLF Santa Rosa APE with No Action and Proposed Action Noise Contours



Map 7. NOLF Site X APE with No Action and Proposed Action Noise Contours



Map 8. NOLF Spencer APE with No Action and Proposed Action Noise Contours

FLORIDA DEPARTMENT *of* STATE

RON DESANTIS
Governor

LAUREL M. LEE
Secretary of State

August 20, 2019

Captain Paul D. Bowdich
Commanding Officer
NAS Whiting Field
7550 USS Essex Street, Suite 200
Milton, Florida 32570-6155

RE: DHR Project File No.: 2019-4856
Proposed Advanced Helicopter Training System (AHTS) at Naval Air Station Whiting Field and Its Associated Navy Outlying Landing Fields (NOLF) in Florida.
Naval Air Station Whiting Field, Santa Rosa County

Dear Captain Bowdich:

The Florida State Historic Preservation Officer reviewed the referenced project for possible effects on historic properties listed, or eligible for listing, on the *National Register of Historic Places.* The review was conducted in accordance with Section 106 of the *National Historic Preservation Act of 1966*, as amended, and its implementing regulations in *36 CFR Part 800: Protection of Historic Properties.*

Based on the information provided, this office concurs with your finding that the proposed undertakings at NAS Whiting Field and NOLFs Spencer, Pace, Herald, Santa Rosa, Choctaw and Site X will have no effect on the historic properties.

If you have any questions, please contact Scott Edwards, Historic Preservationist, by electronic mail *scott.edwards@dos.myflorida.com*, or at 850.245.6333 or 800.847.7278.

Sincerely,

Jason Aldridge
For

Timothy A. Parsons, Ph.D.
Director, Division of Historical Resources
and State Historic Preservation Officer

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Appendix C: Tribal Government-to-Government Documentation

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DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8507
July 17, 2019

Ms. Susie Newport
Tribal Historic Preservation Officer
Absentee Shawnee Tribe of Indians of Oklahoma
2025 S. Gordon Cooper Drive
Shawnee, OK 74801

Dear Ms. Newport:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

Proposed Undertaking Description

The Navy proposes to modernize the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing FIVE located at NAS Whiting Field and six of its 13 associated NOLFs (Spencer, Pace, Site X, Harold, Santa Rosa and Choctaw), by implementing the AHTS. The AHTS would involve the replacement of TH-57 Sea Ranger training helicopters, replacement of existing ground based training systems (i.e., simulators), an increase in operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities and an increase in personnel. The TH-57 would be replaced with a yet-to-be-determined commercially available helicopter, referred to as the TH-XX. A conservative representative surrogate helicopter, the Eurocopter UH-72 Lakota, is used to analyze the potential impacts from the TH-XX because the Navy has not yet selected the specific helicopter that will replace the TH-57. The Proposed Undertaking would provide a replacement of approximately 113 TH-57 helicopters with 130 TH-XX helicopters for Training Air Wing FIVE at NAS Whiting Field. Although 140 TH-57 helicopters were initially all operating at NAS Whiting Field, the number currently in operation is approximately 113 due to airframe attrition over the life of the TH-57 program. All TH-XX flight operations would be conducted at existing airfields and within airspace currently utilized by Training Air Wing FIVE.

Facility development would be needed for TH-XX maintenance hangars and supporting ground-based training systems. The TH-XX and flight simulators would arrive before permanent facilities would be constructed. As a result, in order to meet the transition timeline, temporary facilities would be constructed. There are four facilities projects, two permanent and two temporary. The estimated construction period for temporary facilities would begin as soon as late 2019/early 2020 and extend through 2021. The estimated construction period of permanent

facilities would begin in 2023 and continue through 2026. Two types of facilities would be required for the AHTS: TH-XX maintenance hangars and training facilities (Enclosure 1).

Definition of APE

The APE for this undertaking is defined as the areas underlying modeled noise contours ≥65 decibel (dB) day night average sound level (DNL), where noise from aircraft operations under the Proposed Undertaking may affect historic properties (Enclosure 2). At NAS Whiting Field, the APE also includes the project area associated with the facility and infrastructure development for AHTS maintenance hangars and supporting ground-based training systems, where existing facilities would be demolished or renovated and new ones would be constructed. For archaeological resources, potential effects would be limited to the areas within the APE at NAS Whiting Field (the project area for facility development) where ground disturbance would occur. These areas encompass approximately 47 acres.

Identification of Historic Properties

A search of the Florida Master Site File (FMSF) reveals that no archaeological survey has been conducted --- and no archaeological sites have been identified --- within the project APE at NAS Whiting Field. According to the Integrated Cultural Resources Management Plan (ICRMP), the area of proposed ground disturbance at NAS Whiting Field has been heavily impacted by previous disturbances associated with the construction of buildings and the flight line. NAS Whiting Field does not anticipate that intact archaeological resources are located within the project APE

To date, no consulting party tribe has identified any properties of religious and cultural significance, sacred sites, or Traditional Cultural Properties within the APE at NAS Whiting Field or NOLFs Spencer, Pace, Harold, Santa Rosa, Choctaw and Site X.

Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

In the unlikely event that prehistoric archaeological resources are identified in the course of construction at NAS Whiting Field, the Navy will consult with the SHPO and the tribes to resolve issues of cultural significance and eligibility to the National Register of Historic Places.

In the remote event that "cultural items" subject to the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered, the Navy will follow all procedural safeguards and undertake all requisite consultation with the tribes pursuant to 43 CFR 10.

We hope that your tribe will concur that the AHTS program will not incur effects on Native

American cultural resources. We look forward to hearing from you regarding any issues or areas of concern that you feel should be addressed in the EA. For questions, comments, or input regarding cultural resources, please contact Dr. John Calabrese at john.calabrese@navy.mil or at (904) 542-6985. Questions or comments regarding NEPA can be addressed to Jeff Kissler, Environmental Director at (850) 623-7017; john.j.kissler@navy.mil. For matters related to Government-to-Government consultation, you may contact me directly at (850) 623-7121 or paul.d.bowdich@navy.mil.

Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8508
July 17, 2019

Bryant Celestine
Tribal Historic Preservation Officer
Alabama-Coushatta Tribe of Texas
571 State Park Road 56
Livingston, TX 77351

Dear Mr. Celestine:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

Proposed Undertaking Description

The Navy proposes to modernize the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing FIVE located at NAS Whiting Field and six of its 13 associated NOLFs (Spencer, Pace, Site X, Harold, Santa Rosa and Choctaw), by implementing the AHTS. The AHTS would involve the replacement of TH-57 Sea Ranger training helicopters, replacement of existing ground based training systems (i.e., simulators), an increase in operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities and an increase in personnel. The TH-57 would be replaced with a yet-to-be-determined commercially available helicopter, referred to as the TH-XX. A conservative representative surrogate helicopter, the Eurocopter UH-72 Lakota, is used to analyze the potential impacts from the TH-XX because the Navy has not yet selected the specific helicopter that will replace the TH-57. The Proposed Undertaking would provide a replacement of approximately 113 TH-57 helicopters with 130 TH-XX helicopters for Training Air Wing FIVE at NAS Whiting Field. Although 140 TH-57 helicopters were initially all operating at NAS Whiting Field, the number currently in operation is approximately 113 due to airframe attrition over the life of the TH-57 program. All TH-XX flight operations would be conducted at existing airfields and within airspace currently utilized by Training Air Wing FIVE.

Facility development would be needed for TH-XX maintenance hangars and supporting ground-based training systems. The TH-XX and flight simulators would arrive before permanent facilities would be constructed. As a result, in order to meet the transition timeline, temporary facilities would be constructed. There are four facilities projects, two permanent and two temporary. The estimated construction period for temporary facilities would begin as soon as late 2019/early 2020 and extend through 2021. The estimated construction period of permanent

facilities would begin in 2023 and continue through 2026. Two types of facilities would be required for the AHTS: TH-XX maintenance hangars and training facilities (Enclosure 1).

Definition of APE

The APE for this undertaking is defined as the areas underlying modeled noise contours ≥65 decibel (dB) day night average sound level (DNL), where noise from aircraft operations under the Proposed Undertaking may affect historic properties (Enclosure 2). At NAS Whiting Field, the APE also includes the project area associated with the facility and infrastructure development for AHTS maintenance hangars and supporting ground-based training systems, where existing facilities would be demolished or renovated and new ones would be constructed. For archaeological resources, potential effects would be limited to the areas within the APE at NAS Whiting Field (the project area for facility development) where ground disturbance would occur. These areas encompass approximately 47 acres.

Identification of Historic Properties

A search of the Florida Master Site File (FMSF) reveals that no archaeological survey has been conducted --- and no archaeological sites have been identified --- within the project APE at NAS Whiting Field. According to the Integrated Cultural Resources Management Plan (ICRMP), the area of proposed ground disturbance at NAS Whiting Field has been heavily impacted by previous disturbances associated with the construction of buildings and the flight line. NAS Whiting Field does not anticipate that intact archaeological resources are located within the project APE

To date, no consulting party tribe has identified any properties of religious and cultural significance, sacred sites, or Traditional Cultural Properties within the APE at NAS Whiting Field or NOLFs Spencer, Pace, Harold, Santa Rosa, Choctaw and Site X.

Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

In the unlikely event that prehistoric archaeological resources are identified in the course of construction at NAS Whiting Field, the Navy will consult with the SHPO and the tribes to resolve issues of cultural significance and eligibility to the National Register of Historic Places.

In the remote event that "cultural items" subject to the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered, the Navy will follow all procedural safeguards and undertake all requisite consultation with the tribes pursuant to 43 CFR 10.

We hope that your tribe will concur that the AHTS program will not incur effects on Native

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Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8509
July 17, 2019

Ms. Janice Lowe
Tribal Historic Preservation Officer
Alabama-Quassarte Tribal Town
P.O. Box 187
Wetumka, OK 74883

Dear Ms. Lowe:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

Proposed Undertaking Description

The Navy proposes to modernize the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing FIVE located at NAS Whiting Field and six of its 13 associated NOLFs (Spencer, Pace, Site X, Harold, Santa Rosa and Choctaw), by implementing the AHTS. The AHTS would involve the replacement of TH-57 Sea Ranger training helicopters, replacement of existing ground based training systems (i.e., simulators), an increase in operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities and an increase in personnel. The TH-57 would be replaced with a yet-to-be-determined commercially available helicopter, referred to as the TH-XX. A conservative representative surrogate helicopter, the Eurocopter UH-72 Lakota, is used to analyze the potential impacts from the TH-XX because the Navy has not yet selected the specific helicopter that will replace the TH-57. The Proposed Undertaking would provide a replacement of approximately 113 TH-57 helicopters with 130 TH-XX helicopters for Training Air Wing FIVE at NAS Whiting Field. Although 140 TH-57 helicopters were initially all operating at NAS Whiting Field, the number currently in operation is approximately 113 due to airframe attrition over the life of the TH-57 program. All TH-XX flight operations would be conducted at existing airfields and within airspace currently utilized by Training Air Wing FIVE.

Facility development would be needed for TH-XX maintenance hangars and supporting ground-based training systems. The TH-XX and flight simulators would arrive before permanent facilities would be constructed. As a result, in order to meet the transition timeline, temporary facilities would be constructed. There are four facilities projects, two permanent and two temporary. The estimated construction period for temporary facilities would begin as soon as late 2019/early 2020 and extend through 2021. The estimated construction period of permanent

facilities would begin in 2023 and continue through 2026. Two types of facilities would be required for the AHTS: TH-XX maintenance hangars and training facilities (Enclosure 1).

Definition of APE

The APE for this undertaking is defined as the areas underlying modeled noise contours ≥65 decibel (dB) day night average sound level (DNL), where noise from aircraft operations under the Proposed Undertaking may affect historic properties (Enclosure 2). At NAS Whiting Field, the APE also includes the project area associated with the facility and infrastructure development for AHTS maintenance hangars and supporting ground-based training systems, where existing facilities would be demolished or renovated and new ones would be constructed. For archaeological resources, potential effects would be limited to the areas within the APE at NAS Whiting Field (the project area for facility development) where ground disturbance would occur. These areas encompass approximately 47 acres.

Identification of Historic Properties

A search of the Florida Master Site File (FMSF) reveals that no archaeological survey has been conducted --- and no archaeological sites have been identified --- within the project APE at NAS Whiting Field. According to the Integrated Cultural Resources Management Plan (ICRMP), the area of proposed ground disturbance at NAS Whiting Field has been heavily impacted by previous disturbances associated with the construction of buildings and the flight line. NAS Whiting Field does not anticipate that intact archaeological resources are located within the project APE

To date, no consulting party tribe has identified any properties of religious and cultural significance, sacred sites, or Traditional Cultural Properties within the APE at NAS Whiting Field or NOLFs Spencer, Pace, Harold, Santa Rosa, Choctaw and Site X.

Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

In the unlikely event that prehistoric archaeological resources are identified in the course of construction at NAS Whiting Field, the Navy will consult with the SHPO and the tribes to resolve issues of cultural significance and eligibility to the National Register of Historic Places.

In the remote event that "cultural items" subject to the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered, the Navy will follow all procedural safeguards and undertake all requisite consultation with the tribes pursuant to 43 CFR 10.

We hope that your tribe will concur that the AHTS program will not incur effects on Native

American cultural resources. We look forward to hearing from you regarding any issues or areas of concern that you feel should be addressed in the EA. For questions, comments, or input regarding cultural resources, please contact Dr. John Calabrese at john.calabrese@navy.mil or at (904) 542-6985. Questions or comments regarding NEPA can be addressed to Jeff Kissler, Environmental Director at (850) 623-7017; john.j.kissler@navy.mil. For matters related to Government-to-Government consultation, you may contact me directly at (850) 623-7121 or paul.d.bowdich@navy.mil.

Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8510
July 17, 2019

Karen Brunso
Tribal Historic Preservation Officer
Division of Historic Preservation
Chickasaw Nation
P. O. Box 1548
Ada, OK 74821-1548

Dear Ms. Brunso:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

Proposed Undertaking Description

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Facility development would be needed for TH-XX maintenance hangars and supporting ground-based training systems. The TH-XX and flight simulators would arrive before permanent facilities would be constructed. As a result, in order to meet the transition timeline, temporary facilities would be constructed. There are four facilities projects, two permanent and two temporary. The estimated construction period for temporary facilities would begin as soon as late 2019/early 2020 and extend through 2021. The estimated construction period of permanent facilities would begin in 2023 and continue through 2026. Two types of facilities would be required for the AHTS: TH-XX maintenance hangars and training facilities (Enclosure 1).

Definition of APE

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Identification of Historic Properties

A search of the Florida Master Site File (FMSF) reveals that no archaeological survey has been conducted --- and no archaeological sites have been identified --- within the project APE at NAS Whiting Field. According to the Integrated Cultural Resources Management Plan (ICRMP), the area of proposed ground disturbance at NAS Whiting Field has been heavily impacted by previous disturbances associated with the construction of buildings and the flight line. NAS Whiting Field does not anticipate that intact archaeological resources are located within the project APE

To date, no consulting party tribe has identified any properties of religious and cultural significance, sacred sites, or Traditional Cultural Properties within the APE at NAS Whiting Field or NOLFs Spencer, Pace, Harold, Santa Rosa, Choctaw and Site X.

Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

In the unlikely event that prehistoric archaeological resources are identified in the course of construction at NAS Whiting Field, the Navy will consult with the SHPO and the tribes to resolve issues of cultural significance and eligibility to the National Register of Historic Places.

In the remote event that "cultural items" subject to the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered, the Navy will follow all procedural safeguards and undertake all requisite consultation with the tribes pursuant to 43 CFR 10.

We hope that your tribe will concur that the AHTS program will not incur effects on Native

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Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8511
July 17, 2019

Dr. Ian Thompson (Mississippi contact)
Tribal Historic Preservation Officer
The Choctaw Nation of Oklahoma
P.O. Box 1210
Durant, OK 74702-1210

Dear Dr. Thompson:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

Proposed Undertaking Description

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Facility development would be needed for TH-XX maintenance hangars and supporting ground-based training systems. The TH-XX and flight simulators would arrive before permanent facilities would be constructed. As a result, in order to meet the transition timeline, temporary facilities would be constructed. There are four facilities projects, two permanent and two temporary. The estimated construction period for temporary facilities would begin as soon as late 2019/early 2020 and extend through 2021. The estimated construction period of permanent

facilities would begin in 2023 and continue through 2026. Two types of facilities would be required for the AHTS: TH-XX maintenance hangars and training facilities (Enclosure 1).

Definition of APE

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Identification of Historic Properties

A search of the Florida Master Site File (FMSF) reveals that no archaeological survey has been conducted --- and no archaeological sites have been identified --- within the project APE at NAS Whiting Field. According to the Integrated Cultural Resources Management Plan (ICRMP), the area of proposed ground disturbance at NAS Whiting Field has been heavily impacted by previous disturbances associated with the construction of buildings and the flight line. NAS Whiting Field does not anticipate that intact archaeological resources are located within the project APE

To date, no consulting party tribe has identified any properties of religious and cultural significance, sacred sites, or Traditional Cultural Properties within the APE at NAS Whiting Field or NOLFs Spencer, Pace, Harold, Santa Rosa, Choctaw and Site X.

Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

In the unlikely event that prehistoric archaeological resources are identified in the course of construction at NAS Whiting Field, the Navy will consult with the SHPO and the tribes to resolve issues of cultural significance and eligibility to the National Register of Historic Places.

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Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8512
July 17, 2019

Dr. Linda Langley
Tribal Historic Preservation Officer
Coushatta Tribe of Louisiana
P.O. Box 10
Elton, LA 70532

Dear Dr. Langley:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

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Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

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Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8513
July 17, 2019

Mr. Brett Barnes
Tribal Historic Preservation Officer
Eastern Shawnee Tribe of Oklahoma
12705 S. 705 Road
Wyandotte, OK 74370

Dear Mr. Barnes:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

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Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
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2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8514
July 17, 2019

Mrs. Alina J. Shively
Jena Band of Choctaw Indians
Tribal Historic Preservation Officer
P.O. Box 14
Jena, LA 71342

Dear Mrs. Shively:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

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facilities would begin in 2023 and continue through 2026. Two types of facilities would be required for the AHTS: TH-XX maintenance hangars and training facilities (Enclosure 1).

Definition of APE

The APE for this undertaking is defined as the areas underlying modeled noise contours ≥65 decibel (dB) day night average sound level (DNL), where noise from aircraft operations under the Proposed Undertaking may affect historic properties (Enclosure 2). At NAS Whiting Field, the APE also includes the project area associated with the facility and infrastructure development for AHTS maintenance hangars and supporting ground-based training systems, where existing facilities would be demolished or renovated and new ones would be constructed. For archaeological resources, potential effects would be limited to the areas within the APE at NAS Whiting Field (the project area for facility development) where ground disturbance would occur. These areas encompass approximately 47 acres.

Identification of Historic Properties

A search of the Florida Master Site File (FMSF) reveals that no archaeological survey has been conducted --- and no archaeological sites have been identified --- within the project APE at NAS Whiting Field. According to the Integrated Cultural Resources Management Plan (ICRMP), the area of proposed ground disturbance at NAS Whiting Field has been heavily impacted by previous disturbances associated with the construction of buildings and the flight line. NAS Whiting Field does not anticipate that intact archaeological resources are located within the project APE

To date, no consulting party tribe has identified any properties of religious and cultural significance, sacred sites, or Traditional Cultural Properties within the APE at NAS Whiting Field or NOLFs Spencer, Pace, Harold, Santa Rosa, Choctaw and Site X.

Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

In the unlikely event that prehistoric archaeological resources are identified in the course of construction at NAS Whiting Field, the Navy will consult with the SHPO and the tribes to resolve issues of cultural significance and eligibility to the National Register of Historic Places.

In the remote event that "cultural items" subject to the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered, the Navy will follow all procedural safeguards and undertake all requisite consultation with the tribes pursuant to 43 CFR 10.

We hope that your tribe will concur that the AHTS program will not incur effects on Native

American cultural resources. We look forward to hearing from you regarding any issues or areas of concern that you feel should be addressed in the EA. For questions, comments, or input regarding cultural resources, please contact Dr. John Calabrese at john.calabrese@navy.mil or at (904) 542-6985. Questions or comments regarding NEPA can be addressed to Jeff Kissler, Environmental Director at (850) 623-7017; john.j.kissler@navy.mil. For matters related to Government-to-Government consultation, you may contact me directly at (850) 623-7121 or paul.d.bowdich@navy.mil.

Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO
5700
Ser N00/8515
July 17, 2019

Mr. Brian Givens
Town King
Kialegee Tribal Town; P.O. Box 332;
Wetumka, OK 74883

Dear Mr. Givens:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

Proposed Undertaking Description

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Facility development would be needed for TH-XX maintenance hangars and supporting ground-based training systems. The TH-XX and flight simulators would arrive before permanent facilities would be constructed. As a result, in order to meet the transition timeline, temporary facilities would be constructed. There are four facilities projects, two permanent and two temporary. The estimated construction period for temporary facilities would begin as soon as late 2019/early 2020 and extend through 2021. The estimated construction period of permanent

facilities would begin in 2023 and continue through 2026. Two types of facilities would be required for the AHTS: TH-XX maintenance hangars and training facilities (Enclosure 1).

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Identification of Historic Properties

A search of the Florida Master Site File (FMSF) reveals that no archaeological survey has been conducted --- and no archaeological sites have been identified --- within the project APE at NAS Whiting Field. According to the Integrated Cultural Resources Management Plan (ICRMP), the area of proposed ground disturbance at NAS Whiting Field has been heavily impacted by previous disturbances associated with the construction of buildings and the flight line. NAS Whiting Field does not anticipate that intact archaeological resources are located within the project APE

To date, no consulting party tribe has identified any properties of religious and cultural significance, sacred sites, or Traditional Cultural Properties within the APE at NAS Whiting Field or NOLFs Spencer, Pace, Harold, Santa Rosa, Choctaw and Site X.

Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

In the unlikely event that prehistoric archaeological resources are identified in the course of construction at NAS Whiting Field, the Navy will consult with the SHPO and the tribes to resolve issues of cultural significance and eligibility to the National Register of Historic Places.

In the remote event that "cultural items" subject to the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered, the Navy will follow all procedural safeguards and undertake all requisite consultation with the tribes pursuant to 43 CFR 10.

We hope that your tribe will concur that the AHTS program will not incur effects on Native

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Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8516
July 17, 2019

Billy Cypress
Chairman
Miccosukee Tribe of Indians
P.O. Box 440021
Miami, FL 33144-0021

Dear Mr. Cypress:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

Proposed Undertaking Description

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Facility development would be needed for TH-XX maintenance hangars and supporting ground-based training systems. The TH-XX and flight simulators would arrive before permanent facilities would be constructed. As a result, in order to meet the transition timeline, temporary facilities would be constructed. There are four facilities projects, two permanent and two temporary. The estimated construction period for temporary facilities would begin as soon as late 2019/early 2020 and extend through 2021. The estimated construction period of permanent

facilities would begin in 2023 and continue through 2026. Two types of facilities would be required for the AHTS: TH-XX maintenance hangars and training facilities (Enclosure 1).

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Identification of Historic Properties

A search of the Florida Master Site File (FMSF) reveals that no archaeological survey has been conducted --- and no archaeological sites have been identified --- within the project APE at NAS Whiting Field. According to the Integrated Cultural Resources Management Plan (ICRMP), the area of proposed ground disturbance at NAS Whiting Field has been heavily impacted by previous disturbances associated with the construction of buildings and the flight line. NAS Whiting Field does not anticipate that intact archaeological resources are located within the project APE

To date, no consulting party tribe has identified any properties of religious and cultural significance, sacred sites, or Traditional Cultural Properties within the APE at NAS Whiting Field or NOLFs Spencer, Pace, Harold, Santa Rosa, Choctaw and Site X.

Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

In the unlikely event that prehistoric archaeological resources are identified in the course of construction at NAS Whiting Field, the Navy will consult with the SHPO and the tribes to resolve issues of cultural significance and eligibility to the National Register of Historic Places.

In the remote event that "cultural items" subject to the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered, the Navy will follow all procedural safeguards and undertake all requisite consultation with the tribes pursuant to 43 CFR 10.

We hope that your tribe will concur that the AHTS program will not incur effects on Native

American cultural resources. We look forward to hearing from you regarding any issues or areas of concern that you feel should be addressed in the EA. For questions, comments, or input regarding cultural resources, please contact Dr. John Calabrese at john.calabrese@navy.mil or at (904) 542-6985. Questions or comments regarding NEPA can be addressed to Jeff Kissler, Environmental Director at (850) 623-7017; john.j.kissler@navy.mil. For matters related to Government-to-Government consultation, you may contact me directly at (850) 623-7121 or paul.d.bowdich@navy.mil.

Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8517
July 17, 2019

Kenneth H. Carleton
Tribal Archaeologist
Mississippi Band of Choctaw Indians
P.O. Box 6010
Philadelphia, MS 39350

Dear Mr. Carleton:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

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Facility development would be needed for TH-XX maintenance hangars and supporting ground-based training systems. The TH-XX and flight simulators would arrive before permanent facilities would be constructed. As a result, in order to meet the transition timeline, temporary facilities would be constructed. There are four facilities projects, two permanent and two temporary. The estimated construction period for temporary facilities would begin as soon as late 2019/early 2020 and extend through 2021. The estimated construction period of permanent

facilities would begin in 2023 and continue through 2026. Two types of facilities would be required for the AHTS: TH-XX maintenance hangars and training facilities (Enclosure 1).

Definition of APE

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Identification of Historic Properties

A search of the Florida Master Site File (FMSF) reveals that no archaeological survey has been conducted --- and no archaeological sites have been identified --- within the project APE at NAS Whiting Field. According to the Integrated Cultural Resources Management Plan (ICRMP), the area of proposed ground disturbance at NAS Whiting Field has been heavily impacted by previous disturbances associated with the construction of buildings and the flight line. NAS Whiting Field does not anticipate that intact archaeological resources are located within the project APE

To date, no consulting party tribe has identified any properties of religious and cultural significance, sacred sites, or Traditional Cultural Properties within the APE at NAS Whiting Field or NOLFs Spencer, Pace, Harold, Santa Rosa, Choctaw and Site X.

Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

In the unlikely event that prehistoric archaeological resources are identified in the course of construction at NAS Whiting Field, the Navy will consult with the SHPO and the tribes to resolve issues of cultural significance and eligibility to the National Register of Historic Places.

In the remote event that "cultural items" subject to the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered, the Navy will follow all procedural safeguards and undertake all requisite consultation with the tribes pursuant to 43 CFR 10.

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Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8518
July 17, 2019

Theodore Isham
Seminole Nation of Oklahoma
Historic Preservation Officer
PO Box 1498
Wewoka, OK 74884

Dear Mr. Isham:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

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Identification of Historic Properties

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Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

In the unlikely event that prehistoric archaeological resources are identified in the course of construction at NAS Whiting Field, the Navy will consult with the SHPO and the tribes to resolve issues of cultural significance and eligibility to the National Register of Historic Places.

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Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8519
July 17, 2019

Bradley Mueller
Compliance Review Supervisor
Seminole Tribe of Florida
30290 Josie Billie Highway
Clewiston, FL 33440

Dear Mr. Mueller:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

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Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

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In the remote event that "cultural items" subject to the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered, the Navy will follow all procedural safeguards and undertake all requisite consultation with the tribes pursuant to 43 CFR 10.

We hope that your tribe will concur that the AHTS program will not incur effects on Native

American cultural resources. We look forward to hearing from you regarding any issues or areas of concern that you feel should be addressed in the EA. For questions, comments, or input regarding cultural resources, please contact Dr. John Calabrese at john.calabrese@navy.mil or at (904) 542-6985. Questions or comments regarding NEPA can be addressed to Jeff Kissler, Environmental Director at (850) 623-7017; john.j.kissler@navy.mil. For matters related to Government-to-Government consultation, you may contact me directly at (850) 623-7121 or paul.d.bowdich@navy.mil.

Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
1. Project Area for AHTS Facility Development
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8520
July 17, 2019

Ms. Tonya Tipton
Tribal Historic Preservation Officer
Shawnee Tribe
29 S. Highway 69A
Miami, OK 74355

Dear Ms. Tipton:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

Proposed Undertaking Description

The Navy proposes to modernize the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing FIVE located at NAS Whiting Field and six of its 13 associated NOLFs (Spencer, Pace, Site X, Harold, Santa Rosa and Choctaw), by implementing the AHTS. The AHTS would involve the replacement of TH-57 Sea Ranger training helicopters, replacement of existing ground based training systems (i.e., simulators), an increase in operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities and an increase in personnel. The TH-57 would be replaced with a yet-to-be-determined commercially available helicopter, referred to as the TH-XX. A conservative representative surrogate helicopter, the Eurocopter UH-72 Lakota, is used to analyze the potential impacts from the TH-XX because the Navy has not yet selected the specific helicopter that will replace the TH-57. The Proposed Undertaking would provide a replacement of approximately 113 TH-57 helicopters with 130 TH-XX helicopters for Training Air Wing FIVE at NAS Whiting Field. Although 140 TH-57 helicopters were initially all operating at NAS Whiting Field, the number currently in operation is approximately 113 due to airframe attrition over the life of the TH-57 program. All TH-XX flight operations would be conducted at existing airfields and within airspace currently utilized by Training Air Wing FIVE.

Facility development would be needed for TH-XX maintenance hangars and supporting ground-based training systems. The TH-XX and flight simulators would arrive before permanent facilities would be constructed. As a result, in order to meet the transition timeline, temporary facilities would be constructed. There are four facilities projects, two permanent and two temporary. The estimated construction period for temporary facilities would begin as soon as late 2019/early 2020 and extend through 2021. The estimated construction period of permanent

facilities would begin in 2023 and continue through 2026. Two types of facilities would be required for the AHTS: TH-XX maintenance hangars and training facilities (Enclosure 1).

Definition of APE

The APE for this undertaking is defined as the areas underlying modeled noise contours ≥65 decibel (dB) day night average sound level (DNL), where noise from aircraft operations under the Proposed Undertaking may affect historic properties (Enclosure 2). At NAS Whiting Field, the APE also includes the project area associated with the facility and infrastructure development for AHTS maintenance hangars and supporting ground-based training systems, where existing facilities would be demolished or renovated and new ones would be constructed. For archaeological resources, potential effects would be limited to the areas within the APE at NAS Whiting Field (the project area for facility development) where ground disturbance would occur. These areas encompass approximately 47 acres.

Identification of Historic Properties

A search of the Florida Master Site File (FMSF) reveals that no archaeological survey has been conducted --- and no archaeological sites have been identified --- within the project APE at NAS Whiting Field. According to the Integrated Cultural Resources Management Plan (ICRMP), the area of proposed ground disturbance at NAS Whiting Field has been heavily impacted by previous disturbances associated with the construction of buildings and the flight line. NAS Whiting Field does not anticipate that intact archaeological resources are located within the project APE

To date, no consulting party tribe has identified any properties of religious and cultural significance, sacred sites, or Traditional Cultural Properties within the APE at NAS Whiting Field or NOLFs Spencer, Pace, Harold, Santa Rosa, Choctaw and Site X.

Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

In the unlikely event that prehistoric archaeological resources are identified in the course of construction at NAS Whiting Field, the Navy will consult with the SHPO and the tribes to resolve issues of cultural significance and eligibility to the National Register of Historic Places.

In the remote event that "cultural items" subject to the provisions of the Native American Graves Protection and Repatriation Act (NAGPRA) are discovered, the Navy will follow all procedural safeguards and undertake all requisite consultation with the tribes pursuant to 43 CFR 10.

We hope that your tribe will concur that the AHTS program will not incur effects on Native

American cultural resources. We look forward to hearing from you regarding any issues or areas of concern that you feel should be addressed in the EA. For questions, comments, or input regarding cultural resources, please contact Dr. John Calabrese at john.calabrese@navy.mil or at (904) 542-6985. Questions or comments regarding NEPA can be addressed to Jeff Kissler, Environmental Director at (850) 623-7017; john.j.kissler@navy.mil. For matters related to Government-to-Government consultation, you may contact me directly at (850) 623-7121 or paul.d.bowdich@navy.mil.

Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

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2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8521
July 17, 2019

Mr. Galen Cloud
Tribal Historic Preservation Officer
Thlopthlocco Tribal Town
P.O. Box 188
Okemah, OK 74859

Dear Mr. Cloud:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

Proposed Undertaking Description

The Navy proposes to modernize the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing FIVE located at NAS Whiting Field and six of its 13 associated NOLFs (Spencer, Pace, Site X, Harold, Santa Rosa and Choctaw), by implementing the AHTS. The AHTS would involve the replacement of TH-57 Sea Ranger training helicopters, replacement of existing ground based training systems (i.e., simulators), an increase in operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities and an increase in personnel. The TH-57 would be replaced with a yet-to-be-determined commercially available helicopter, referred to as the TH-XX. A conservative representative surrogate helicopter, the Eurocopter UH-72 Lakota, is used to analyze the potential impacts from the TH-XX because the Navy has not yet selected the specific helicopter that will replace the TH-57. The Proposed Undertaking would provide a replacement of approximately 113 TH-57 helicopters with 130 TH-XX helicopters for Training Air Wing FIVE at NAS Whiting Field. Although 140 TH-57 helicopters were initially all operating at NAS Whiting Field, the number currently in operation is approximately 113 due to airframe attrition over the life of the TH-57 program. All TH-XX flight operations would be conducted at existing airfields and within airspace currently utilized by Training Air Wing FIVE.

Facility development would be needed for TH-XX maintenance hangars and supporting ground-based training systems. The TH-XX and flight simulators would arrive before permanent facilities would be constructed. As a result, in order to meet the transition timeline, temporary facilities would be constructed. There are four facilities projects, two permanent and two temporary. The estimated construction period for temporary facilities would begin as soon as late 2019/early 2020 and extend through 2021. The estimated construction period of permanent

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Identification of Historic Properties

A search of the Florida Master Site File (FMSF) reveals that no archaeological survey has been conducted --- and no archaeological sites have been identified --- within the project APE at NAS Whiting Field. According to the Integrated Cultural Resources Management Plan (ICRMP), the area of proposed ground disturbance at NAS Whiting Field has been heavily impacted by previous disturbances associated with the construction of buildings and the flight line. NAS Whiting Field does not anticipate that intact archaeological resources are located within the project APE

To date, no consulting party tribe has identified any properties of religious and cultural significance, sacred sites, or Traditional Cultural Properties within the APE at NAS Whiting Field or NOLFs Spencer, Pace, Harold, Santa Rosa, Choctaw and Site X.

Determination of Effect

The Navy concludes that the AHTS program will not incur effects on cultural resources that may be esteemed by the tribes.

In the unlikely event that prehistoric archaeological resources are identified in the course of construction at NAS Whiting Field, the Navy will consult with the SHPO and the tribes to resolve issues of cultural significance and eligibility to the National Register of Historic Places.

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Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

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2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

DEPARTMENT OF THE NAVY
COMMANDING OFFICER
NAS WHITING FIELD
7550 USS ESSEX STREET SUITE 200
MILTON, FLORIDA 32570-6155

IN REPLY REFER TO

5700
Ser N00/8522
July 17, 2019

Earl J. Barbry, Jr.
Tribal Historic Preservation Officer
Tunica-Biloxi Indian Tribe
P.O. Box 1589
Marksville, LA 71351

Dear Mr. Barbry:

The United States Navy (Navy) is initiating Government-to-Government consultation in accordance with Section 106 of the National Historic Preservation Act (54 U.S.C. 306108) regarding a Proposed Undertaking to implement the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields (NOLFs) in Florida. The Navy is preparing an Environmental Assessment (EA) under the National Environmental Policy Act to evaluate potential environmental impacts associated with the AHTS at NAS Whiting Field. The project Area of Potential Effects (APE), compliance steps and findings are outlined below.

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Sincerely,

PAUL D. BOWDICH
Captain, U.S. Navy
Commanding Officer

Enclosures:
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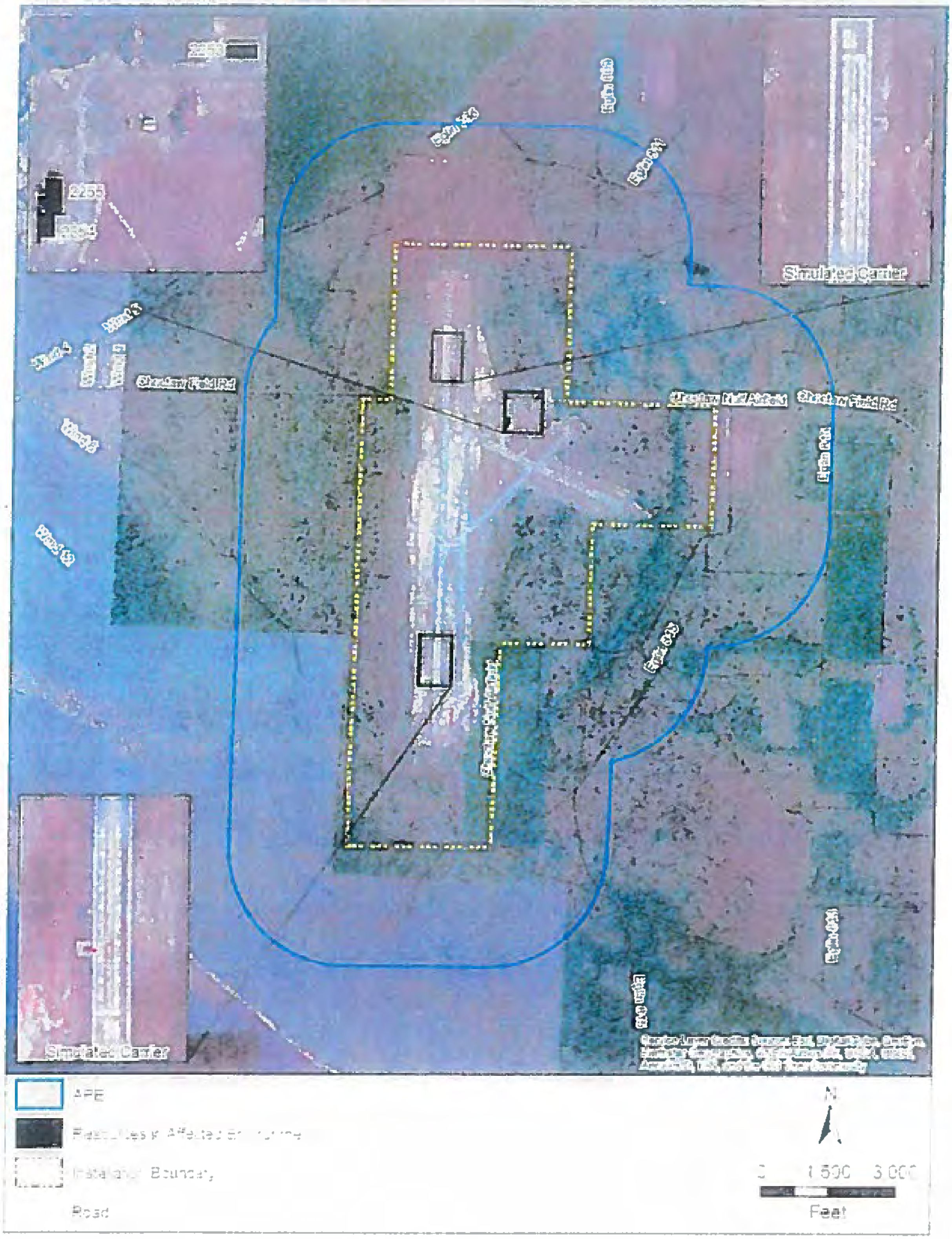
2. Day/Night Average Sound Level Contours and APE for Proposed AHTS at NAS Whiting Field and its NOLFs

Map 2. NAS Whiting Field Project Area with Key Project Buildings

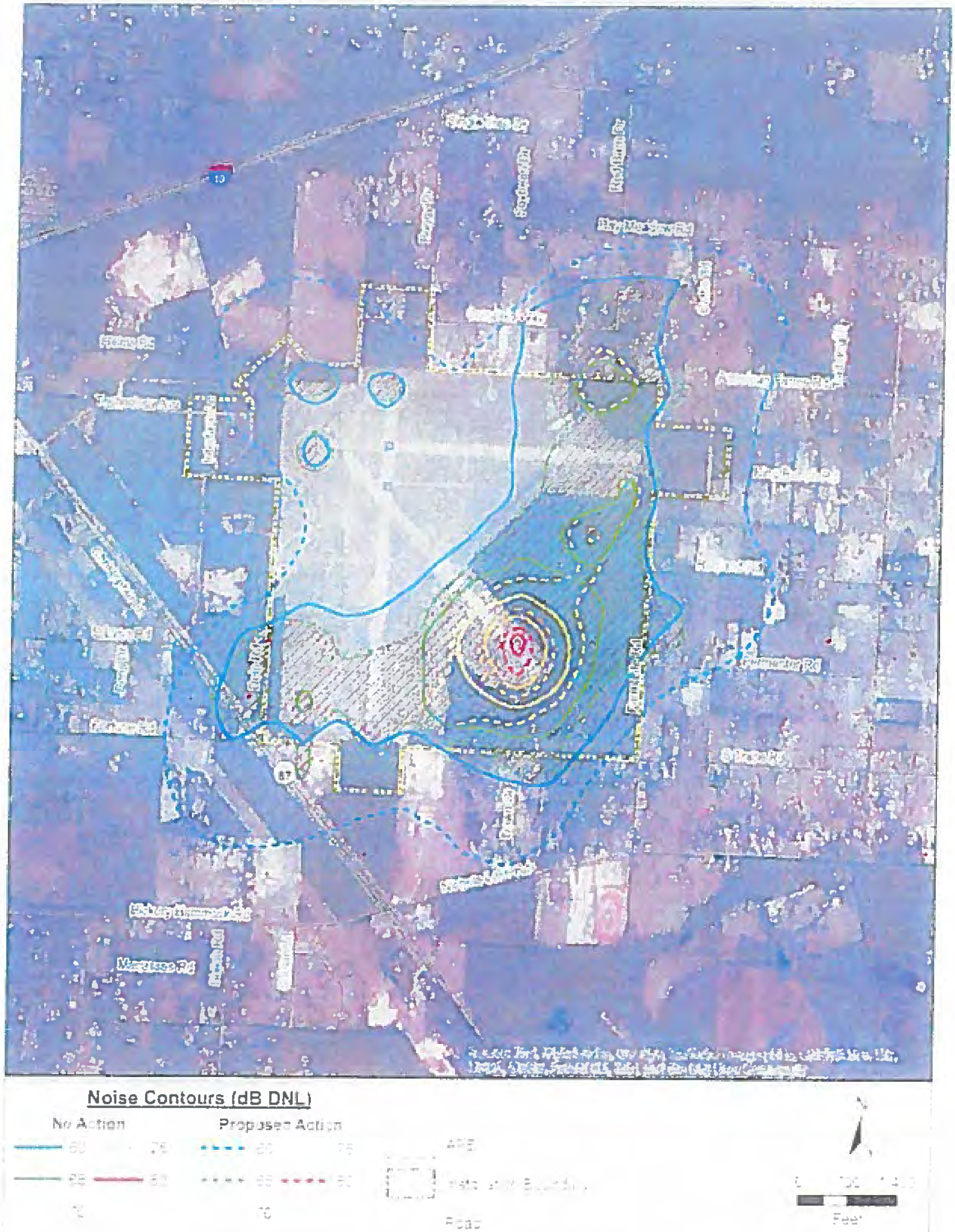
Map 1. NAS Whiting Field APE with No Action and Proposed Action Noise Contours



Map 3. NOLF Choctaw APE

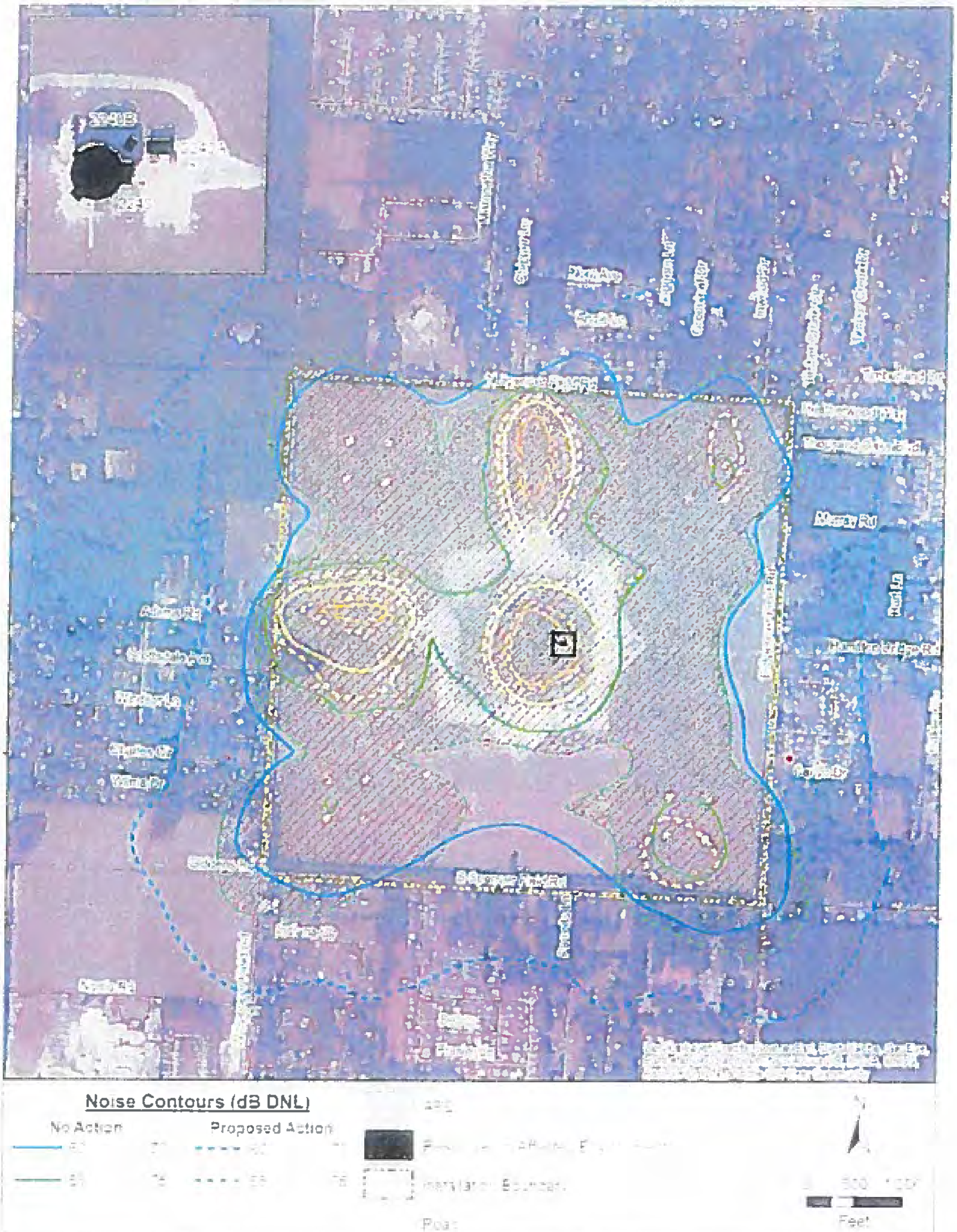
Map 4. NOLF Harold APE with No Action and Proposed Action Noise Contours

Map 5. NOLF Pace APE with No Action and Proposed Action Noise Contours



Map 6. NOLF Santa Rosa APE with No Action and Proposed Action Noise Contours

Map 7. NOLF Site X APE with No Action and Proposed Action Noise Contours



Map 8. NOLF Spencer APE with No Action and Proposed Action Noise Contours

From: Raynella D. Fontenot <RDFontenot@coushatta.org>
Sent: Thursday, July 25, 2019 2:08 PM
To: Bowdich, Paul D CAPT USN NAS WFLD MILTON FL (USA) <paul.d.bowdich@navy.mil>
Cc: Calabrese, John A CIV USN NAVFAC SE JAX FL (USA) <john.calabrese@navy.mil>; Kissler, John J CIV USN NAVFAC SE JAX FL (US) <john.j.kissler@navy.mil>
Subject: [Non-DoD Source] Section 106 Determination for Proposed Undertaking to implement the Advanced Helicopter Training System at Naval Air Station (NAS) Whiting Field and its associated Navy Outlying Landing Fields in Florida.

Dear Captain Bowdich, U.S. Navy,

Thank you for requesting our 106/EA determination. Based on the information provided, I do not believe that this project will have a negative impact on any archaeological, historic or cultural resources of the Coushatta people. Accordingly, we do not wish to consult further on this project. If any inadvertent discoveries are made in the course of this project, we expect to be contacted immediately and reserve the right to consult with you at that time.

Aliilamo (thank you),

Raynella Fontenot
Coushatta Revitalization Coordinator
Acting Section 106 Coordinator
Coushatta Tribe of Louisiana
P.O. Box 10
Elton, LA 70532
337-584-1585

From: Tonya Tipton <tonya@shawnee-tribe.com>
Sent: Monday, August 5, 2019 11:32 AM
To: Roy, Randy R CIV USN (US) <randy.roy@navy.mil>
Subject: [Non-DoD Source] RE: Letter from Naval Air Station Whiting Field Florida

This letter is in response to the above referenced project.

The Shawnee Tribe's Tribal Historic Preservation Department concurs that no known historic properties will be negatively impacted by this project.

We have no issues or concerns at this time, but in the event that archaeological materials are encountered during construction, use, or maintenance of this location, please re-notify us at that time as we would like to resume immediate consultation under such a circumstance.

If you have any questions, you may contact me via email at tonya@shawnee-tribe.com

Thank you for giving us the opportunity to comment on this project.

Sincerely,

Tonya Tipton

Shawnee Tribe-THPO

29 S Highway 69A
Miami, OK 74354
Phone:(918)542-2441
Fax: (918)542-2922
tonya@shawnee-tribe.com

From: Bradley Mueller <bradleymueller@semtribe.com>
Sent: Tuesday, August 20, 2019 8:59 AM
To: Bowdich, Paul D CAPT USN NAS WFLD MILTON FL (USA) <paul.d.bowdich@navy.mil>
Cc: Calabrese, John A CIV USN NAVFAC SE JAX FL (USA) <john.calabrese@navy.mil>
Subject: [Non-DoD Source] Advanced Helicopter Training System at Naval Air Station Whiting Field and Associated NOFL's, Florida

SEMINOLE TRIBE OF FLORIDA
TRIBAL HISTORIC PRESERVATION OFFICE
AH-TAH-THI-KI MUSEUM

TRIBAL HISTORIC PRESERVATION OFFICE
SEMINOLE TRIBE OF FLORIDA
AH-TAH-THI-KI MUSEUM
30290 JOSIE BILLIE HIGHWAY
PMB 1004
CLEWISTON, FL 33440
THPO PHONE: (863) 983-6549
MUSEUM PHONE: (863) 902-1113
FAX: (863) 902-1117
THPO WEBSITE: WWW.STOFTHPO.COM
MUSEUM WEBSITE: WWW.AHTAHTHIKI.COM

August 20, 2019

Captain Paul D. Bowdich
U.S. Navy Commanding Officer
Navy Region Southeast
Naval Air Station Jacksonville
Jacksonville, FL
Phone: 850-623-7121
Email: paul.d.bowdich@navy.mil

Subject: Advanced Helicopter Training System at Naval Air Station Whiting Field and Associated NOFL's, Florida
THPO Compliance Tracking Number: 0031589

Dear Captain Bowdich,

Thank you for contacting the Seminole Tribe of Florida – Tribal Historic Preservation Office (STOF-THPO), Compliance Section regarding the Advanced Helicopter Training System at Naval Air Station Whiting Field and Associated NOFL's, Florida undertaking.

The proposed undertaking does fall within the STOF Area of Interest. We have reviewed the documents you provided and have no objections to the project at this time as long as a Secretary of the Interior qualified archaeologist is present to monitor construction related ground disturbing activities. Despite what appears to be extensive previous disturbances in the Area of Potential Effect, past experience has shown us that there still remains a possibility of intact cultural resources in these settings. We also base our "no objection" assessment on our understanding that no new construction or ground disturbance will be occurring on any of the six Navy Outlying Landing Fields (NOFLs) mentioned in your July 17, 2019 consultation letter. Please notify us if any archaeological, historical, or burial resources are inadvertently discovered during any phase of project implementation. Thank you and feel free to contact us with any questions or concerns.

Most Respectfully,

Bradley M. Mueller, MA, Compliance Specialist
STOF-THPO, Compliance Review Section
30290 Josie Billie Hwy, PMB 1004
Clewiston, FL 33440

Office: 863-983-6549 ext 12245
Fax: 863-902-1117
Email: bradleymueller@semtribe.com
Web: www.stofthpo.com

Appendix D: Coastal Consistency Determination

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FEDERAL AGENCY COASTAL ZONE MANAGEMENT ACT
CONSISTENCY DETERMINATION FOR THE STATE OF FLORIDA

INTRODUCTION

This document provides the State of Florida with the Department of the Navy's (Navy) Consistency Determination under Coastal Zone Management Act (CZMA) of 1972, as amended, and 15 Code of Federal Regulations (CFR) part 930, subpart c, for the proposed Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field, Santa Rosa County, Florida (Figure 1). The information in this Consistency Determination is provided pursuant to 15 CFR part 930.39.

REGULATORY BACKGROUND INFORMATION

The CZMA, codified in 16 U.S. Code (U.S.C.) section 1451 et seq., established a comprehensive regulatory scheme for effective management, beneficial use, protection, and development of the coastal zone and its natural resources. The CZMA encourages coastal states and provides a mechanism for them to develop, obtain federal approval for, and implement a broad-based coastal management program.

CZMA section 307 provides that federal agency activities shall be carried out in a manner which is consistent to the maximum extent practicable with the enforceable policies of approved state management programs. Section 307 applies to federal agency activity in a state's coastal zone and also to federal agency activity outside the coastal zone, if the activity affects a land or water use in or natural resources of the coastal zone. Federal agency activity includes activity performed by a federal agency, approved by a federal agency, or for which a federal agency provides financial assistance. Such activity, whether direct, indirect, or cumulative, must be demonstrated to be consistent with the enforceable policies of the state's coastal management program, unless full consistency is otherwise prohibited by federal law (per 15 CFR part 930.32, "consistent to the maximum extent practicable"). Pursuant to 16 U.S.C. 1453, the term "coastal zone" specifically excludes "lands the use of which is by law subject solely to the discretion of or which is held in trust by the Federal Government, its officers or agents." Therefore, the coastal zone excludes NAS Whiting Field.

The State of Florida developed the Florida Coastal Management Program (FCMP), which was approved by the National Oceanic and Atmospheric Administration in 1981. The FCMP consists of a network of 24 Florida statutes, administered by multiple state agencies and water management districts. The FCMP includes enforceable policies that ensure the wise use and protection of the state's water, cultural, historic, and biological resources; minimize the state's vulnerability to coastal hazards; ensure compliance with the state's growth management laws; protect the state transportation system; and protect the state's proprietary interest as the owner of sovereignty submerged lands.

After review of the FCMP, the Navy determined policies that may be applicable to the proposed action and then conducted an "effects test" to determine whether the proposed action would have a reasonably foreseeable direct, indirect, or cumulative effect on the state's coastal uses or resources. After conducting the effects test, the Navy determined that the proposed action may result in reasonably foreseeable direct, indirect, or cumulative effects on Florida's coastal uses or resources. More specifically, the Navy determined that the proposed action operations would generate air emissions and noise with potential to affect coastal zone resources. The proposed facilities construction on the military installation has potential to indirectly affect coastal zone resources. Therefore, the Navy has prepared this consistency determination.

DESCRIPTION OF THE PROPOSED FEDERAL AGENCY ACTION

The Navy proposes to modernize the rotary-wing and tilt-rotor integrated pilot production training program at Training Air Wing Five located at NAS Whiting Field and its associated Navy Outlying Landing Fields (NOLFs), in Florida, by implementing the AHTS. The AHTS would involve the replacement of TH-57 Sea Ranger training helicopters, replacement of existing ground based training systems (i.e., simulators), an increase in operational training tempo, changes in operational tactics based on a new curriculum, construction of new facilities, and an increase in personnel.

The TH-57 would be replaced with a similar commercially available helicopter. As the specific commercial helicopter has not yet been selected, the new helicopter is referred to as the TH-XX. A surrogate helicopter, the Eurocopter UH-72 Lakota, is used to analyze the potential impacts from the TH-XX. The existing TH-57 helicopters would be replaced with 130 TH-XX helicopters. Training Air Wing Five would progressively transition to the TH-XX at a rate of 30 to 36 aircraft per year beginning in 2021, with the transition to be complete in the 2025 timeframe. The older TH-57 helicopters would gradually be retired during the transition period.

All TH-XX flight operations would be conducted at existing airfields and within airspace currently utilized by Training Air Wing Five. The total number of flight training hours would increase by approximately 22 percent. Proposed flight training with the TH-XX and Ground Based Training System includes helicopter familiarization, basic and radio instruments, and basic warfighting skills. Basic warfighting skills involve the following: energy management, night vision devices, terrain flight, formation flight, confined area and pinnacle landings, external load vertical replenishment operations, search and rescue with hoist, and shipboard operations. Flight patterns, altitudes, and airspeeds for training operations with the TX-XX would remain similar to those currently conducted with the TH-57. The new curriculum will include additional flight training operations that involve night vision devices, night formation flying, and search and rescue, skill sets identified as training gaps by Fleet helicopter pilots. The newer AHTS training syllabus would provide the right mix of virtual and actual training to maximize student pilot training. Nine additional simulators would be added to the Ground Based Training System in support of the TX-XX.

During the transition, both the TH-57 and TH-XX support, infrastructure, and maintenance actions would be required to continue meeting the student training needs of Training Air Wing Five. As the TH-XX increase in number, the TH-57 systems and support would diminish until the transition is complete.

Implementing the AHTS would require an increase of 33 military personnel and contractors. The AHTS would also require development of facilities and infrastructure to support the necessary training, maintenance, and operational requirements. Two temporary and two permanent facilities would be constructed for the new helicopter maintenance hangars and supporting ground-based training systems within the approximately 47-acre project area shown in Figure 2.

P-288 – AHTS Temporary Maintenance Hangar

The proposed temporary hangar would be a commercially-available tension fabric structure. Construction would include a 52,534 square foot (SF) concrete pad with utility connections to support installation of a tension fabric structure and temporary trailers for crew, equipment, and administrative space for temporary use at Whiting Field South. The tension fabric structure would be located north of the existing aircraft parking apron located on the west side the existing hangar Building 1406 (Figure 2). The hangar would accommodate 30 helicopters. The structures would include full fire suppression and fire alarm throughout. This project would also provide new utility lines and connections to existing electrical, water, sewer, and communications utilities. The estimated construction period would be from January through November 2020. Once the permanent aircraft maintenance hangar is constructed, the tension fabric structure would be removed from the site and the utility systems and concrete pad would be secured/abandoned in place.

NF 18-1783 - Temporary Ground Based Training System Structure

The proposed temporary Ground Based Training System would be a 15,000 SF temporary, relocatable, pre-engineered structure that would be installed on a concrete pad. The project would also include two temporary and relocatable administrative, breakroom, and restroom trailers totaling approximately 1,440 SF. The new structures would require connections to the existing electrical, water, sewer, communications, and telephone utilities that would be incorporated into the existing base infrastructure. The Ground Based Training System facility would be located on an empty lot on the corner of USS Long Island Street and USS Ranger Street (Figure 2). The building would accommodate up to eight simulators and eight briefing spaces. The estimated construction period would be from fall 2019 through summer 2021. Following construction of the permanent AHTS facility, the temporary Ground Based Training System improvements would be removed from the site and the utility systems would be secured/abandoned in place.

P-286 – AHTS Aircraft Maintenance Hangar

The proposed permanent hangar would be an approximately 166,000 SF AHTS-compliant Type I aircraft maintenance hangar consisting of high bay space, crew and equipment space, administrative space, and data network areas. The project would include the extension of the aircraft parking apron near the hangar. The AHTS hangar would be designed to support the 130 new helicopters. Site improvements would include grading, pavements, curbs, sidewalks, fencing, landscaping and signage. Mechanical utilities include new water, sanitary sewer, and storm water collection systems. Electrical utilities include new primary and secondary systems, communication systems, and site lighting. Built-in equipment includes a floor-level fire suppression system in the maintenance bays. P-286 would be located along the flight line (Figure 2) and would involve the demolition of Buildings 1406, 1454, 2977 and, 2978. The estimated construction period would be from the fall of 2022 through the spring of 2025.

P-282 – AHTS Flight Simulator Facility

The proposed AHTS Flight Simulator Facility would be 52,052 SF operational trainer facility to accommodate 18 TH-XX flight trainers (12 Level 7 and 6 Level 6) and the associated support space. Construction would include a two-story steel frame building with a reinforced concrete structural slab with a pile foundation. The facility would include spaces for brief/de-brief, instructors, simulator maintenance, and administrative support. The facility would include fire protection, environmentally controlled HVAC system, electrical and mechanical utilities, parking lot, and site improvements. The project would demolish Building 3005 (34,776 SF) and renovate 2,928 SF of Building 2946 by relocating existing simulators and converting the space back to classrooms. P-282 would be located in the corner of USS Enterprise Street and USS Lexington Circle (Figure 2). The estimated construction period would be from fall 2024 to summer 2025.

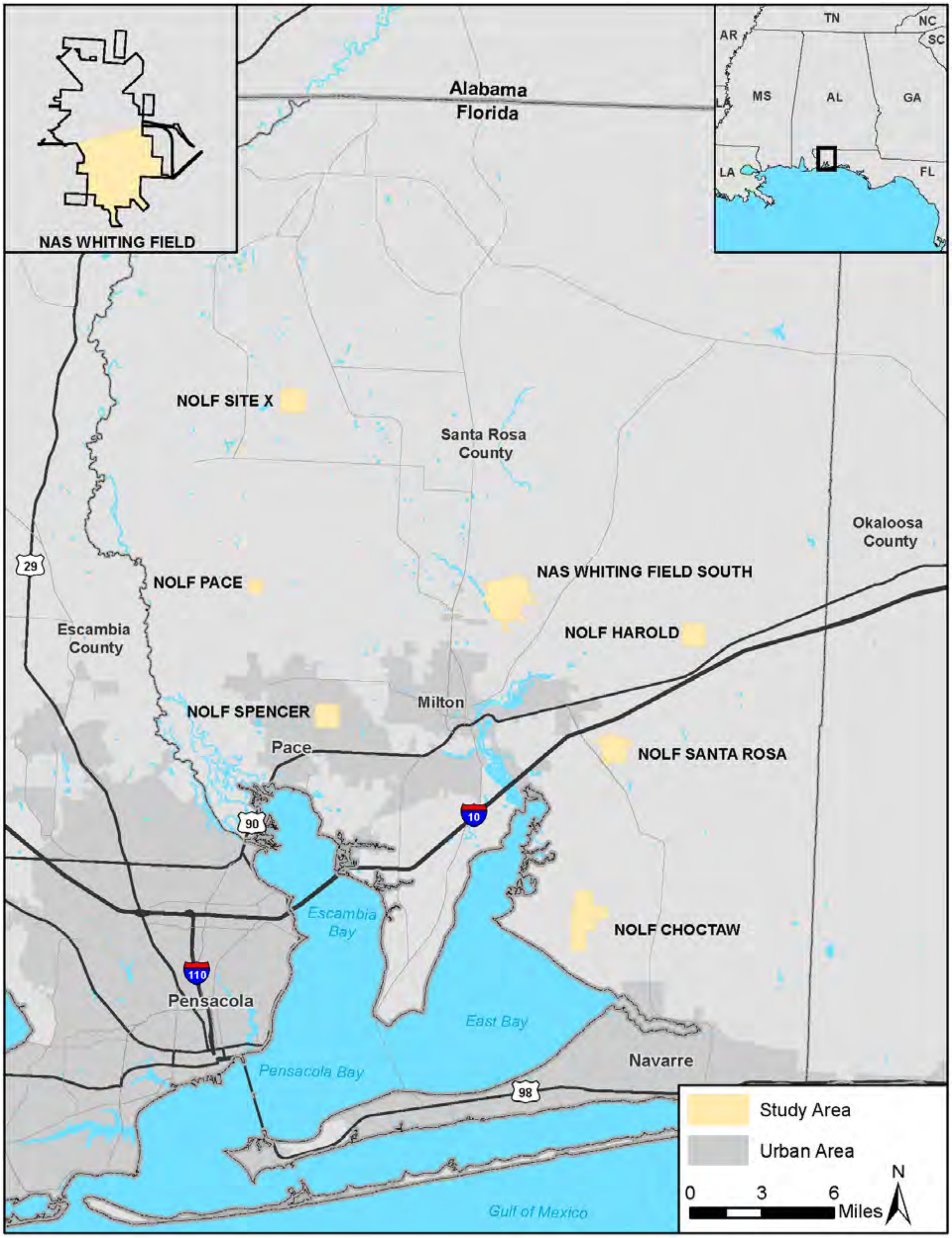

Figure 1: Project Location Area

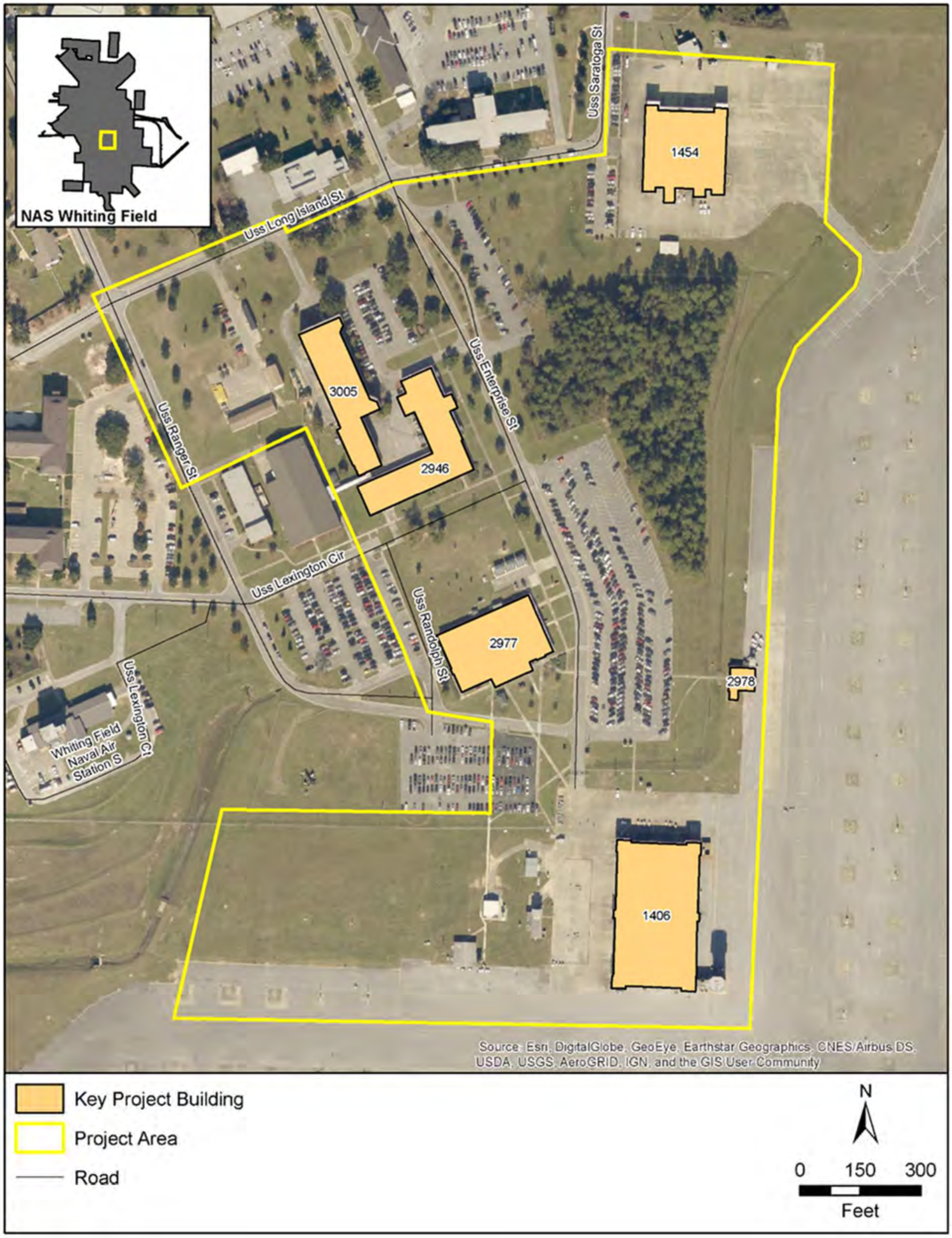

Figure 2: AHTS Project Area

FEDERAL CONSISTENCY REVIEW

The FCMP is composed of state statutes, which constitute the enforceable policies of the Coastal Management Program. Statutes addressed as part of the FCMP consistency review that are not applicable to the proposed action are discussed in Table 1. Enforceable policies that are applicable to the proposed action are analyzed below. As described in the consistency evaluation, the Navy has determined that modernization of rotary-wing and tilt-rotor integrated pilot production training program by implementing the AHTS at NAS Whiting Field and its NOLFs would be either fully consistent or consistent to the maximum extent practicable with the applicable enforceable policies of the FCMP.

Table 1: Florida Coastal Management Program Enforceable Policies Not Applicable to the Proposed Action

Florida Statute	*Legal Scope*	*Consistency Evaluation*
Chapter 161 *Beach and Shore Preservation*	Authorizes the Bureau of Beaches and Coastal Systems within Department of Environmental Protection to regulate construction on or seaward of the state's beaches.	The proposed action would not include construction within or adjacent to any beach or shoreline and would not affect beach and shore management, specifically as it pertains to: • Coastal Construction Permit Program • Coastal Construction Control Line Program • Coastal Zone Protection Program
Chapter 163, Part II *Growth Policy; County and Municipal Planning; Land Development Regulation*	Requires local governments to prepare, adopt, and implement comprehensive plans that encourage the most appropriate use of land and natural resources in a manner consistent with the public interest.	The proposed action would not affect local (municipal or county) government comprehensive plans because it would not affect public health, safety, comfort, good order, appearance, convenience, law enforcement, fire prevention, general welfare, concentration of population on the land, public facilities and services, or natural resources.
Chapter 186 *State and Regional Planning*	Details state-level planning requirements. Requires the development of special statewide plans governing water use, land development, and transportation.	The proposed action would not affect Florida state- or regional-level planning requirements and would not have a negative effect on state plans for water use, land development, or transportation.
Chapter 252 *Emergency Management*	Provides for planning and implementation of the state's response to, efforts to recover from, and mitigation of natural and man- made disasters.	The proposed action would not have an effect on the ability of the state to respond to or recover from natural or man-made disasters and would not affect evacuation procedures or food-control procedures.
Chapter 253 *State Lands*	Addresses the state's administration of public lands and property of this state and provides direction regarding the acquisition, disposal, and management of all state lands.	Construction associated with the proposed action would occur entirely within NAS Whiting Field property. No state lands would be disturbed during the construction of temporary and permanent facilities and, therefore, would not be affected.

Florida Statute	***Legal Scope***	***Consistency Evaluation***
Chapter 258 *State Parks and Preserves*	Addresses administration and management of state parks and preserves.	The proposed action would not impact the administration or management of state parks and preserves. Proposed TH-XX training flights would follow the existing course rules currently used for TH-57, which overfly the following state parks and preserves: • Course rules for NOLF Site X overfly the Escambia River State Wildlife Management Area. • Course rules for NOLF Harold overfly the Blackwater River State Park. • Course rules for NOLF Santa Rosa overfly the Yellow River Wildlife Management Area, the Blackwater River State Park. • Course rules for NOLF Choctaw overfly the Yellow River Marsh Aquatic Preserve, Yellow River Wildlife Management Area, Yellow River Marsh State Preserve Park, and the Escribano Point Wildlife Management Area.
Chapter 259 *Land Acquisitions for Conservation or Recreation*	Authorizes acquisition of environmentally endangered lands and outdoor recreation lands.	The proposed action would not have an effect on the acquisition of environmentally endangered and outdoor recreation lands.
Chapter 260 *Florida Greenways and Trails Act*	Authorizes acquisition of land, planning, and management of a statewide system of greenways and trails for recreational and conservation purposes	The proposed action would not have an impact on the acquisition of land, planning or management of the statewide greenways and trails system.

Florida Statute	*Legal Scope*	*Consistency Evaluation*
Chapter 267 *Historical Resources*	Addresses management and preservation of the state's archaeological and historical resources.	The proposed action would not affect the management or preservation of the archaeological resources of the State of Florida, as there are no known archaeological resources within the Area of Potential Effects. In the unlikely event that previously unrecorded archaeological sites were encountered during the construction, the Navy would stop work in the immediate area and follow Standard Operating Procedure 5, Inadvertent Discoveries, per the installation's Integrated Cultural Resources Management Plan. This process includes stopping the work and securing the area, and evaluating the site for National Register of Historic Places (NRHP) eligibility in consultation with the State Historic Preservation Officer, affected American Indian tribes, and other interested parties, pursuant to the implementing regulation of the National Historic Preservation Act (36 CFR Part 800), other applicable federal laws, and Department of Defense and Navy regulations. The proposed action would not affect the management or preservation of the architectural resources of the State of Florida because the five buildings proposed for demolition and one building to be partially renovated were determined not eligible for listing in the NRHP. In addition, the noise environment for the NRHP-eligible NAS Whiting Field Historic District would not change; noise impacts for buildings at the NOLFs that have not been evaluated for the NRHP would remain the same or increase, but the increases would be below 65 dB DNL (day-night average sound level). There are no eligible architectural resources within the affected environment at NOLFs Pace, Site X, Santa Rosa, and Choctaw. The proposed action would not affect traditional cultural properties because there are no known traditional cultural properties at NAS Whiting Field or the NOLFs.
Chapter 288 *Commercial Development and Capital Improvements*	Provides the framework for promoting and developing the general business, trade, and tourism components of the state economy.	The proposed action would not have an effect on commercial development or capital improvements.

Florida Statute	*Legal Scope*	*Consistency Evaluation*
Chapter 334 *Transportation Administration*	Addresses the state's policy concerning transportation administration.	The proposed action would not have an impact on the state's transportation administration policies.
Chapter 339 *Transportation Finance and Planning*	Addresses the finance and planning needs of the state's transportation system.	The proposed action would not have an effect on the finance and planning needs of the state's transportation system.
Chapter 375 *Outdoor Recreation and Conservation Lands*	Develops comprehensive multipurpose outdoor recreation plan to document recreational supply and demand, describe current recreational opportunities, estimate need for additional recreational opportunities, and propose means to meet the identified needs.	The proposed action would not impact the state's development or evaluation of multipurpose outdoor recreation plans.
Chapter 377 *Energy Resources*	Addresses regulation, planning, and development of energy resources of the state.	The proposed action would not have an impact on the development of Florida's energy resources.
Chapter 380 *Land and Water Management*	Establishes land and water management policies to guide and coordinate local decisions relating to growth and development.	The proposed action would not have an impact on the development of: • State lands with regional (i.e., more than one county) concerns • Areas of Critical State Concern • Areas with approved state resource management plans The proposed action does not provide for, or affect changes to, coastal infrastructure or require state funds for infrastructure planning, designing, or construction.
Chapter 381 *Public Health, General Provisions*	Establishes public policy concerning the state's public health system.	The proposed action does not involve the construction of an on-site sewage treatment and disposal system. Construction activities associated with the proposed action are governed by regulations established in the Navy Safety and Occupational Health Program and the Occupational Safety and Health Administration. NAS Whiting Field and its NOLFs are restricted from public access.
Chapter 388 *Mosquito Control*	Addresses mosquito control efforts in the state.	The proposed action would not affect mosquito control efforts of the State of Florida.

Florida Statute	***Legal Scope***	***Consistency Evaluation***
Chapter 553 *Building Construction Standards*	Provides a mechanism for the uniform adoption, updating, amendment, interpretation, and enforcement of a single, unified state building code, to be called the Florida Building Code. Obtain a permit from the appropriate enforcing agency.	The proposed action would not affect the Building Construction Standards of the State of Florida. The Navy would coordinate for all applicable permits as required by law.
Chapter 597 *Aquaculture*	Establishes public policy concerning the cultivation of aquatic organisms.	The proposed action would not affect aquaculture.

Florida Coastal Management Program Enforceable Policies Applicable to the Proposed Action

Chapter 373 – Water Resources

This statute addresses sustainable water management; the conservation of surface and ground waters for full beneficial use; the preservation of natural resources, fish, and wildlife; protecting public land; and promoting the health and general welfare of Floridians. The state's policy manages and conserves water and related natural resources by determining whether activities will unreasonably consume water; degrade water quality; or adversely affect environmental values (such as protected species habitat, recreational pursuits, and marine productivity).

The proposed action would be conducted in a manner consistent with Chapter 373. The proposed action would not unreasonably consume water, degrade water quality, or adversely affect environmental values. Potable water consumption at NAS Whiting Field would not be expected to significantly increase as a result of the increase of 73 people (33 personnel and 40 family members). The proposed action does not involve the use of groundwater. There are no wetlands within or adjacent to the project area where facility development would occur. Potential impacts on nearby surface waters from sedimentation associated with construction activities would be minimized by the use of appropriate best management practices (BMPs), and all applicable regulatory requirements and stormwater permits (e.g., Environmental Resources Permit) would be obtained prior to any construction activities.

The Navy has determined that the proposed action would be fully consistent with Florida's Water Resources policy.

Chapter 376 – Pollution Discharge Prevention and Removal

This statute provides a framework for the protection of the state's coastline from spills, discharges, and releases of pollutants. The discharge of pollutants into or upon any coastal waters, estuaries, tidal flats, beaches, and lands adjoining the seacoast of the state is prohibited.

The statute:

- Provides for hazards & threats of danger and damages resulting from any pollutant discharge to be evaluated
- Requires the prompt containment and removal of pollution; provides penalties for violations
- Ensures the prompt payment of reasonable damages from a discharge

All required permits would be procured for the proposed action, and established procedures for transport, storage, and handling of hazardous materials would be followed. The Navy does not anticipate the discharge of any pollutants upon surface or ground waters. In the event of a spill, a written Spill Prevention, Control, and Countermeasure Plan would be followed. BMPs would be incorporated to avoid impacts on water quality.

The Navy has determined that the proposed action would be fully consistent with Florida's Pollutant Discharge Prevention and Removal policy.

Chapter 379 – Fish and Wildlife Conservation

This statute establishes the framework for the management and protection of Florida's wide diversity of fish and wildlife resources. It is Florida's policy to conserve and wisely manage these resources. Particular attention is given to those species defined as being endangered or threatened.

One candidate species for federal listing, the gopher tortoise, is known to occur within the area of the proposed action. The gopher tortoise is currently exposed to ongoing air operations at NAS Whiting Field and its associated NOLFs. There would be no significant change in noise contours associated with the proposed increase in airfield operations and ambient noise levels would not significantly increase. Pursuant to the Endangered Species Act, no effects to threatened and endangered species would occur. The Navy will continue to manage gopher tortoise actions in accordance with the Candidate Conservation Agreement (revised December 2012). The proposed action has the potential to impact other wildlife species from noise associated with the proposed construction activities. However, wildlife populations in the vicinity of the proposed construction sites are currently exposed to elevated noise associated with aircraft and general military industrial use. In addition, the demolition and construction activities would occur in a highly developed area, generally devoid of wildlife. As a result, indirect impacts from construction noise are expected to be minimal because the ambient noise levels within the vicinity are high under existing conditions and would be unlikely to substantially increase by the relatively minor and temporary nature of the proposed demolition and construction. Construction activities would not further threaten the existence of any protected species or result in the loss of any critical/sensitive habitats.

The increased helicopter training tempo would expose wildlife to increased overflights and would create an increase in the potential for bird/animal aircraft strike hazard (BASH) incidents. The Navy would reduce impacts to wildlife by continuing to implement the BASH Plan which minimizes aircraft risks from potentially hazardous wildlife strikes, and, in turn, protects wildlife from aircraft strikes. The plan establishes methods to decrease the attractiveness of the airfield/nearby areas to birds and animals, and provides guidelines for dispersing birds and animals when they compromise the safety of operations on the airfield.

The Navy has determined that the proposed action would be consistent to the maximum extent practicable with Florida's Fish and Wildlife Conservation policy.

Chapter 403 – Environmental Control

The statute establishes public policy concerning environmental control in the state. Those policies most relevant to the proposed action include air and water pollution, pollution prevention, and ecosystem management.

The proposed action would be conducted in a manner consistent with Chapter 403. The proposed action would comply with applicable regulations for air and water quality, solid and hazardous waste management, pollution prevention, and ecosystem management. The Navy would coordinate for all applicable permits as required by law.

The proposed action has the potential to increase emissions of criteria pollutants associated with construction and flight training operations. The region is currently in attainment for all criteria pollutants. Changes in construction emissions are not considered significant. Changes in mobile emissions would contribute to regional emission totals; however, would not be large enough, at the emission levels estimated, to result in the area being designated as nonattainment. No significant impacts would occur, and Santa Rosa County would remain in attainment for all criteria pollutants.

The proposed action includes implementation of appropriate BMPs for erosion and sediment control for facility construction at NAS Whiting Field, along with practices to prevent spills if petroleum products are temporarily stored on site during construction. The proposed action would not significantly affect fish, wildlife, or critical habitats. Surface waters of the state would not be significantly affected by the project.

Construction and demolition activities are not anticipated to degrade the water quality or affect beneficial uses of surface water or groundwater resources.

The Navy has determined that the proposed action would be consistent to the maximum extent practicable with Florida's Environmental Control policy.

Chapter 582 – Soil and Water Conservation

This statute provides for the control and prevention of soil erosion. It is Florida's policy to preserve natural resources; control and prevent soil erosion; prevent floodwater and sediment damages; and further the conservation, development, and use of soil and water resources, and the disposal of water. Land use policies are evaluated in terms of their tendency to cause or contribute to soil erosion or to conserve, develop, and use soil and water resources on site or in adjoining properties.

The construction activities associated with the proposed action have the potential to result in soil erosion. BMPs for reducing soil erosion are included in the NAS Whiting Field Stormwater Pollution Prevention Plan, which was developed in accordance with the Clean Water Act and Chapter 582 of the Florida Statutes. BMPs would be implemented during demolition and construction activities to minimize direct and indirect adverse impacts due to soil loss from erosion, and to stabilize soils once construction is completed. Construction activities would result in an increase of approximately 6.5 acres of impervious surface; however, BMPs would be implemented to reduce or eliminate stormwater that may carry non-point source pollutants to nearby surface waters.

The Navy would be fully consistent with Florida's Soil and Water Conservation policy.

CONCLUSION

The Navy has reviewed the FCMP and reviewed the proposed action for how and to what degree the activities in or near the coastal zone could affect Florida's coastal uses and resources. The Navy determined that the proposed action may have an effect on a coastal use or resources of Florida's coastal zone. The Navy would reduce the impacts on coastal zone uses and resources by adhering to the BMPs included in the proposed action.

The Navy has determined that the proposed action would be consistent to the maximum extent practicable with the applicable enforceable policies of the FCMP.

Farak, Amy M CIV USN USFFC (US)

From: Stahl, Chris <Chris.Stahl@dep.state.fl.us>
Sent: Tuesday, August 13, 2019 15:18
To: Farak, Amy M CIV USN USFFC (US)
Cc: State_Clearinghouse
Subject: [Non-DoD Source] State_Clearance_Letter_For_FL201906258634C_Construct An Advanced Helicopter Training System (AHTS) At Naval Air Station Whiting Field, Santa Rosa County, Florida.

August 13, 2019

Amy Farak
Department of the Navy
1562 Mitscher Avenue, Suite 250
Norfolk, Virginia 23551

RE: Department of the Navy - Construct an Advanced Helicopter Training System (AHTS) at Naval Air Station Whiting Field, Santa Rosa County, Florida.
SAI # FL201906258634C

Dear Amy:

Florida State Clearinghouse staff has reviewed the original proposal as well as the additional riprap placement site under the following authorities: Presidential Executive Order 12372; § 403.061(42), Florida Statutes; the Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464, as amended; and the National Environmental Policy Act, 42 U.S.C. §§ 4321-4347, as amended.

The Florida Department of Environmental Protection (FDEP) has reviewed the proposed project and noted that based on the information provided, 1. Cleanup – The proposed construction area shown in Figure 2 of the document includes two (2) locations with engineering/institutional controls for soil contamination. These controls require maintenance and yearly inspection of the impervious surfaces. There is also an active petroleum cleanup site. A Map Direct link to the site is provided below. This is a web map provided by the Florida Department of Environmental Protection. https://ca.dep.state.fl.us/mapdirect/?map=6cdfd4ca39254088af09dcc108f5b590. 2. ERP – The project description states that wetlands will not be impacted. The project may require DEP authorization for the treatment of surface water runoff. The applicant is advised to contact the NWD stormwater engineer for further permitting guidance. 3. Potable Water /Wastewater - The proposed project at NAS Whiting Field may require potable water and wastewater collection system permitting depending on how the work is accomplished. Consultation with the department is recommended to determine if potable water and collection system permitting is needed for the various phases of development. 4. Any significant noise resulting from training activities effecting Blackwater Heritage State Trail users may need to need to be mitigated.

If prehistoric or historic artifacts, such as pottery or ceramics, projectile points, dugout canoes, metal implements, historic building materials, or any other physical remains that could be associated with Native American, early European, or American settlement are encountered at any time within the project site area, the permitted project shall cease all activities involving subsurface disturbance in the vicinity of the discovery. The applicant shall contact the Florida Department of State, Division of Historical Resources, Compliance Review Section at (850)-245-6333. Project activities shall not resume without verbal and/or written authorization. In the event that unmarked human remains are encountered during permitted activities, all work shall stop immediately and the proper authorities notified in accordance with Section 872.05, Florida Statutes.

Based on the information submitted and minimal project impacts, the state has no objections to the subject project and, therefore, it is consistent with the Florida Coastal Management Program (FCMP). Thank you for the opportunity to review the proposed plan. If you have any questions or need further assistance, please don't hesitate to contact me at (850) 717-9076.

Sincerely,

Chris Stahl

Chris Stahl, Coordinator
Florida State Clearinghouse
Florida Department of Environmental Protection
3800 Commonwealth Blvd., M.S. 47
Tallahassee, FL 32399-2400
ph. (850) 717-9076
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Appendix E: Noise Methodology and Calculations

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DRAFT Report

Noise Analysis in Support of an Environmental Assessment for the Advanced Helicopter Training System at Naval Air Station Whiting Field & Navy Outlying Landing Fields, FL

May 2019

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Subcontract Number:
031029-32622

BRRC Report Number:
BRRC 19-06

List of Acronyms

AAM	Advanced Acoustic Model
AGL	Above Ground Level
AHTS	Advanced Helicopter Training System
AICUZ	Air Installation Compatible Use Zones
ANSI	American National Standards Institute
BRRC	Blue Ridge Research and Consulting, LLC
CAL	Confined Air Landing
dB	Decibel
dBA	A-Weighted Sound Level, Decibel
DNL	Day-Night Average Sound Level
DoD	Department of Defense
EA	Environmental Assessment
EPA	Environmental Protection Agency
FAA	Federal Aviation Administration
FICON	Federal Interagency Committee on Noise
FICUN	Federal Interagency Committee on Urban Noise
GCA	Ground Controlled Approach
Hz	Hertz
IFR	Instrument Flight Rules
kts	Knots
KIAS	Knots Indicated Airspeed
L_{dn}	A-weighted Day-Night Average Sound Level
L_{eq}	Equivalent Sound Level
L_{Aeq}	Equivalent A-weighted Sound Level
L_{Amax}	A-weighted Maximum Sound Level
L_{max}	Maximum Sound Level
L_{Pk}	Peak Level
NAS	Naval Air Station
NAVAIR	Naval Air System Command
NOLF	Navy Outlying Landing Field
NM	Nautical Mile
NVG	Night Vision Goggle
OLF	Outlying Landing Field
SEL	Sound Exposure Level
T&G	Touch and Go
TRAWING 5	Training Air Wing Five
TRBO	Tail Rotor/Boost Off
USN	United States Navy
VFR	Visual Flight Rules

Table of Contents

List of Figures

List of Tables

1 Introduction

This noise analysis report supports the US Navy's (USN) preparation of an Environmental Assessment (EA) for the Advanced Helicopter Training System (AHTS) at Naval Air Station (NAS) Whiting Field, Florida. This report is divided into sections: this first section provides an overview of the proposed action and current operations at NAS Whiting Field and six Navy Outlying Fields (NOLF). Section 2 summarizes the noise metrics used to describe and quantify the noise environments, with a brief description of the computer noise analysis model used to calculate the noise exposures. Section 3 describes the aircraft operational modelling parameters at NAS Whiting Field South and the six NOLFs. Section 4 provides the resulting noise contours and supplemental metrics at representative points of interest near the airfields.

1.1 Purpose

NAS Whiting Field is home to Training Air Wing Five (TRAWING 5) and is located in the Milton/Pensacola area of Northwest Florida, in the County of Santa Rosa. NAS Whiting Field South currently hosts a fleet of approximately 115 TH-57s, but as part of modernizing its rotary-wing and tilt-rotor integrated pilot production training program, the USN is transitioning to a new helicopter as part of the AHTS. The primary purpose of this report is to present the helicopter noise exposure for Baseline, Proposed Action, and future No Action scenarios at NAS Whiting Field South and six of its associated NOLFs: Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw.

1.2 Description of Scenarios

This noise analysis report evaluates three scenarios: Baseline, Proposed Action, and No Action. The Baseline is based on a five-year average of operations and represents current operational tempos at NAS Whiting Field South and the NOLFs. The baseline scenario does not include operations at NOLF Site X since operations at this NOLF have just started after its establishment and the closure of Site 8. The Proposed Action represents the new operations for the AHTS at the main field and the NOLFs. For this scenario, the distribution of the sorties to the NOLFs are changed to account for the new operations at Site X. It also includes a 22% increase in operations compared to the Baseline tempo. For the No Action scenario, the operational levels are the same as the Baseline tempo, but the utilization of the NOLFs are the same as the Proposed Action to account for the newly established NOLF Site X.

For the Proposed Action, the actual helicopter type is unknown at the time of this analysis. Thus, a surrogate helicopter was identified for use to represent the potential noise of the AHTS. This surrogate aircraft is the UH-72 Lakota (Thompson, 2019). The UH-72 is a twin-engine aircraft and was recently selected by the U.S. Army as a primary helicopter trainer. Additionally, it has reference noise data for use in the Advanced Acoustic Model (AAM), which is used to model the operational noise in this study. Currently, it is not known whether a single engine or twin-engine commercial helicopter will be selected for AHTS. Therefore the use of a twin-engine military trainer as the noise modeling surrogate for AHTS is considered a conservative alternative for purposes of assessing potential noise impacts.

2 Noise Metrics and Models

Noise represents one of the most contentious environmental issues associated with aircraft operations. Although many other sources of noise are present in today's communities, aircraft noise is readily identifiable based on its uniqueness. An assessment of aircraft noise requires a general understanding of how sound affects people and the natural environment, as well as how it is measured.

Around a military or civilian airfield, the noise environment is normally described in terms of the time-average sound level generated by aircraft operating at that facility. In this study, operations consist of the flight activities conducted during an average annual day, including arrivals and departures at the airfields, flight patterns in the general vicinity of the airfields, and ground run up, hover, and maintenance operations.

2.1 Noise Metrics

A noise metric refers to a unit or quantity that measures an aspect of the received noise used in environmental noise analyses. A metric is used to relate the received noise to its various effects. To quantify these effects, the Department of Defense (DoD) and the Federal Aviation Administration (FAA) use a series of metrics to describe the noise environment. These metrics range from simple to complex measures of the noise environment.

Simple metrics quantify the sound levels occurring during an individual aircraft overflight (single event) and the total noise exposure from the event. Single noise events can be described with Maximum Sound Level (L_{max}) and Sound Exposure Level (SEL).

Complex metrics quantify the cumulative noise exposure using a number of different methods of analyzing the noise based on the expected flight and aircraft engine run-up maintenance schedules. Some common metrics are the Equivalent Average Sound Level (L_{eq}) and the Day/Night Average Sound Level (DNL or L_{dn}). The DNL is the fundamental metric used to describe the aircraft noise environment in and around an airfield and is directly related to the long-term community annoyance resulting from this noise. The other metrics (simple and descriptive) supplement this long-term characterization of the noise environment and help to clarify different aspects of the noise effects.

During an aircraft overflight, the noise level starts at the ambient or background noise level, rises to the maximum level as the aircraft flies closest to the observer, and returns to the background level as the aircraft recedes into the distance. The following metrics describe different aspects of this transient noise event.

2.1.1 Maximum Sound Level (L_{Amax})

The highest A-weighted integrated sound level measured during a single noise event in which the sound level changes value with time (e.g., an aircraft overflight) is called the maximum A-weighted sound level or maximum sound level. The term A-weighted refers to the adjustment of the spectral content to approximate the human ear’s sensitivities to the range of audible sound frequencies. All metrics in this document reflect A-weighting, and thus, A-weighting is not indicated in the text or tables.

L_{Amax} indicates the maximum sound level occurring for a fraction of a second during the event. For aircraft noise, the "fraction of a second" over which the maximum level is defined is generally 1/8th of a second. The maximum sound level is important in judging the interference caused by a noise event with conversation, TV listening, sleep, or other common activities. Although it provides some measure of the intrusiveness of the event, it does not completely describe the total event, because it does not include the period of time over which the sound is heard.

2.1.2 Sound Exposure Level (SEL)

SEL is a metric that represents both the intensity of a sound and its duration. Individual time-varying noise events (e.g., aircraft overflights) have two main characteristics: a sound level that changes throughout the event and a period of time during which the event is heard. SEL provides a measure of the net exposure of the entire acoustic event, but it does not directly represent the sound level heard at any given time. During an aircraft flyover, SEL would include both the maximum sound level and the lower sound levels produced during onset and recess periods of the overflight.

SEL is a logarithmic measure of the total acoustic energy transmitted to the listener during the event. Mathematically, it represents the sound level of a constant sound that would, in one second, generate the same acoustic energy as the actual time-varying noise event. For sound from aircraft overflights, which typically last more than one second, the SEL is usually greater than the L_{Amax} because an individual overflight takes seconds and the L_{Amax} occurs in a fraction of a second. SEL also provides the best measure to compare noise levels from different aircraft and/or operations.

2.1.3 Day/Night Average Sound Level, DNL or L_{dn}

Day-Night Average Sound Level (DNL or L_{dn}) is a complex metric that accounts for the SEL of all noise events in a 24-hour period. To account for increased human sensitivity to noise at night (2200 to 0700), a 10 dB adjustment is applied to nighttime events. The adjustment incorporated into the DNL metric accounts for the added intrusiveness of sounds that occur during normal sleeping hours, both because of the increased sensitivity to noise during those hours and because ambient sound levels during nighttime are typically about 10 dB lower than during daytime hours.

DNL is an average quantity mathematically representing the continuous A-weighted sound level that would be present if all of the variations in sound level that occur over a 24-hour period were smoothed out so as to contain the same total sound energy. DNL accounts for the maximum noise levels, the duration of the events (operations), the number of events and the timing of their occurrence over a 24-hour period. Like SEL, DNL does not represent the sound level heard at any particular time, but it quantifies the total sound energy received. While it is normalized as an average, it represents all of the sound energy, and is therefore a cumulative measure.

Although DNL provides a single measure of the overall noise impact, it does not provide specific information on the number of noise events or the individual sound levels that occur during the 24-hour period. For example, a daily average sound level of 65 dB could result from very few noisy events or a large number of quieter events.

In 1979, the Federal Interagency Committee on Urban Noise (FICUN) was established, and they published "Guidelines for Considering Noise in Land-Use Planning and Control" (FICUN,1980). These guidelines complement federal agency criteria by providing for the consideration of noise in all land-use planning and interagency/intergovernmental processes. The FICUN established Day-Night Average Sound Level (DNL), which is the most appropriate descriptor for all noise sources. In 1982, the Environmental Protection Agency (EPA) published "Guidelines for Noise Impact Analysis" to provide all types of decision-makers with analytic procedures to uniformly express and quantify noise impacts (EPA, 1982). The American National Standards Institute (ANSI) endorsed DNL in 1990 as the "acoustical measure to be used in assessing compatibility between various land uses and outdoor noise environment" (ANSI, 2003). In 1992, the Federal Interagency Committee on Noise (FICON) reaffirmed the use of DNL as the principal aircraft noise descriptor in the document entitled "Federal Agency Review of Selected Airport Noise Analysis Issues" (FICON, 1992). In general, scientific studies and social surveys have found a high correlation between the percentages of groups of people highly annoyed and the level of average noise exposure measured in DNL (Schultz, 1974; Fidell et al., 1991; Finegold et al., 1994).

2.2 Computerized Noise Exposure Models

Analyses of aircraft noise exposure around airfield facilities are normally accomplished by using NoiseMap (Czech & Plotkin, 1998) and AAM (Bradley, Hobbs, Wilmer, & Czech, 2016). NoiseMap is a suite of computer programs that were developed by the US Air Force. AAM is a suite of computer programs developed by NASA for both single event and cumulative helicopter flight noise analysis. AAM is the DoD recommended noise model for helicopter flyover noise modeling. It should be noted that hover and static helicopter operations are currently modeled with NoiseMap. Together, NoiseMap and AAM allow noise predictions without the actual implementation of noise monitoring of those actions.

The latest NoiseMap package of computer programs consists of BASEOPS Version 7, OMEGA10, OMEGA11, NoiseMap Version 7.3, NMPLOT Version 4.6, and the latest issue of NOISEFILE. NOISEFILE is the DoD noise database originating from noise measurements of controlled flyovers at prescribed power, speed, and drag configurations for many models of aircraft. AAM is also incorporated into this suite of programs through the integration of the data input module BASEOPS. With BASEOPS, the user enters the runway coordinates, airfield information, flight tracks, flight profiles along each track by each aircraft, numbers of flight operations, run-up coordinates, run-up profiles, and run-up operations. After the operational parameters are defined, both NoiseMap and AAM calculate DNL values on a grid of ground locations on and around the facility. The NMPLOT program draws contours of equal DNL for overlay onto land-use maps. For noise studies, as a minimum, DNL contours of 60, 65, 70, 75, and 80 dBA are developed.

NoiseMap and AAM also have the flexibility of calculating SEL, L_{Amax}, and DNL values at specified points so that noise values at representative locations around an airfield can be described in more detail. NoiseMap and AAM are most accurate for comparing "before-and-after" community noise effects, which would result from the implementation of proposed changes or alternative noise control actions when the calculations are made in a consistent manner. It allows noise predictions for such proposed actions without the actual implementation and noise monitoring of those actions. Results of these computer programs and noise impact guidelines provide a relative measure of noise effects around air facilities.

3 Operational Parameters

The noise modeling process involves distributing the flight operations to the nominal flight tracks. A detailed description of the flight tracks, flight profiles, and the distribution of operations can be found in Appendices A-1, B, and C-1, respectively. For this analysis, the flight tracks and flight profiles will not change among the scenarios. The other change will be the use of UH-72 reference source noise for the Proposed Action. The Baseline and No Action Scenarios will use the TH-57B reference source noise.

3.1 NAS Whiting Field Airfield

3.1.1 Description

NAS Whiting Field is home to TRAWING 5 and is located in the Milton/Pensacola area of Northwest Florida, in the County of Santa Rosa. NAS Whiting Field currently hosts a fleet of T-6 and TH-57 aircraft. NAS Whiting Field is composed of two separate fully-operational airfields: North Field and South Field. Primary and intermediate fixed-wing flight training is conducted at North Field, and South Field is used for all phases of helicopter training. Additional transient aircraft operate out of South Field as an Aviation Park. These transient operations are grouped into three categories according to aircraft type: multiple-engine propeller aircraft, multiple-engine propeller cargo aircraft, and corporate jets. These aircraft groups are represented in the noise modeling by the T-44 (King Air), C-130, and C-21A (Learjet), respectively. The operations associated with the Aviation Park will remain unchanged. Runways at NAS Whiting Field are depicted in Figure 1 and described in Table 1. This noise study will only include operations at the South Field.

Table 1. NAS Whiting Field South Runway Descriptions

Runway Pair	Width (ft)	Length (ft)	Heading	Runway	Latitude Longitude	Runway	Latitude Longitude
NAS Whiting Field - South Field							
05/23	200	6,132	48/228	**5**	30.694616° N 87.019329° W	**23**	30.705842° N 87.005354° W
14/32	200	6,009	138/318	**14**	30.702963° N 87.022967° W	**32**	30.690873° N 87.009974° W

South Field helicopter pads and run-up locations are depicted in Figure **2** and described in Table 2. Note that the modeled static pads in the parking areas are representative of general locations where ground starts and hovers are conducted.

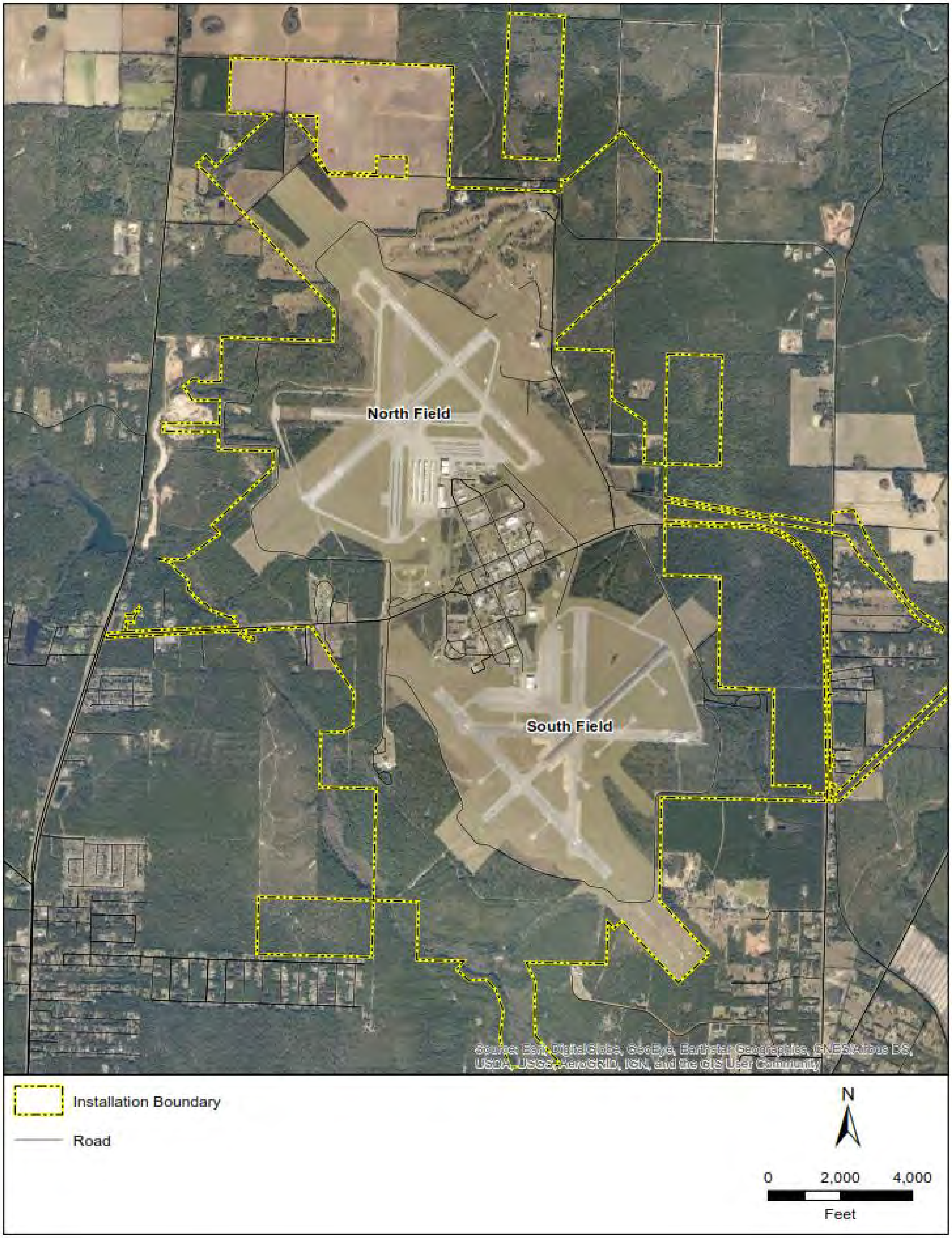

Figure 1. NAS Whiting Field Located in the Milton/Pensacola Area of Northwest Florida

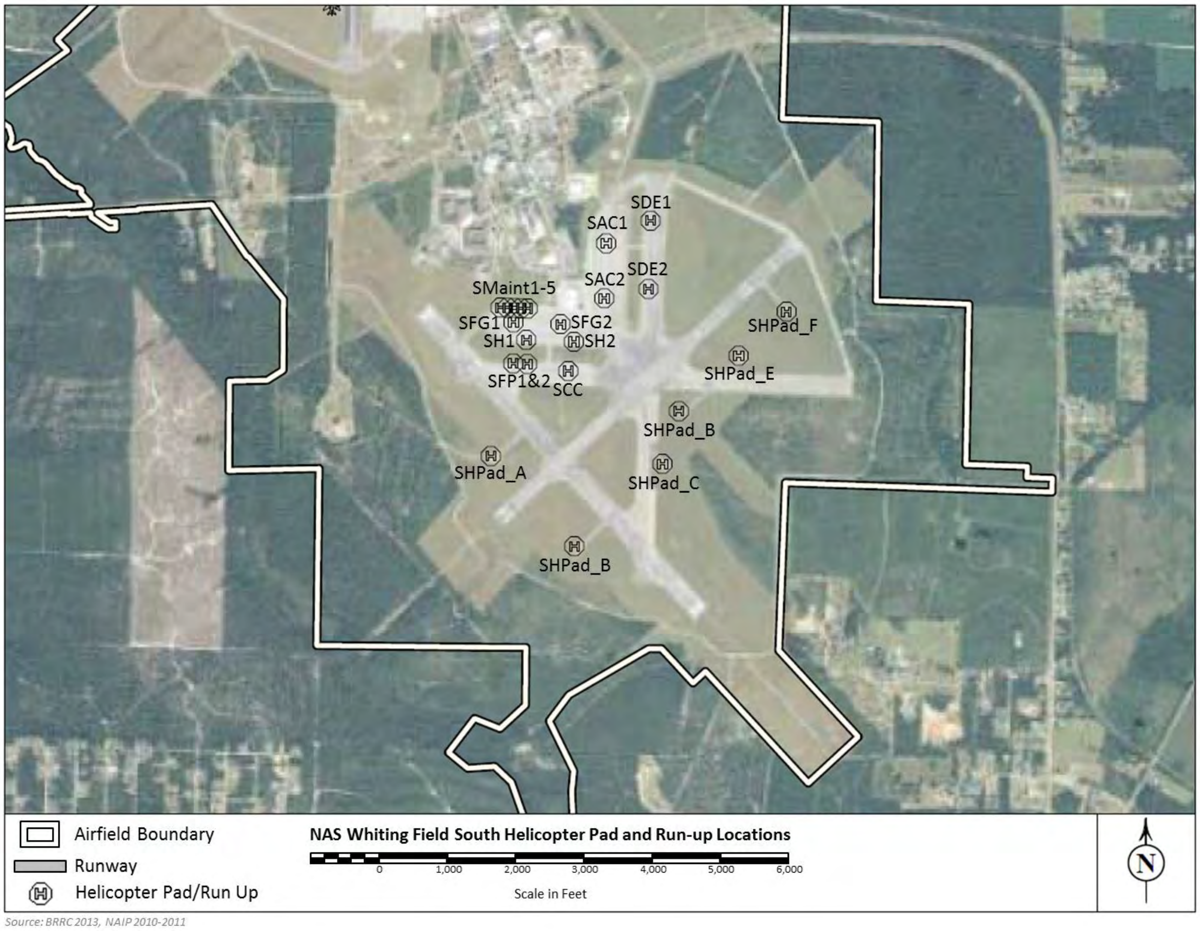

Figure 2. NAS Whiting Field South Helicopter Pad and Run-Up Locations

Table 2. South Field Helicopter Pads/Run-Up Locations

South Field Helicopter Pads/Run-up Locations			
Name	**Description**	**Latitude**	**Longitude**
SAC1	A & B & C Rows	30.705582° N	87.014206° W
SAC2	A & B & C Rows	30.703370° N	87.014299° W
SCC	Crew Change Center	30.700440° N	87.015979° W
SDE1	D & E Rows	30.706493° N	87.012135° W
SDE2	D & E Rows	30.703741° N	87.012230° W
SFG1	F & G Rows	30.702402° N	87.018539° W
SFG2	F & G Rows	30.702330° N	87.016342° W
SFP1	Fuel Pit 1	30.700746° N	87.018550° W
SFP2	Fuel Pit 2	30.700724° N	87.017899° W
SH1	H Row	30.701693° N	87.017941° W
SH2	H Row	30.701617° N	87.015715° W
SHPad_A	Helipad A	30.697015° N	87.019596° W
SHPad_B	Helipad B	30.693390° N	87.015698° W
SHPad_C	Helipad C	30.696700° N	87.011576° W
SHPad_D	Helipad D	30.698824° N	87.010807° W
SHPad_E	Helipad E	30.701057° N	87.008021° W
SHPad_F	Helipad F	30.702831° N	87.005779° W
SMaint1	Maintenance Pad	30.702997° N	87.019151° W
SMaint2	Maintenance Pad	30.702990° N	87.018817° W
SMaint3	Maintenance Pad	30.702980° N	87.018509° W
SMaint4	Maintenance Pad	30.702971° N	87.018189° W
SMaint5	Maintenance Pad	30.702959° N	87.017877° W

3.1.2 Annual Flight Operations and Distributions

For annual aircraft operations at NAS Whiting Field South, data were obtained from airfield activity reports from 2014 to 2018. Table 3 shows the number of annual operations conducted at the airfield for the years 2014 to 2018 along with the average. The breakout between helicopter and fixed-wing operations is based on data from noise analyses from the recent Air Installation Compatible Use Zones (AICUZ) study (Downing & Salton, 2015). For calculation of DNL, the operations need to be split between "Acoustic Day" and "Acoustic Night." "Acoustic Day" refers to the hours between 0700 and 2200, and "Acoustic Night" refers to the hours from 2200 to 0700. The modeled day/night splits are provided in Table 4.

Table 5 describes the breakdown of the total operations by operation type and day/night splits. Note that additional breakdown information for NAS Whiting Field South is presented in Table 6.

Table 3. NAS Whiting Field South Historical Annual Operations

Year	Total		
	Total	Helicopter*	Fixed-wing*
2014	96,823	75,846	20,977
2015	96,706	75,754	20,952
2016	101,033	79,144	21,889
2017	96,404	75,518	20,886
2018	97,528	76,398	21,130
Average	**97,699**	**76,532**	**21,167**

* Estimated breakout for NAS White Field South operations

Table 4. Distribution of Operations for Acoustic Day/Night Splits

	Day (0700 to 2200)	Night (2200 to 0700)
Departures	98%	2%
Arrivals	94%	6%
Patterns	90%	10%
T-6 GCA	99%	1%
Aviation Park	100%	0%

Table 5. Distribution of Airfield Operations At South Field For The Scenarios

Operation Type	Average Annual Operations		
	Baseline	Proposed Action	No Action
Navy Aircraft			
Departure	28,404	34,652	28,404
Instrument Departure	3,945	4,813	3,945
Arrival	32,349	39,465	32,349
Pattern	11,835	14,438	11,835
T-6 GCA	2,367	2,367	2,367
Aviation Park			
Departure	9,400	9,400	9,400
Arrival	9,400	9,400	9,400
TOTAL	**97,699**	**114,536**	**97,699**

Table 6. Additional South Field Operational Distribution Parameters

Departure Waypoints	Utilization
Able	40%
Baker	60%

Arrival Waypoints	Utilization
Bell	15%
Cypress	34%
Igor	51%

Pad	Utilization
Along Runway Depart to SW from Spot 1	75%
Offset Parallel to Runway Depart to SW from Spot 2	25%

T-6 GCA Runway	Utilization
Rwy 23	50%
Rwy 32	50%

3.1.3 Annual Static Operations

For aircraft static operations at NAS Whiting Field South, the modeling parameters from the AICUZ noise data were utilized with the only adjustments based on the annual average operations. Table 7 describes the TH-57 run-up, hover, and maintenance operations conducted at NAS Whiting Field South. For the Proposed Action, the same tempo and type of run-up, hover, and maintenance operations is assumed.

Table 7. TH-57 Ground and Hover Operations

Static Profile	Events/ Sortie	Mode	Duration (sec)	Profile Name	Total Operations	Acoustic Day	Acoustic Night	% within group
Pre-Flight	1.00	Low Idle (1200 s)/ High Idle (600 s)	1800	SAC1	31.402	98%	2%	19%
				SAC2	31.402	98%	2%	19%
				SDE1	26.725	98%	2%	16%
				SDE2	26.725	98%	2%	16%
				SFG1	17.371	98%	2%	10%
				SFG2	17.371	98%	2%	10%
				SH1	9.354	98%	2%	6%
				SH2	9.354	98%	2%	6%
Fuel Pits	0.50	Low Idle	600	SFP1	42.426	98%	2%	50%
				SFP2	42.426	98%	2%	50%
Crew Swap	0.25	Low Idle	600	SCC	42.426	100%	0%	100%
Maintenance Pads	0.10	Low Idle (600 s)/ High Idle (600 s)	1200	SMaint 1	3.394	100%	0%	20%
				SMaint 2	3.394	100%	0%	20%
				SMaint 3	3.394	100%	0%	20%
				SMaint 4	3.394	100%	0%	20%
				Smaint 5	3.394	100%	0%	20%

3.2 Navy Outlying Landing Fields

TRAWING 5 utilizes twelve NOLFs located in two states and five counties. The NOLFs are primarily used by TRAWING 5 aircraft originating from NAS Whiting Field. Six of the NOLFs are included in this study: Spencer, Pace, Site X, Harold, Santa Rosa, and Choctaw. For this analysis, detailed modeling is provided at Spencer, Pace, Site X, Harold, and Santa Rosa since the helicopter operations are the only ones being conducted at these NOLFs. For NOLF Choctaw, military jets also utilize the airfield for pattern training (United States Air Force, 2014). Thus, the contribution of helicopter operations to the overall noise exposure at NOLF Choctaw is negligible, and they are not modeled.

In addition to arrival and departure operations, helicopter pattern operations at these airfields include:

- **Standard Patterns** (basic race track with 500 ft above ground level (AGL) downwind at 70 knots-indicated airspeed [KIAS]),
- **90° Auto-rotation Patterns** (race track with descent initiated at mid-point of the turn to final),
- **180° Auto-rotation Patterns** (race track with descent initiated at turn to final),
- **Tactical Low Altitude Patterns (TLA)** (low altitude, high speed),
- **High-Speed Tactical Patterns (HST)** (race track with increased speed),
- **Tail Rotor/Boost Off (TRBO) Patterns** (race track with increased initial climb rate),
- **Confined Air Landing (CAL) Patterns**,
- **External Load Patterns**, and
- **Pinnacle Patterns** (approach and land on an elevated platform).

For aircraft operations at the six NOLFs, data were obtained from airfield activity reports as shown in Table 8. It should be noted that NOLF Site X replaced former NOLF Site 8 as part of a Congressionally-authorized land transfer with Escambia County. For the historical data, operations from Site 8 are included to provide an overall view of current operational tempos. Table 9 shows a summary of the total projected annual operations conducted at each NOLF, and Table 10 indicated the associated pattern types conducted at each NOLF. Helicopters conduct standard and autorotation patterns at all six helicopter NOLFs. External Load and Pinnacle patterns are conducted at NOLFs Site X and Harold. Eighty percent (80%) of the Night Vision Goggle (NVG) training is distributed between three NOLFs: 40% of NVG training is conducted at NOLF Santa Rosa, and the remaining 40% is split evenly between NOLF Site X and NOLF Harold. The NVG training utilizes the standard pattern. The five modeled NOLFs use the same course distribution based on the local wind patterns as provided in Table 11.

The following sections provide a brief description of each NOLF, and the annual operations for each scenario. Refer to Appendices A, B, and C for a detailed description of modeled flight tracks, flight profiles, and distribution of operations.

Table 8. Historical Annual Operations at the NOLFs

Annual Operations for NAS Whiting Field South NOLFs							
Year	NOLFs						
	Spencer	Pace	Site 8	Site X	Harold	Santa Rosa	Choctaw
2014	257,883	147,961	66,744		102,642	231,838	17,090
2015	289,366	126,954	59,860		111,533	221,149	10,365
2016	316,096	127,495	58,780		94,747	215,935	2,088
2017	272,363	114,944	75,006		47,319	192,347	7,087
2018	211,046	132,380	28,178		84,946	162,853	6,508
Average	**269,351**	**129,947**	**57,714**		**88,237**	**204,824**	**8,628**

Table 9. Modeled Annual Operations at the NOLFs

Rotary Wing TH-57 Operations			
Airfield	Baseline	Proposed	No Action
NOLF Spencer	269,351	306,495	251,221
NOLF Pace	129,947	153,250	125,611
NOLF Site 8	57,714		
NOLF Site X		136,145	111,593
NOLF Harold	88,237	75,911	62,221
NOLF Santa Rosa	204,824	247,022	202,472
NOLF Choctaw	8,628	6,811	5,583
TOTAL	**758,701**	**925,634**	**758,701**

Table 10. Training Operations Conducted at each NOLF

Airfield	Standard	90° Auto	180° Auto	TLA	HST	Tail Rotor/ Boost Off	Confined Air Landing	External Load	Pinnacle
NOLF Spencer	X	X	X		X	X			
NOLF Pace	X	X	X						
NOLF Site X	X	X	X	X	X	X	X	X	X
NOLF Harold	X	X	X	X	X		X	X	X
NOLF Santa Rosa	X	X	X	X	X	X			
NOLF Choctaw	X	X	X						

Table 11. NOLF Modeled Course Utilizations

Course	Utilization
North	30.8%
South	24.9%
West	27.6%
East	16.7%

3.2.1 NOLF Spencer

3.2.1.1 Description of Airfield

NOLF Spencer, shown in Figure 3, is located approximately 9 NM southwest of NAS Whiting Field, in Santa Rosa County, Florida. The field operates according to one of four courses, depending on airfield conditions. The field is divided into two identical sides, depending on the course in use, by splitting the field directly over the centerline. The low work areas at NOLF Spencer are inbound of the duty runways and upwind of the infield. Helicopter pad locations are modeled to represent low work in these areas. The refueling and crew change area are located in the infield. Two fuel pads are available at NOLF Spencer, for all courses.

3.2.1.2 Annual Airfield Helicopter Operations

For the Proposed Action scenario, the overall operations will increase by 14% from 269,351 to 306,495 operations. For the No Action scenario, the overall operations will decrease by 7% from 269,351 to 251,221. Table 12 shows the modeled distribution of these annual operations by operational type. All operations are conducted during the acoustic day, between the hours of 0700 to 2200. The operations in Table 12 are distributed to the four courses by the utilization values in Table 11.

Aircraft arrive in the direction that aligns with the course in use via point SNAKE, however all courses require aircraft to depart from the northeast or southeast corners. Arrival operations are distributed between right- and left-hand pattern entry scenarios, with a 60%/40% split between the operations turning to the eastern and western side, respectively, for courses 180 and 360, and to the southern side and northern side, respectively, for courses 090 and 270. Although aircraft normally depart from the southeast corner (90%), they may depart from the northeast corner for flights proceeding to the north, west, or towards NOLF Pace.

Pattern operations at NOLF Spencer include standard patterns, 180° and 90° autorotation patterns, and TRBO patterns. Standard and autorotation patterns are conducted in a lane parallel to the respective centerline. TRBO operations are conducted on the duty runway. For courses 360 and 180, pattern operations are distributed 60% to the eastern side and 40% to the western side. For courses 090 and 270, pattern operations are distributed 60% to the southern side and 40% to the northern side.

Refer to Appendices A-2, B, and C-2 for a detailed description of the flight tracks, flight profiles, and distribution of operations at NOLF Spencer.

Figure 3. NOLF Spencer Located in Santa Rosa County, Florida

Table 12. NOLF Spencer Annual Operations

NOLF Spencer	Baseline	Proposed	No Action
Departure	6,413	7,298	5,981
Arrival	6,413	7,298	5,981
Standard Pattern	153,915	175,140	143,555
180° Autorotation	25,653	29,190	23,926
90° Autorotation	25,653	29,190	23,926
Tail Rotor/Boost Off	25,652	29,190	23,926
High-Speed Tactical	25,652	29,190	23,926
TOTAL	269,351	306,495	251,221

3.2.1.3 Annual Low Work and Refueling Operations

The low work areas at NOLF Spencer are inbound of the duty runways and upwind of the infield. Helicopter pad locations are modeled to represent low work in these areas. Low work operations are estimated to occur for 75% of the projected annual sorties. The operations are distributed based on the course utilization and equally distributed between the three modeled pad locations. Overall, the amount of low work is expected to increase from 4,810 to 5,473 annual operations for the Proposed Action scenario and to decrease to 4,486 annual operations for the No Action scenario.

The refueling and crew change area are located in the infield. Two fuel pads are available at NOLF Spencer, for all courses. The amount of fuel pit operations is also estimated at 75% of the annual sorties. Thus, these static operations will have the same annual operations as the low work operations. The operations are equally distributed between the two fuel pads.

3.2.2 NOLF Pace

3.2.2.1 Description of Airfield

NOLF Pace, shown in Figure 4, is located approximately 11 NM west of NAS Whiting Field, in Santa Rosa County, Florida. The field operates according to one of four courses, depending on airfield conditions. The field is divided by the centerline into two identical sides, depending on the course in use. Low work areas at NOLF Pace extend 50 ft from each side of the centerline on the upwind half of the field. Helicopter pad locations are modeled to represent areas where low hover work is performed.

3.2.2.2 Annual Airfield Helicopter Operations

For the Proposed Action scenario, the overall operations will increase by 18% from 129,947 to 153,250 annual operations. For the No Action scenario, the overall operations will decrease by 3% from 129,947 to 125,611. Table 13 shows the modeled distribution of these annual operations by operational type. All operations are conducted during the acoustic day, between the hours of 0700 to 2200. The operations in Table 13 are distributed to the four courses by the utilization values in Table 11.

Figure 4. NOLF Pace Located in Santa Rosa County, Florida

Aircraft arrive in the direction that aligns with the course in use via Tree Field, however all courses require aircraft to depart from the southeast corner. Arrival operations are distributed between right- and left-hand pattern entry scenarios, with a 60%/40% split between the operations turning to the eastern and western side, respectively, for courses 180 and 360, and to the southern and northern side, respectively, for courses 090 and 270.

Pattern operations at NOLF Pace include standard patterns, 180° autorotation patterns, and 90° autorotation patterns. Standard patterns and autorotations are conducted in a numbered lane parallel to the respective centerline. For courses 360 and 180, pattern operations are distributed 60% to the eastern side and 40% to the western side. For courses 090 and 270, pattern operations are distributed 60% to the southern side and 40% to the northern side. Each side is divided into three lanes: the normal lane, the 90° autorotation lane, and the 180° autorotation lane. Operations are prohibited south of the access road located along the eastern field boundary and in the northwest corner of the field.

Refer to Appendices A-3, B, and C-3 for a detailed description of the flight tracks, flight profiles, and distribution of operations at NOLF Pace.

Table 13. NOLF Pace Annual Airfield Operations

NOLF Pace	Baseline	Proposed	No Action
Departure	3,094	3,649	2,991
Arrival	3,094	3,649	2,991
Standard Pattern	92,819	109,464	89,722
180° Autorotation	12,376	14,595	11,963
90° Autorotation	12,376	14,595	11,963
Tail Rotor/Boost Off	6,188	7,298	5,981
TOTAL	**129,947**	**153,250**	**125,611**

3.2.2.3 Annual Low Work and Refueling Operations

Low work areas at NOLF Pace extend 50 ft from each side of the centerline on the upwind half of the field. Helicopter pad locations are modeled to represent low work in these areas, shown in Figure 4. Low work operations are estimated to occur for 75% of the projected annual sorties. The operations are distributed based on the course utilization and equally distributed between the three modeled pad locations. Overall, the amount of low work is expected to increase from 2,320 to 2,737 annual operations for the Proposed Action scenario and to decrease to 2,243 annual operations for the No Action scenario.

3.2.3 NOLF Site X

3.2.3.1 Description of Airfield

NOLF Site X, shown in Figure 5, is located approximately 10 NM northwest of NAS Whiting Field, in Santa Rosa County, Florida. The field operates according to one of four courses, depending on airfield conditions. The field has four inboard runways, which brackets the refueling and parking spots in the center of the field. The field has four out-board lanes, of which two are paved. The field also includes 16

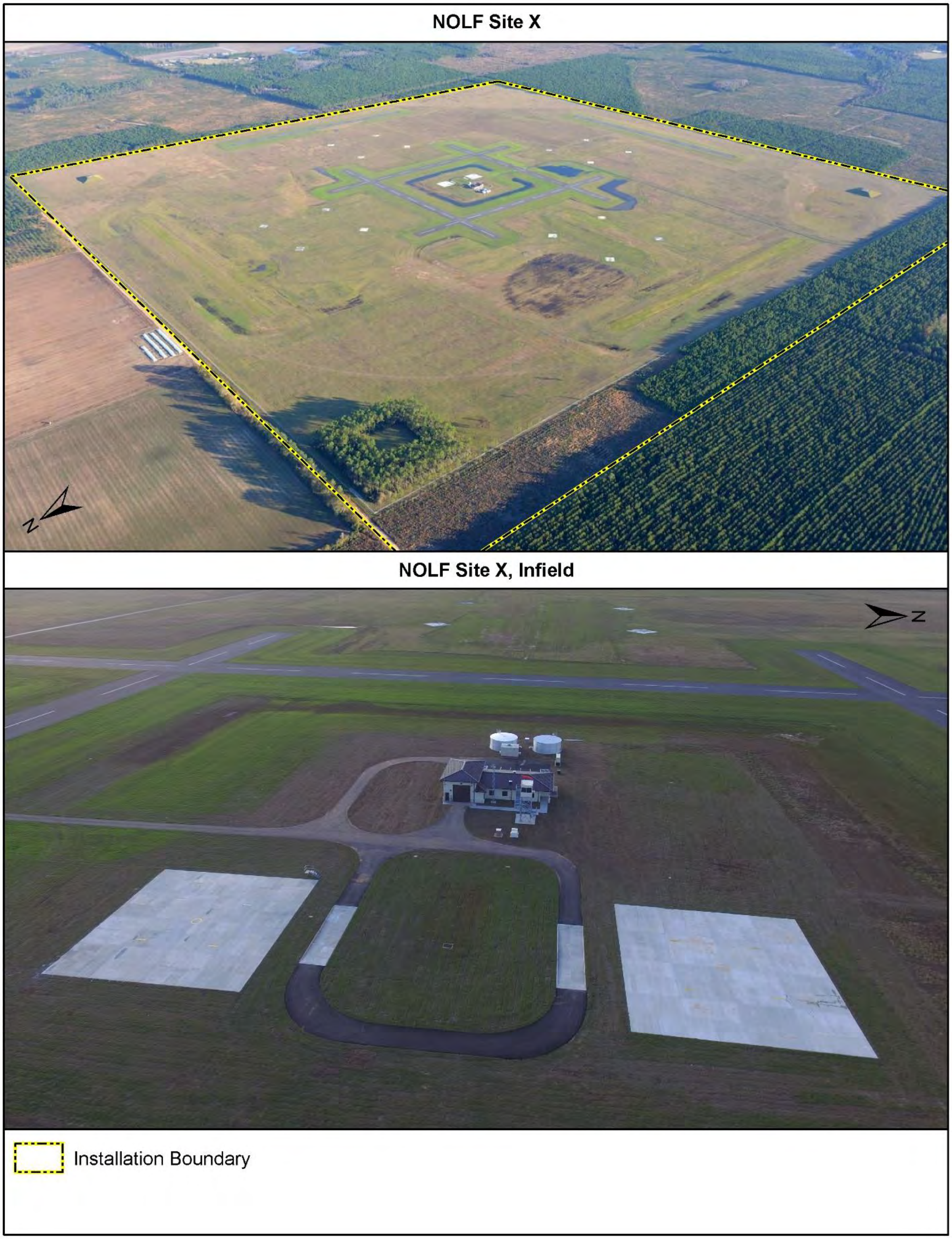

Figure 5. NOLF Site X Located in Santa Rosa County, Florida

helicopter pads that lie between the inboard and out-board lanes. The field is divided by the centerline into two sides: normal and tactics. The normal side includes the paved out-board runways, and the tactics side is the opposite side. Low work areas at NOLF Site X are inboard and upwind of the inboard duty lanes. Thirteen helicopter static locations are modeled to represent areas where low hover work is performed.

3.2.3.2 Annual Airfield Helicopter Operations

No Baseline scenario exists for Site X since it is a new airfield. For the Proposed Action scenario, the overall operations will increase by 22% compared to the No Action scenario. The Proposed Action scenario is estimated to have 136,145 annual operations, and the No Action scenario will have 111,593 annual operations. Table 13 shows the modeled distribution of these annual operations by operational type. The operations in Table 13 are distributed to the four courses by the utilization values in Table 11.

The majority of the operations are conducted during the acoustic day, between the hours of 0700 to 2200. However, around 6% of the annual operations are projected to occur during the acoustic night, between the hours of 2200 and 0700. This percentage includes 40% of the NVG sorties being conducted during acoustic nighttime.

Aircraft arrive from the south and the west in the direction that aligns with the course in use. The southern arrivals are 25% of the sorties, and western arrivals are 75%. Departures are evenly distributed from the northwest and southwest corners. Arrival operations are distributed between right- and left-hand pattern entry scenarios, with a 60%/40% split between the operations turning to the normal and tactics side, respectively.

Pattern operations at NOLF Site X include the following patterns: standard, 180° and 90° auto-rotations, TRBO, tactical low altitude, tactical high speed, confined area landing, external load, and pinnacle. Standard patterns are conducted to the helicopter pads. The autorotation patterns are conducted along the paved out-board runways to the east and south of the field. TRBO, high speed tactical, and external load pattern operations are conducted along the inboard runways. Tactical low altitude operations are conducted along the outboard runway on the normal side, and the helicopter spots on the tactics side. The CAL zone is located in the northwest corner of the field, and two pinnacle locations are in the northeast and southwest corners. The pinnacle operations are equally distributed between the two spots.

Refer to Appendices A-4, B, and C-4 for a detailed description of the flight tracks, flight profiles, and distribution of operations at NOLF Site X.

Table 14. NOLF Site X Annual Operations

NOLF Site X	Proposed	No Action
Departure	4,379	3,589
Arrival	4,379	3,589
Standard Pattern	69,510	56,975
180° Autorotation	9,630	7,894
90° Autorotation	9,630	7,894
Tail Rotor/ Boost Off	9,630	7,894
Tactical Low Altitude	14,993	12,289
High-Speed Tactical	3,748	3,072
Confined Air Landing	4,998	4,096
Ext Load	250	205
Pinnacle	4,998	4,096
TOTAL	136,145	111,593

3.2.3.3 Annual Low Work and Refueling Operations

Low work areas at NOLF Site X are inboard and upwind of the inboard duty runways. Three helicopter Static operation locations, for each course, are modeled to represent low work in these areas. The amount of low work is projected to reach 1,589 operations for the Proposed Action and 1,302 operations for the No Action. The operations are distributed based on the course utilization, course side utilization, and equally distributed between the representative modeled pad locations located on each side.

The fuel pits and crew change area are located in the center of the field. A single fuel pit spot, for all courses, are modeled to represent the fuel pit operations in this area. The amount of fuel pit operations is expected to be reach 1,806 operations for the Proposed Action and 1,480 for the No Action.

3.2.4 NOLF Harold

3.2.4.1 Description of Airfield

NOLF Harold, shown in Figure 6 is located approximately 8 NM southeast of NAS Whiting Field, in Santa Rosa County, Florida. The field operates according to one of four courses, depending on airfield conditions. The field is divided into two sides, depending on the course in use. For courses 360 or 180, the field is divided between the base and the top of the “T.” For courses 090 or 270, the field is divided by the white gravel centerline.

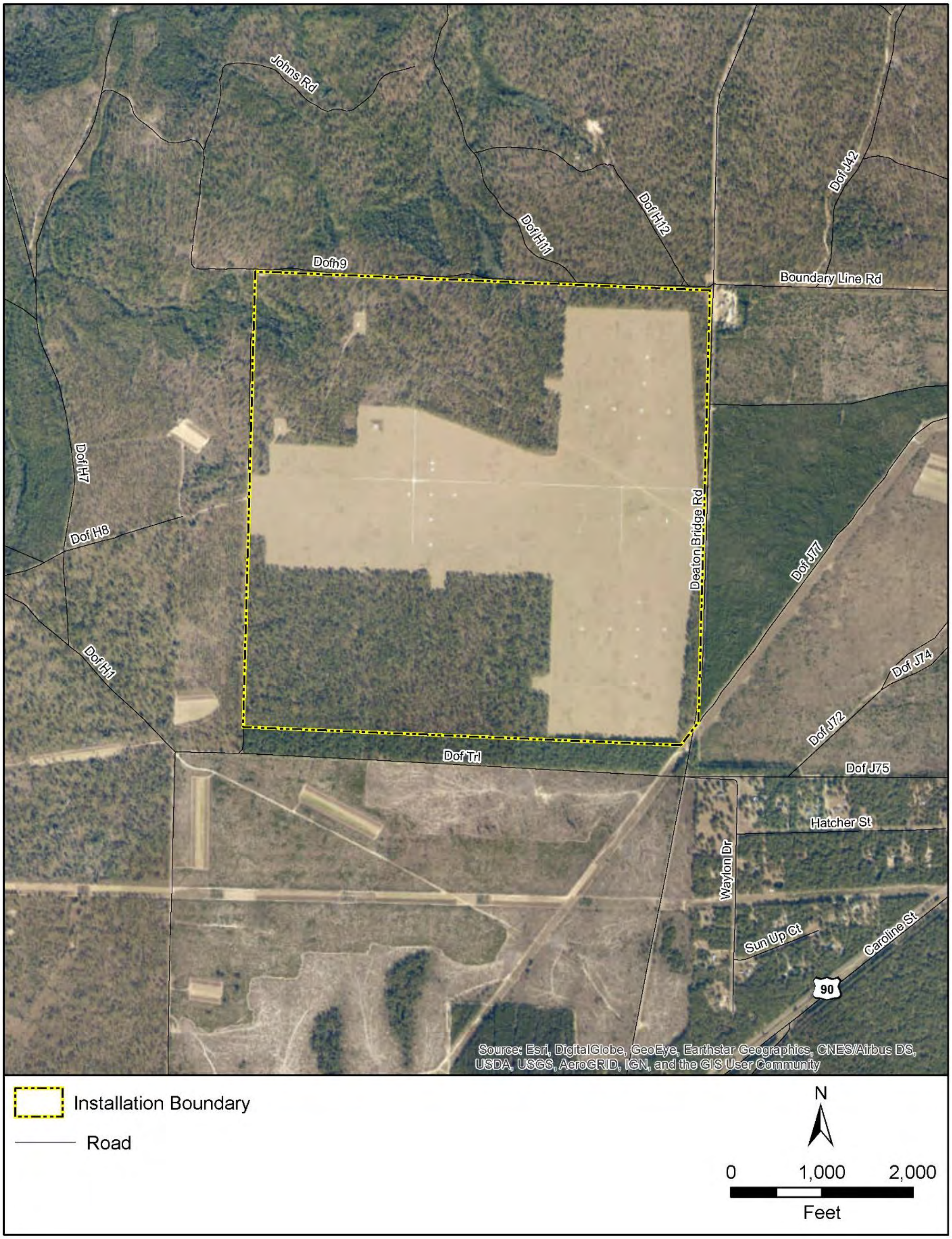

Figure 6. NOLF Harold Located in Santa Rosa County, Florida

3.2.4.2 Annual Airfield Helicopter Operations

For the Proposed Action scenario, the overall operations will decrease by 14% from 88,237 to 75,911 annual operations. For the No Action scenario, the overall operations will decrease by 29% from 88,237 to 62,221. Table 15 shows the modeled distribution of these annual operations by operational type. The majority of the operations are conducted during the acoustic day, between the hours of 0700 to 2200. However, 40% of the NVG training annual operations at NOLF Harold are projected to occur during the acoustic night, between the hours of 2200 and 0700. The operations in Table 15 are distributed to the four courses by the utilization values in Table 11.

Aircraft arrive in the direction that aligns with the course in use, however all courses require aircraft to depart from the northeast corner. Arrival operations are equally distributed between the traffic pattern entries arriving via point HOTEL and point RACETRACK. Additionally, arrival operations are equally distributed between right- and left-hand pattern entry scenarios.

Pattern operations at NOLF Harold include the following patterns: standard, 180° and 90° autorotations, tactical low altitude, high speed tactical, external load, pinnacle, and confined area landings. Standard, autorotation, and high speed tactical patterns are conducted in a numbered lane parallel to the respective centerline on the eastern side for courses 360 and 180, and the southern side for courses 090 and 270. Pattern operations on the eastern side of the airfield are distributed between four lanes, with 80% conducted on lanes 3 and 4, closest to the centerline, and 20% on lanes 1 and 2 closest to the eastern boundary. Pattern operations on the eastern side of the airfield are equally distributed between three lanes. Confined area, external load, and pinnacle operations are conducted in the northwest quadrant of the airfield. Tactical low altitude operations may use either side of the airfield, and are equally distributed between three locations in the northeast corner, southeast corner, and near the western border.

Refer to Appendices A-5, B, and C-5 for a detailed description of the flight tracks, flight profiles, and distribution of operations at NOLF Harold.

Table 15. NOLF Harold Annual Airfield Operations

NOLF Harold	Baseline	Proposed	No Action
Departure	2,827	2,433	1,994
Arrival	2,827	2,433	1,994
Standard	54,176	46,609	38,203
180° Autorotation	6,545	5,630	4,615
90° Autorotation	6,545	5,630	4,615
Tactical Low Altitude	6,808	5,856	4,800
High-Speed Tactical	1,702	1,464	1,200
CAL	2,269	1,952	1,600
Ext Load	2,269	1,952	1,600
Pinnacle	2,269	1,952	1,600
TOTAL	**88,237**	**75,911**	**62,221**

3.2.5 NOLF Santa Rosa

3.2.5.1 Description of Airfield

NOLF Santa Rosa, shown in Figure 7, is located approximately 8 NM southeast of NAS Whiting Field, in Santa Rosa County, Florida. The field operates according to one of four courses, depending on airfield conditions. The field is divided into two sides, depending on the course in use, by splitting the field directly over the Maltese cross. NOLF Santa Rosa contains two active runway pairs, Runway 9/27 and Runway 18/36 depicted in Figure 7 and described in Table 16. The low work area at NOLF Santa Rosa is located in the southwest quadrant of the field, near the end of Runway 9, for all courses. Two helicopter static locations are modeled to represent low work in these areas.

3.2.5.2 Annual Airfield Helicopter Operations

For the Proposed Action scenario, the overall operations will increase by 21% from 204,824 to 247,022 annual operations. For the No Action scenario, the overall operations will decrease by 1% from 204,824 to 202,472. Table 17 shows the modeled distribution of these annual operations by operational type. The majority of the operations are conducted during the acoustic day, between the hours of 0700 to 2200. However, 40% of the NVG training annual operations at NOLF Santa Rosa are projected to occur during the acoustic night, between the hours of 2200 and 0700. The operations in Table 17 are distributed to the four courses by the utilization values in Table 11.

Aircraft arrive from the north in the direction that aligns with the course in use, however all courses require aircraft to depart from the northwest corner. Arrival operations are equally distributed between right- and left-hand pattern entry scenarios. Departure operations are distributed with 75% departing to point ECHO and the remaining 25% of operations departing north.

Pattern operations at NOLF Santa Rosa include standard patterns, 180° and 90° autorotation patterns, TRBO patterns, tactical low altitude patterns, and high-speed tactical patterns. Standard patterns are conducted in a numbered lane parallel to the respective centerline on the eastern side for courses 360 and 180 and the southern side for courses 090 and 270. Standard pattern operations are equally distributed between five lanes. Autorotation pattern, tactical pattern, and TRBO pattern operations are conducted on the western side for courses 360 and 180 and the northern side for courses 090 and 270. Tactical operations are equally distributed between two locations in the corners of the respective course side. The duty runway is used for TRBO approaches. The high-speed tactical patterns are flown just parallel to the runways. For 360/180 flows, the arrival portion is to the east of runway 36/18. For 090/270 flows, the landing portion of the pattern is to the south of runway 9/27.

Refer to Appendices A-6, B, and C-6 for a detailed description of the flight tracks, flight profiles, and distribution of operations at NOLF Santa Rosa.

Figure 7. NOLF Santa Rosa Located in Santa Rosa County, Florida

Table 16. NOLF Santa Rosa runway descriptions

Runway Pair	Width (ft)	Length (ft)	Heading	Runway	Lat, Long	Runway	Lat, Long
9/27	150	4,403	92/272	9	30.613169° N 86.945539 W	27	30.612838° N 86.93155° W
18/36	150	4,499	182/2	18	30.614944° N 86.94181° W	36	30.602577° N 86.942078° W

Table 17. NOLF Santa Rosa Annual Airfield Operations

NOLF Sant Rosa	Baseline	Proposed	No Action
Departure	5,039	6,078	4,981
Arrival	5,039	6,078	4,981
Standard Pattern	128,246	154,668	126,774
180° Autorotation	17,578	21,199	17,376
90° Autorotation	17,578	21,199	17,376
Tail Rotor/Boost Off	17,578	21,199	17,376
Tactical Low Altitude	11,013	13,281	10,886
High-Speed Tactical	2,753	3,320	2,722
TOTAL	204,824	247,022	202,472

3.2.5.3 Annual Low Work and Refueling Operations

The low work area at NOLF Santa Rosa is located in the southwest quadrant of the field, near the end of Runway 9, for all courses (Figure 7). Two helicopter static locations are modeled to represent low work in these areas. Low work operations are estimated to occur for 75% of the projected annual sorties. The operations are equally distributed between the two modeled static locations. Overall, the amount of low work is expected to increase from 3,779 to 4,558 annual operations for the Proposed Action scenario and to decrease to 3,736 annual operations for the No Action scenario.

3.3 Climatological Data

NoiseMap and AAM utilize the daily average temperatures and relative humidity for each month to determine the appropriate values to represent the nominal acoustic absorption. Table 18 displays the monthly average temperatures and relative humidity for NAS Whiting Field, where the selected nominal values (in red) are 66.5°F (19.2°C), 72.4% relative humidity and 30.00 in Hg (1,015.8 hPa) barometric pressure. It should be noted that these values represent the mean acoustic absorption conditions of the atmosphere and not the average weather conditions for the area.

Table 18. Monthly Average Weather Conditions at NAS Whiting Field

Month	Temperature °F	Humidity %
Jan	44.5	73.3
Feb	45.0	73.7
Mar	54.7	71.3
Apr	**66.5**	**72.4**
May	76.2	78.6
Jun	81.3	80.8
Jul	82.5	81.5
Aug	82.4	85.6
Sep	77.9	78.9
Oct	67.5	71.3
Nov	58.1	79.4
Dec	51.3	76.3

4 Noise Modeling Results

The resulting DNL noise contours are compared among the three scenarios for NAS Whiting Field South and the five NOLFs. The comparison figure provides the DNL contours for values ranging from 60 dBA to 80 dBA in 5 dB increments. The Proposed Action contours are plotted as solid lines; the Baseline is plotted as dashed lines; and the No Action (if it is different from Baseline) is plotted with dotted lines.

4.1 NAS Whiting Field South

Figure 8 provides the comparison plot of the three scenarios for NAS Whiting Field South. For the main airfield the Baseline and No Action scenarios are the same. The Proposed Action scenario includes the replacement of the TH-57B/C with the new AHTS along with a 22% increase in airfield operations. For Baseline (and No Action), the 60 dBA DNL noise contour, shown in blue in Figure 8, stays within the airfield boundaries. For the Proposed Action, the 60 dBA DNL contour, shown in green in Figure 8, does extend beyond the airfield boundary in a few locations to the southeast and the west. However, the contour's area outside of the boundary appears to contain no housing/structures. The 65 dBA DNL contour remains within the boundary for the Proposed Action. The outermost 60 and 65 dBA DNL contour lobes primarily follow the path of arrival operations to the various operating spots.

For all of the scenarios, the 70 dB DNL noise contours are somewhat centered along the runways end points. The higher DNL contour levels are concentrated in the northwest quadrant of the airfield, north of Runway 23 and east of Runway 14. The concentration of noise in this area is generated by the operations conducted on the helicopter pads, maintenance pads, fuel pit pads, and crew change center clustered in this region.

To supplement the DNL results, Table 19 provides a comparison of the DNL values at two locations identified in Figure 8. At these locations, the DNL values increases range from 3.8 to 7.5 dBA DNL, but they remain under 65 dBA. In addition to the DNL, Table 20 and Table 21 provide the SEL and L_{Amax} values for top five operations contributing to the DNL at their location for T-57B/C and AHTS operations, respectively. These tables provide more detail into the actual operations that are primary drivers on the overall noise environment for both the current TH-57B/C and proposed AHTS operations.

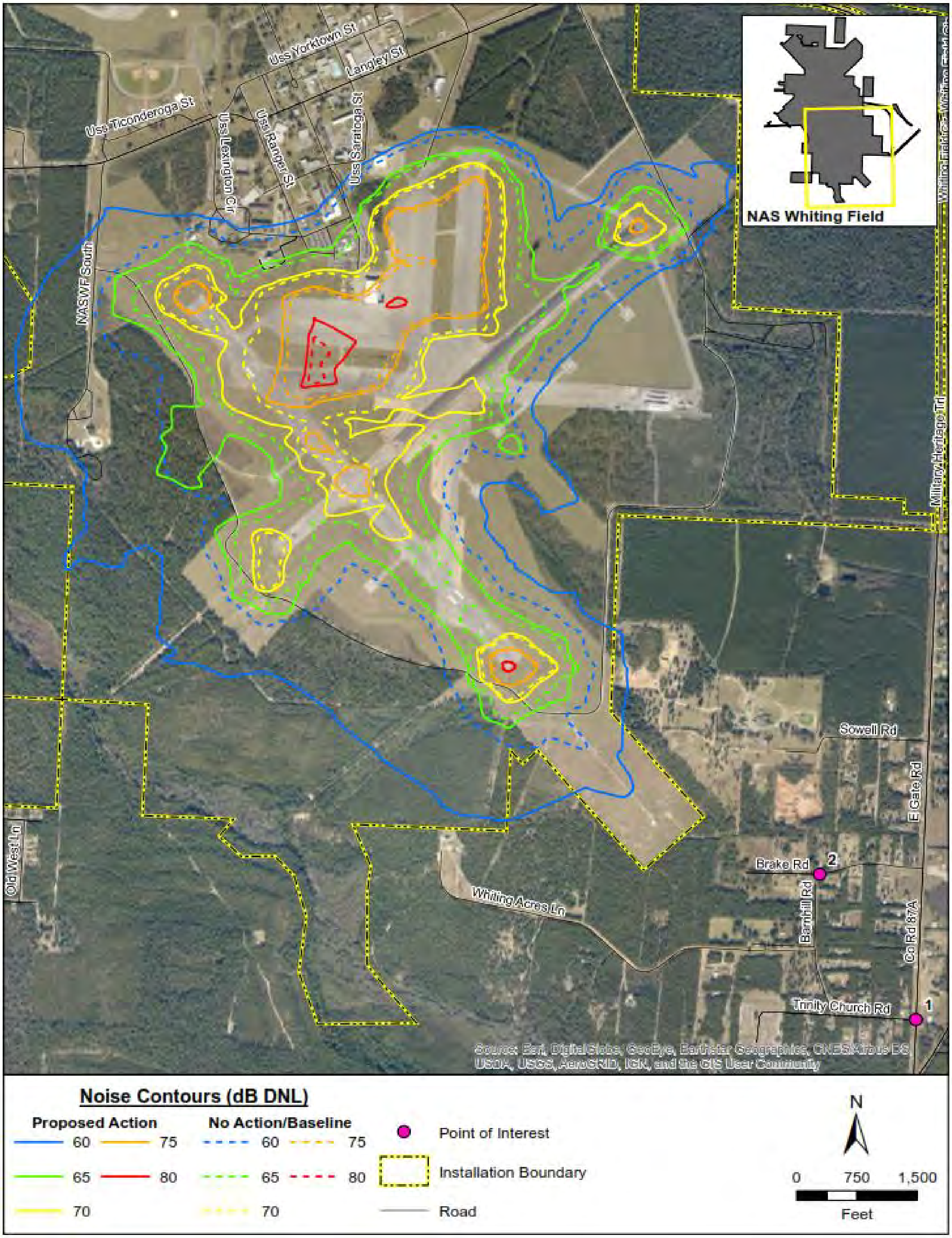

Figure 8. Comparison of DNL Noise Contours at NAS Whiting Field South

Table 19. Comparison of DNL Values at Representative Locations Near NAS Whiting Field South

Location	ID	Name	Baseline	Proposed Action		No Action
				DNL	Change*	
			dBA	dBA	Δ dBA	dBA
South Field	1	Trinity Church Rd	44.0	51.5	7.5	44.0
	2	Brake Rd.	49.0	52.8	3.8	49.0

* Change is relative to No Action Scenario

Table 20. SEL and L_{Amax} of Top Five Contributors to the DNL for Representative Locations near NAS Whiting Field South for TH-57B/C Operations

Point	Rank	Operation Type	Track ID	Annual Average Daily Events		SEL	Lmax	Baseline DNL	No Action DNL
				Acoustic Day	Acoustic Night				
				700-2200	2200-700	(dBA)	(dBA)	(dBA)	(dBA)
1	1	Arrival	SP2W_AB	3.461	0.221	78.4	65.8	44.0	44.0
	2	Departure	SP4W_DA	12.232	0.25	74.1	60.0		
	3	Arrival	SP4E_AB	3.758	0.24	76.0	62.4		
	4	Arrival	SP3N_AB	1.737	0.111	76.2	62.6		
	5	Departure	SP1S_DA	6.337	0.129	71.8	56.7		
2	1	Departure	SP4W_DA	12.232	0.25	77.9	64.5	49.0	49.0
	2	Departure	SP1S_DA	6.337	0.129	77.5	63.8		
	3	Arrival	SP2W_AB	3.461	0.221	77.5	65.0		
	4	Arrival	SP4E_AC	8.519	0.544	73.2	58.3		
	5	Arrival	SP2W_AC	7.846	0.501	73.3	58.5		

Table 21. SEL and L_{Amax} of Top Five Contributors to the DNL for Representative Locations near NAS Whiting Field South for AHTS Operations

Point	Rank	Operation Type	Track ID	Annual Average Daily Events		SEL	Lmax	Proposed Action DNL
				Acoustic Day	Acoustic Night			
				700-2200	2200-700	(dBA)	(dBA)	(dBA)
1	1	Departure	SP4W_DA	14.924	0.305	77.3	62.0	51.5
	2	Arrival	SP2W_AB	4.223	0.269	81.4	68.2	
	3	Arrival	SP4E_AB	4.585	0.293	79.0	64.6	
	4	Departure	SP1S_DA	7.732	0.158	75.7	59.0	
	5	Arrival	SP3N_AB	2.119	0.135	79.1	64.7	
2	1	Departure	SP4W_DA	14.924	0.305	80.9	66.3	52.8
	2	Departure	SP1S_DA	7.732	0.158	81.4	66.0	
	3	Arrival	SP2W_AB	4.223	0.269	81.2	67.2	
	4	Arrival	SP2W_AC	9.572	0.611	77.4	61.4	
	5	Arrival	SP4E_AC	10.393	0.663	76.5	61.2	

4.2 NOLF Spencer

Figure 9 provides the comparison plot of the three scenarios for NOLF Spencer. The Proposed Action scenario includes the replacement of the TH-57B/C with the new AHTS along with a 14% increase in airfield operations relative to Baseline. For the Proposed Action contours, the 60 dBA DNL noise contour, shown in blue in Figure 9, extends outside of the airfield boundary. Its 65 dBA DNL contour overlay the Baseline and No Action 60 dBA DNL contours and falls outside of the boundary along the corners and the western side. Some of these areas do appear to include potential populated areas. The 70 dB contours are close to the middle of the western boundary. These higher-level DNL noise contours are concentrated in the low work areas, which are inbound of the duty runways and upwind of the infield. The low work operations result in higher-level contour bulging to the north and west. Additionally, Spencer Field has two Fuel pads located infield, whose associated operations result in higher-level noise contours in this area.

Four representative location are provided to supplement the DNL results; Table 22 provides a comparison of the DNL values at four locations identified in Figure 9. For these locations which are close to the boundary, the increased DNL values range from 4.6 to 6.0 dBA, and the resulting DNL values range from 63.5 to 65.7dBA DNL. In addition to the DNL, Table 23 and Table 24 provide the SEL and L_{Amax} values for top five operations contributing to the DNL at their location for T-57B/C and AHTS operations, respectively. These tables provide more detail into the actual operations that are primary drivers on the overall noise environment for both the current TH-57B/C and proposed AHTS operations.

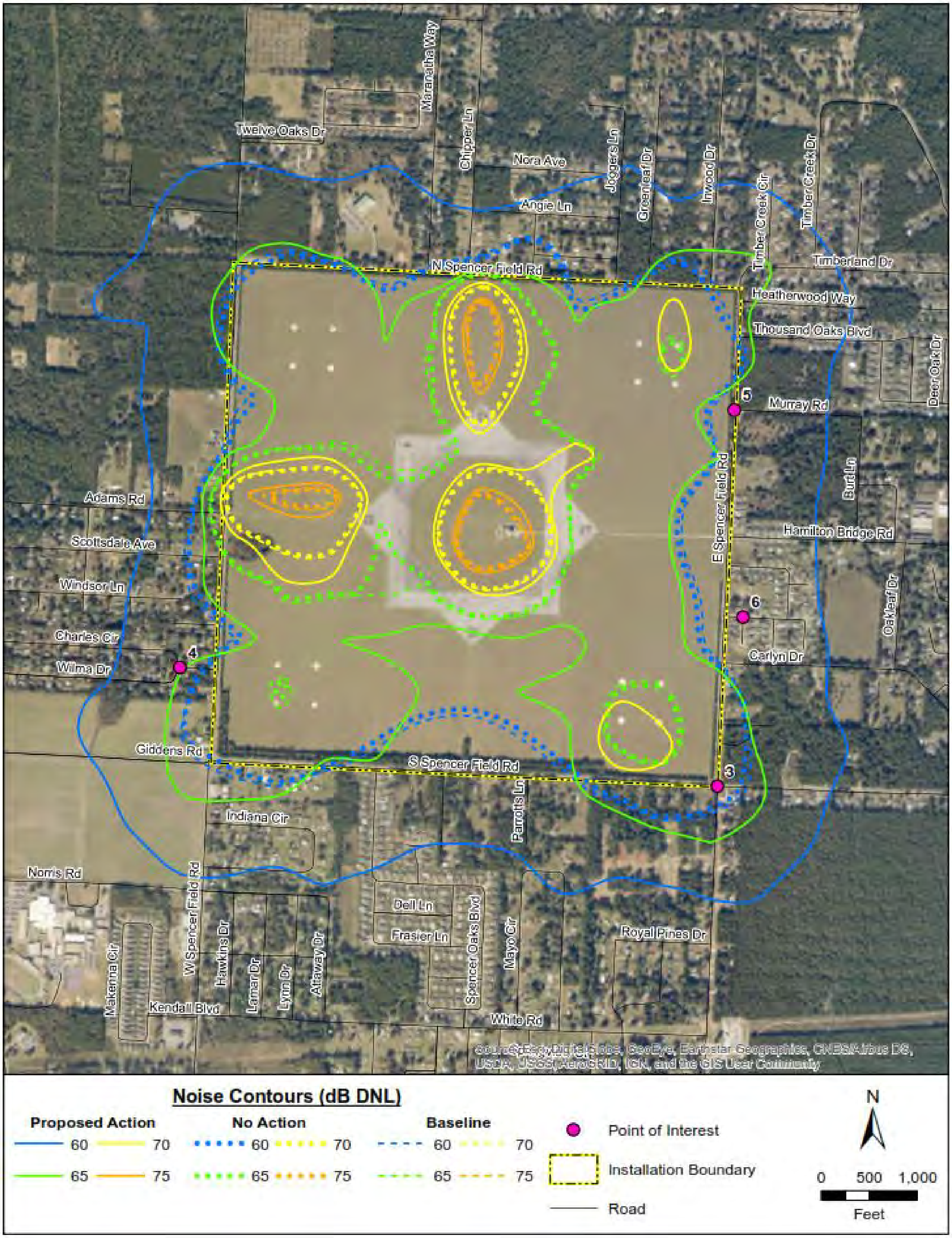

Figure 9. DNL Noise Contours at NOLF Spencer

Table 22. Comparison of DNL Values at Representative Locations near NOLF Spencer

Location	ID	Name	Baseline	Proposed Action		No Action
				DNL	Change*	
			dBA	dBA	Δ dBA	dBA
NOLF Spencer	3	Southest Corner	61.1	65.7	4.9	60.8
	4	Wilma Dr.	58.5	64.2	6.0	58.2
	5	Murray Rd	59.2	63.5	4.6	58.9
	6	East Side	59.3	63.6	4.6	59.0

* Change is relative to No Action Scenario

Table 23. SEL and L_{Amax} of Top Five Contributors to the DNL for Representative Locations near NOLF Spencer for TH-57B/C Operations

Point	Rank	Operation Type	Track ID	Annual Average Daily Events		SEL	Lmax	Baseline DNL	No Action DNL
				Acoustic Day	Acoustic Night				
				700-2200	2200-700	(dBA)	(dBA)	(dBA)	(dBA)
3	1	Std. Pattern	C4N	19.482	0	91.0	78.4	61.1	60.8
	2	Std. Pattern	C3N	19.482	0	89.4	78.5		
	3	Autorotation	AR180N2	6.494	0	92.4	82.5		
	4	Std. Pattern	C4W	10.563	0	90.0	76.8		
	5	Departure	D1_SE	15.813	0	88.2	81.8		
4	1	Std. Pattern	C3E	17.458	0	89.5	78.7	58.5	58.2
	2	Std. Pattern	C4E	17.458	0	85.8	74.2		
	3	Std. Pattern	C1N	12.988	0	86.2	71.8		
	4	Std. Pattern	C1S	10.5	0	86.4	76.1		
	5	Std. Pattern	C2N	12.988	0	84.8	72.6		
5	1	Std. Pattern	C4N	19.482	0	86.8	74.9	59.2	58.9
	2	Std. Pattern	C3N	19.482	0	86.2	75.2		
	3	Std. Pattern	C4S	15.75	0	87.1	72.9		
	4	Std. Pattern	C2W	7.042	0	90.4	78.2		
	5	Std. Pattern	C3S	15.75	0	85.7	71.6		
6	1	High Speed Tactical	HST_W2	2.347	0	98.1	93.0	59.3	59.0
	2	Std. Pattern	C4N	19.482	0	85.0	69.8		
	3	Std. Pattern	C4S	15.75	0	85.9	72.6		
	4	Std. Pattern	C3N	19.482	0	84.9	73.3		
	5	Std. Pattern	C3S	15.75	0	85.0	73.6		

Table 24. SEL and L_{Amax} of Top Five Contributors to the DNL for Representative Locations near NOLF Spencer for AHTS Operations

Point	Rank	Operation Type	Track ID	Annual Average Daily Events Acoustic Day 700-2200	Annual Average Daily Events Acoustic Night 2200-700	SEL (dBA)	Lmax (dBA)	Proposed Action DNL (dBA)
3	1	Std. Pattern	C4N	23.768	0	93.4	81.2	65.7
	2	Std. Pattern	C3N	23.768	0	93.3	83.4	
	3	Autorotation	AR180N2	7.923	0	97.4	87.1	
	4	Std. Pattern	C4W	12.887	0	94.2	82.0	
	5	Std. Pattern	C3W	12.887	0	93.8	85.0	
4	1	Std. Pattern	C3E	21.299	0	95.7	86.9	64.2
	2	Tail Rotor/Boost Off	TRBO2E	7.099	0	94.6	87.3	
	3	Std. Pattern	C4E	21.299	0	89.6	77.5	
	4	Autorotation	AR90E2	7.099	0	93.8	84.3	
	5	Std. Pattern	C1N	15.845	0	89.8	76.7	
5	1	Std. Pattern	C2W	8.591	0	96.5	86.1	63.5
	2	Std. Pattern	C4S	19.215	0	90.3	74.5	
	3	Std. Pattern	C4N	23.768	0	88.6	75.4	
	4	Std. Pattern	C3S	19.215	0	89.4	76.5	
	5	Std. Pattern	C3N	23.768	0	88.1	77.0	
6	1	High Speed Tactical	HST_W2	2.863	0	100.7	94.8	63.6
	2	Autorotation	AR90W2	2.863	0	98.9	90.7	
	3	Std. Pattern	C3N	23.768	0	89.1	78.2	
	4	Std. Pattern	C4N	23.768	0	88.5	74.5	
	5	Std. Pattern	C4S	19.215	0	88.2	75.1	

4.3 NOLF Pace

Figure 10 provides the comparison plot of the three scenarios for NOLF Pace. The Proposed Action scenario includes the replacement of the TH-57B/C with the new AHTS along with a 18% increase in airfield operations relative to Baseline. For the Proposed Action contours, the 60 dBA DNL noise contour, shown in blue in Figure 10, lies completely outside of the airfield boundary, the 65 dBA DNL lies primarily along the boundary and it is loosely aligned with the Baseline and No Action 60 dBA DNL contours. The Proposed Action 65 dBA contour does not appear to overlay any housing/structures. For all of the scenarios, the higher-level DNL noise contours are concentrated in the low work areas in the northwest quadrant. Although the contour features are driven by the standard and autorotation pattern lanes, as is more clearly seen on the southeastern side of the airfield, the low work operations result in higher level contour bulging to the north and west.

Four representative location are provided to supplement the DNL results; Table 25 provides a comparison of the DNL values at four locations, three of which are identified in Figure 10. At these locations, the DNL values increases range from 4.5 to 6.3 dBA, but they remain under 65 dBA. In addition to the DNL, Table 26 and Table 27 provide the SEL and L_{Amax} values for top five operations contributing to the DNL at their location for T-57B/C and AHTS operations, respectively. These tables provide more detail into the actual operations that are primary drivers on the overall noise environment for both the current TH-57B/C and proposed AHTS operations. These tables provide more detail into the actual operations that are primary drivers on the overall noise environment for both the current TH-57B/C and proposed AHTS operations.

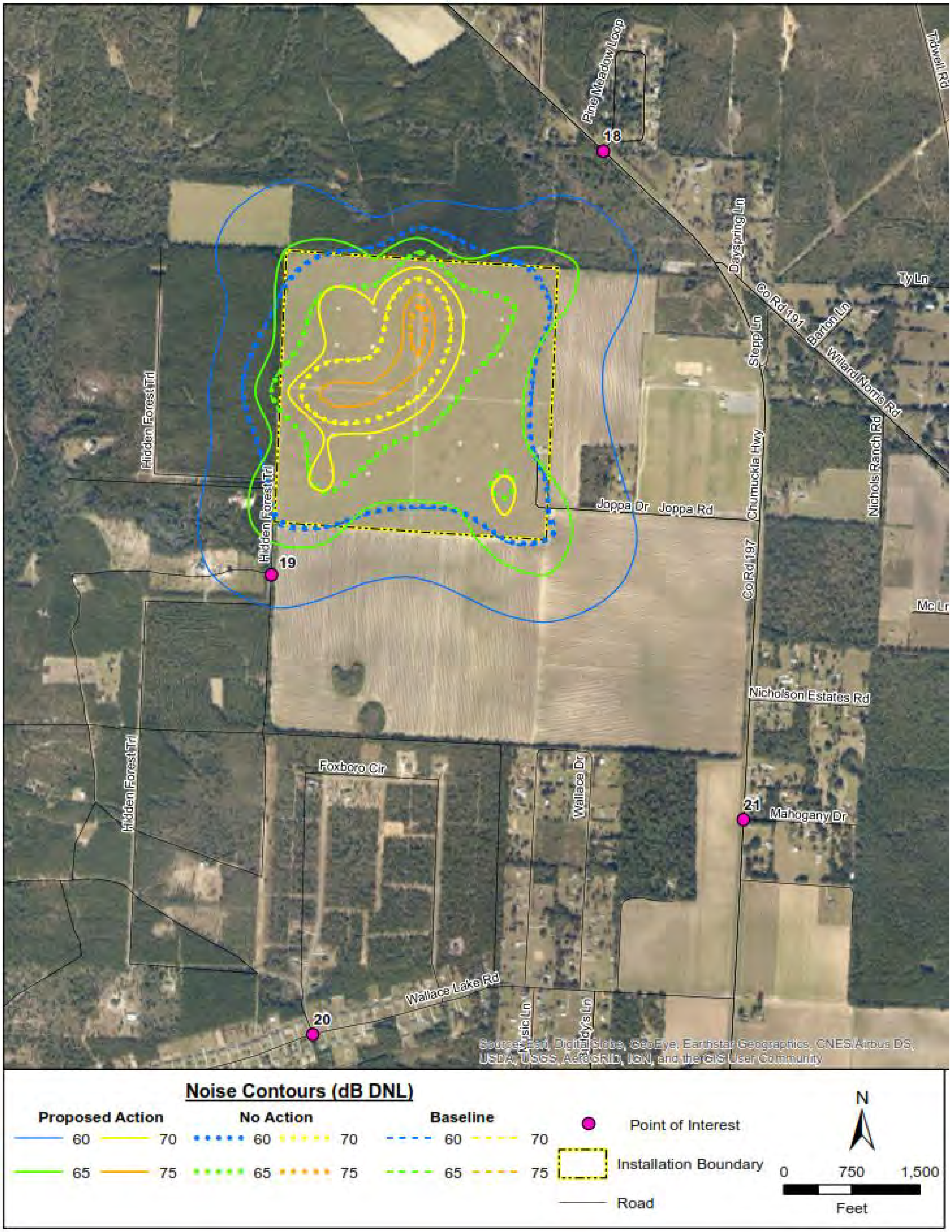

Figure 10. DNL Noise Contours at NOLF Pace

Table 25. Comparison of DNL Values at Representative Locations near NOLF Pace

Location	ID	Name	Baseline	Proposed Action		No Action
				DNL	Change*	
			dBA	dBA	Δ dBA	dBA
NOLF Pace	18	Northeast (Willard Norris Rd.)	49.6	54.7	5.2	49.5
	19	Southwest	56.1	62.3	6.3	56.0
	20	South (off map)	36.2	42.3	6.2	36.1
	21	Mahogany Dr.	44.4	48.8	4.5	44.3

* Change is relative to No Action Scenario

Table 26. SEL and L_{Amax} of Top Five Contributors to the DNL for Representative Locations near NOLF Pace for TH-57B/C Operations

Point	Rank	Operation Type	Track ID	Annual Average Daily Events		SEL	Lmax	Baseline DNL	No Action DNL
				Acoustic Day	Acoustic Night				
				700-2200	2200-700	(dBA)	(dBA)	(dBA)	(dBA)
18	1	Std. Pattern	C2S	18.996	0	78.4	66.2	49.6	49.5
	2	Std. Pattern	C2N	23.497	0	77.4	67.3		
	3	Std. Pattern	C1E	14.037	0	78.8	67.8		
	4	Std. Pattern	C1W	8.494	0	79.6	67.1		
	5	Tail Rotor/Boost Off	TRBON2	1.566	0	81.3	71.2		
19	1	Std. Pattern	C2E	21.056	0	87.0	79.3	56.1	56.0
	2	Std. Pattern	C1N	15.665	0	86.1	75.9		
	3	Std. Pattern	C2W	12.74	0	84.7	74.0		
	4	Std. Pattern	C1S	12.664	0	83.4	74.3		
	5	Autorotate	AR180E2	2.807	0	86.7	73.5		
20	1	Std. Pattern	C1N	15.665	0	65.3	54.2	36.2	36.1
	2	Std. Pattern	C2E	21.056	0	63.6	49.3		
	3	Departure	D_SE	8.477	0	65.7	50.2		
	4	Std. Pattern	C2W	12.74	0	63.5	49.4		
	5	Std. Pattern	C2N	23.497	0	59.9	47.7		
21	1	Departure	D_SE	8.477	0	82.7	73.7	44.4	44.3
	2	Std. Pattern	C2N	23.497	0	68.4	55.5		
	3	Std. Pattern	C2E	21.056	0	66.9	54.9		
	4	Std. Pattern	C2S	18.996	0	66.4	54.4		
	5	Std. Pattern	C2W	12.74	0	67.6	55.4		

Table 27. SEL and L_{Amax} of Top Five Contributors to the DNL for Representative Locations near NOLF Pace for AHTS Operations

Point	Rank	Operation Type	Track ID	Annual Average Daily Events Acoustic Day	Annual Average Daily Events Acoustic Night	SEL	Lmax	Proposed Action DNL
				700-2200	2200-700	(dBA)	(dBA)	(dBA)
18	1	Std. Pattern	C2S	27.33	0	83.3	71.2	54.7
	2	Std. Pattern	C1W	12.221	0	85.2	73.4	
	3	Std. Pattern	C2N	33.806	0	80.6	68.4	
	4	Std. Pattern	C1E	20.196	0	81.5	70.4	
	5	Tail Rotor/Boost Off	TRBON2	2.253	0	86.7	77.6	
19	1	Std. Pattern	C2E	30.294	0	94.0	85.0	62.3
	2	Std. Pattern	C1N	22.537	0	92.3	82.0	
	3	Std. Pattern	C2W	18.331	0	87.3	76.3	
	4	Std. Pattern	C1S	18.221	0	86.6	77.2	
	5	Autorotate	AR180E2	4.039	0	92.9	83.5	
20	1	Std. Pattern	C1N	22.537	0	71.2	59.9	42.3
	2	Std. Pattern	C2E	30.294	0	69.0	55.9	
	3	Std. Pattern	C2N	33.806	0	67.5	54.4	
	4	Std. Pattern	C2W	18.331	0	68.1	53.9	
	5	Departure	D_SE	12.195	0	68.9	52.8	
21	1	Departure	D_SE	12.195	0	85.4	75.8	48.8
	2	Std. Pattern	C2N	33.806	0	74.7	61.4	
	3	Std. Pattern	C2W	18.331	0	73.5	59.7	
	4	Std. Pattern	C2E	30.294	0	70.6	59.5	
	5	Std. Pattern	C2S	27.33	0	70.3	58.4	

4.4 NOLF Site X

Figure 11 provides the comparison plot of the three scenarios for NOLF Site X. The Proposed Action scenario includes the replacement of the TH-57B/C with the new AHTS along with a 22% increase in airfield operations relative to No Action. Overall, the noise is skewed to the normal sides of the airfield since most operations occur in these areas. For the Proposed Action contours, the 60 dBA DNL noise contour, shown in blue in Figure 11, lies partially outside of the airfield boundary.. The 65 dBA DNL contour extends just outside the airfield boundary at the southwest corner. For the No Action contours, the 60 dBA DNL contour lies on the western boundary, and the 65 dBA DNL contour lies within the airfield boundary. The Proposed Action 60 dBA contour does not appear to overlay any housing/structures. For all of the scenarios, the higher-level DNL noise contours are concentrated in the low work areas in the southeast quadrant.

Three representative locations are provided to supplement the DNL results; Table 28 provides a comparison of the DNL values at three locations identified in Figure 11. At these locations the change in the DNL values increase range from 3.7 to 11.3 dBA, but they remain under 65 dBA DNL. In addition to the DNL, Table 29 and Table 30 provide the SEL and L_{Amax} values for top five operations contributing to the DNL at their location for T-57B/C and AHTS operations, respectively. These tables provide more detail into the actual operations that are primary drivers on the overall noise environment for both the current TH-57B/C and proposed AHTS operations.

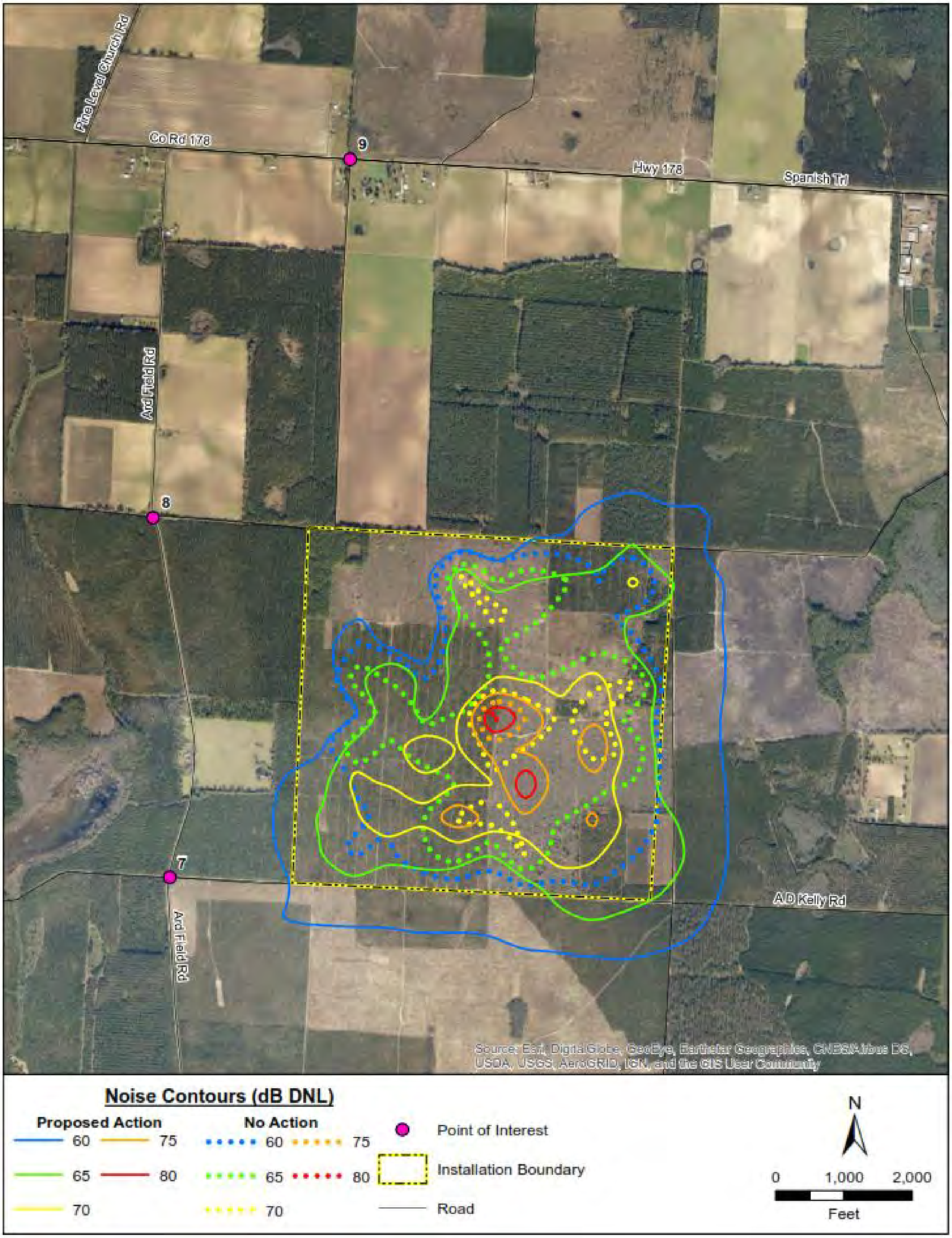

Figure 11. DNL Noise Contours at NOLF Site X

Table 28. Comparison of DNL Values at Representative Locations near NOLF Site X

Location	ID	Name	Baseline	Proposed Action		No Action
				DNL	Change*	
			dBA	dBA	Δ dBA	dBA
NOLF Site X	7	Southwest (Intersection of Ard Field and A D Kelly Rds.)	-	52.2	4.4	47.8
	8	Northwest (Ard Field Rd.)	-	48.0	3.7	44.3
	9	North (Hwy 178)	-	46.0	11.3	34.7

* Change is relative to No Action Scenario

Table 29. SEL and L_{Amax} of Top Five Contributors to the DNL for Representative Locations near NOLF Site X for TH-57B/C Operations

Point	Rank	Operation Type	Track ID	Annual Average Daily Events		SEL	Lmax	Baseline DNL	No Action DNL
				Acoustic Day	Acoustic Night				
				700-2200	2200-700	(dBA)	(dBA)	(dBA)	(dBA)
7	1	Arrival	ARRW_360N	1.284	0.078	83.4	71.8	-	47.8
	2	Arrival	ARRW_090N	1.151	0.07	83.6	71.8		
	3	Arrival	ARRW_180N	1.038	0.063	83.0	71.6		
	4	Arrival	ARRW_360T	0.856	0.052	83.6	72.2		
	5	Pinnacle	PINNB_270	0.442	0.027	85.9	73.5		
8	1	Departure	DEPWOA	4.634	0.283	78.4	65.9	-	44.3
	2	Arrival	ARRW_360N	1.284	0.078	80.5	69.1		
	3	Arrival	ARRW_180N	1.038	0.063	80.4	69.0		
	4	Arrival	ARRW_360T	0.856	0.052	80.9	69.4		
	5	Arrival	ARRW_180T	0.692	0.042	80.8	69.5		
9	1	Departure	DEPWOA	4.634	0.283	64.3	52.4	-	34.7
	2	Arrival	ARRW_360N	1.284	0.078	68.9	58.1		
	3	Arrival	ARRW_360T	0.856	0.052	69.2	58.1		
	4	Arrival	ARRW_180N	1.038	0.063	67.5	57.6		
	5	Std. Pattern	STD360_SP1	5.664	0.346	59.3	46.7		

Table 30. SEL and L_{Amax} of Top Five Contributors to the DNL for Representative Locations near NOLF Site X for AHTS Operations

Point	Rank	Operation Type	Track ID	Annual Average Daily Events: Acoustic Day 700-2200	Annual Average Daily Events: Acoustic Night 2200-700	SEL (dBA)	Lmax (dBA)	Proposed Action DNL (dBA)
7	1	Autorotate	AR_270	2.533	0.155	85.8	77.2	52.2
	2	Autorotate	AR_270	2.533	0.155	85.8	77.2	
	3	Arrival	ARRW_360N	1.912	0.117	86.2	74.7	
	4	Arrival	ARRW_090N	1.713	0.105	86.6	75.1	
	5	Arrival	ARRW_180N	1.546	0.094	85.9	75.1	
8	1	Departure	DEPWOA	6.897	0.421	81.2	70.1	48.0
	2	Arrival	ARRW_360N	1.912	0.117	83.6	71.9	
	3	Arrival	ARRW_180N	1.546	0.094	83.4	71.8	
	4	Arrival	ARRW_360T	1.275	0.078	84.1	72.3	
	5	Arrival	ARRW_180T	1.031	0.063	84.0	72.2	
9	1	Departure	DEPTF	6.897	0.421	85.0	75.0	46.0
	2	Arrival	ARRW_360N	1.912	0.117	72.5	61.6	
	3	Departure	DEPWOA	6.897	0.421	66.5	54.1	
	4	Arrival	ARRW_360T	1.275	0.078	72.9	61.5	
	5	Tail Rotor/Boost Off	TRBO_360	4.673	0.285	66.5	54.0	

4.5 NOLF Harold

Figure 12 provides the comparison plot of the three scenarios for NOLF Harold. The Proposed Action scenario includes the replacement of the TH-57B/C with the new AHTS along with a 14% decrease in airfield operations relative to Baseline. For the Proposed Action contours, the 60 dBA DNL noise contour, shown in blue in Figure 12, lies primarily within the airfield boundary except along the primary lanes, and the 65 dB DNL contours are within the boundary except for a small extension in the middle of the eastern boundary. The outermost 60 dBA DNL contour is centered along the standard and autorotation pattern lanes, located along the grassy "T" area. The features of the 60 dBA DNL contour are driven by the confluence of the arrivals and pattern work. The lobe located on the north part of the base of the "T" that points to the northwest, results from the confluence of pinnacle work in this area. Although the CAL zones are located in the northwest quadrant of the field, and both external load and pinnacle patterns reach this corner, the projected operations do not generate DNL levels greater than 60 dB in this area of the NOLF. The DNL noise levels are greater on the eastern side of the airfield because of the larger utilization percentages of the 180/360 Course (55.7%) than the 090/270 Course (44.3%). The Baseline and No Action contour are less than 65 dBA DNL.

Four representative locations are provided to supplement the DNL results; Table 31 provides a comparison of the DNL values at four locations identified in Figure 12. At these locations, the DNL values increases range from 5.4 to 6.2 dBA, but the levels remain under 65 dBA DNL. In addition to the DNL, Table 32 and Table 33 provide the SEL and L_{Amax} values for top five operations contributing to the DNL at their location for T-57B/C and AHTS operations, respectively. These tables provide more detail into the actual operations that are primary drivers on the overall noise environment for both the current TH-57B/C and proposed AHTS operations.

Figure 12. DNL Noise Contours at NOLF Harold

Table 31. Comparison of DNL Values at Representative Locations near NOLF Harold

Location	ID	Name	Baseline	Proposed Action		No Action
				DNL	Change*	
			dBA	dBA	Δ dBA	dBA
NOLF Harold	10	Northeast Corner	56.4	60.3	5.4	54.9
	11	Southeast Corner	57.8	62.5	6.2	56.3
	12	Waylon Dr.	50.9	55.3	5.9	49.4
	13	Sun Up Ct.	44.7	48.6	5.4	43.2

* Change is relative to No Action Scenario

Table 32. SEL and L_{Amax} of Top Five Contributors to the DNL for Representative Locations near NOLF Harold for TH-57B/C Operations

Point	Rank	Operation Type	Track ID	Annual Average Daily Events		SEL	Lmax	Baseline DNL	No Action DNL
				Acoustic Day	Acoustic Night				
				700-2200	2200-700	(dBA)	(dBA)	(dBA)	(dBA)
10	1	Std. Pattern	C3N	9.021	0.123	86.7	76.3	56.4	54.9
	2	Std. Pattern	C3S	7.293	0.099	87.5	75.4		
	3	Departure	D1_NE	7.684	0.062	87.2	80.9		
	4	Std. Pattern	C4S	7.293	0.099	86.7	75.3		
	5	Std. Pattern	C4N	9.021	0.123	85.4	75.0		
11	1	Std. Pattern	C3N	9.021	0.123	91.2	83.8	57.8	56.3
	2	Std. Pattern	C4N	9.021	0.123	88.5	79.0		
	3	Std. Pattern	C3S	7.293	0.099	87.7	78.0		
	4	Std. Pattern	C2N	2.255	0.031	91.8	84.0		
	5	Std. Pattern	C4S	7.293	0.099	85.9	75.9		
12	1	Std. Pattern	C3N	9.021	0.123	81.5	71.0	50.9	49.4
	2	Std. Pattern	C3S	7.293	0.099	81.6	71.2		
	3	Std. Pattern	C4N	9.021	0.123	80.2	70.9		
	4	Std. Pattern	C4S	7.293	0.099	80.1	69.1		
	5	Std. Pattern	C1N	2.255	0.031	83.1	70.8		
13	1	Std. Pattern	C3N	9.021	0.123	73.2	62.0	44.7	43.2
	2	Std. Pattern	C4N	9.021	0.123	72.7	61.5		
	3	Std. Pattern	C3S	7.293	0.099	73.6	61.3		
	4	Arrival	A1W_L	0.53	0.004	84.6	71.0		
	5	Std. Pattern	C4S	7.293	0.099	72.9	60.3		

Table 33. SEL and L_{Amax} of Top Five Contributors to the DNL for Representative Locations near NOLF Harold for AHTS Operations

Point	Rank	Operation Type	Track ID	Annual Average Daily Events Acoustic Day 700-2200	Annual Average Daily Events Acoustic Night 2200-700	SEL (dBA)	Lmax (dBA)	Proposed Action DNL (dBA)
10	1	Std. Pattern	C4S	7.654	0.104	94.7	85.5	60.3
	2	Std. Pattern	C3S	7.654	0.104	94.1	84.2	
	3	Std. Pattern	C1S	1.914	0.026	96.7	87.2	
	4	Std. Pattern	C3N	9.467	0.128	88.6	77.9	
	5	Departure	D1_NE	8.065	0.066	89.0	83.9	
11	1	Std. Pattern	C3N	9.467	0.128	96.4	88.4	62.5
	2	Std. Pattern	C4N	9.467	0.128	95.4	86.4	
	3	Std. Pattern	C1N	2.367	0.032	97.8	89.3	
	4	Std. Pattern	C2N	2.367	0.032	97.6	89.3	
	5	Tactical	T2N	1.005	0	100.3	96.2	
12	1	Std. Pattern	C3N	9.467	0.128	87.9	78.8	55.3
	2	Std. Pattern	C4N	9.467	0.128	86.3	75.5	
	3	Std. Pattern	C1N	2.367	0.032	89.5	80.0	
	4	Std. Pattern	C3S	7.654	0.104	84.4	74.5	
	5	Std. Pattern	C2N	2.367	0.032	89.2	80.5	
13	1	Std. Pattern	C4N	9.467	0.128	78.7	65.9	48.6
	2	Std. Pattern	C3N	9.467	0.128	78.7	67.4	
	3	Std. Pattern	C3S	7.654	0.104	77.5	66.1	
	4	Arrival	A1W_L	0.556	0.005	88.2	73.4	
	5	Std. Pattern	C4S	7.654	0.104	76.5	64.2	

4.6 NOLF Santa Rosa

Figure 13 provides the comparison plot of the three scenarios for NOLF Santa Rosa. The Proposed Action scenario includes the replacement of the TH-57B/C with the new AHTS along with a 21% increase in airfield operations relative to Baseline. For the Proposed Action contours, the 60 dBA DNL noise contour, shown in blue in Figure 13, lies mostly outside of the airfield boundary, and the 65 dBA DNL lies mostly inside of the boundary. The 65 dBA DNL contour's area outside the boundary, extending to the south and west, appears to contain no housing/structures. However, the extension of the 65 dBA DNL contour near the northeast corner does appear to encompass some houses/structures. Also, the 65 dBA DNL contour aligns with the Baseline and No Action 60 dBA DNL contours. The 70 dBA DNL contour also extends beyond the boundary in the northeast corner. For all scenarios, the higher-level DNL noise contours are concentrated in the southeast corner of the airfield because of low work operations located in this area.

Four representative locations are provided to supplement the DNL results; Table 34 provides a comparison of the DNL values at four locations identified in Figure 12. At these locations, the DNL values increases range from 2.5 to 5.5 dBA, but the levels remain under 65 dBA DN. In addition to the DNL, Table 35 and Table 36 provide the SEL and L_{Amax} values for top five operations contributing to the DNL at their location for T-57B/C and AHTS operations, respectively. These tables provide more detail into the actual operations that are primary drivers on the overall noise environment for both the current TH-57B/C and proposed AHTS operations.

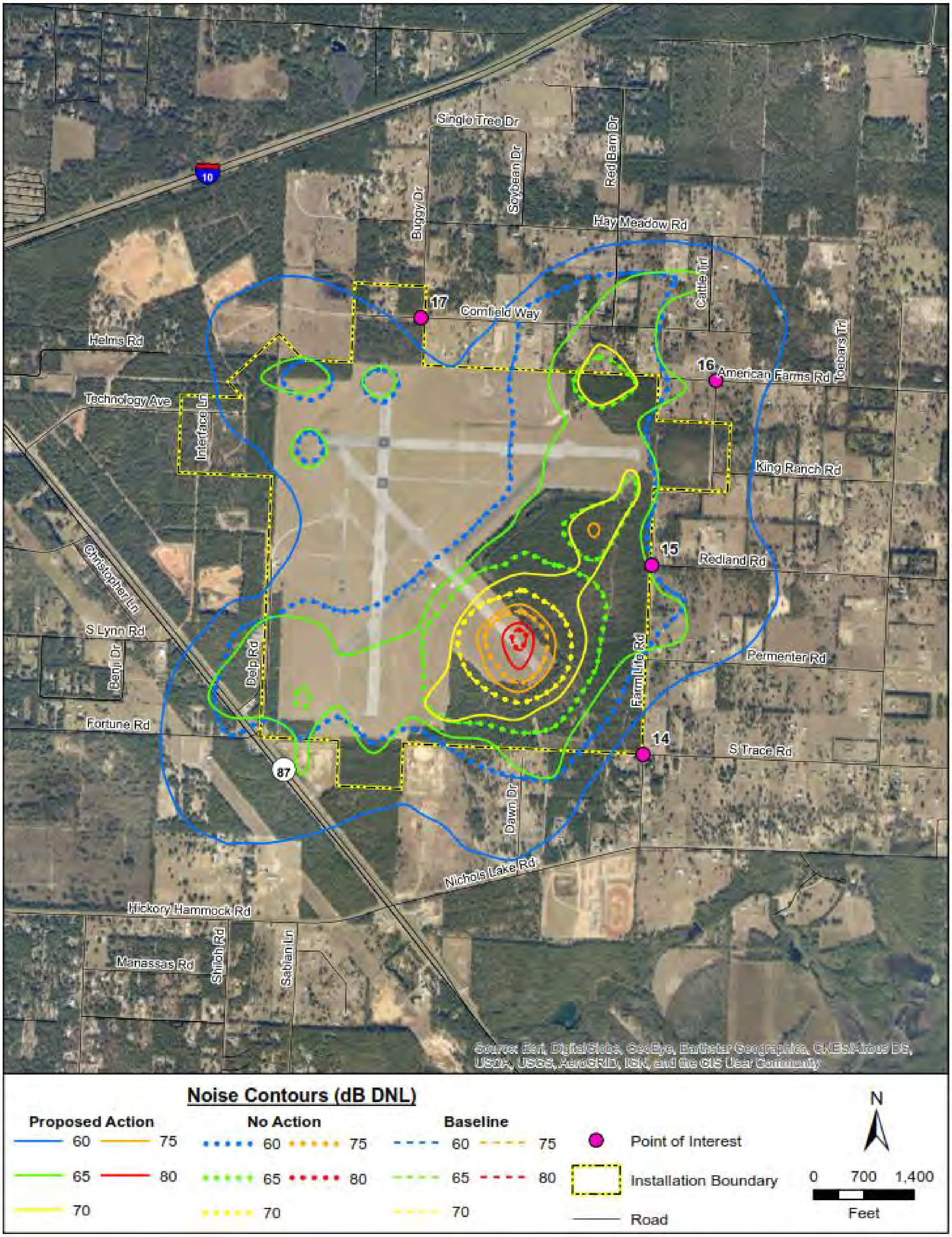

Figure 13. DNL Noise Contours at NOLF Santa Rosa

Table 34. Comparison of DNL Values at Representative Locations near NOLF Santa Rosa

Location	ID	Name	Baseline	Proposed Action		No Action
				DNL	Change*	
			dBA	dBA	Δ dBA	dBA
NOLF Santa Rosa	14	Southeast Corner	54.7	57.1	2.5	54.6
	15	East (Redland Rd.)	59.1	62.1	3.1	59.0
	16	American Farms Rd	56.4	61.8	5.5	56.3
	17	Cornfield Way	53.6	58.1	4.6	53.5

* Change is relative to No Action Scenario

Table 35. SEL and L_{Amax} of Top Five Contributors to the DNL for Representative Locations near NOLF Santa Rosa for TH-57B/C Operations

Point	Rank	Operation Type	Track ID	Annual Average Daily Events		SEL	Lmax	Baseline DNL	No Action DNL
				Acoustic Day	Acoustic Night				
				700-2200	2200-700	(dBA)	(dBA)	(dBA)	(dBA)
14	1	Std. Pattern	C3W	9.544	0.156	79.0	67.7	54.7	54.6
	2	Std. Pattern	C2W	9.544	0.156	78.9	67.4		
	3	Std. Pattern	C1W	9.544	0.156	78.5	66.1		
	4	Std. Pattern	C4W	9.544	0.156	78.5	66.3		
	5	Std. Pattern	C5W	9.544	0.156	77.7	65.8		
15	1	Std. Pattern	C1N	10.651	0.174	89.3	73.9	59.1	59.0
	2	Std. Pattern	C1S	8.611	0.141	88.5	77.7		
	3	Std. Pattern	C4N	10.651	0.174	86.9	75.1		
	4	Std. Pattern	C3N	10.651	0.174	86.5	71.1		
	5	Std. Pattern	C2N	10.651	0.174	86.4	71.2		
16	1	Std. Pattern	C2N	10.651	0.174	84.1	73.4	56.4	56.3
	2	Std. Pattern	C3N	10.651	0.174	84.0	74.1		
	3	Std. Pattern	C2S	8.611	0.141	84.7	71.4		
	4	Std. Pattern	C3S	8.611	0.141	84.7	73.1		
	5	Std. Pattern	C1S	8.611	0.141	84.6	68.5		
17	1	Autorotate	AR180W	6.65	0	84.8	71.5	53.6	53.5
	2	Tail Rotor/Boost Off	TRBO1W	6.65	0	83.8	72.9		
	3	Autorotate	AR90W	6.65	0	83.2	69.1		
	4	Autorotate	AR180E	4.024	0	85.2	71.6		
	5	Tail Rotor/Boost Off	TRBO1S	5.999	0	82.5	68.9		

Table 36. SEL and L_{Amax} of Top Five Contributors to the DNL for Representative Locations near NOLF Santa Rosa for AHTS Operations

Point	Rank	Operation Type	Track ID	Annual Average Daily Events Acoustic Day 700-2200	Annual Average Daily Events Acoustic Night 2200-700	SEL (dBA)	Lmax (dBA)	Proposed Action DNL (dBA)
14	1	Std. Pattern	C3W	14.042	0.229	82.9	67.6	57.1
	2	Std. Pattern	C2W	14.042	0.229	82.5	68.1	
	3	Std. Pattern	C1W	14.042	0.229	82.2	67.6	
	4	Std. Pattern	C1N	15.671	0.256	80.2	65.6	
	5	Std. Pattern	C2N	15.671	0.256	80.1	65.6	
15	1	Std. Pattern	C5N	15.671	0.256	92.1	82.6	62.1
	2	Std. Pattern	C1N	15.671	0.256	92.0	77.7	
	3	Std. Pattern	C4N	15.671	0.256	90.2	79.1	
	4	Std. Pattern	C1S	12.668	0.207	90.4	78.9	
	5	Std. Pattern	C3N	15.671	0.256	88.2	73.1	
16	1	Arrival	A1W_R	2.702	0	97.9	90.4	61.8
	2	Tail Rotor/Boost Off	TRBO1W	9.784	0	91.9	84.0	
	3	Autorotate	AR180W	9.784	0	91.8	84.0	
	4	Std. Pattern	C3S	12.668	0.207	89.9	78.7	
	5	Std. Pattern	C2S	12.668	0.207	89.3	76.4	
17	1	Autorotate	AR180W	9.784	0	88.9	76.3	58.1
	2	Tail Rotor/Boost Off	TRBO1W	9.784	0	88.7	77.9	
	3	Autorotate	AR180E	5.921	0	89.1	76.4	
	4	Tail Rotor/Boost Off	TRBO1E	5.921	0	88.9	78.1	
	5	Autorotate	AR90W	9.784	0	86.6	70.4	

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Appendix A: Flight Tracks

The future projected operations are assumed to use the same nominal flight tracks that are in use today at the airfield, per the Fixed Wing Standard Operating Procedures Manual, Rotary-Wing Operating Procedures Manual, and pilot interviews. The Site X NOLF flight tracks were derived from pilot interviews and the Rotary-Wing Operating Procedures Manual dated March 2019. The modeled flight tracks for the projected conditions at NAS Whiting Field and the five NOLFs are grouped by operational type and displayed in Appendices A-1 through A-6.

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Appendix A-1: NAS Whiting Field South Flight Tracks

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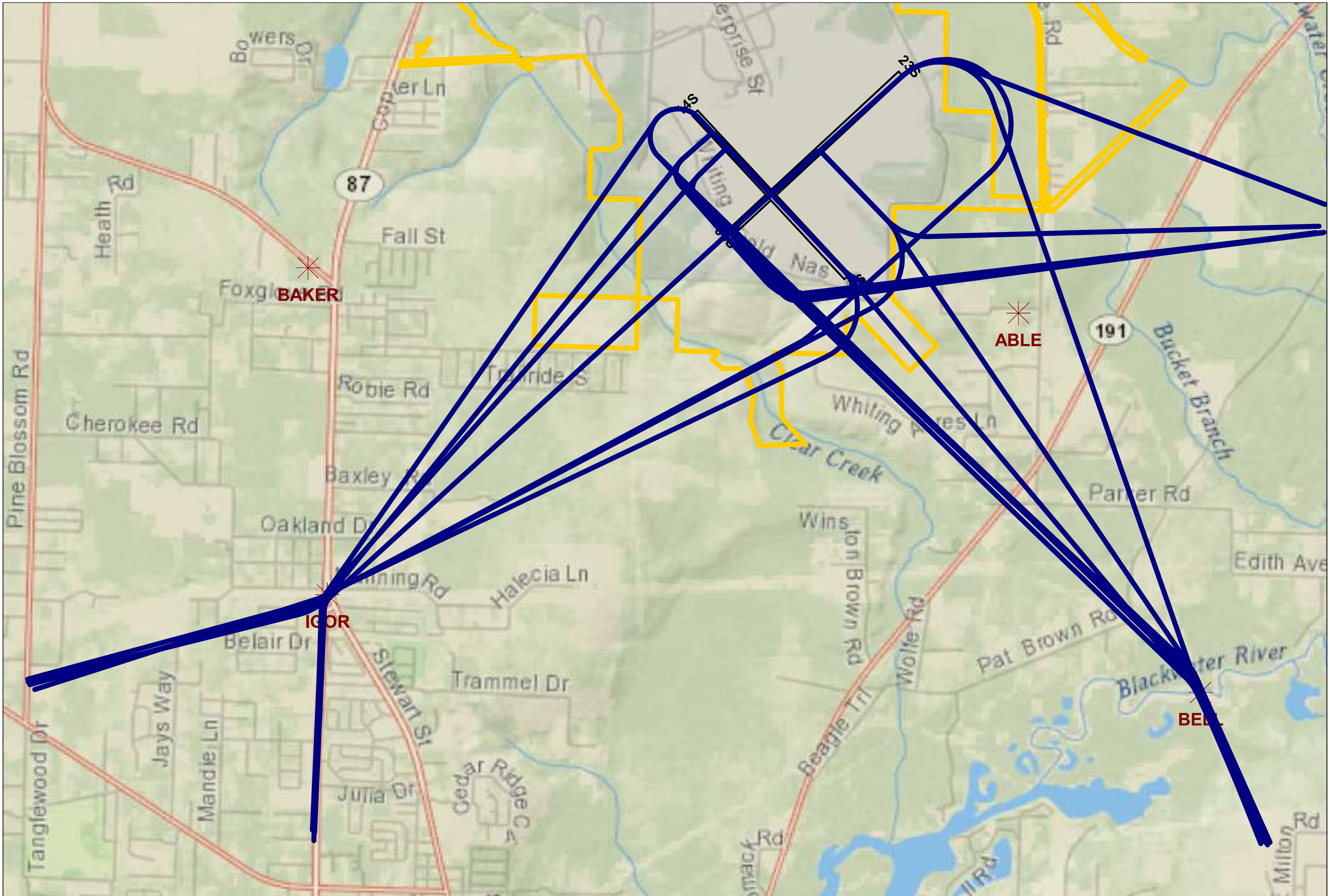
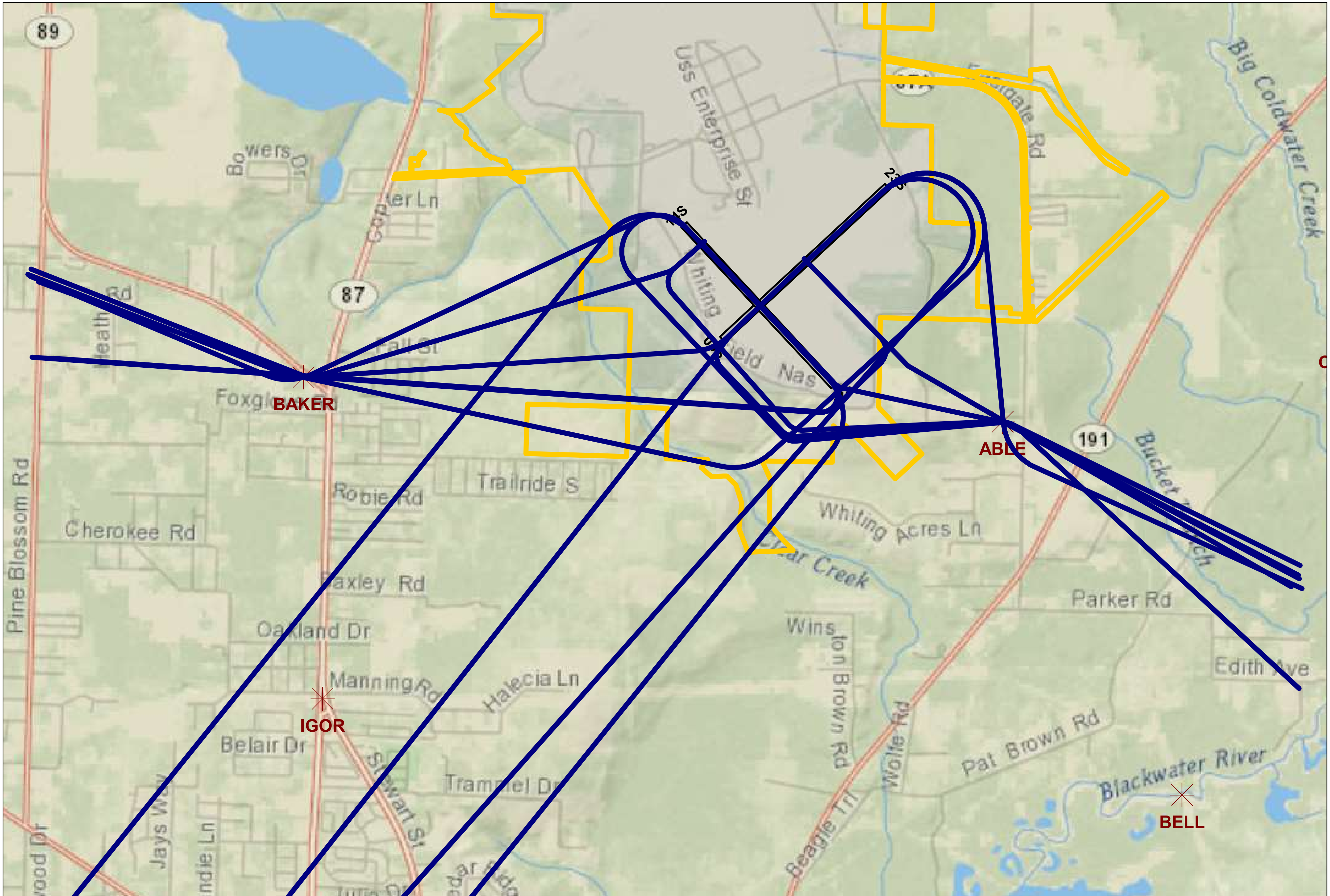


Helicopter Arrival Flight Tracks at NAS Whiting Field South

0 2,000 4,000 6,000 8,000 10,000 12,000

Scale in Feet 1:40,700 (1 inch = 3,390 feet)



Helicopter Departure Flight Tracks at NAS Whiting Field South

0 2,000 4,000 6,000 8,000 10,000 12,000

Scale in Feet 1:41,300 (1 inch = 3,450 feet)

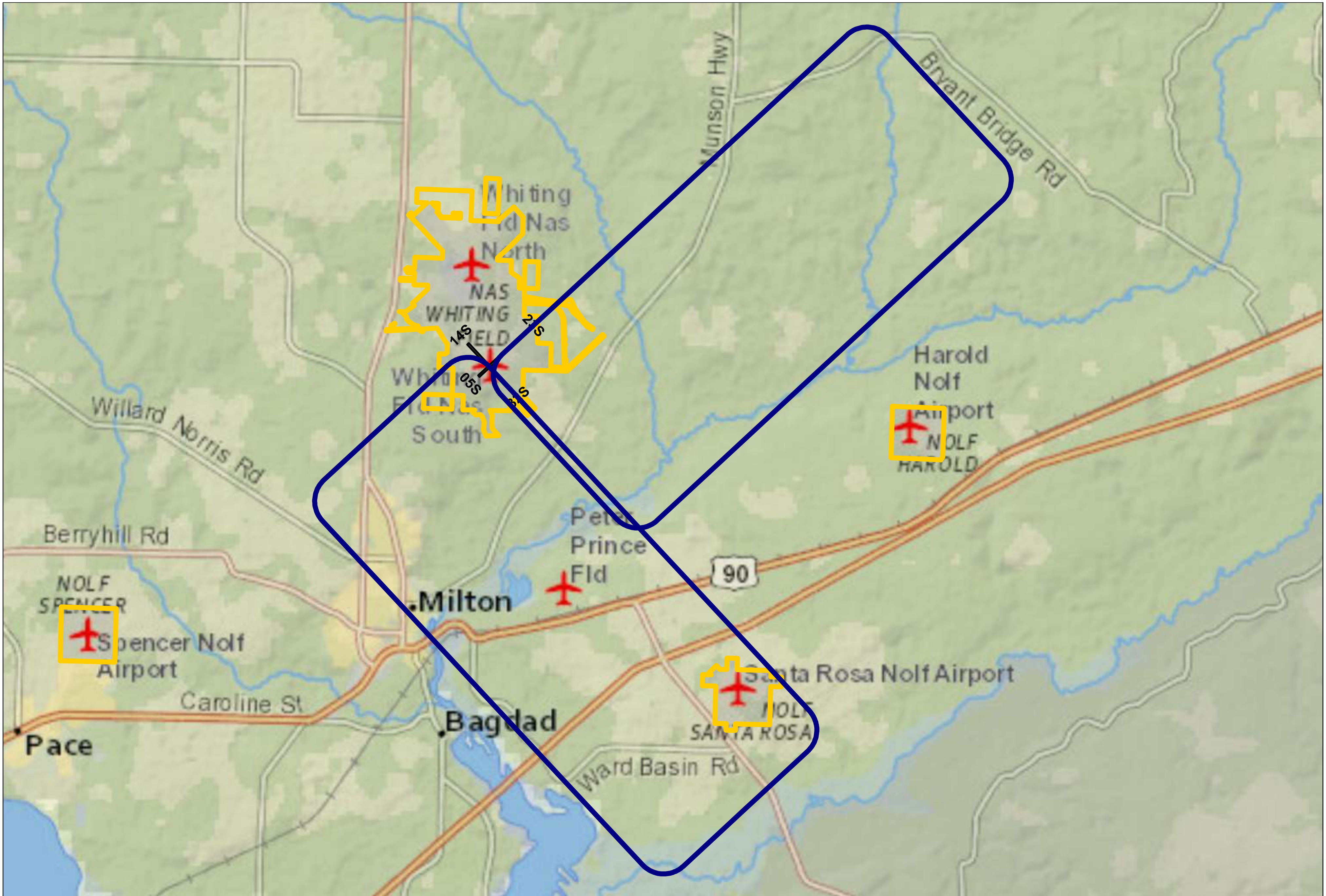
N

Helicopter Closed Pattern Flight Tracks at NAS Whiting Field South

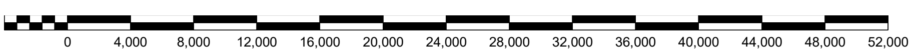
0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600 4,000 4,400 4,800

Scale in Feet 1:13,700 (1 inch = 1,140 feet)

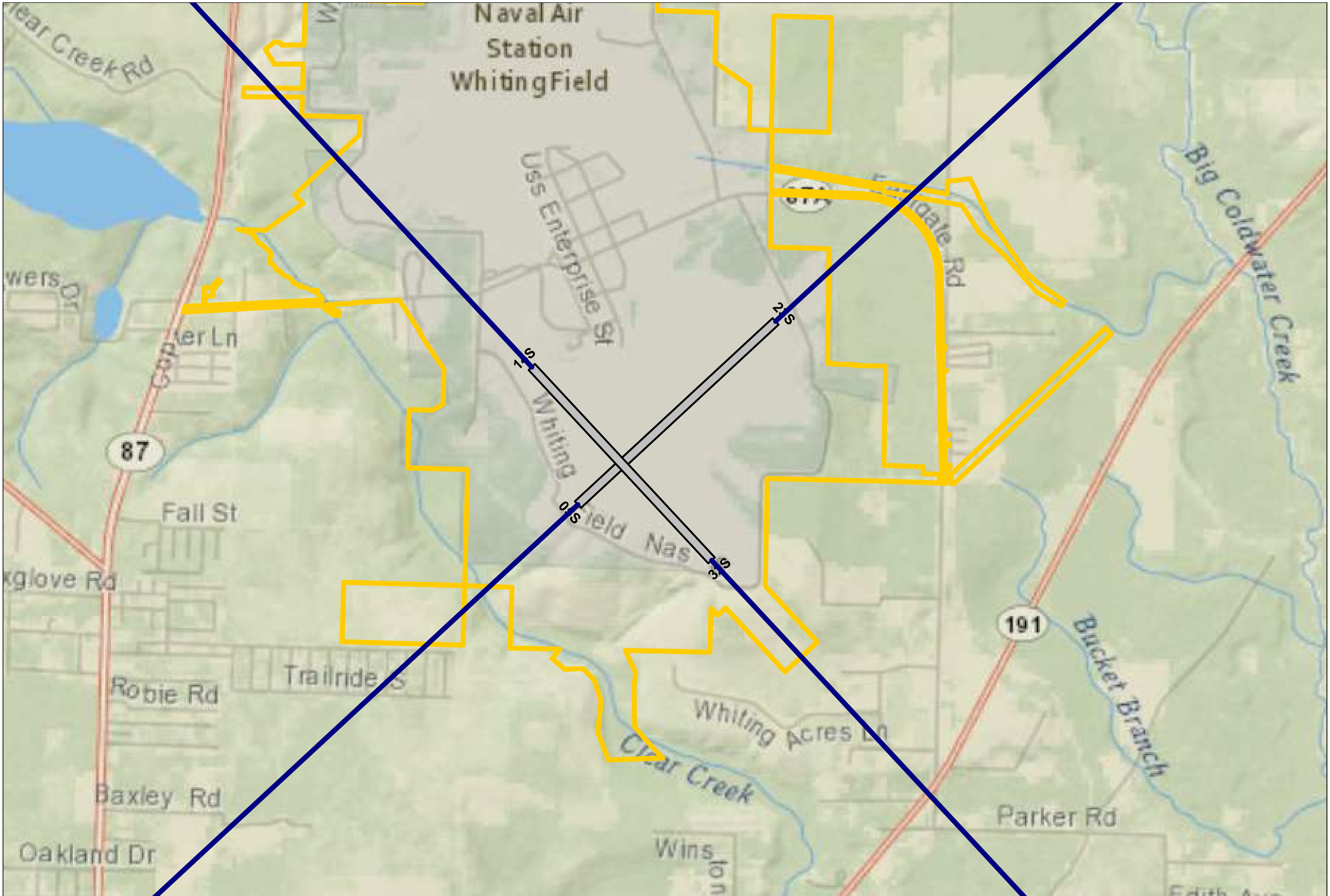
N



T-6 GCA Box Pattern Tracks at NAS Whiting Field South



Scale in Feet 1:146,000 (1 inch = 12,200 feet)



Fixed Wing Aircraft Arrival Flight Tracks at NAS Whiting Field South

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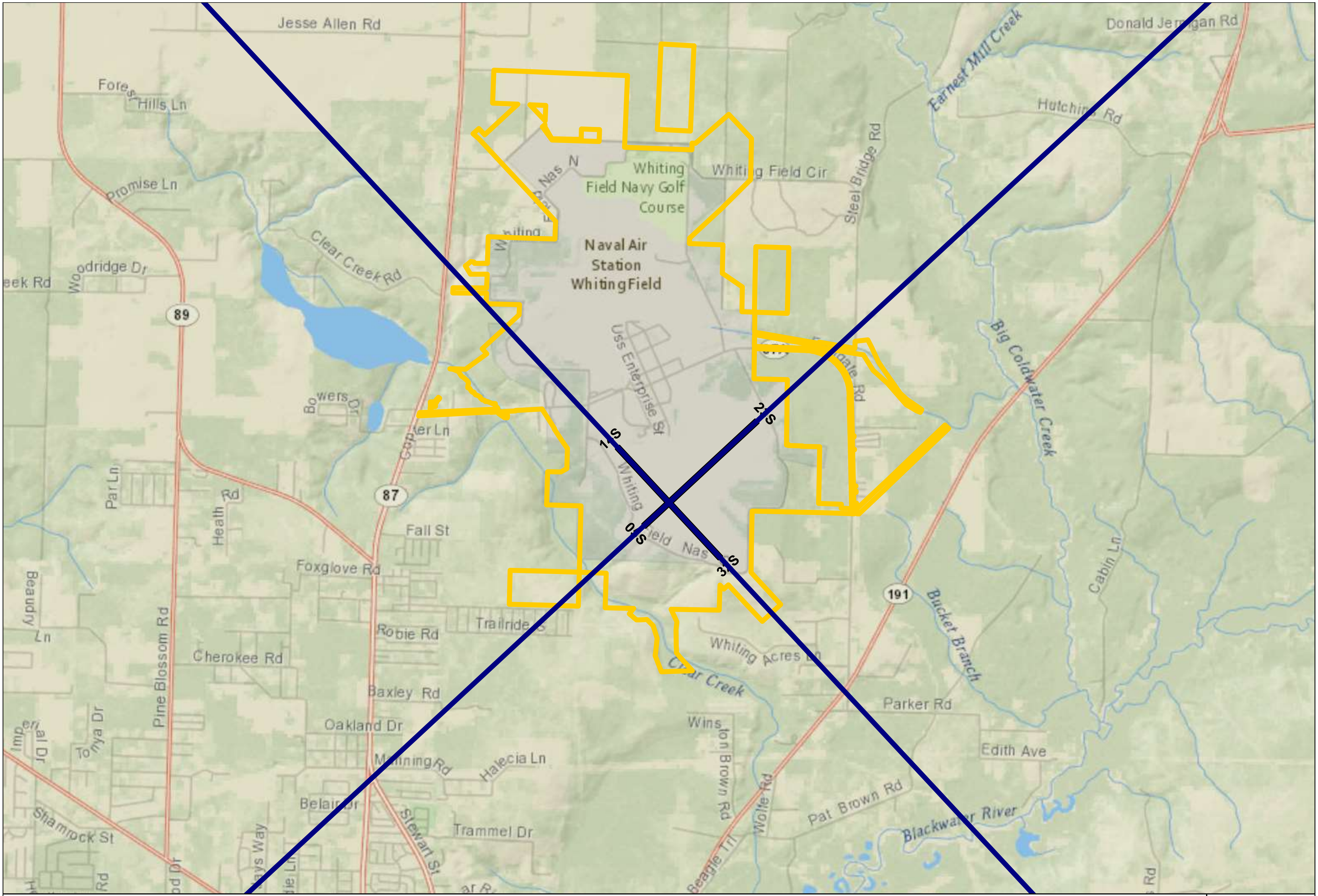
Scale in Feet 1:34,500 (1 inch = 2,870 feet)

N



Fixed Wing Aircraft Departure Flight Tracks at NAS Whiting Field South

0 2,000 4,000 6,000 8,000 10,000 12,000 14,000 16,000 18,000 20,000

Scale in Feet 1:59,800 (1 inch = 4,980 feet)

N

Appendix A-2: NOLF Spencer Flight Tracks

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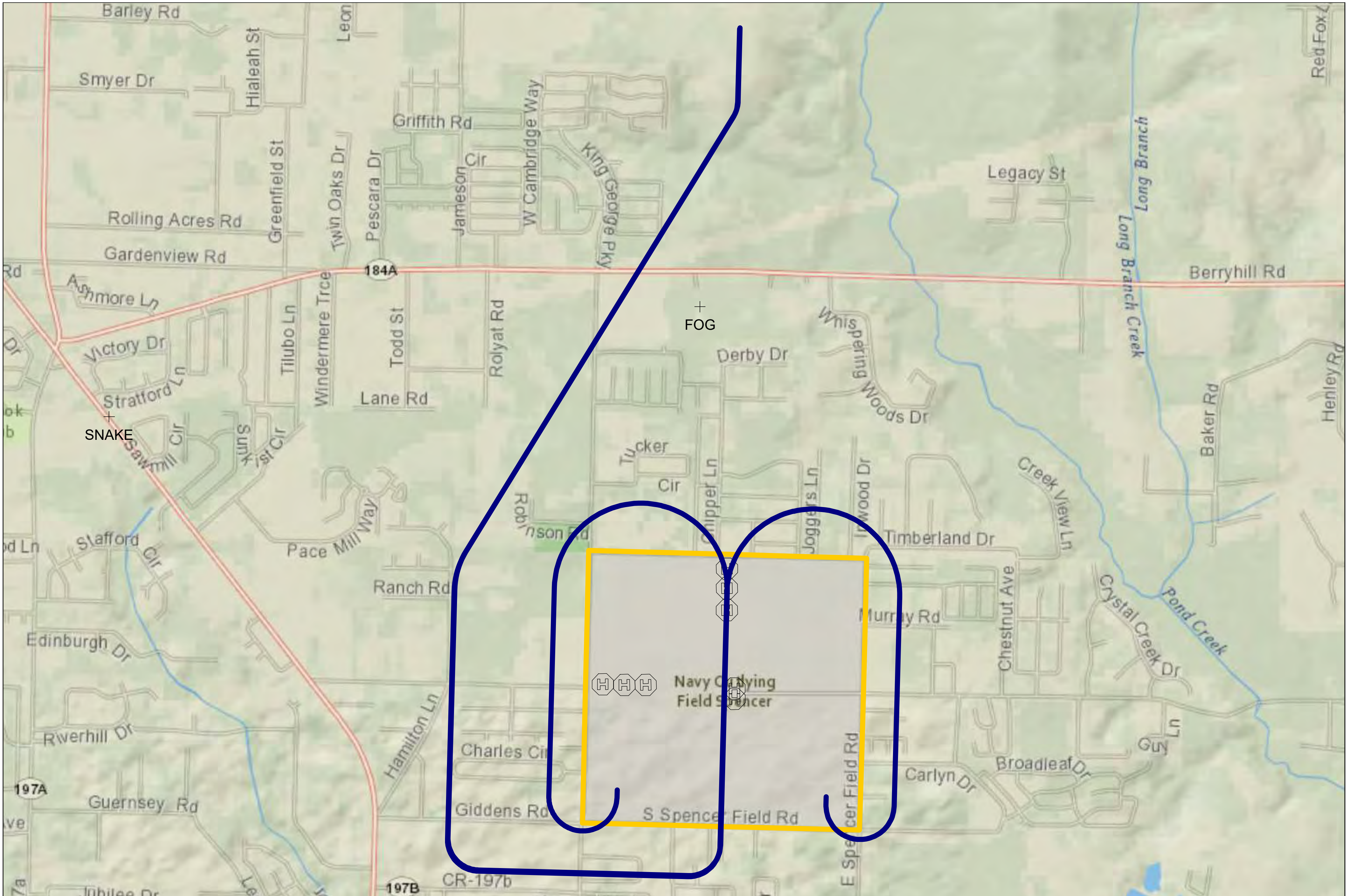

Arrival Tracks at NOLF Spencer
Course 360

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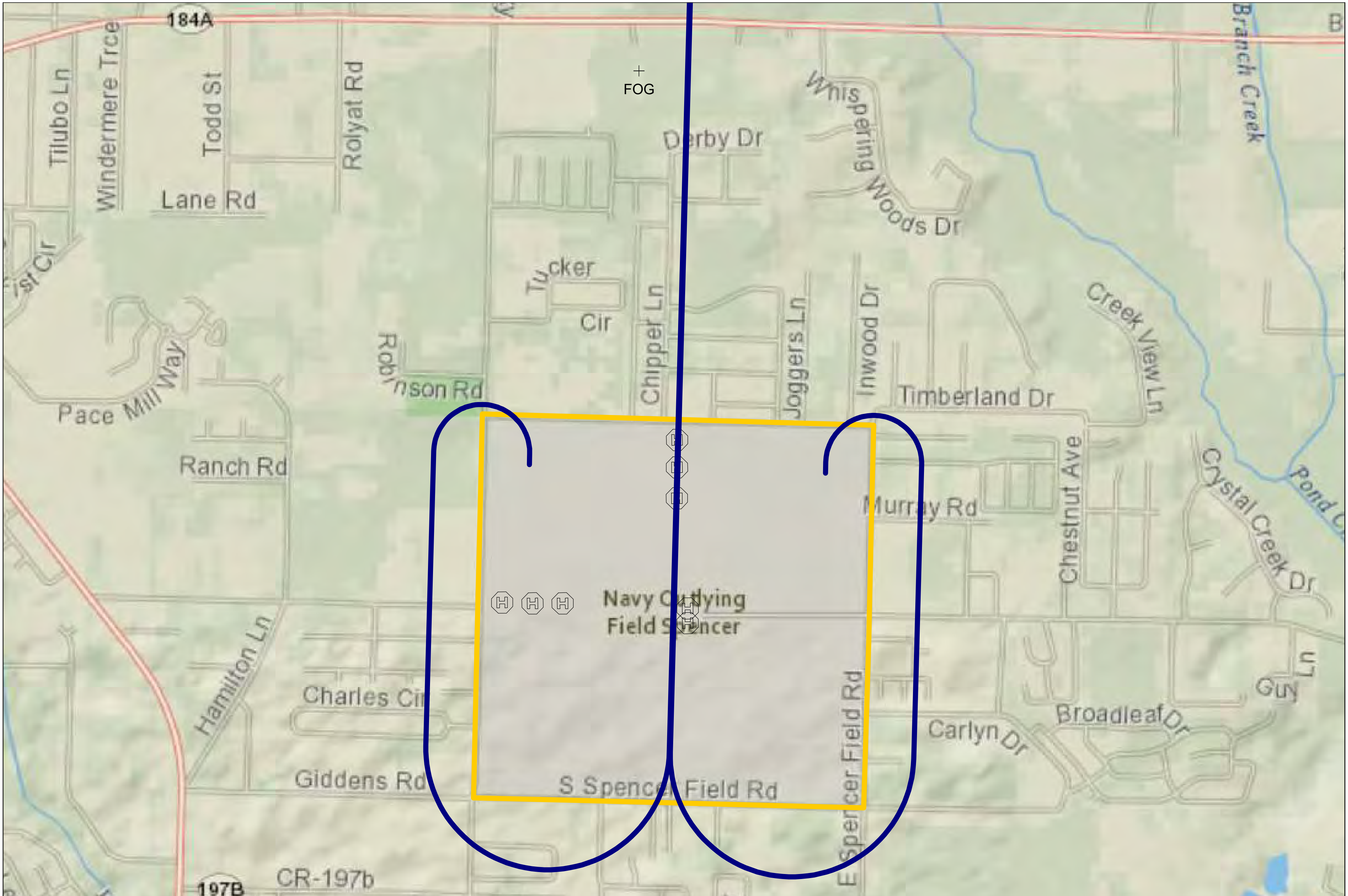
Scale in Feet 1:29,300 (1 inch = 2,440 feet)

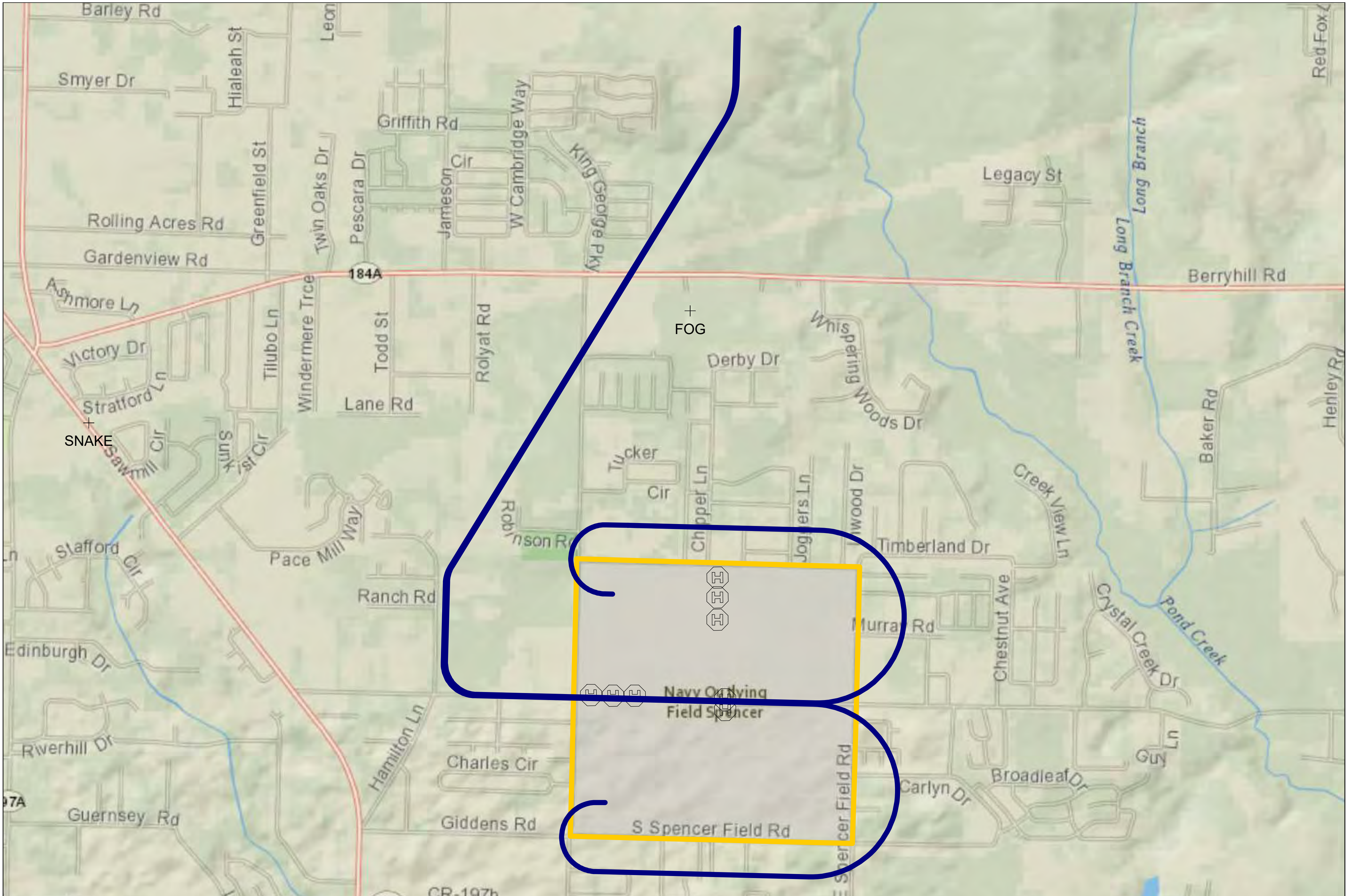


Arrival Tracks at NOLF Spencer
Course 180

0 1,000 2,000 3,000 4,000 5,000 6,000

Scale in Feet 1:20,800 (1 inch = 1,730 feet)

N



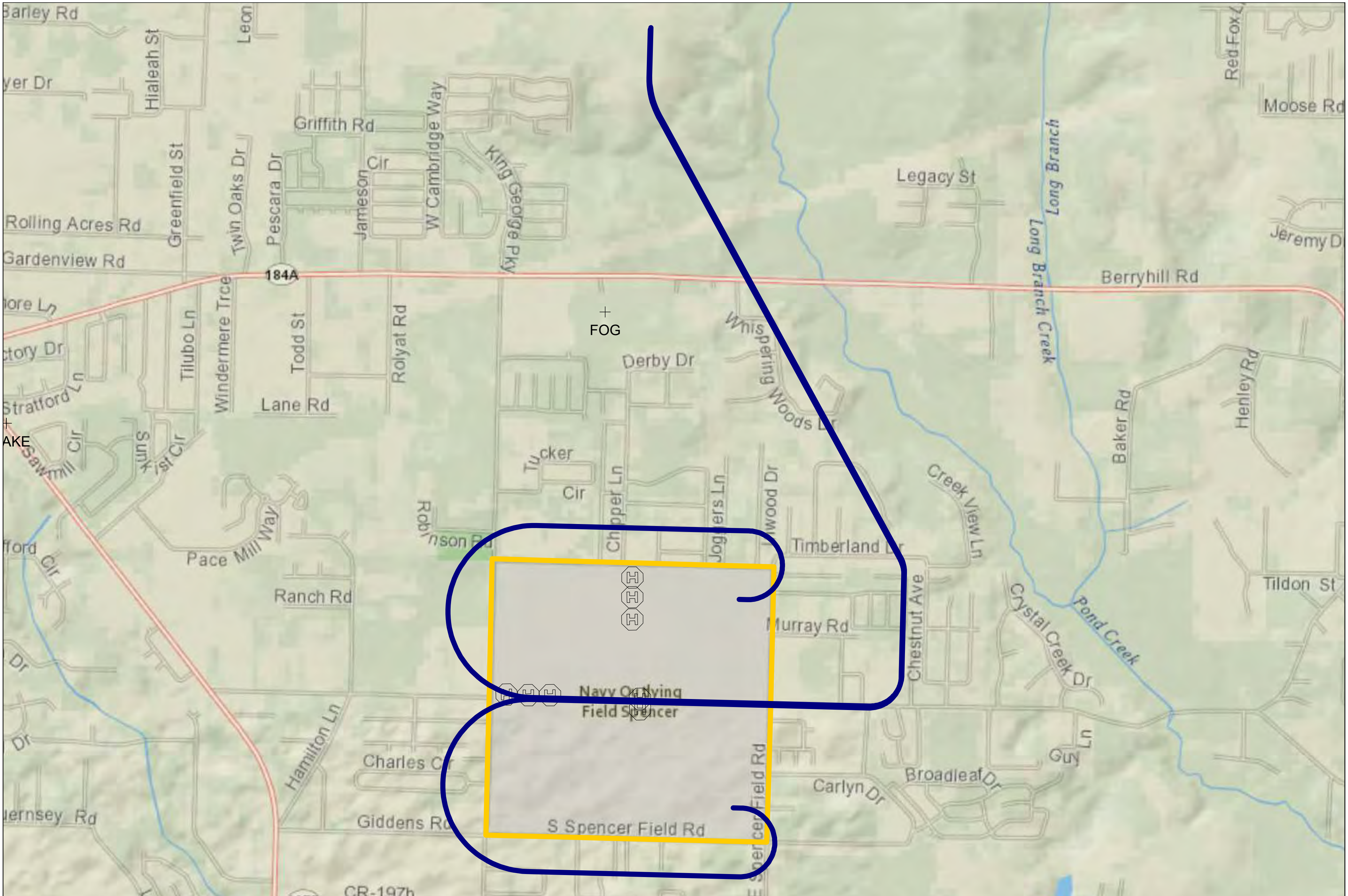
Arrival Tracks at NOLF Spencer

Course 090

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000

Scale in Feet 1:28,800 (1 inch = 2,400 feet)

N



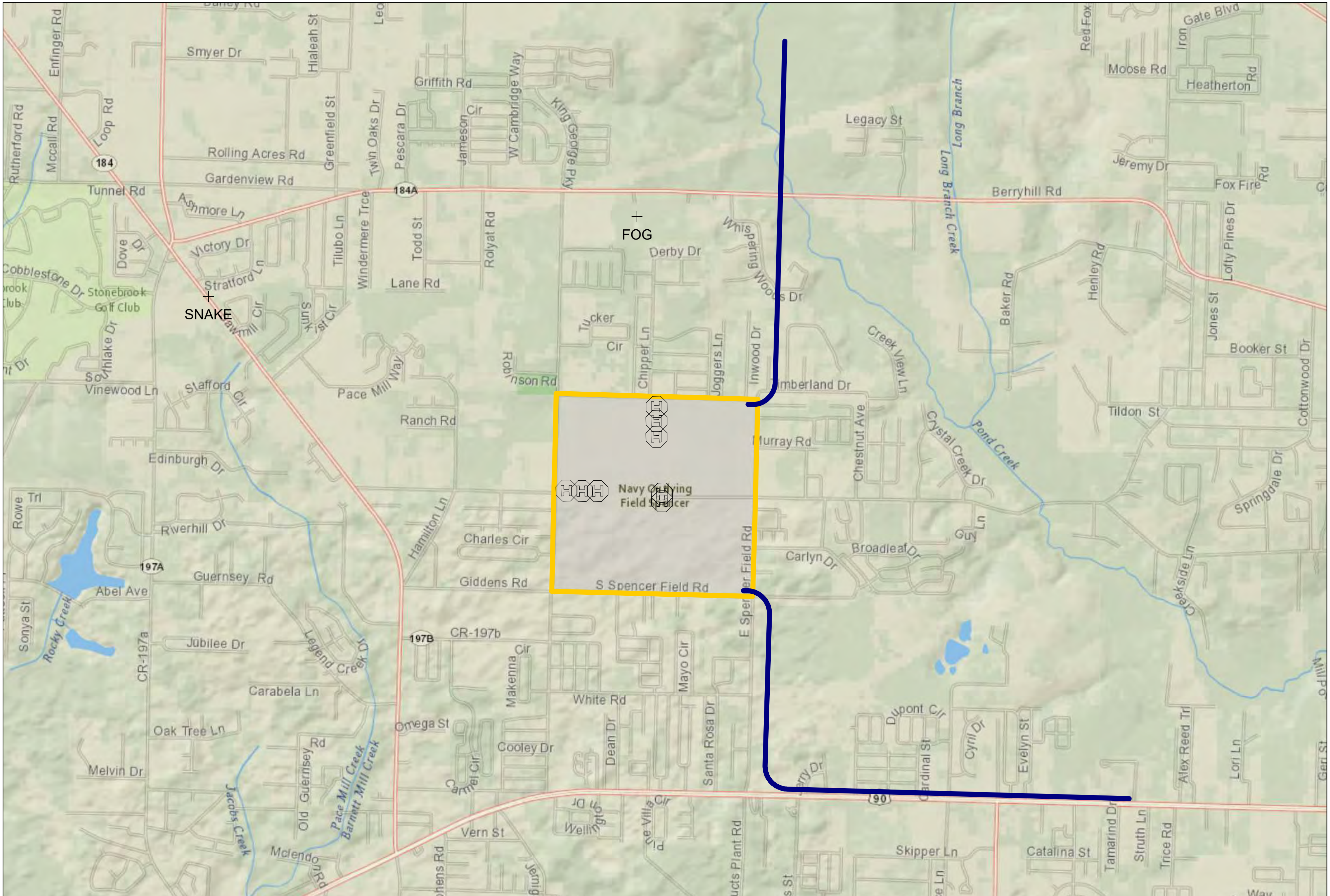
Arrival Tracks at NOLF Spencer

Course 270

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000

Scale in Feet 1:28,900 (1 inch = 2,410 feet)

N

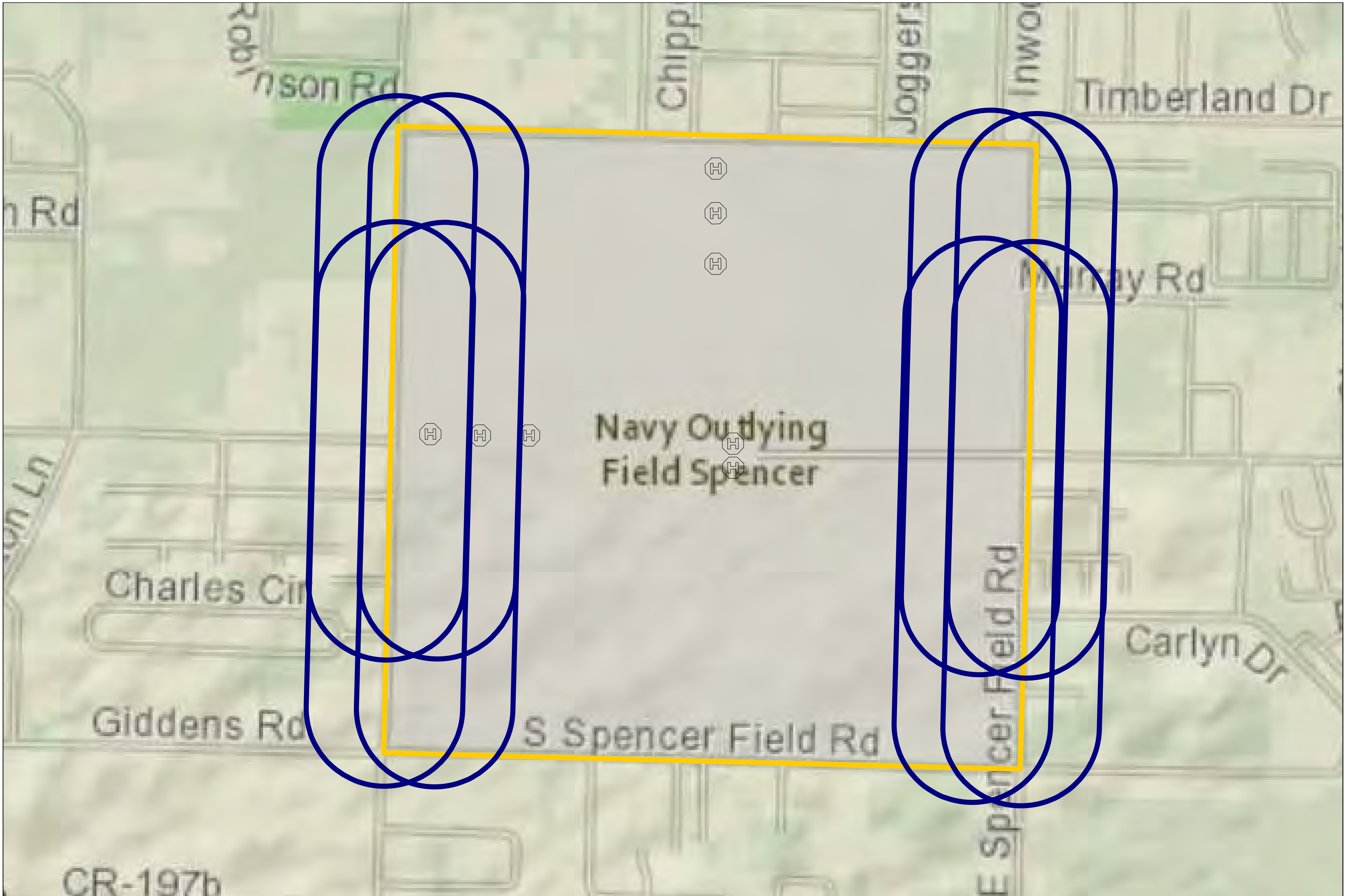


Departure Tracks at NOLF Spencer

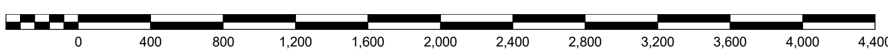
0 2,000 4,000 6,000 8,000 10,000 12,000

Scale in Feet 1:39,900 (1 inch = 3,320 feet)

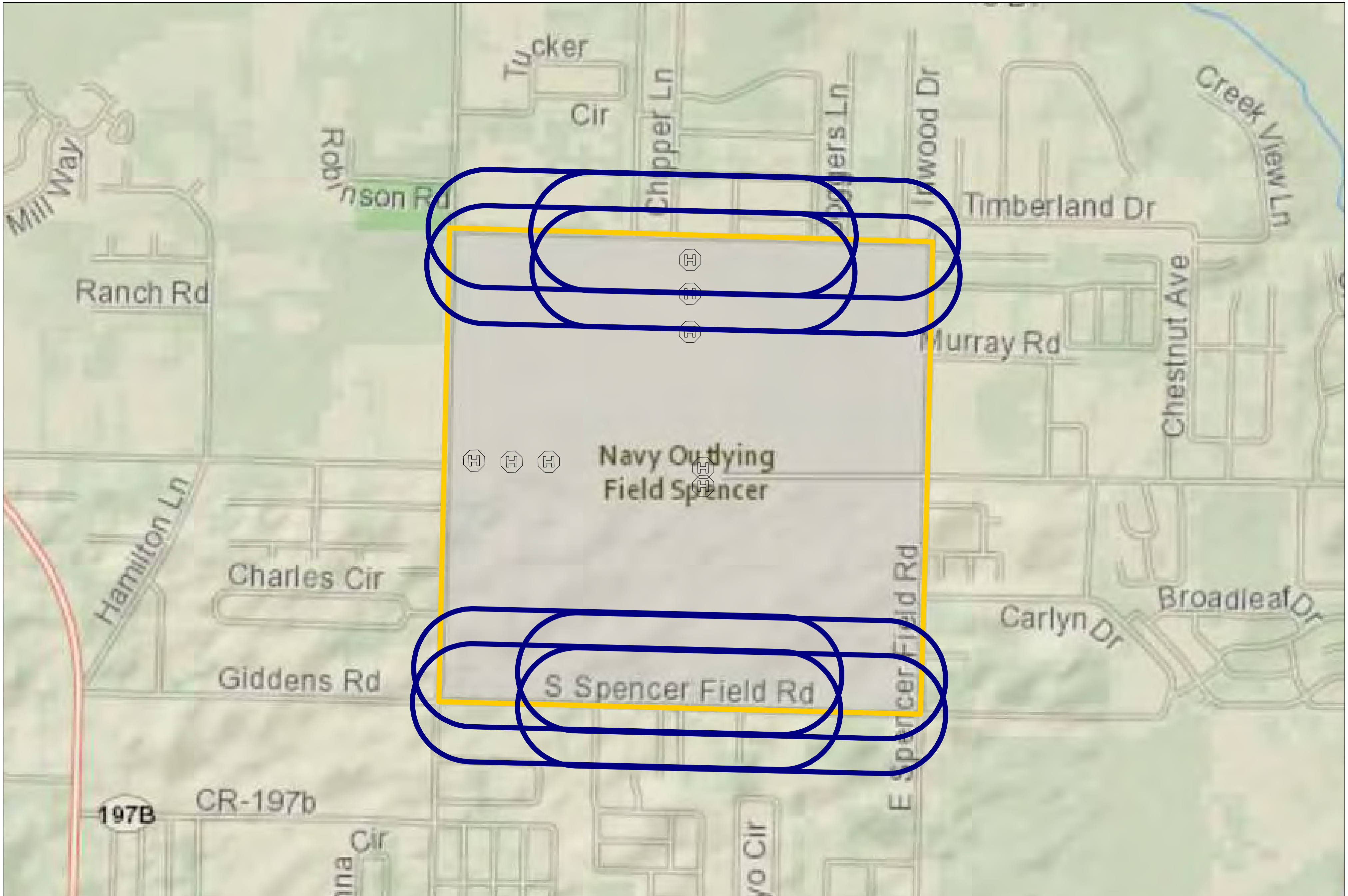
N



Standard Pattern Tracks at NOLF Spencer
Course 180/360

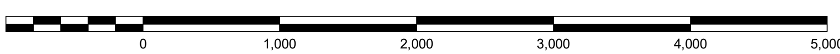


Scale in Feet 1:12,700 (1 inch = 1,060 feet)

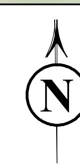


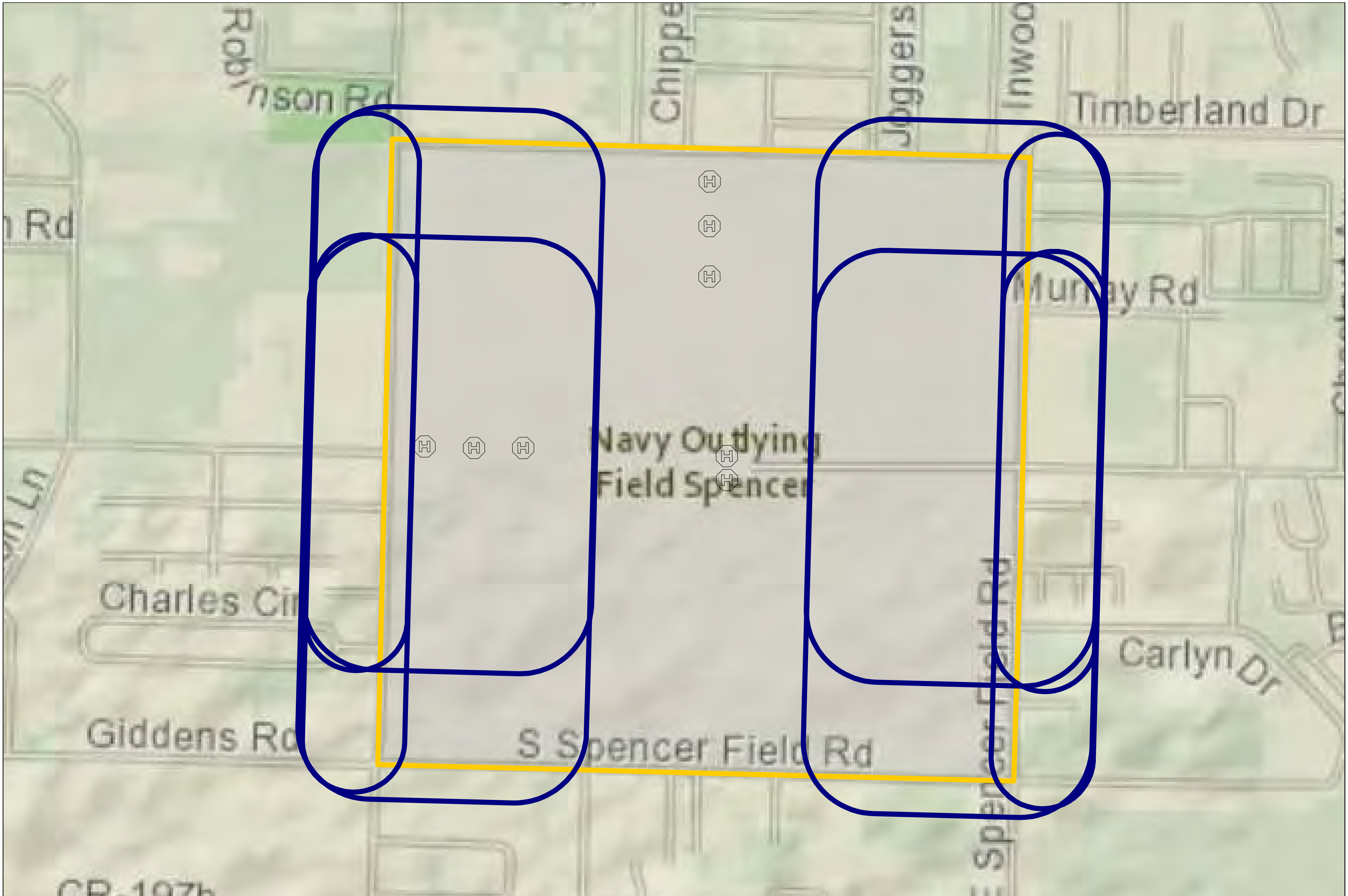
Standard Pattern Tracks at NOLF Spencer

Course 090/270

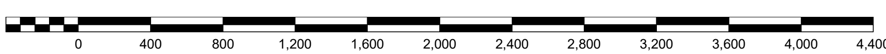


Scale in Feet 1:16,900 (1 inch = 1,410 feet)

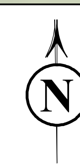


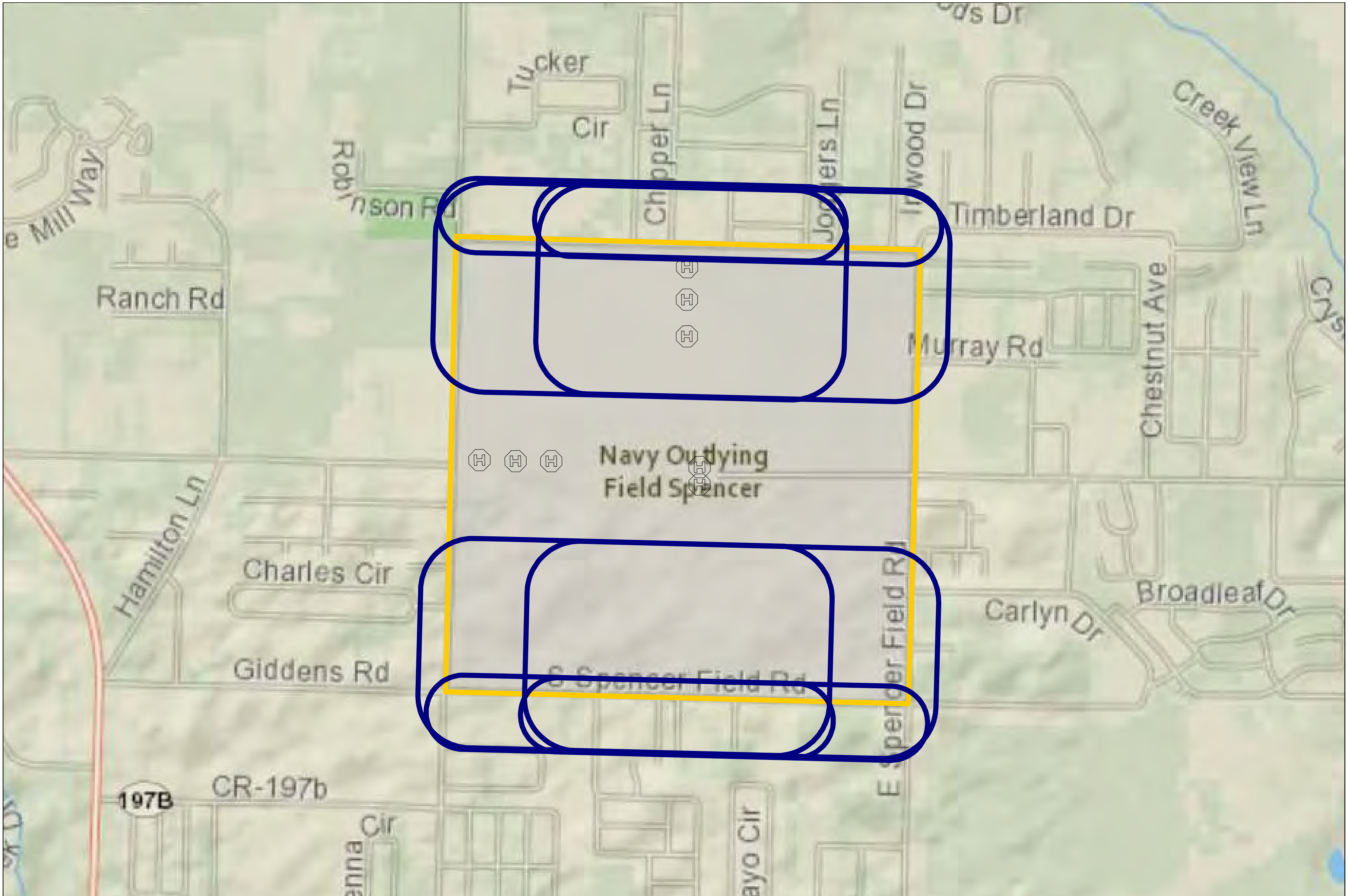


Autorotation Pattern Tracks at NOLF Spencer
Course 180/360

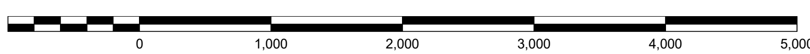


Scale in Feet 1:12,800 (1 inch = 1,060 feet)

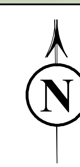




Autorotation Pattern Tracks at NOLF Spencer
Course 090/270

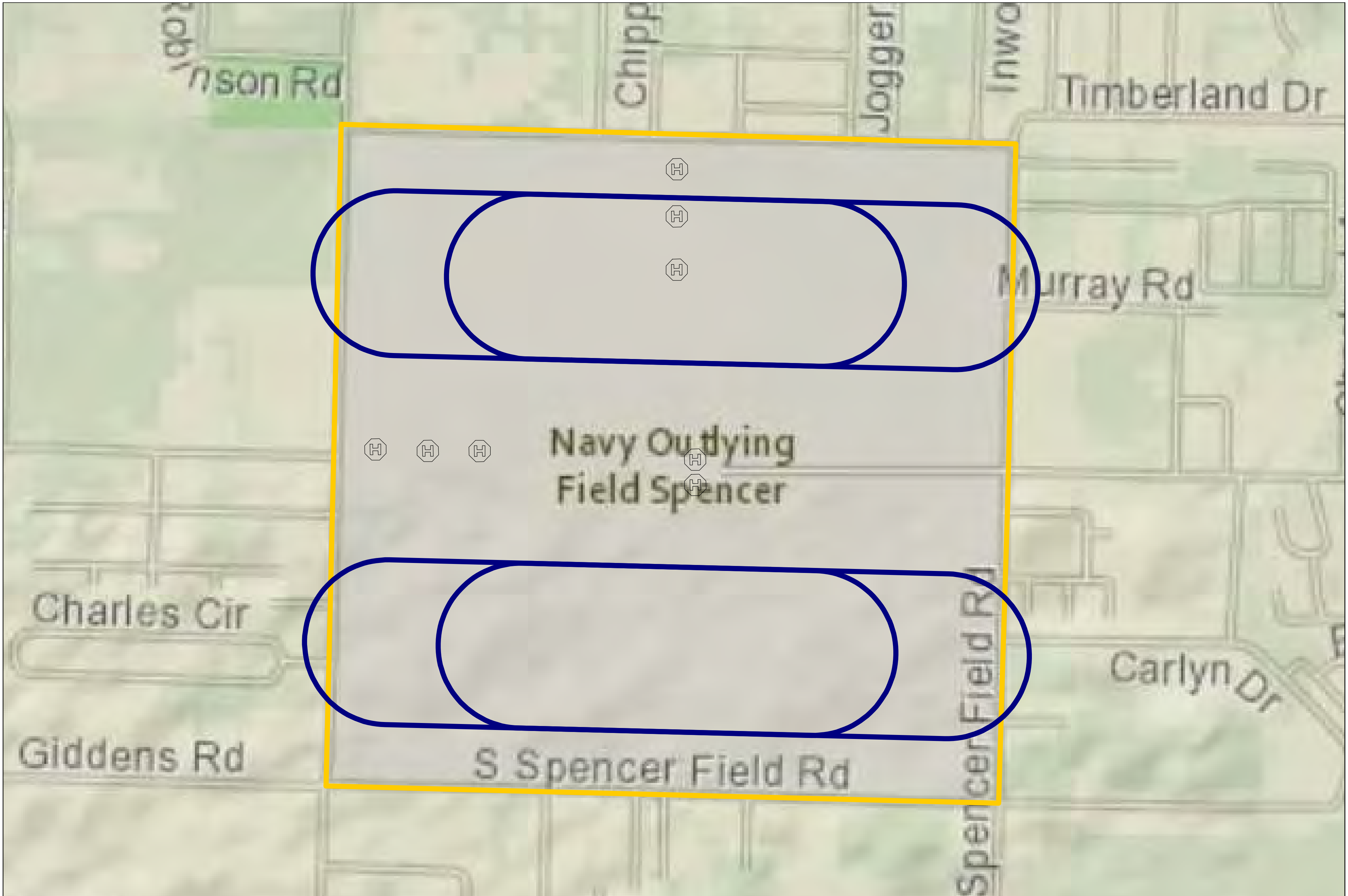


Scale in Feet 1:17,500 (1 inch = 1,460 feet)



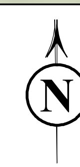
Tail Rotor/Boost Off Pattern Tracks at NOLF Spencer
Course 180/360

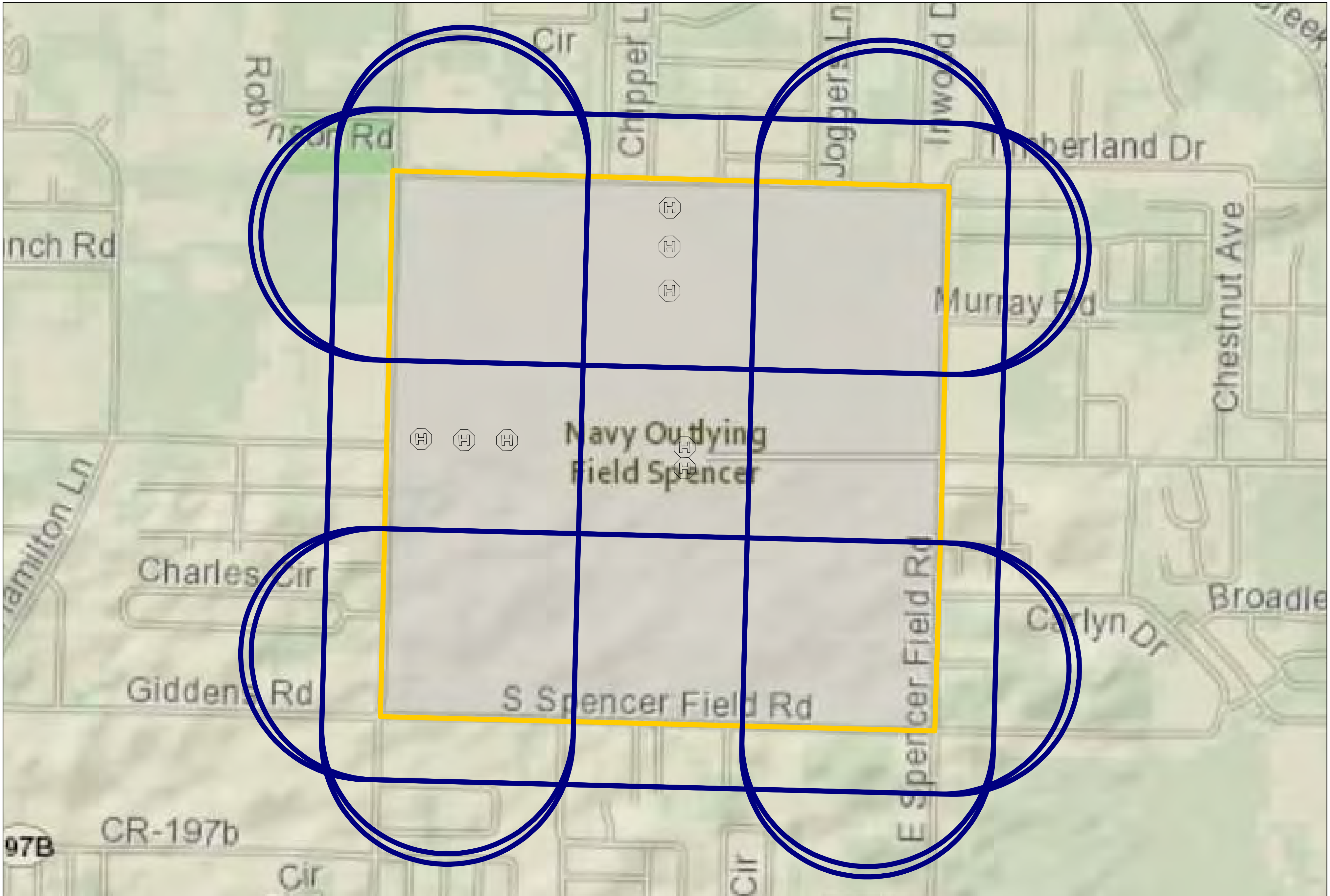
Scale in Feet 1:12,400 (1 inch = 1,040 feet)



Tail Rotor/Boost Off Pattern Tracks at NOLF Spencer
Course 090/270

Scale in Feet 1:12,100 (1 inch = 1,010 feet)





High Speed Tactical Pattern Tracks at NOLF Spencer

0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600 4,000 4,400 4,800

Scale in Feet 1:14,500 (1 inch = 1,200 feet)

N

Appendix A-3: NOLF Pace Flight Tracks

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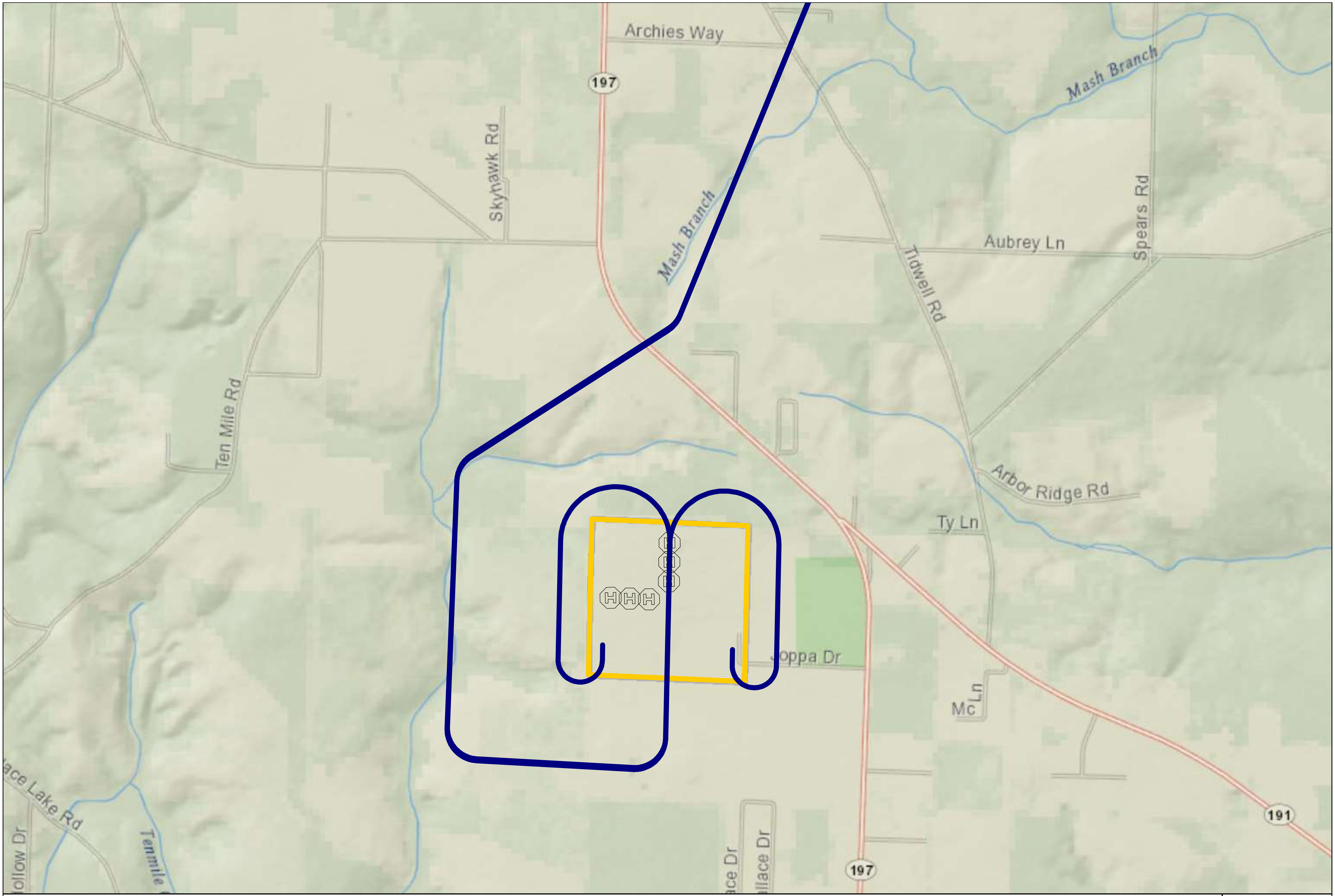
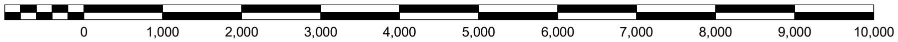
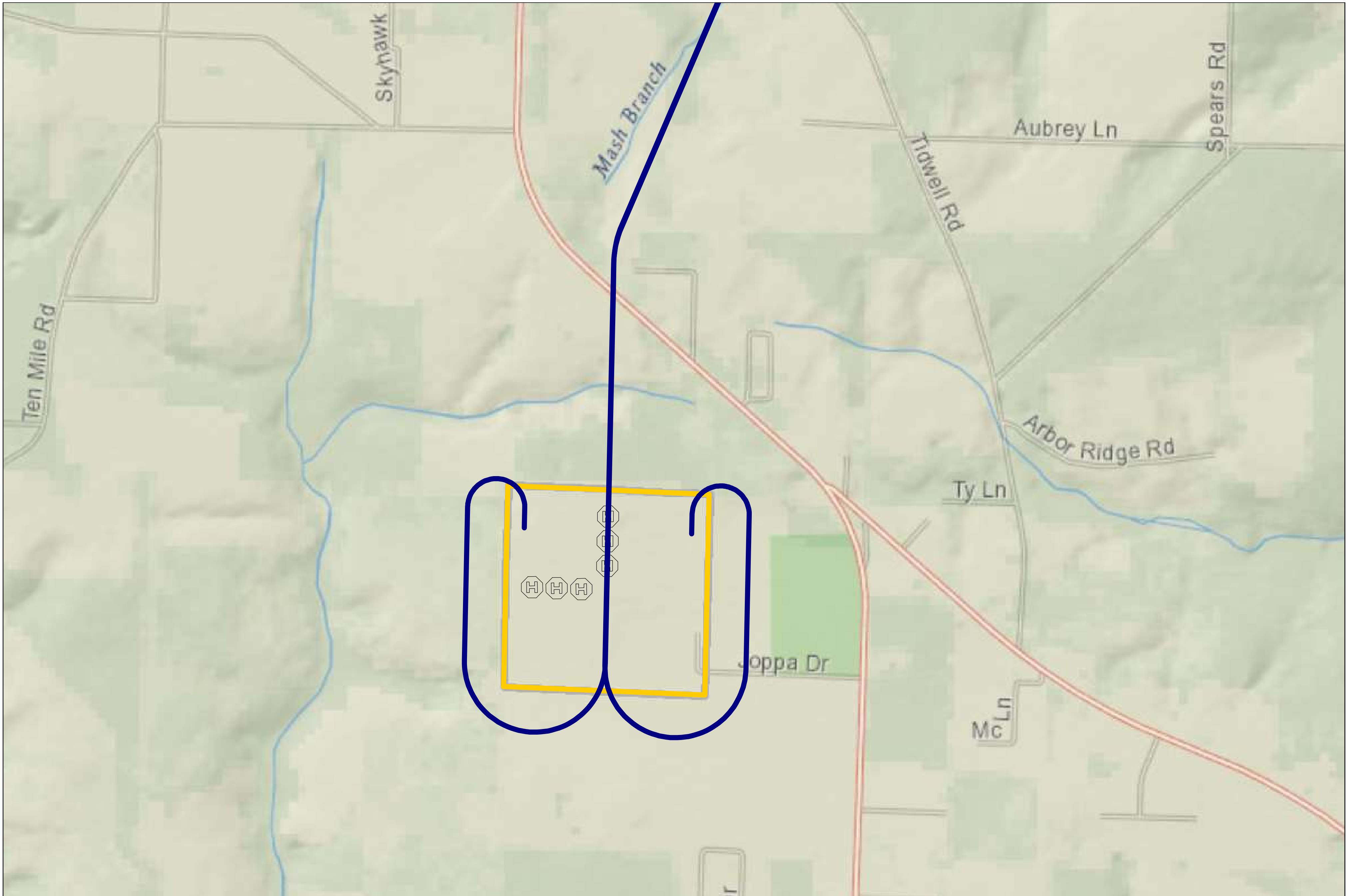


Arrival Tracks at NOLF Pace
Course 360



Scale in Feet 1:29,200 (1 inch = 2,440 feet)



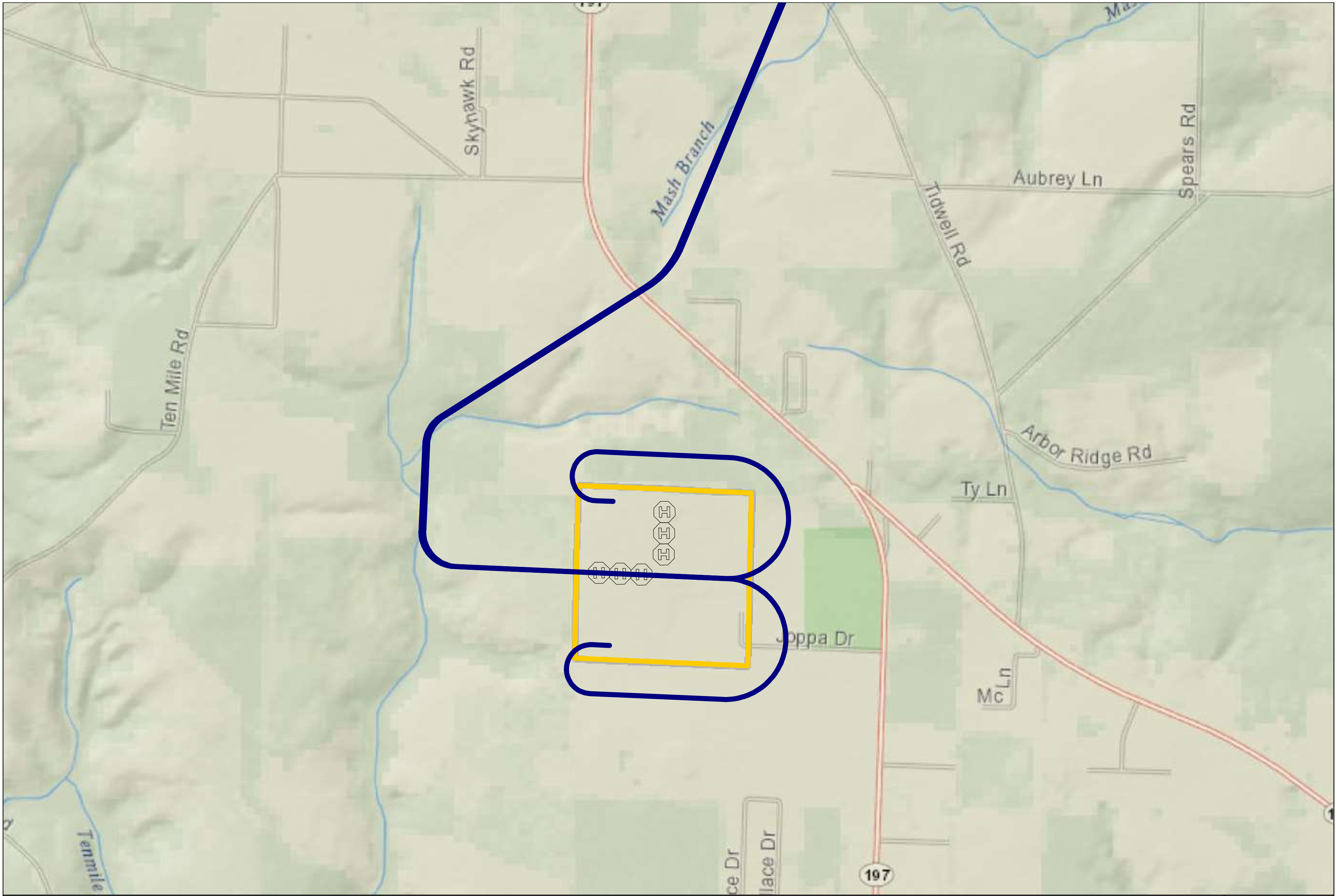
Arrival Tracks at NOLF Pace

Course 180

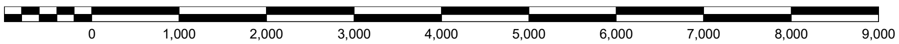
0 1,000 2,000 3,000 4,000 5,000 6,000 7,000

Scale in Feet 1:22,900 (1 inch = 1,910 feet)

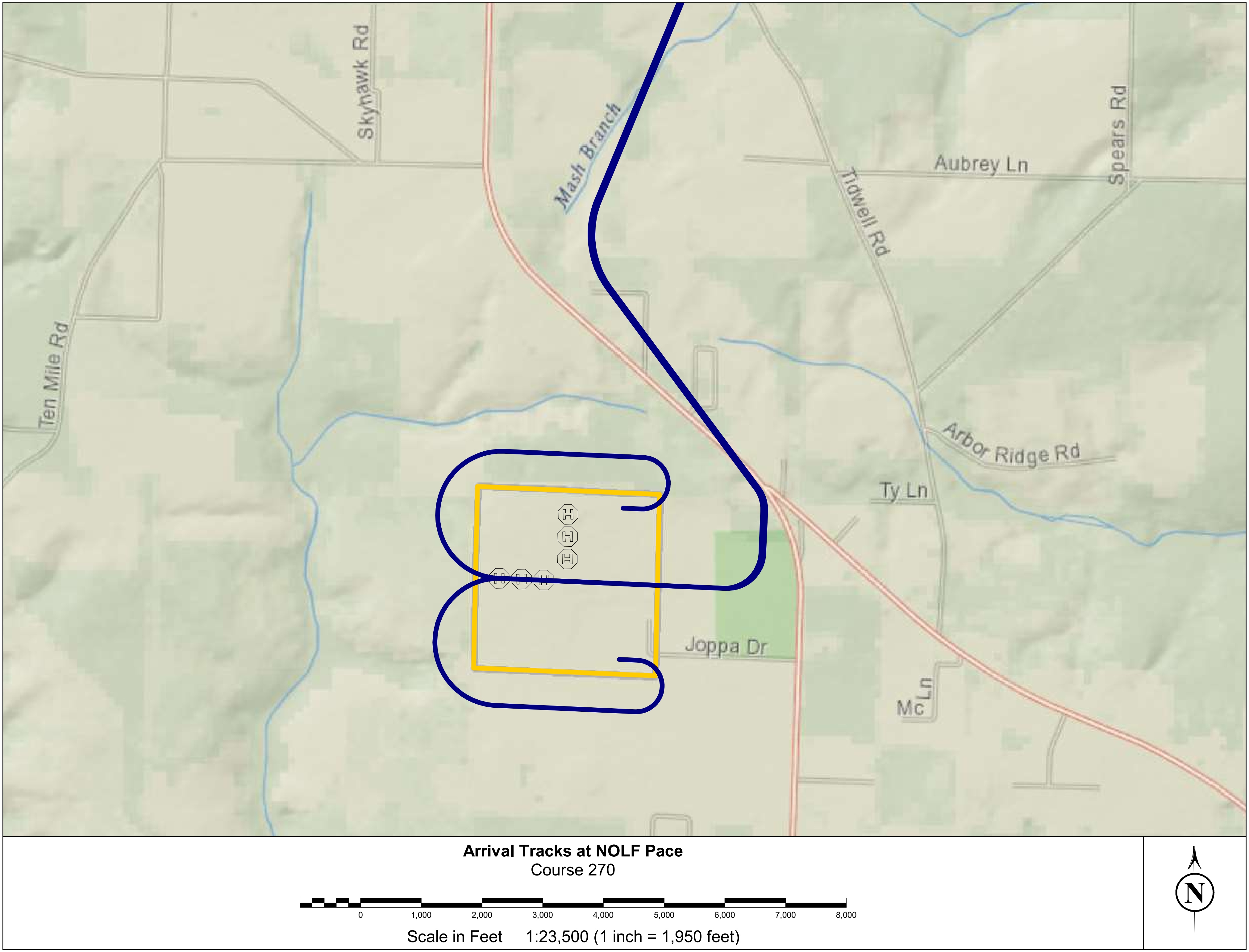
N



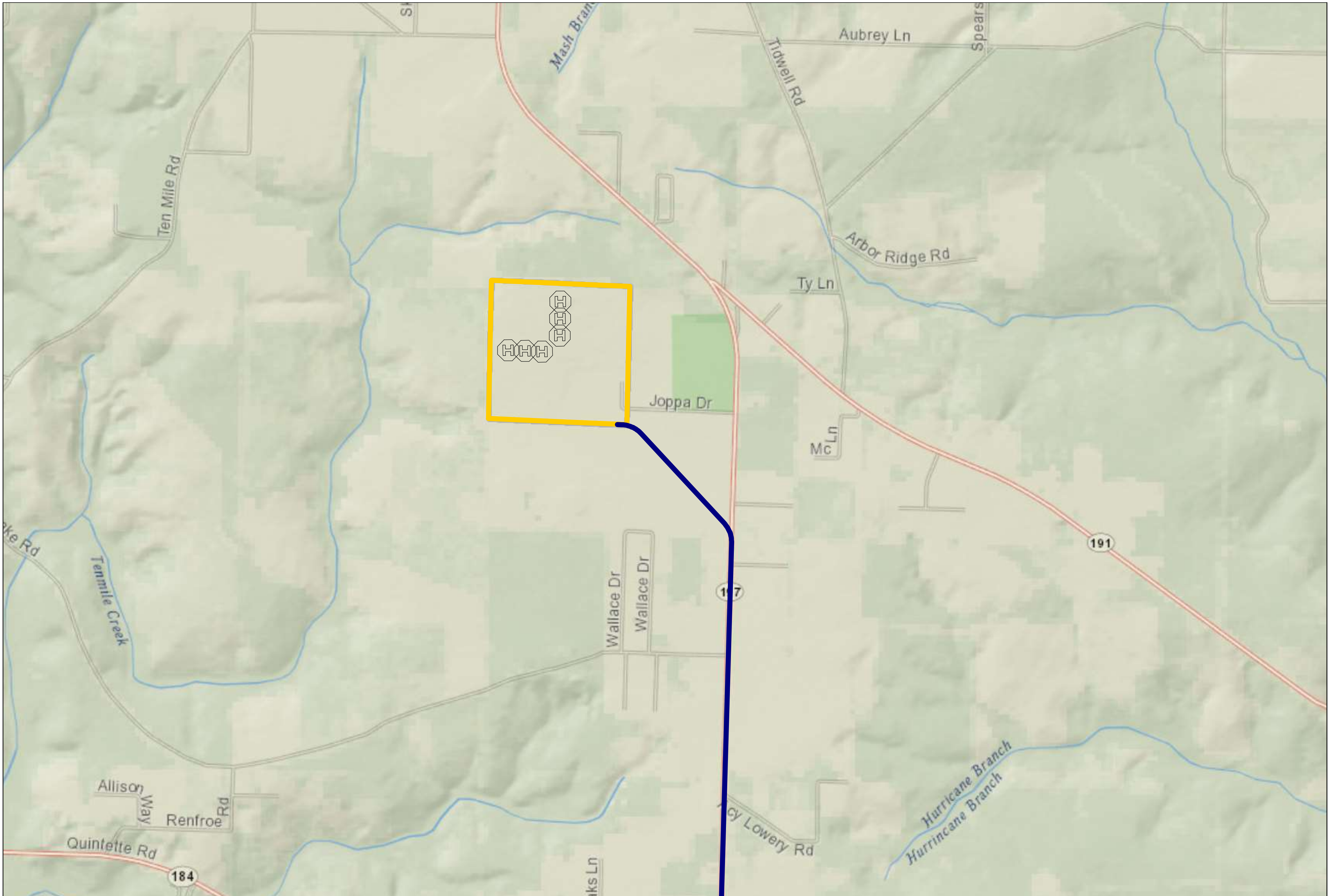
Arrival Tracks at NOLF Pace
Course 090



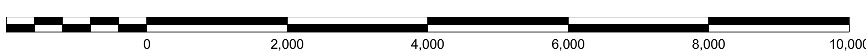
Scale in Feet 1:26,400 (1 inch = 2,200 feet)



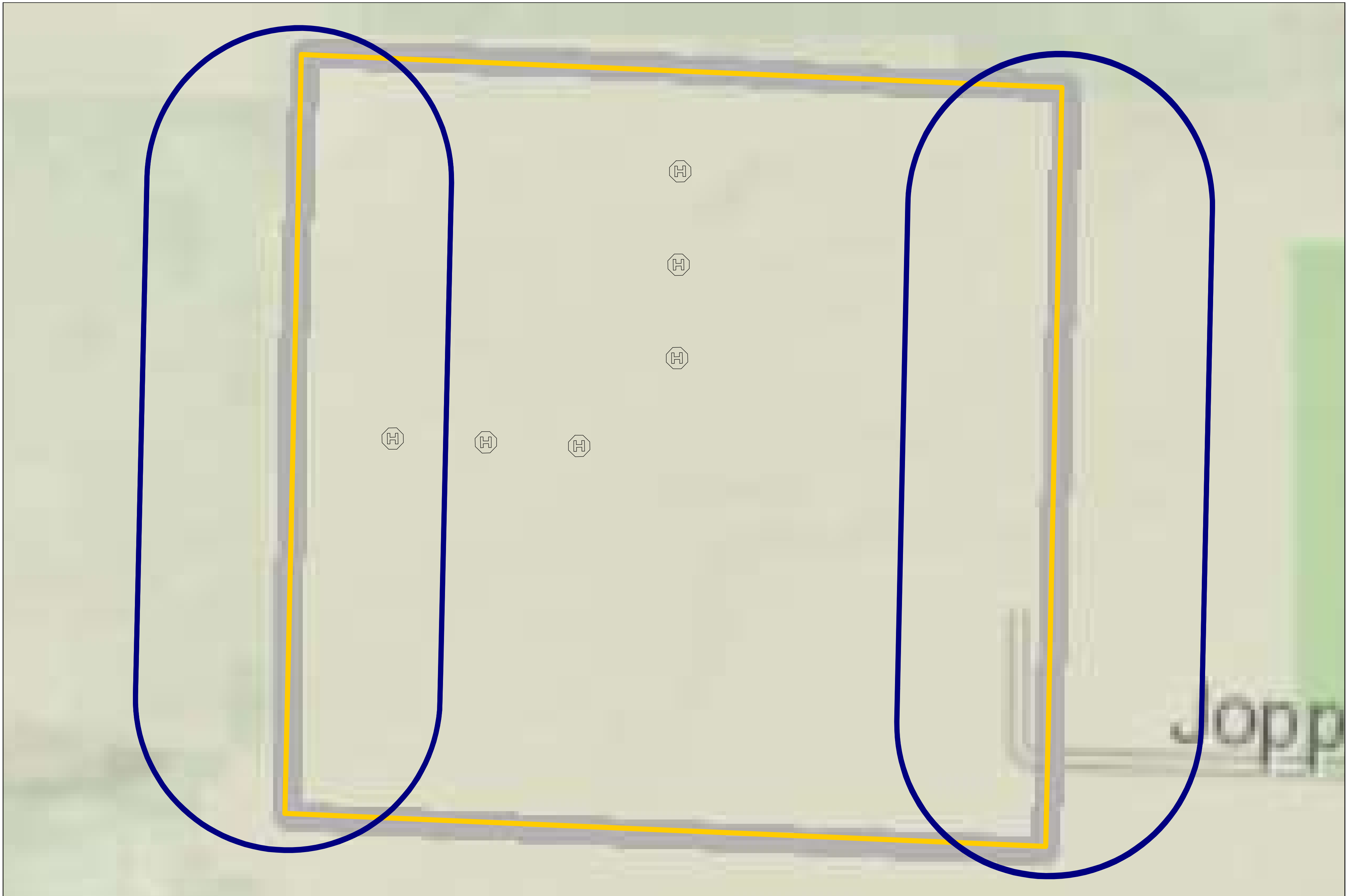
Arrival Tracks at NOLF Pace
Course 270



Departure Tracks at NOLF Pace



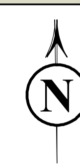
Scale in Feet 1:32,800 (1 inch = 2,740 feet)

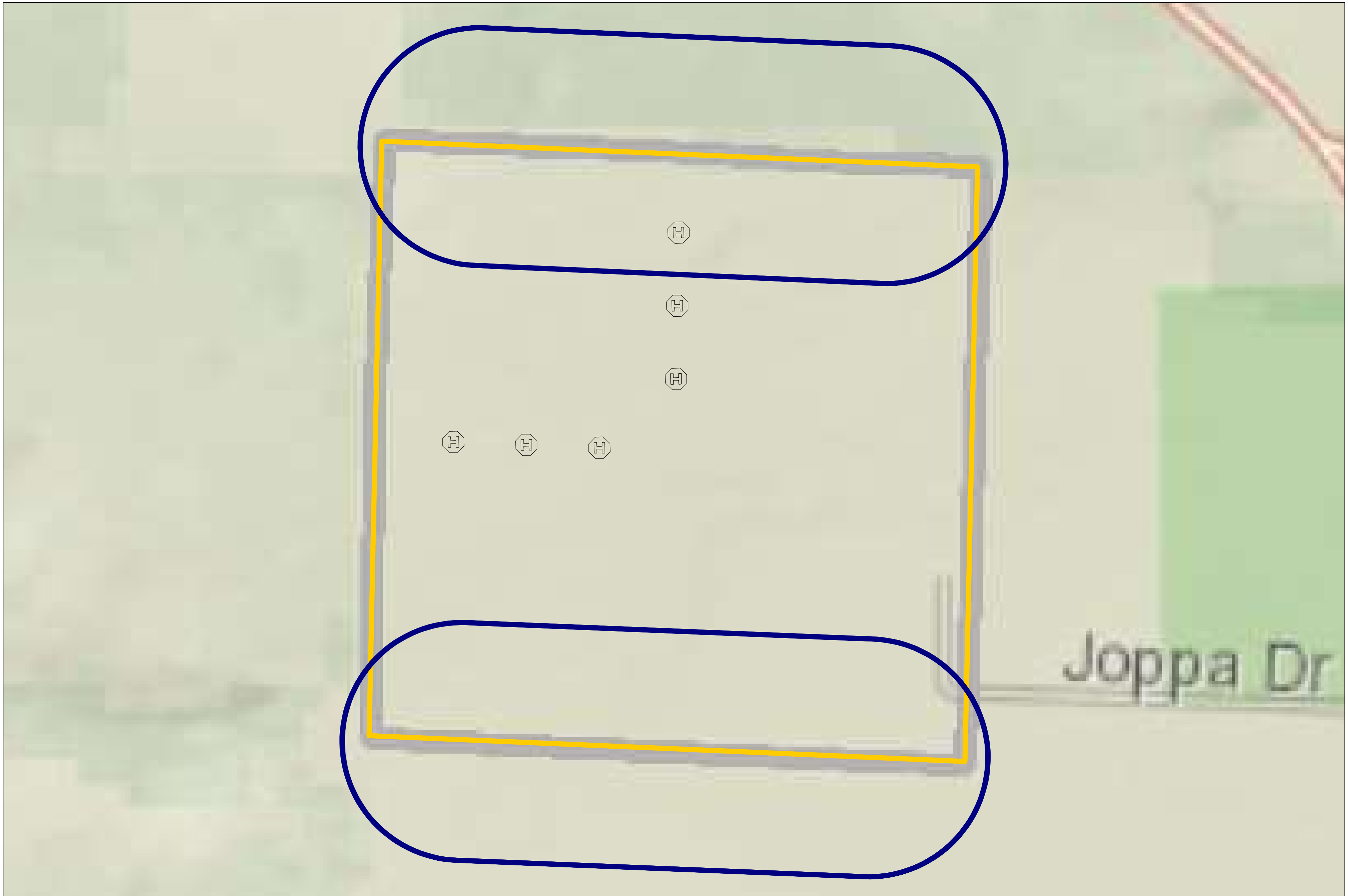


Standard Pattern Tracks at NOLF Pace

Course 180/360

Scale in Feet 1:6,050 (1 inch = 504 feet)



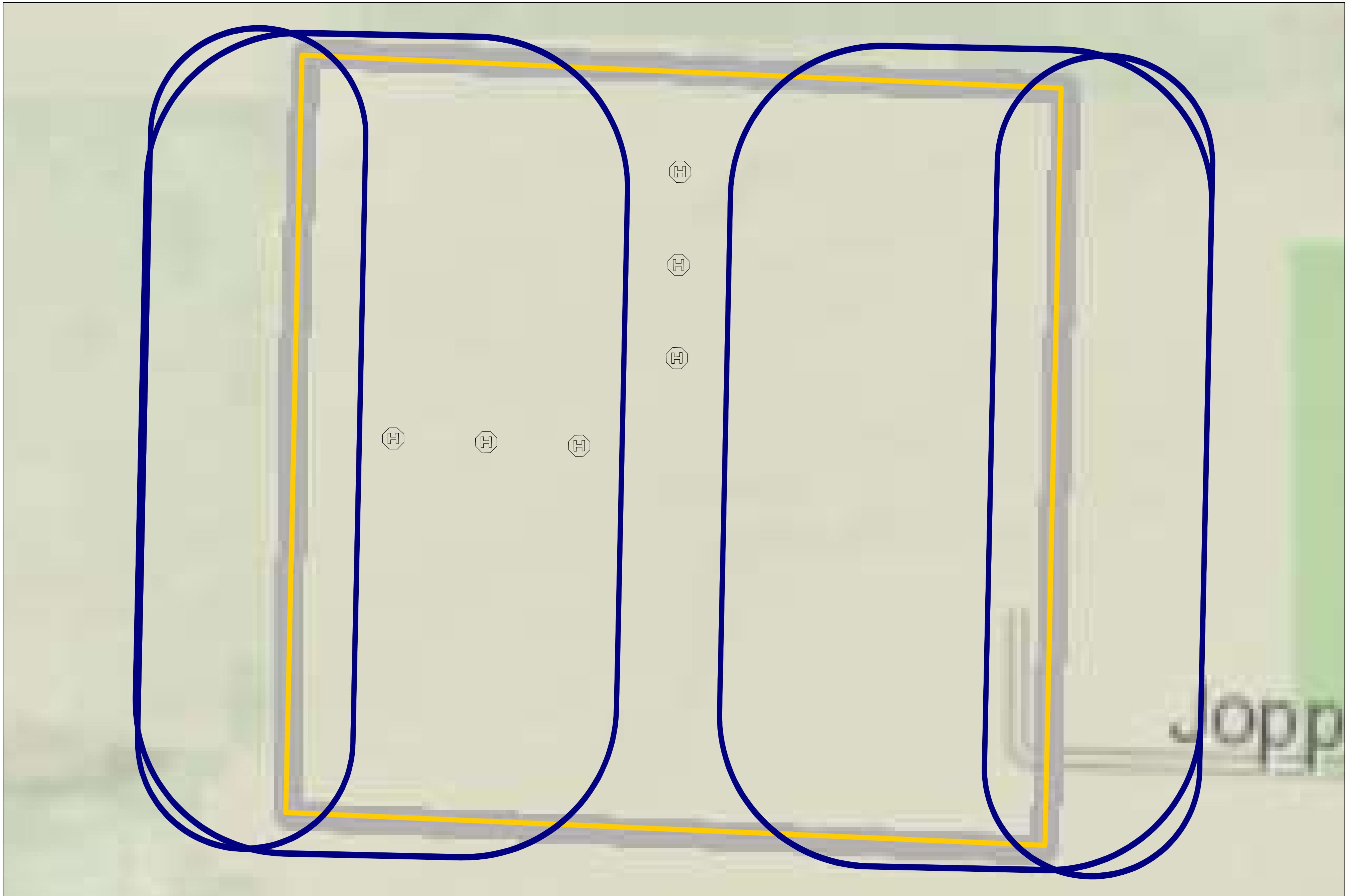


Standard Pattern Tracks at NOLF Pace
Course 090/270

0 400 800 1,200 1,600 2,000 2,400

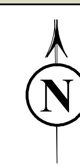
Scale in Feet 1:7,730 (1 inch = 644 feet)

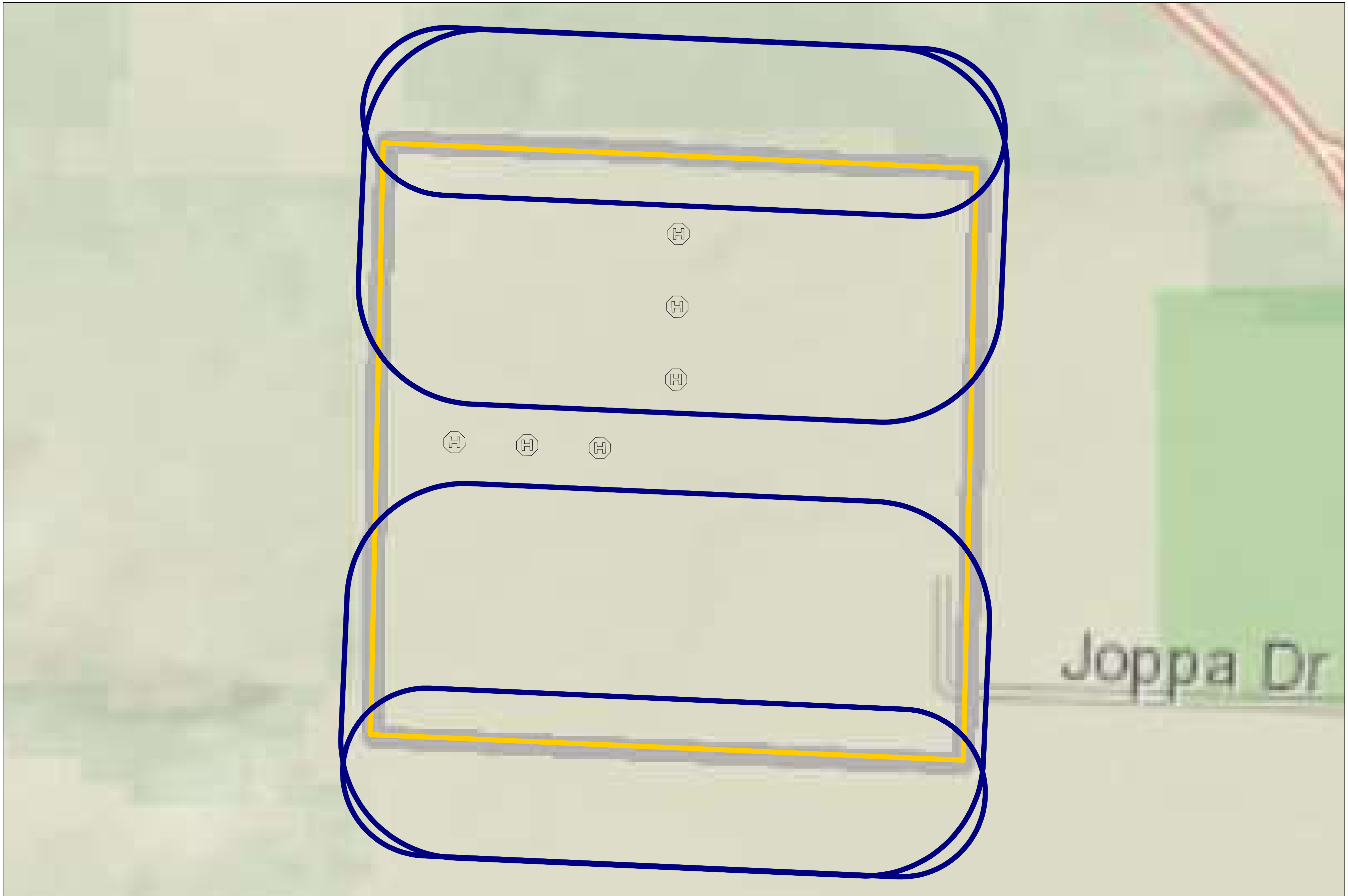
N



Autorotation Pattern Tracks at NOLF Pace
Course 180/360

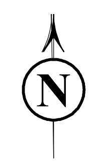
Scale in Feet 1:6,070 (1 inch = 505 feet)





Autorotation Pattern Tracks at NOLF Pace
Course 090/270

Scale in Feet 1:7,760 (1 inch = 647 feet)



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Appendix A-4: NOLF Site X Flight Tracks

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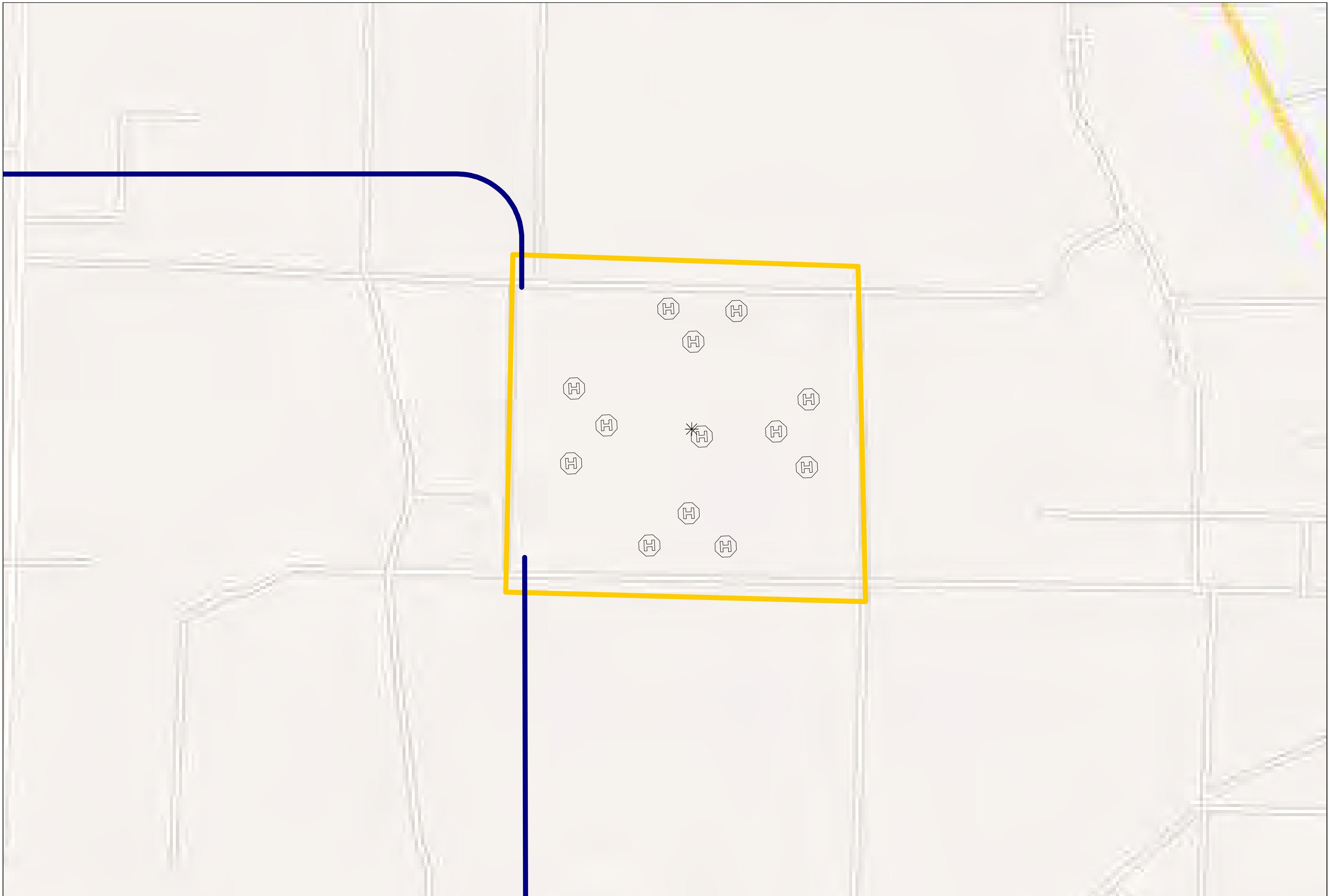
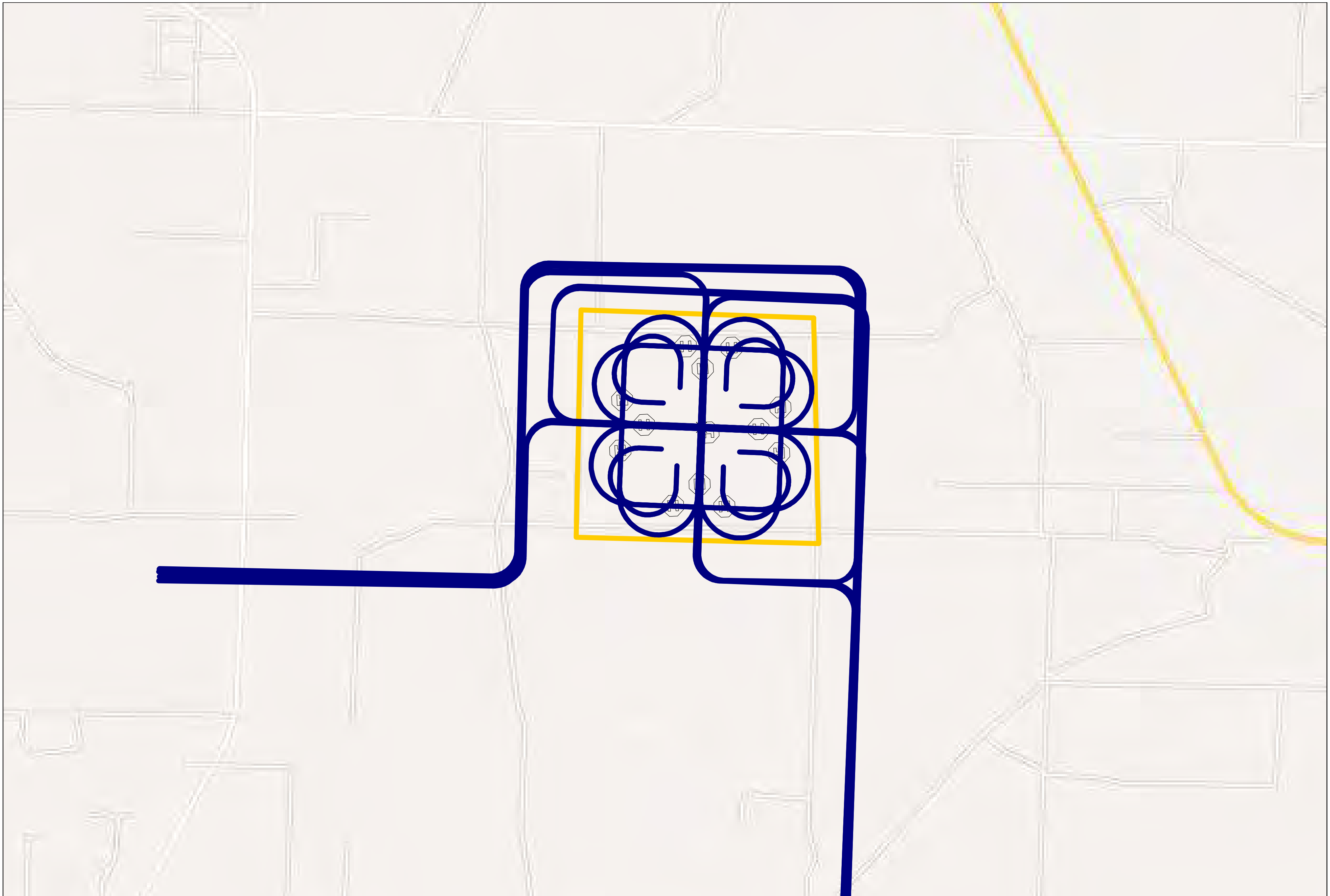


Departure Tracks at NOLF Site X

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000

Scale in Feet 1:23,500 (1 inch = 1,950 feet)

N

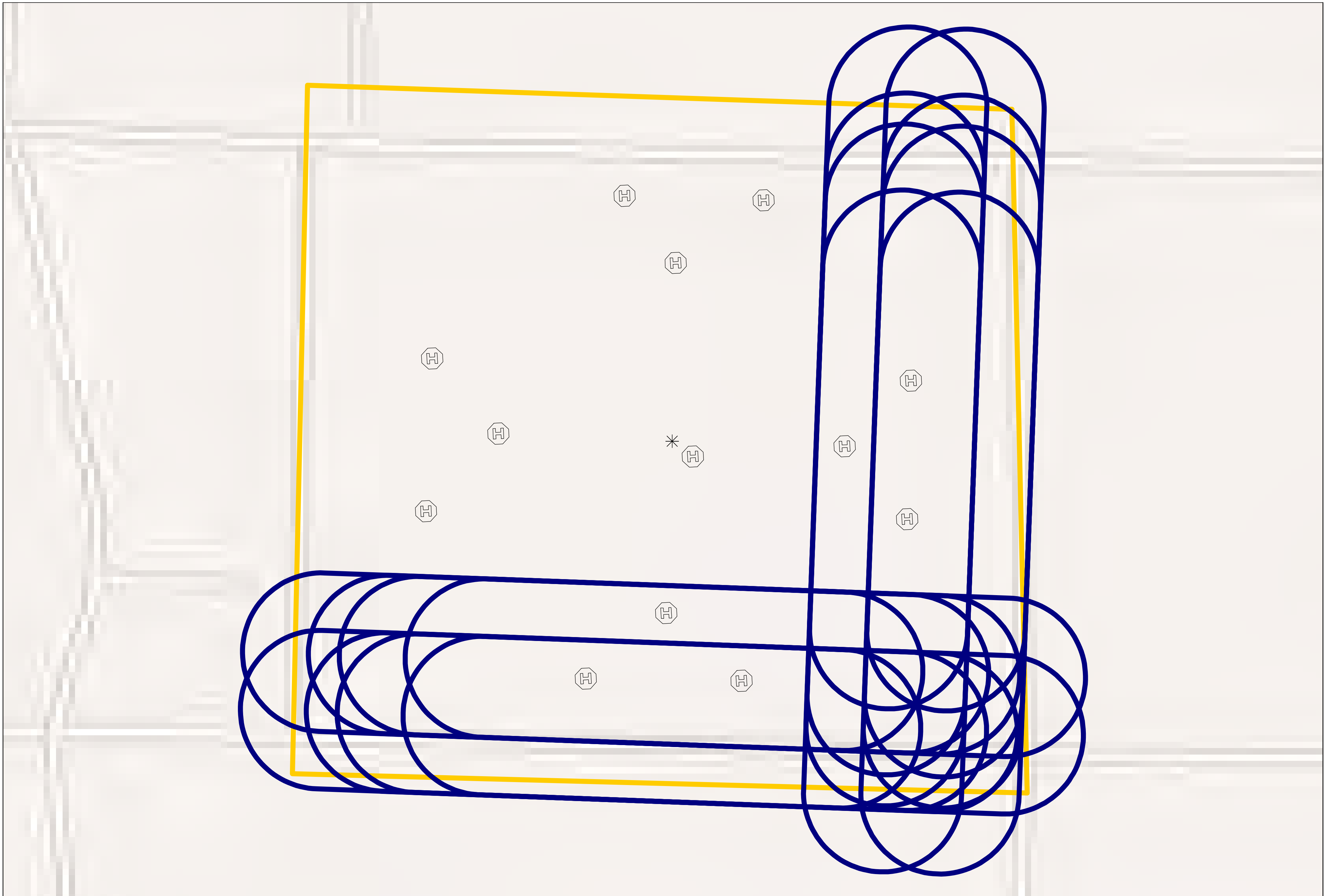


Arrival Tracks at NOLF Site X

0 2,000 4,000 6,000 8,000 10,000

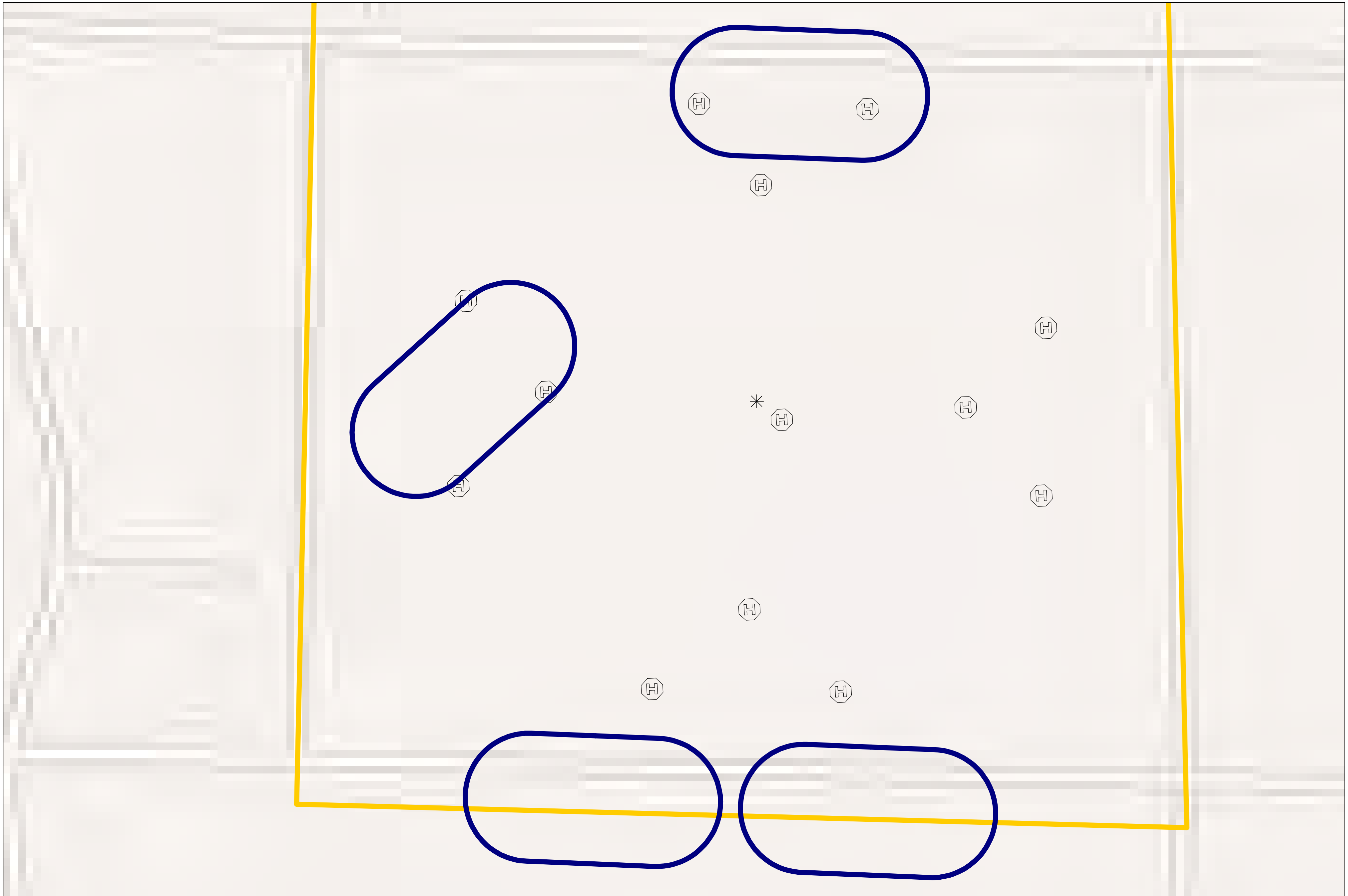
Scale in Feet 1:34,800 (1 inch = 2,900 feet)

N

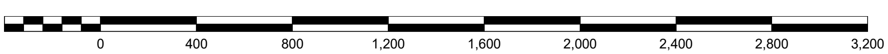


Standard Closed Pattern Tracks at NOLF Site X

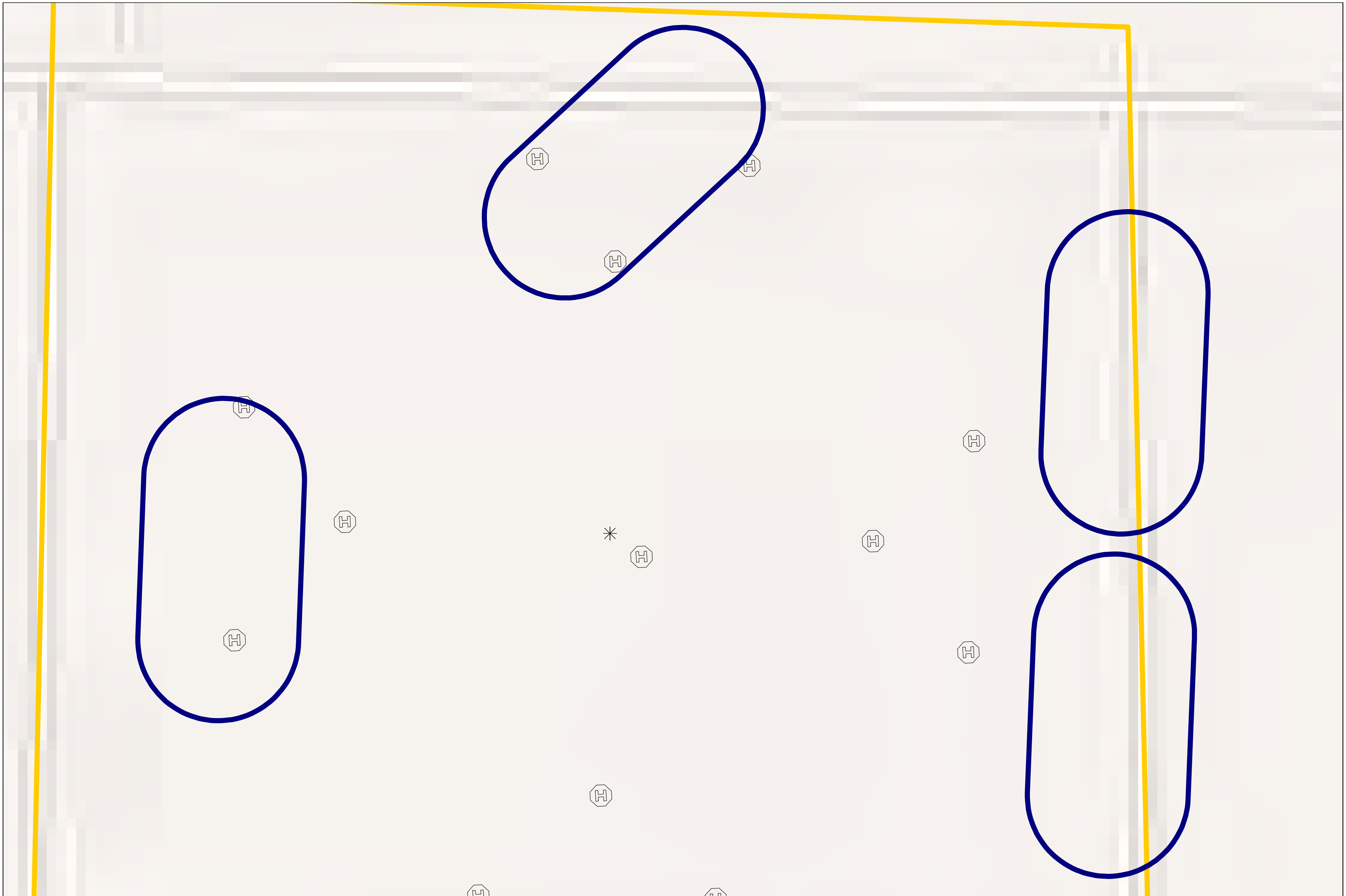
Scale in Feet 1:11,500 (1 inch = 955 feet)



TLA Closed Pattern Tracks at NOLF Site X
090 Flow

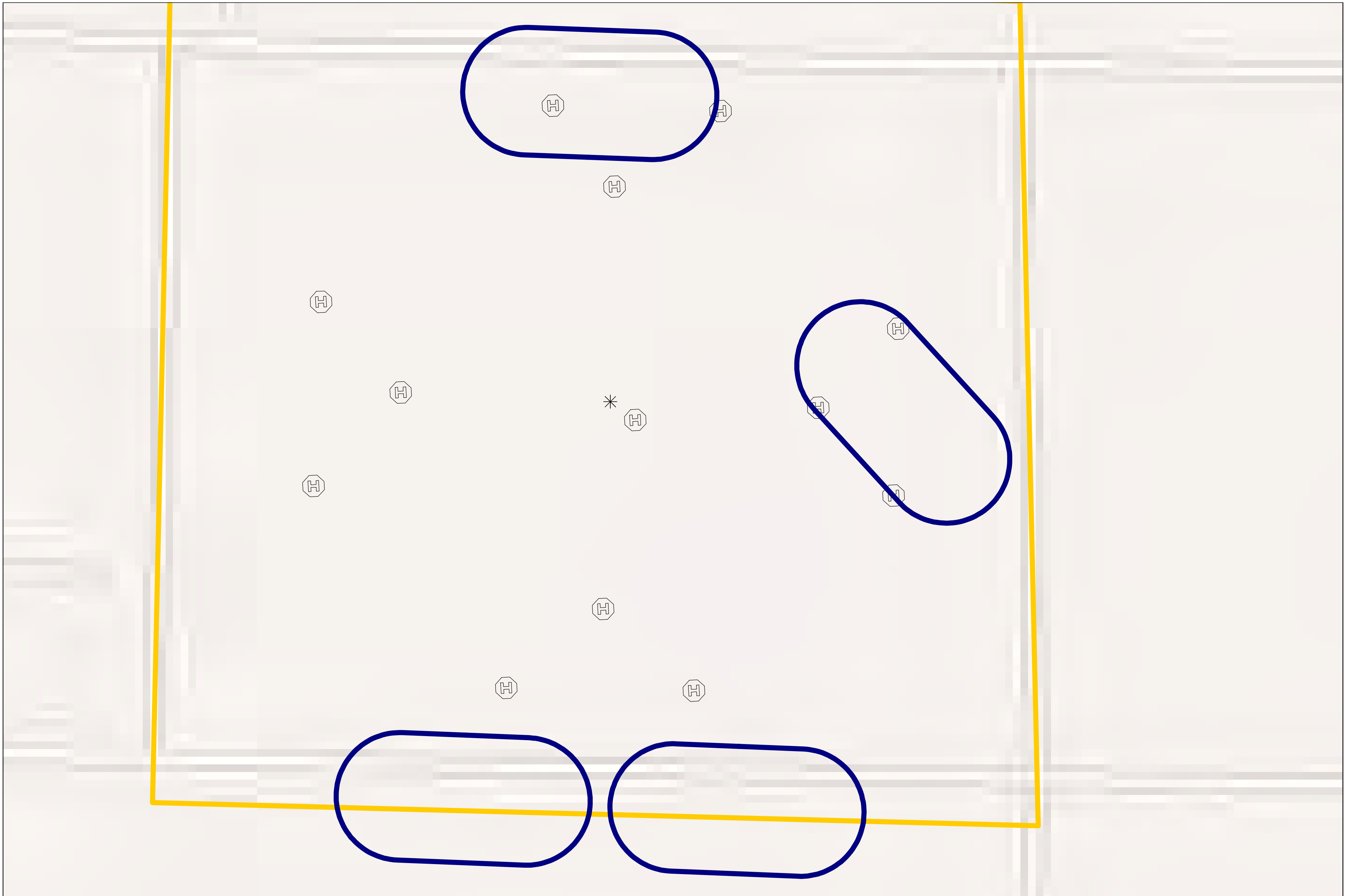


Scale in Feet 1:9,620 (1 inch = 801 feet)



TLA Closed Pattern Tracks at NOLF Site X
180 Flow

Scale in Feet   1:7,630 (1 inch = 636 feet)

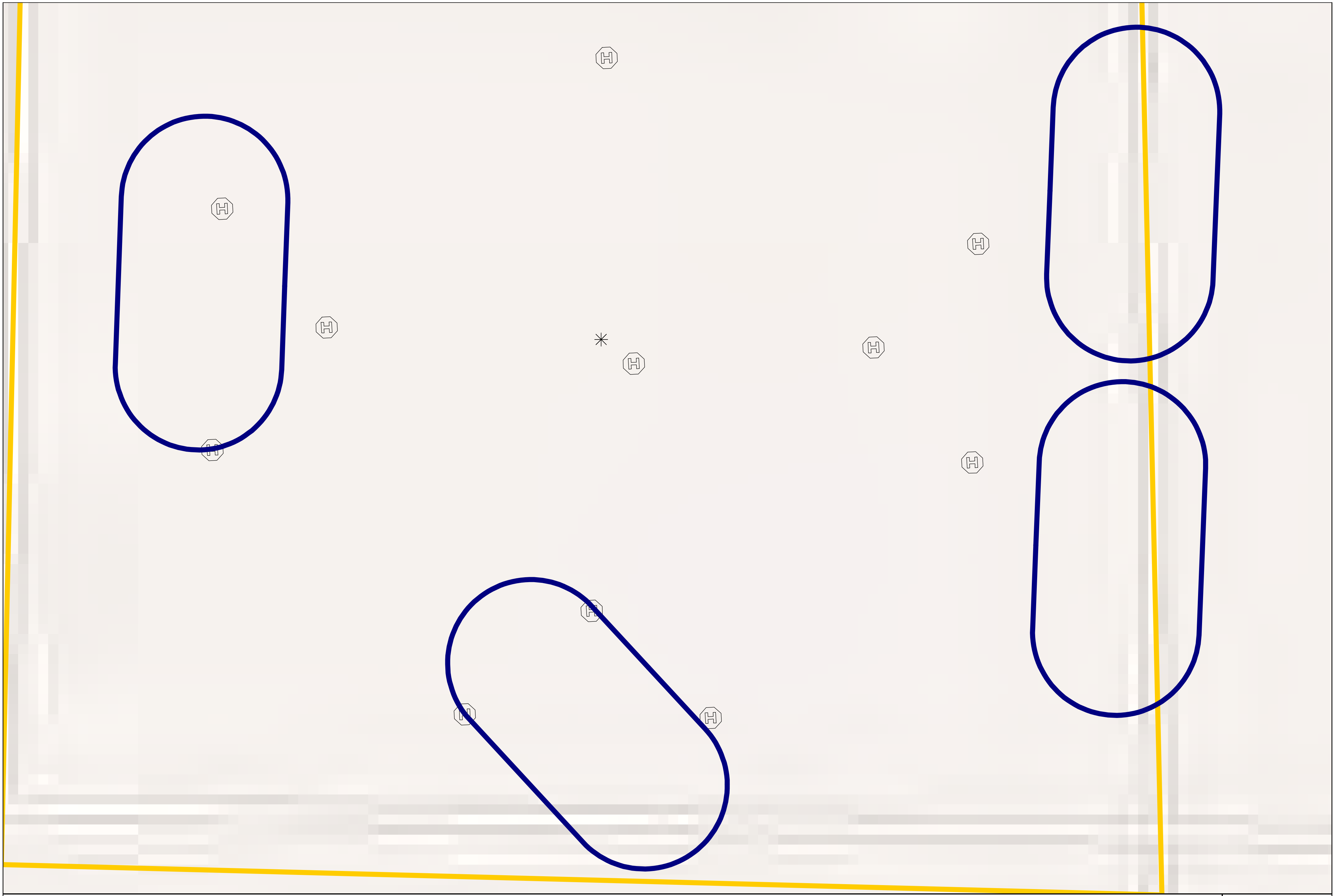


TLA Closed Pattern Tracks at NOLF Site X
270 Flow

0 400 800 1,200 1,600 2,000 2,400 2,800 3,200

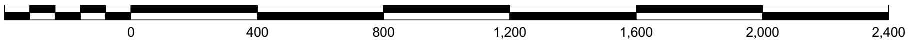
Scale in Feet 1:9,650 (1 inch = 804 feet)

N

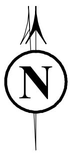


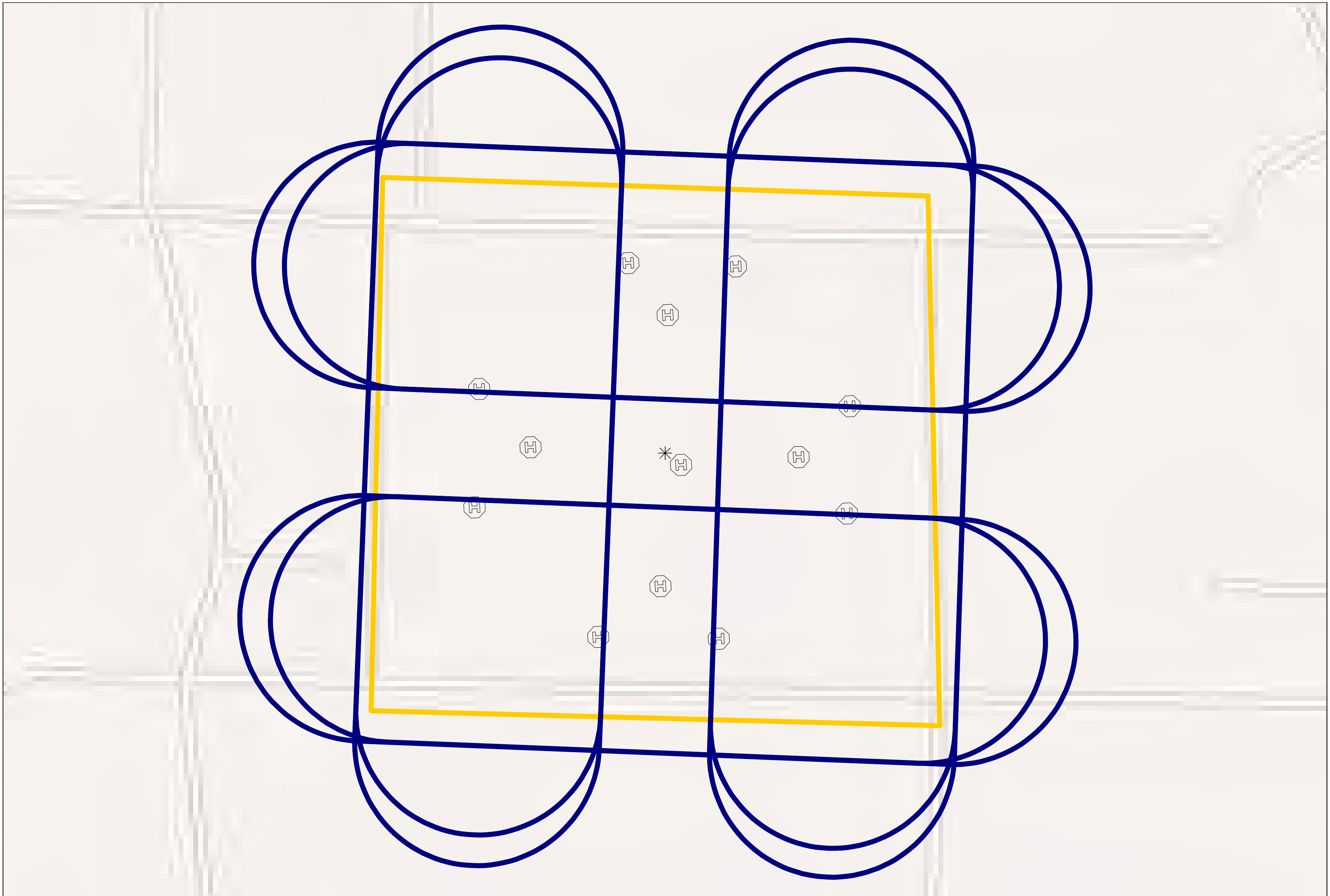
TLA Closed Pattern Tracks at NOLF Site X

360 Flow

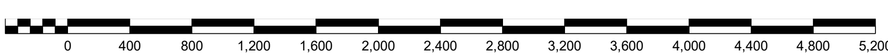


Scale in Feet 1:7,310 (1 inch = 609 feet)

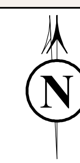


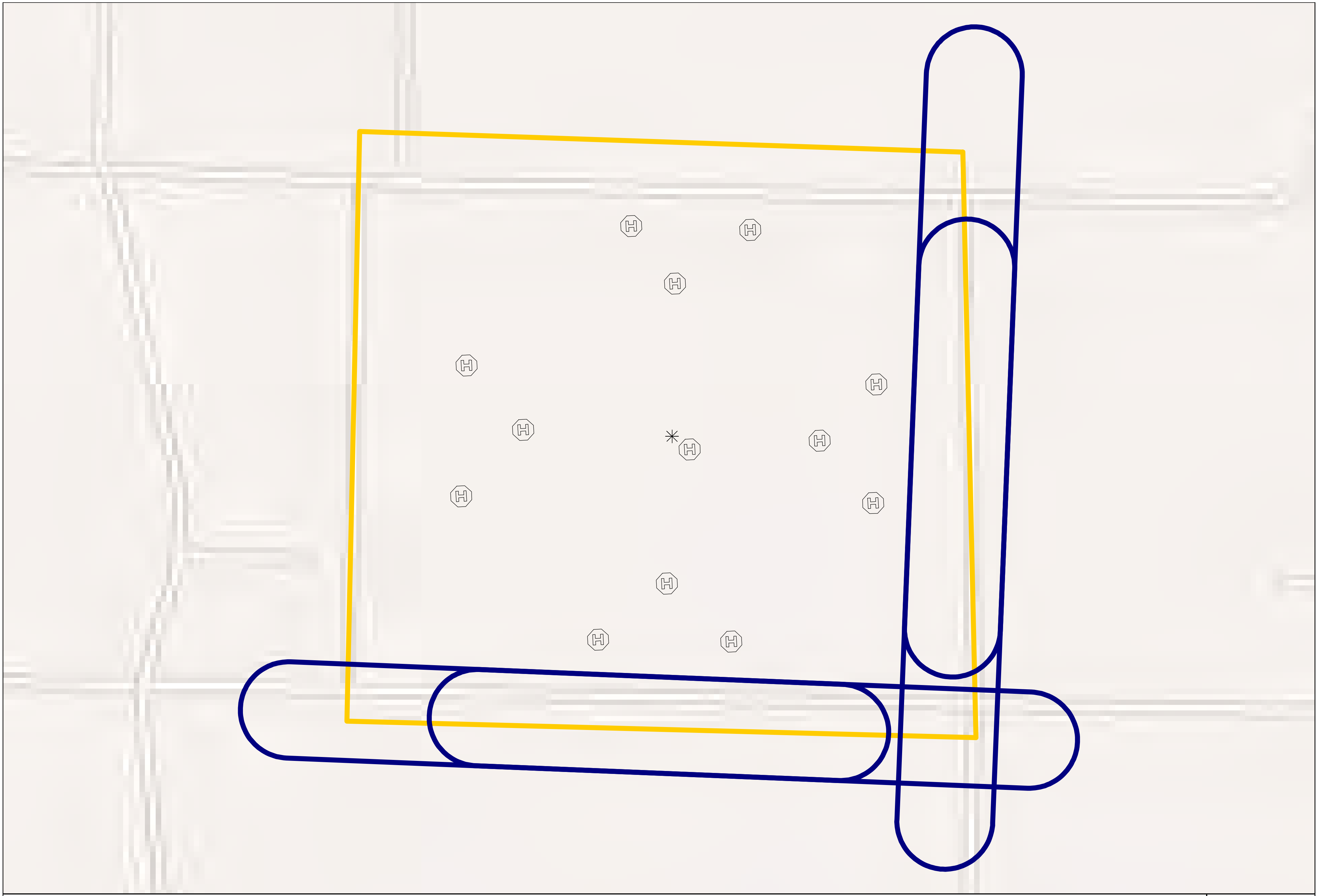


High Speed Tactical Pattern Tracks at NOLF Site X

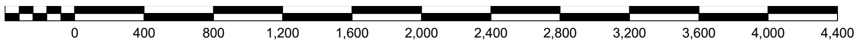


Scale in Feet 1:14,800 (1 inch = 1,240 feet)

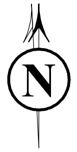


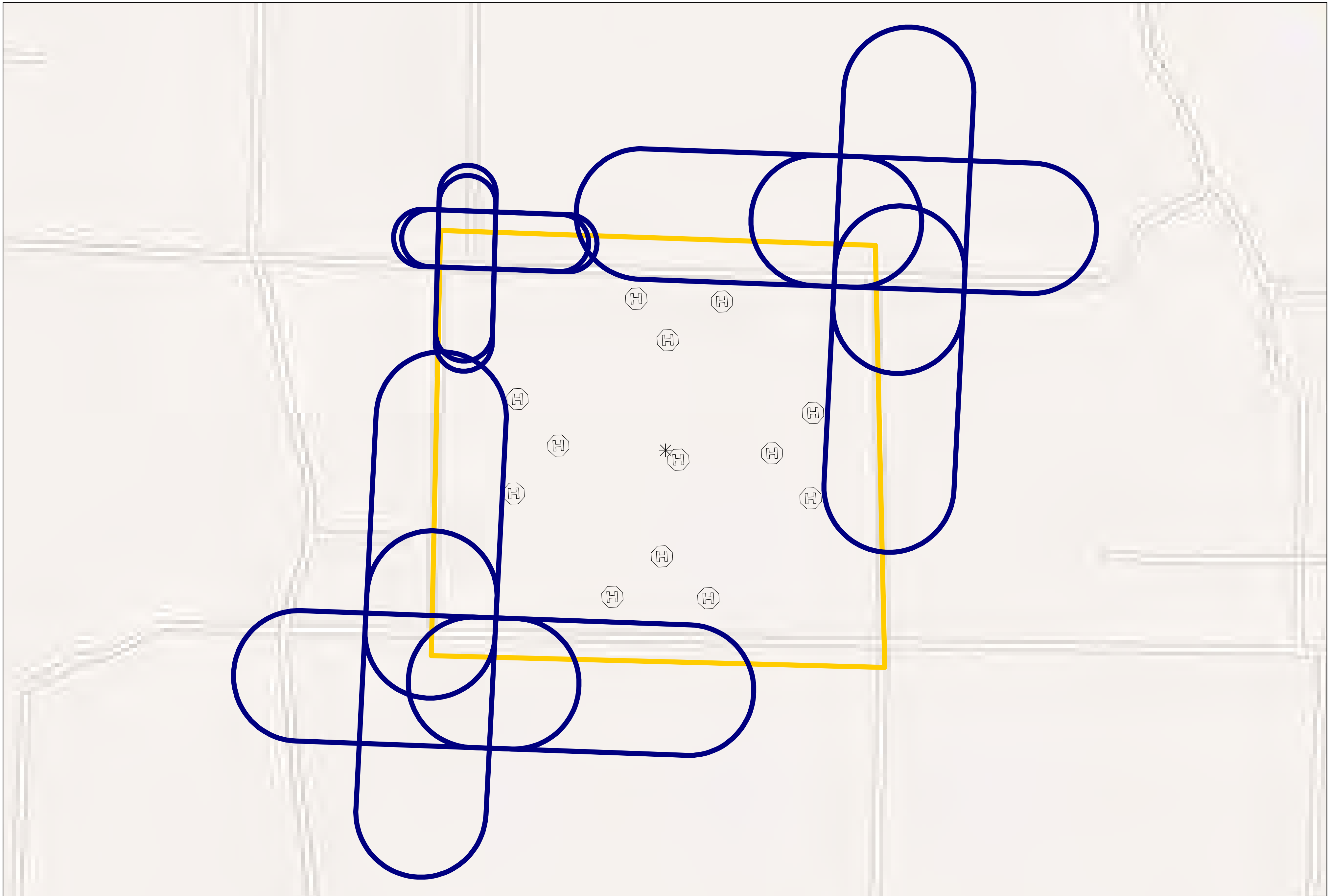


Autorotation Pattern Tracks at NOLF Site X



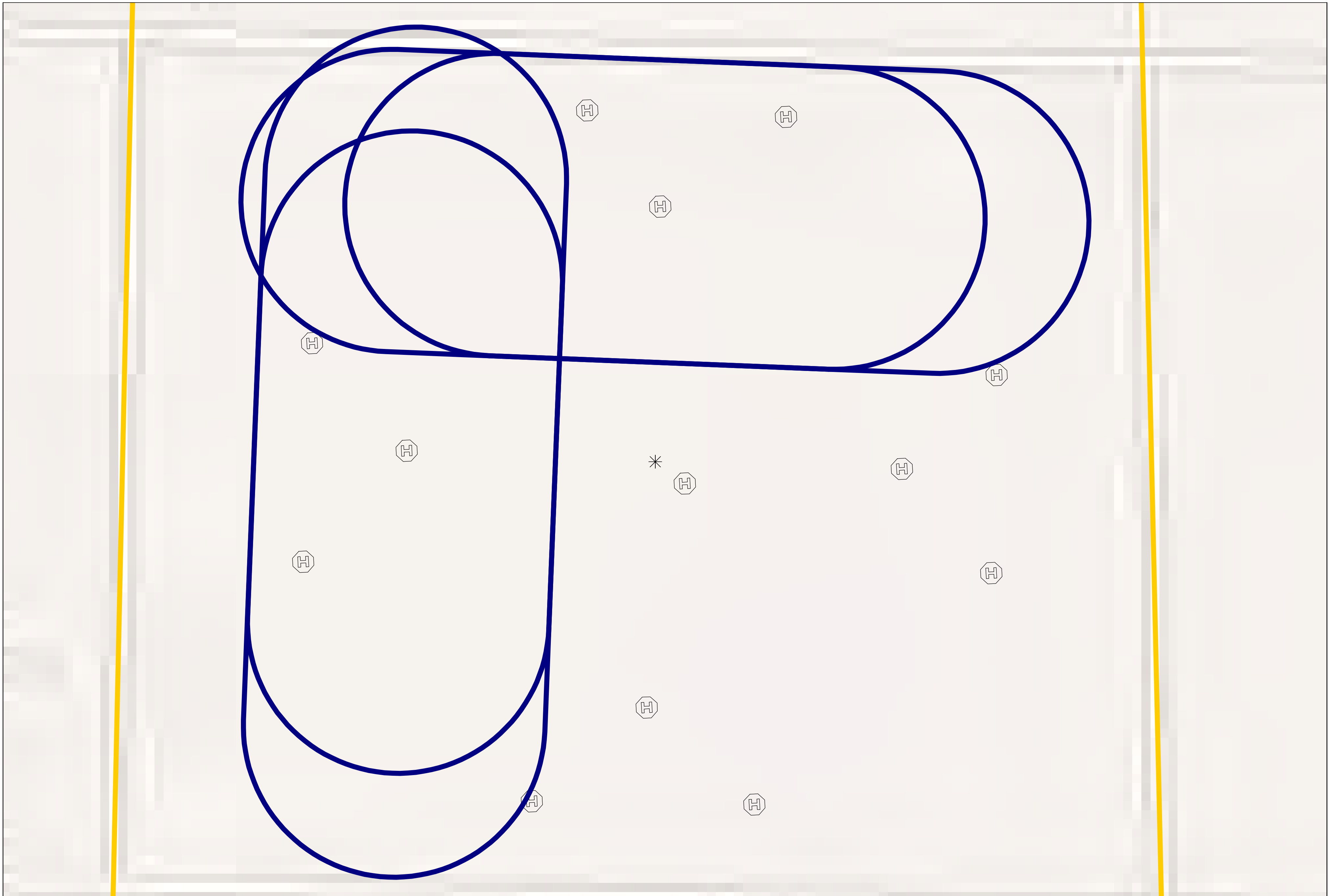
Scale in Feet   1:13,300 (1 inch = 1,110 feet)





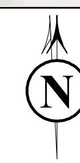
CLA and Pinacle Pattern Tracks at NOLF Site X

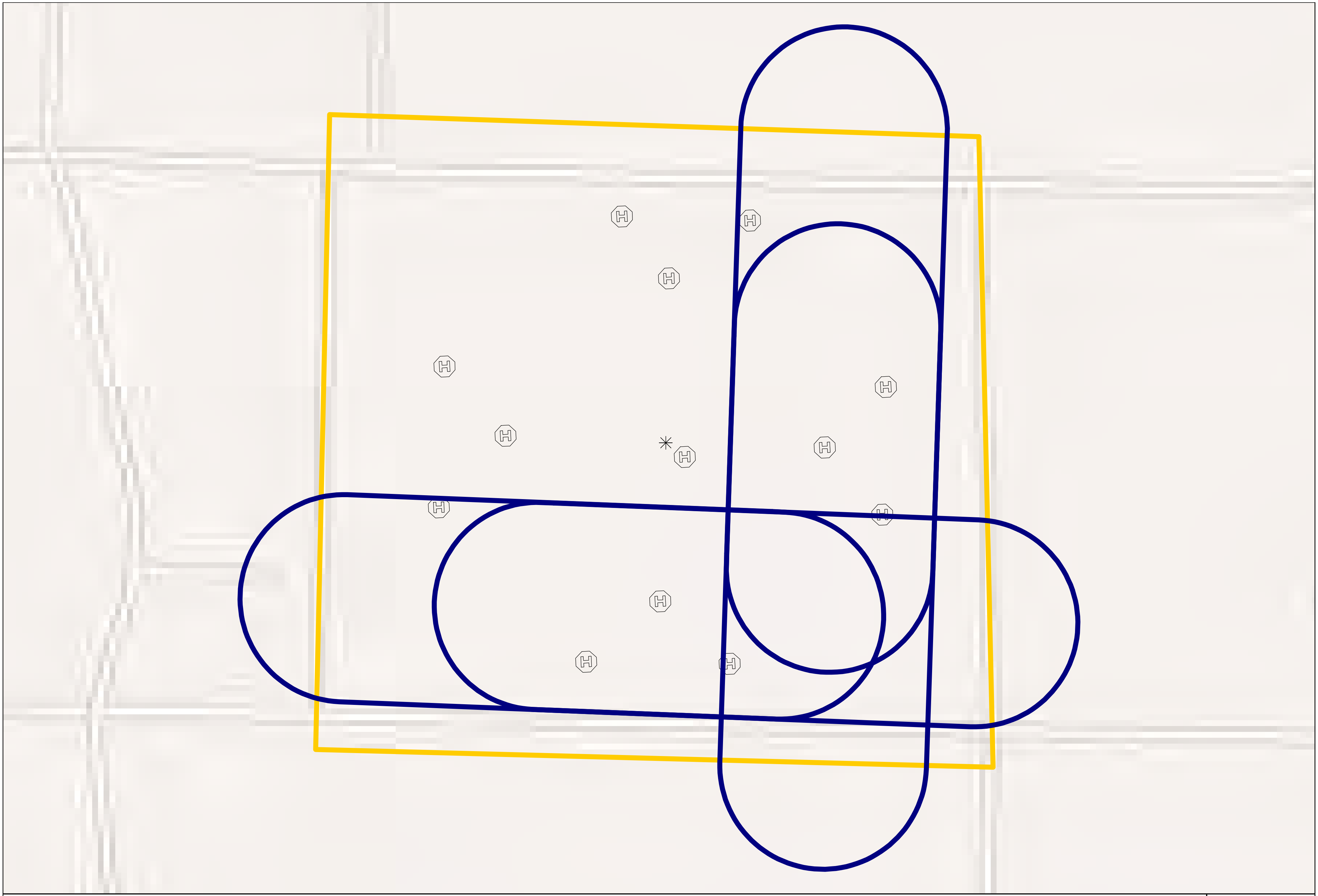
Scale in Feet 1:18,600 (1 inch = 1,550 feet)



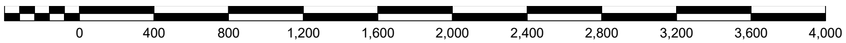
External Load Pattern Tracks at NOLF Site X

Scale in Feet 1:8,040 (1 inch = 670 feet)

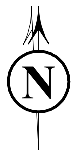




Tail Rotor/Boost Off Pattern Tracks at NOLF Site X



Scale in Feet 1:12,400 (1 inch = 1,030 feet)



Appendix A-5: NOLF Harold Flight Tracks

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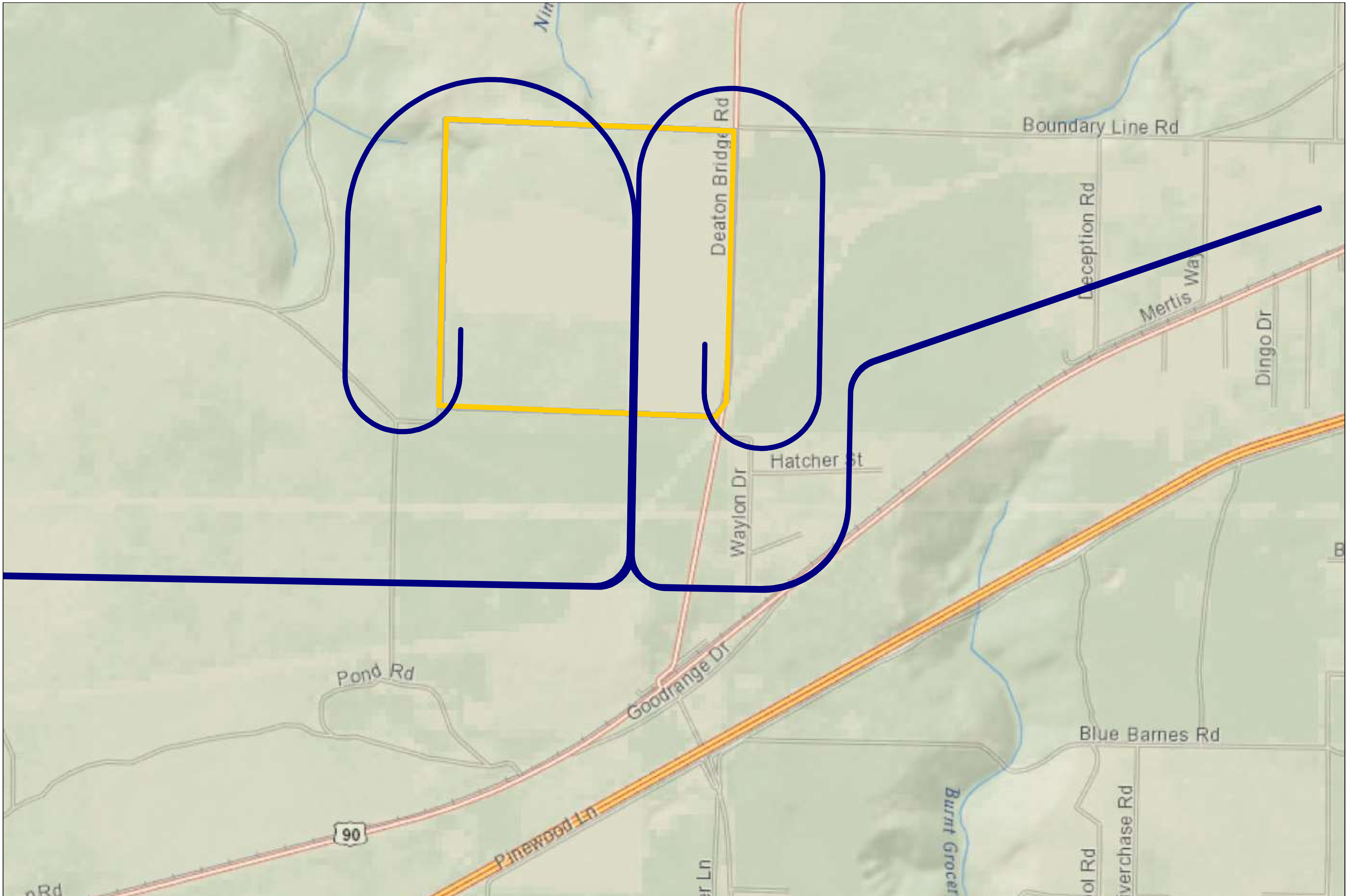
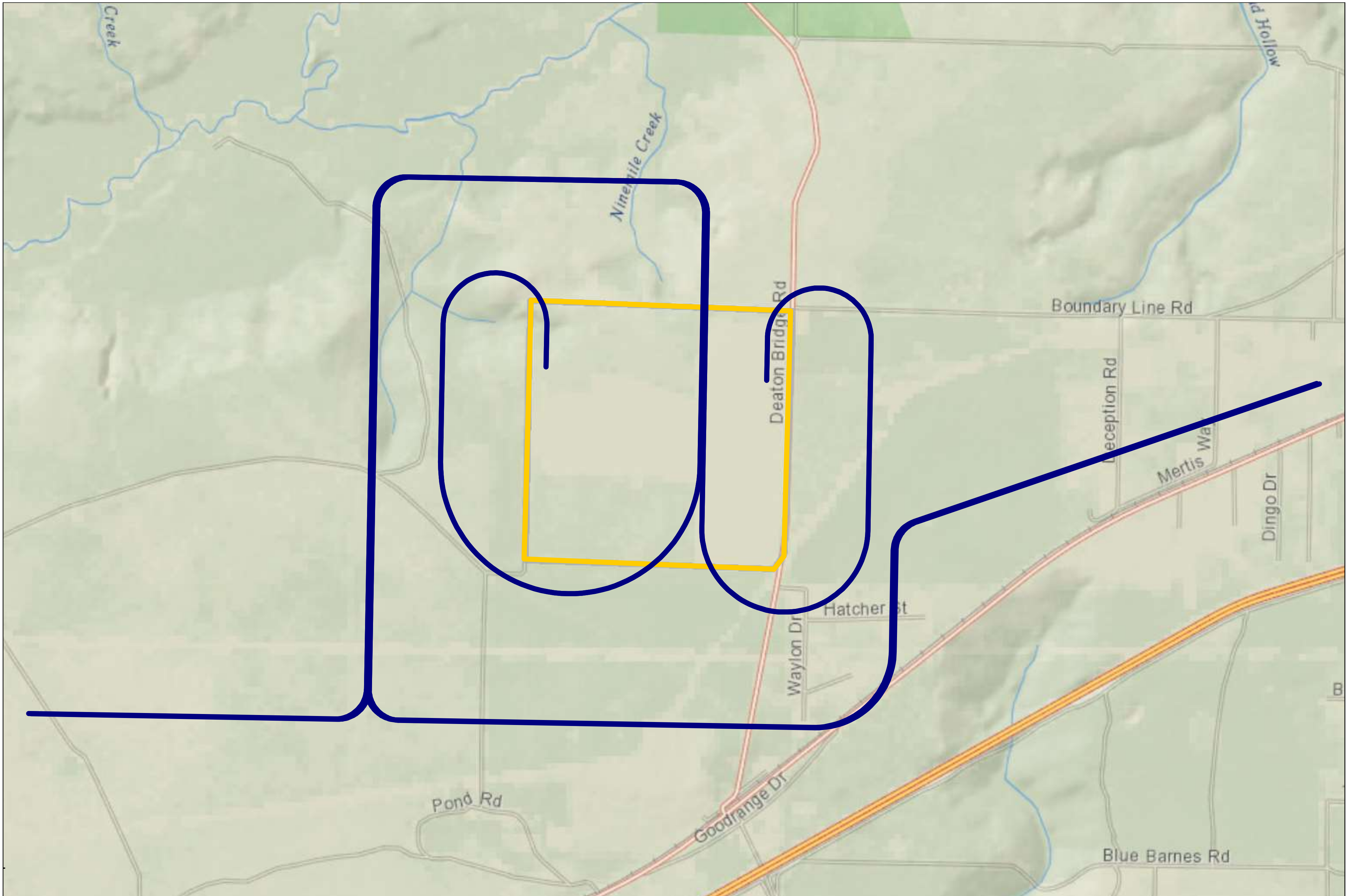


Arrival Tracks at NOLF Harold
Course 360

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000

Scale in Feet 1:26,700 (1 inch = 2,230 feet)

N

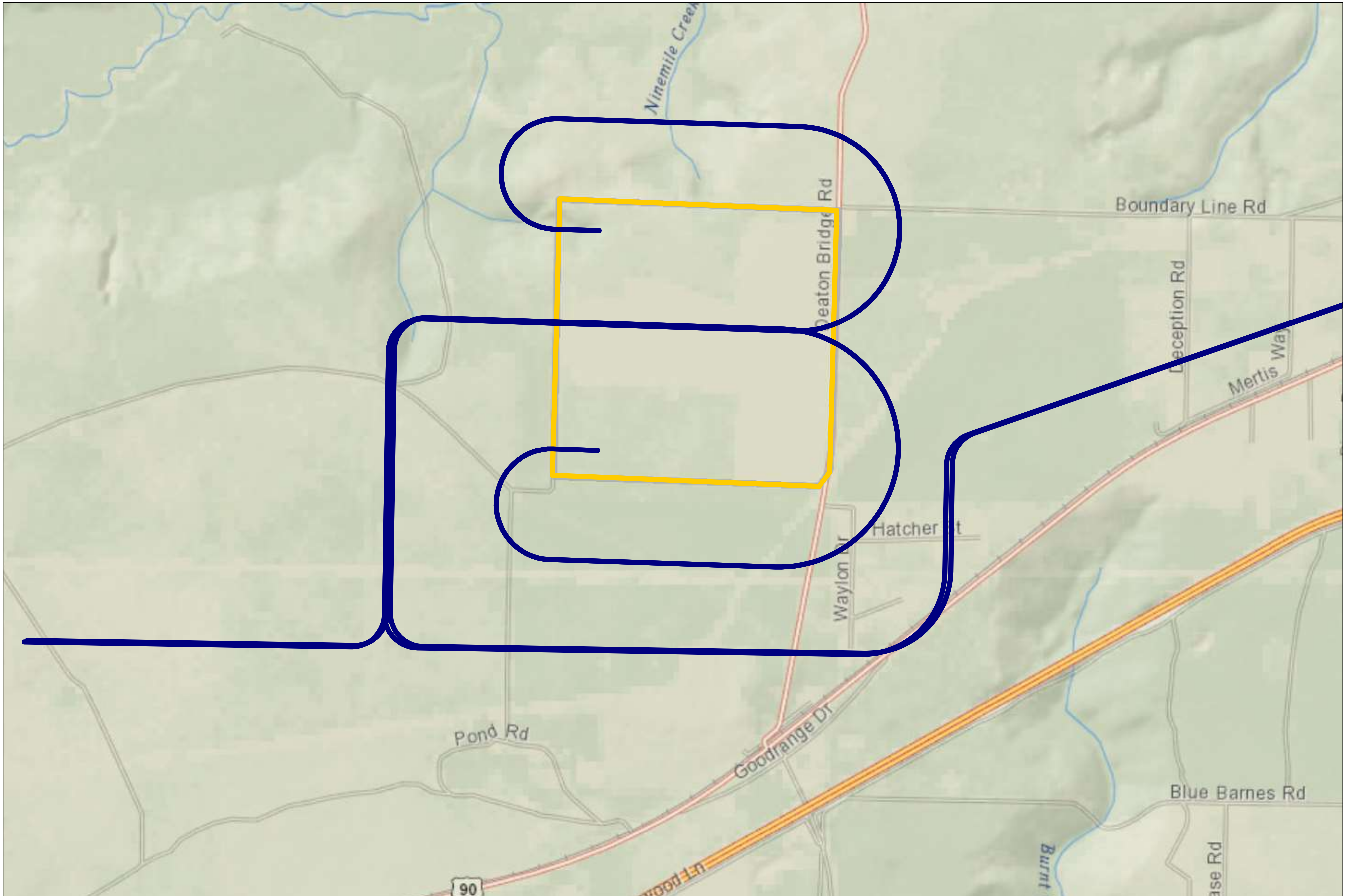


Arrival Tracks at NOLF Harold
Course 180

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000

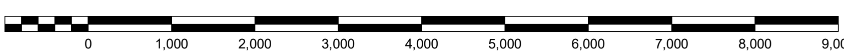
Scale in Feet 1:29,600 (1 inch = 2,470 feet)

N

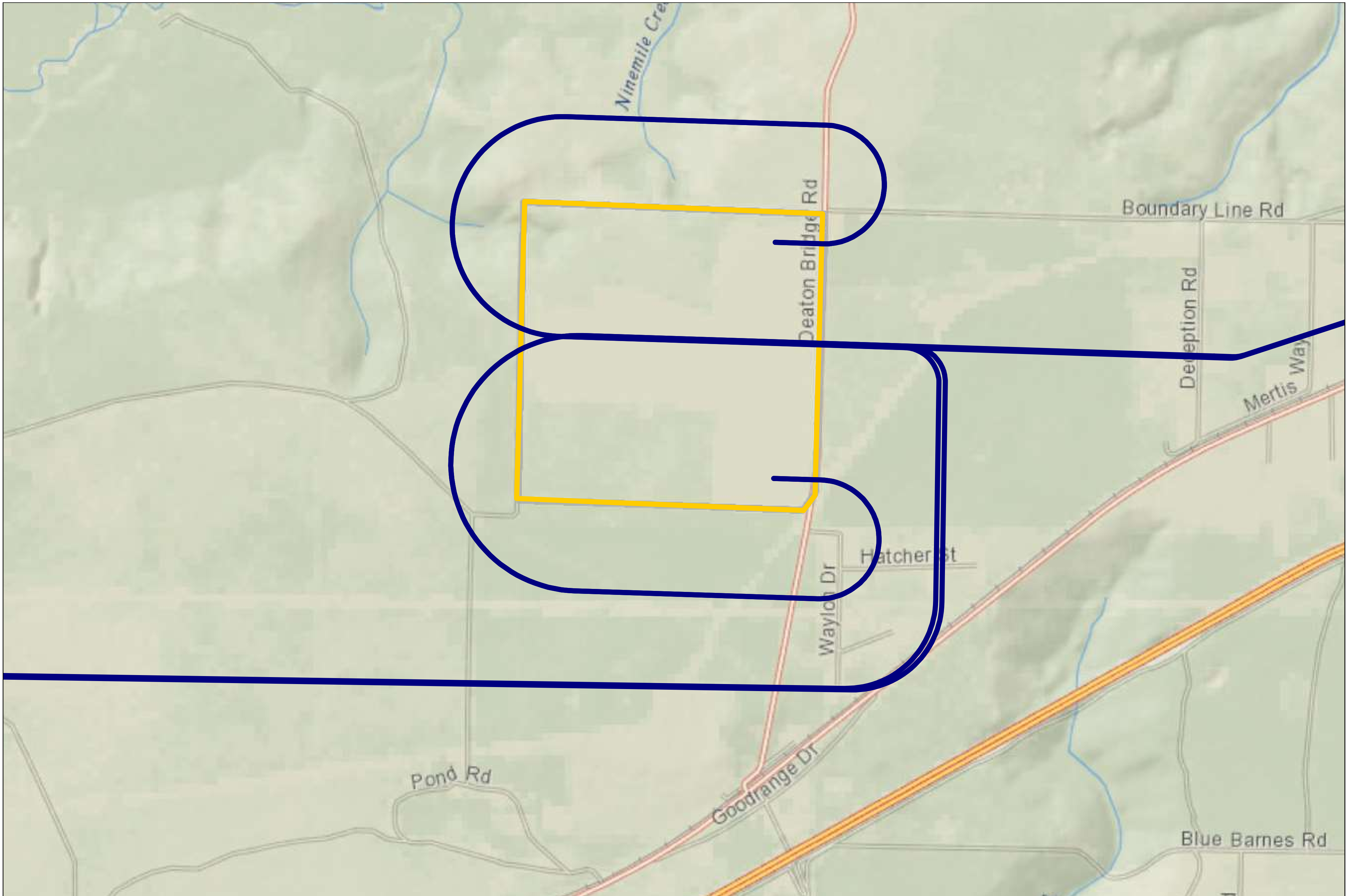


Arrival Tracks at NOLF Harold

Course 090



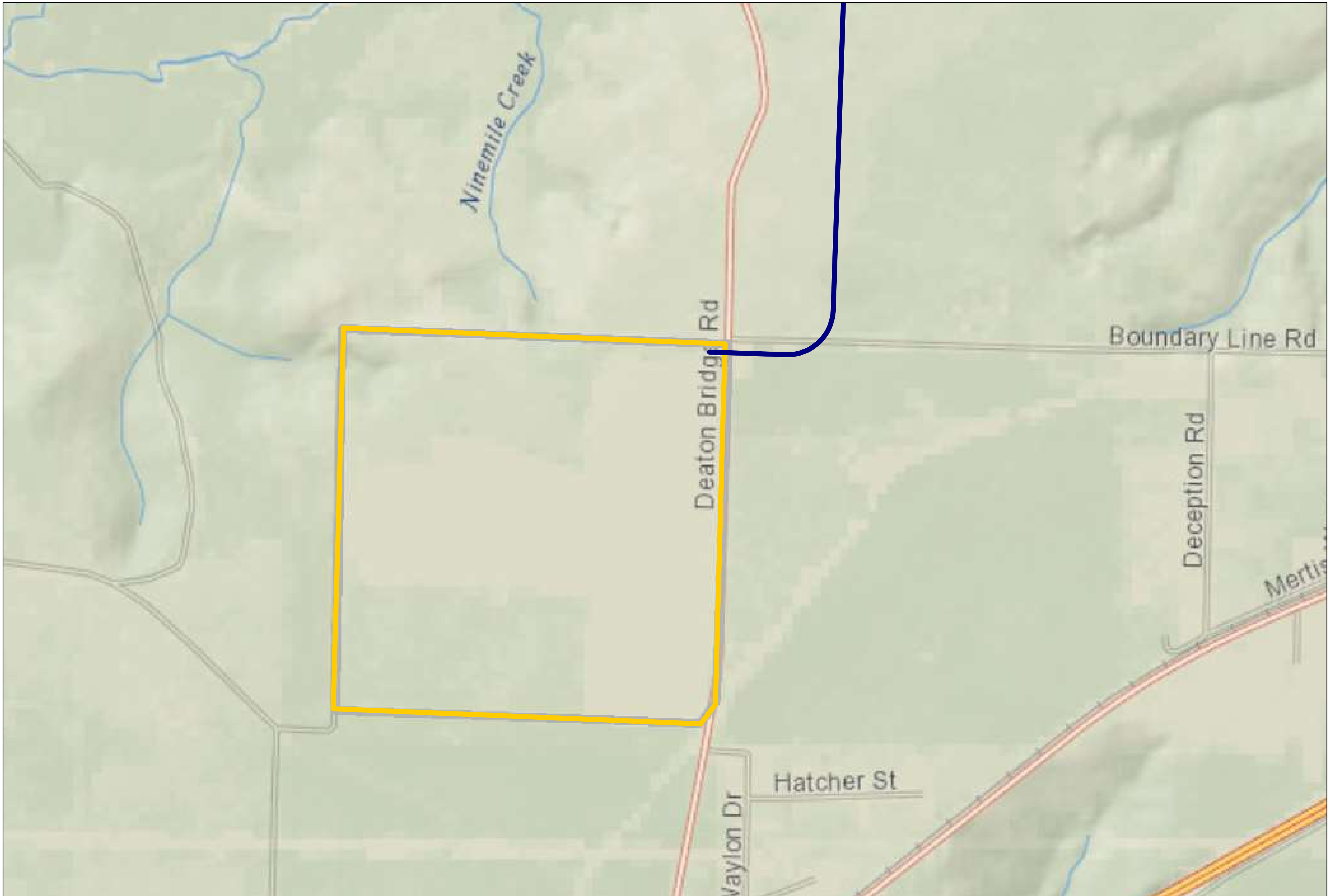
Scale in Feet 1:27,700 (1 inch = 2,310 feet)



Arrival Tracks at NOLF Harold
Course 270

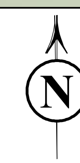
0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000
Scale in Feet 1:25,800 (1 inch = 2,150 feet)

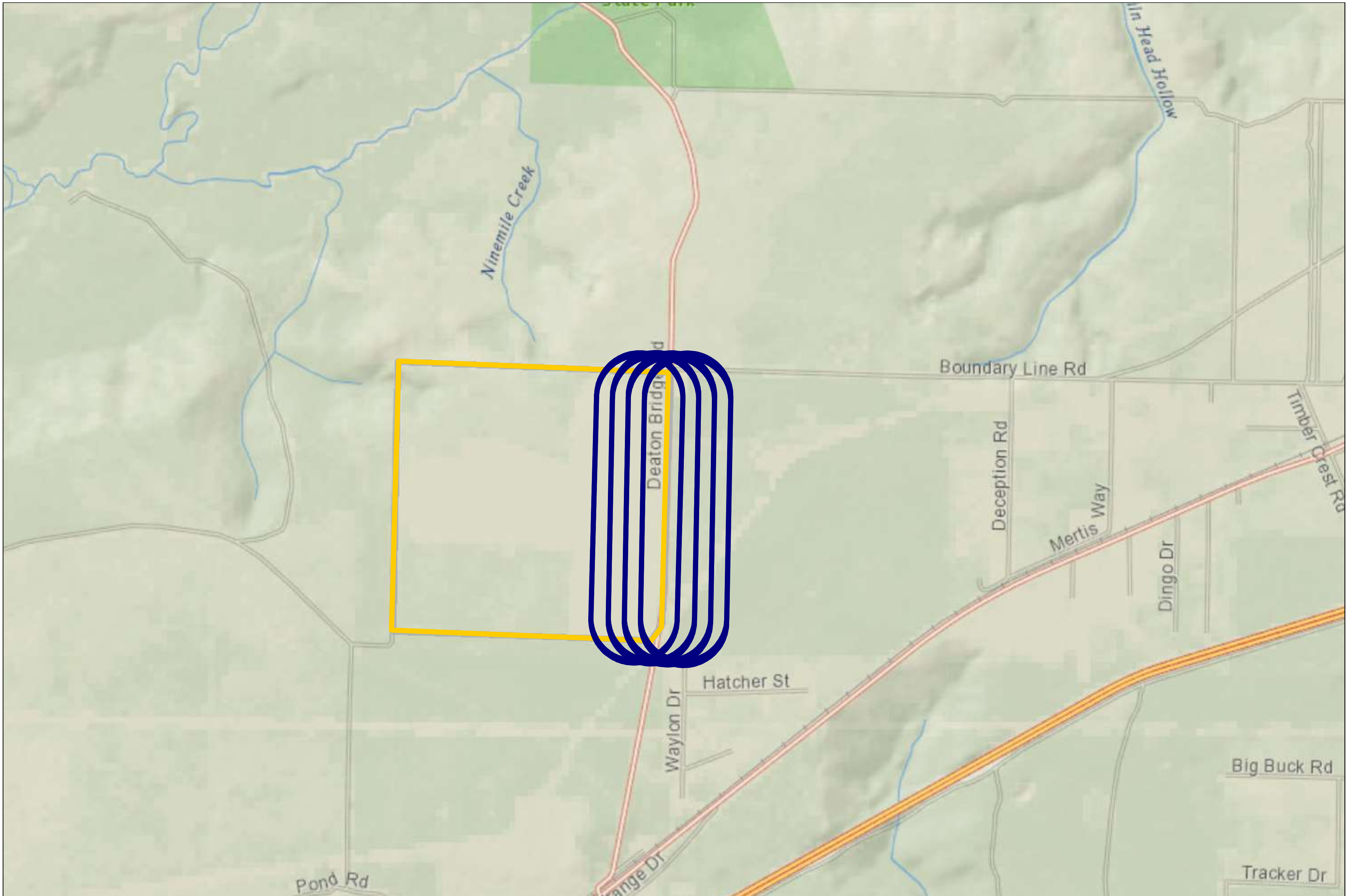
N



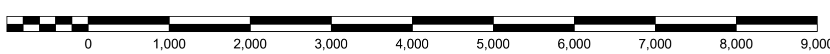
Departure Tracks at NOLF Harold

Scale in Feet 1:19,900 (1 inch = 1,650 feet)

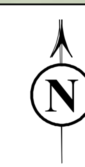


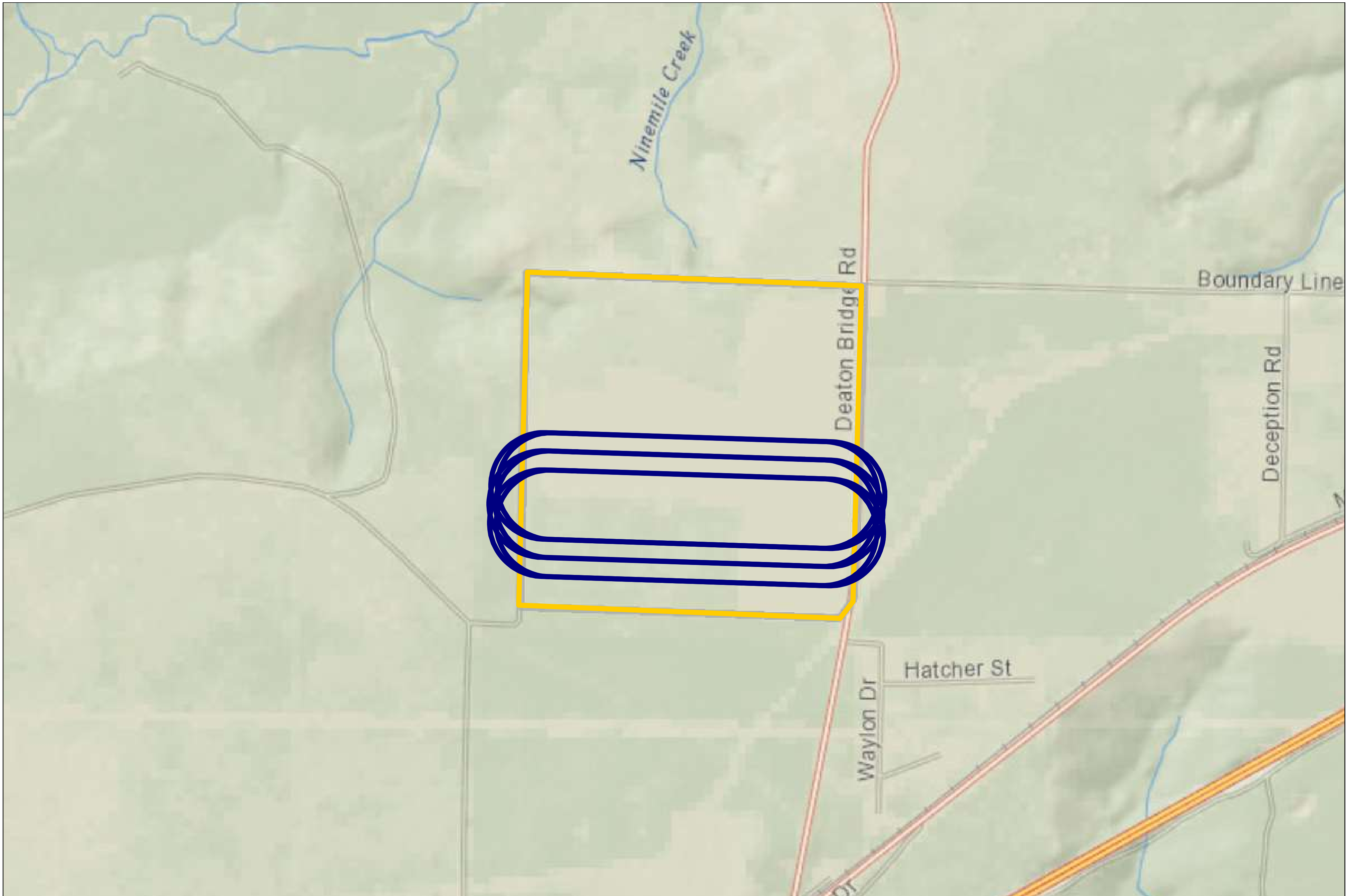


Standard Pattern Tracks at NOLF Harold
Course 180/360



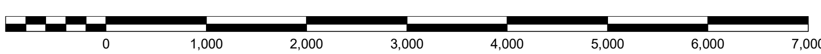
Scale in Feet 1:28,500 (1 inch = 2,370 feet)



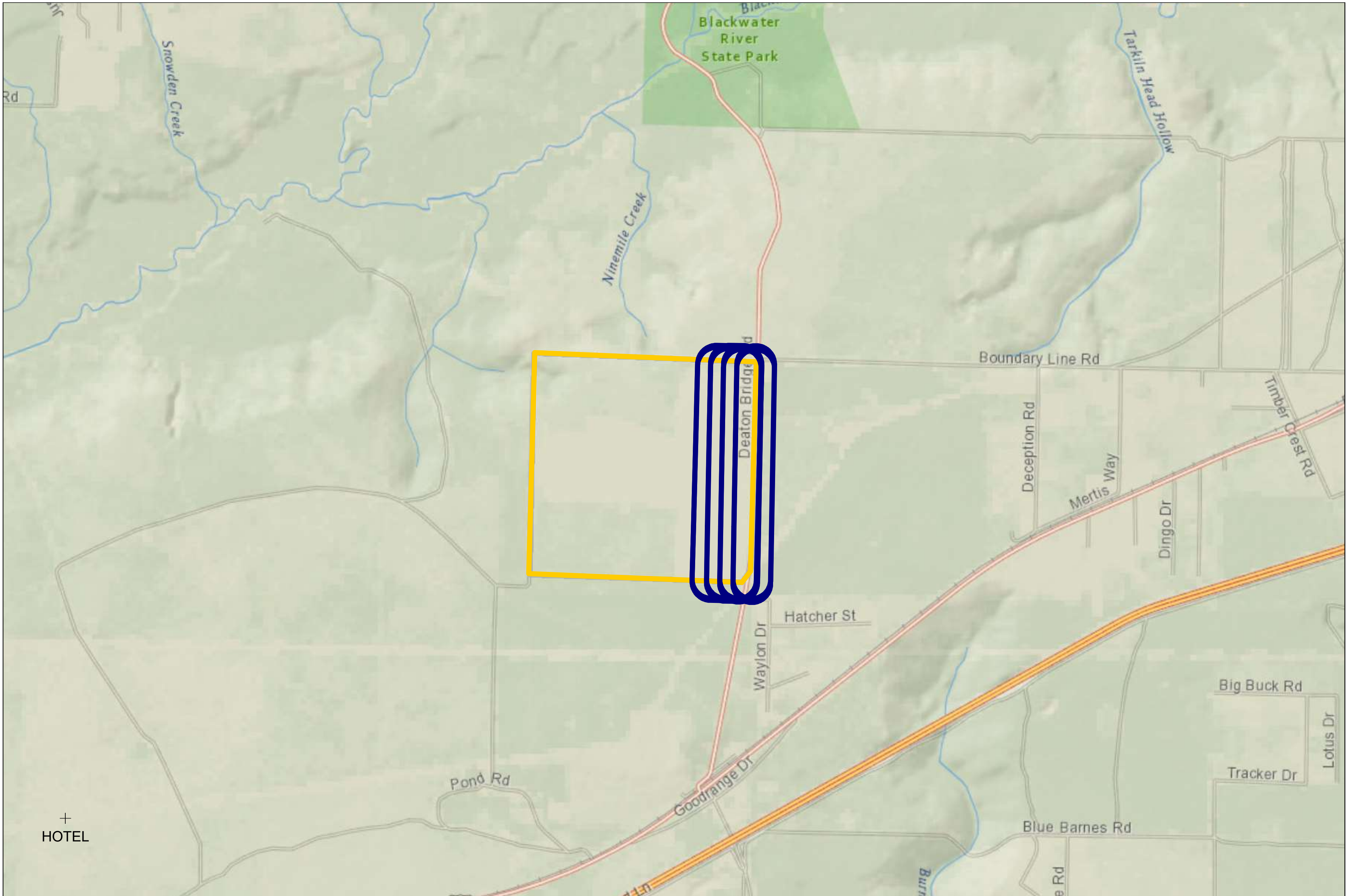


Standard Pattern Tracks at NOLF Harold

Course 090/270



Scale in Feet 1:23,000 (1 inch = 1,920 feet)



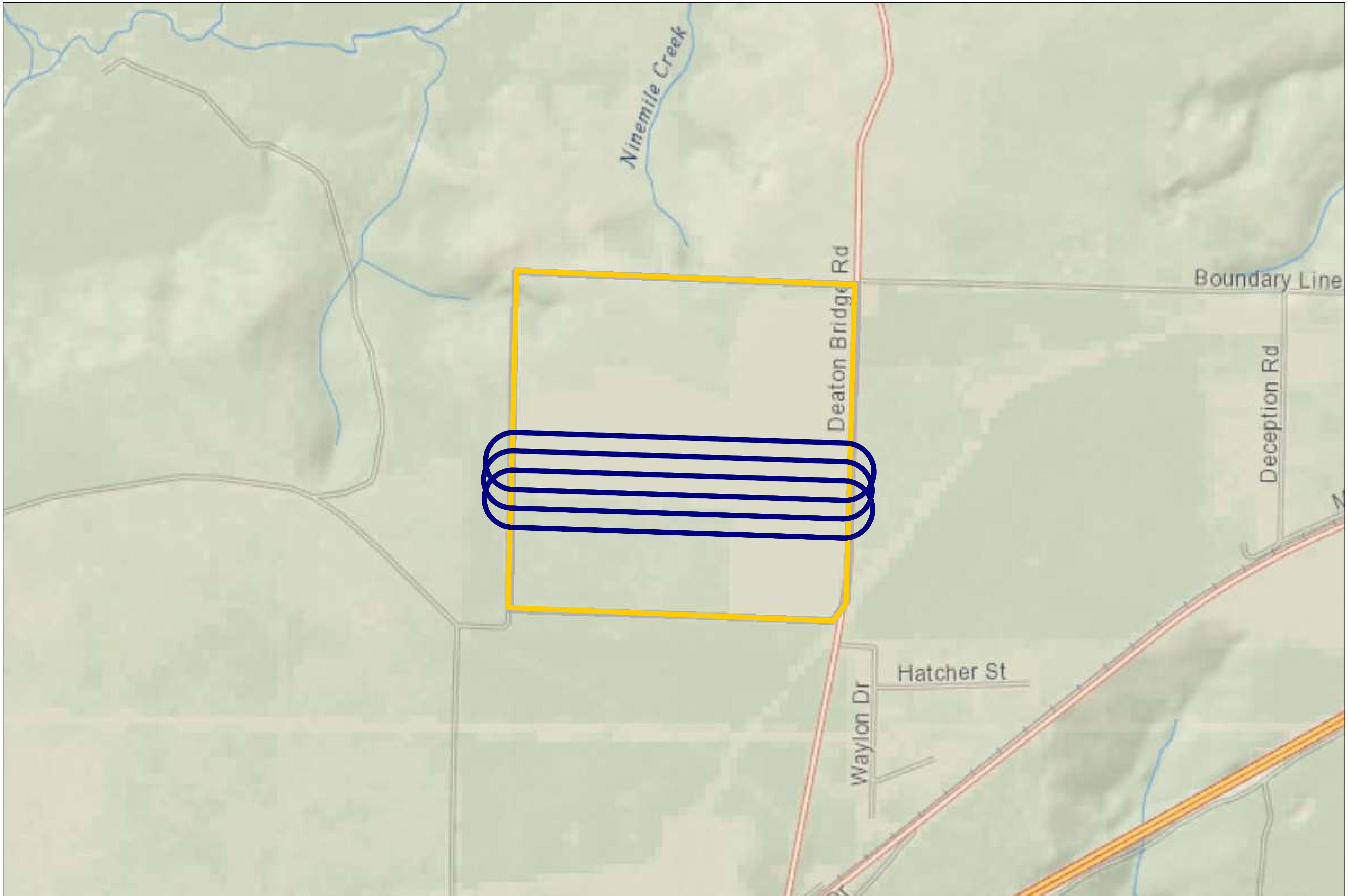
Autorotation Pattern Tracks at NOLF Harold

Course 180/360

0 2,000 4,000 6,000 8,000 10,000

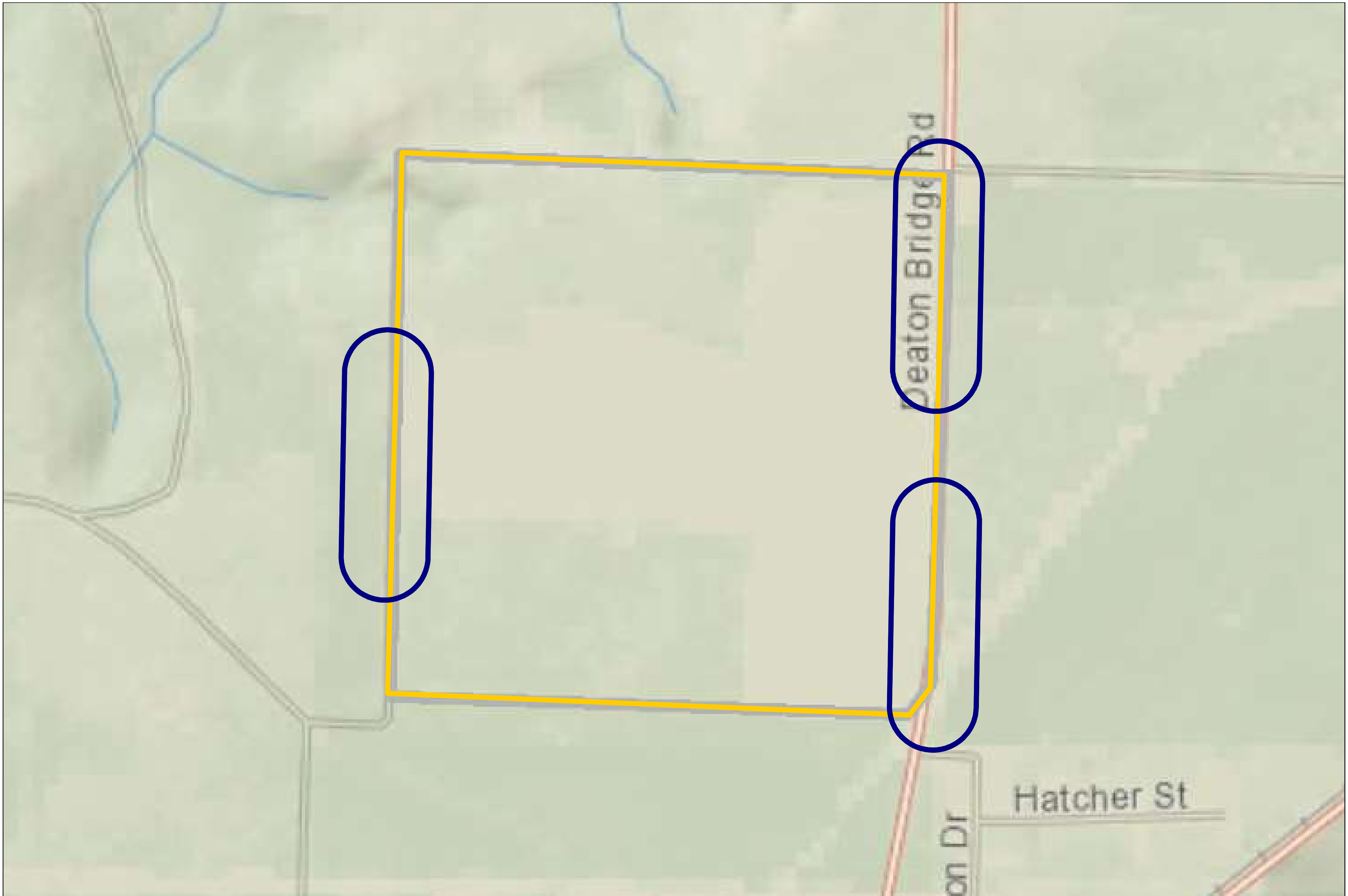
Scale in Feet 1:34,700 (1 inch = 2,890 feet)

N

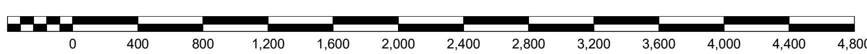


Autorotation Pattern Tracks at NOLF Harold
Course 090/270

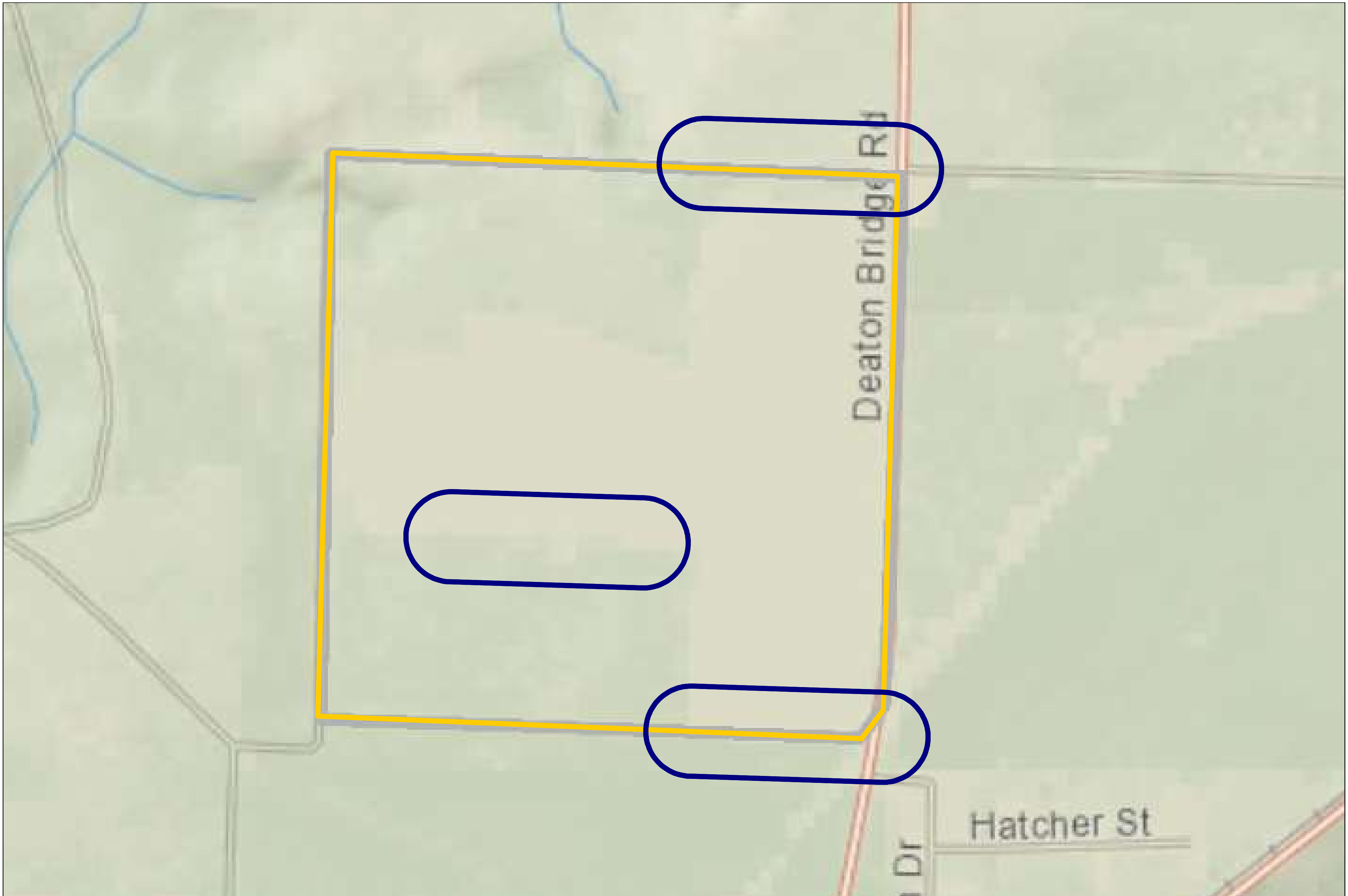
Scale in Feet 1:22,700 (1 inch = 1,890 feet)



Tactical Pattern Tracks at NOLF Harold
Course 180/360



Scale in Feet 1:14,200 (1 inch = 1,180 feet)

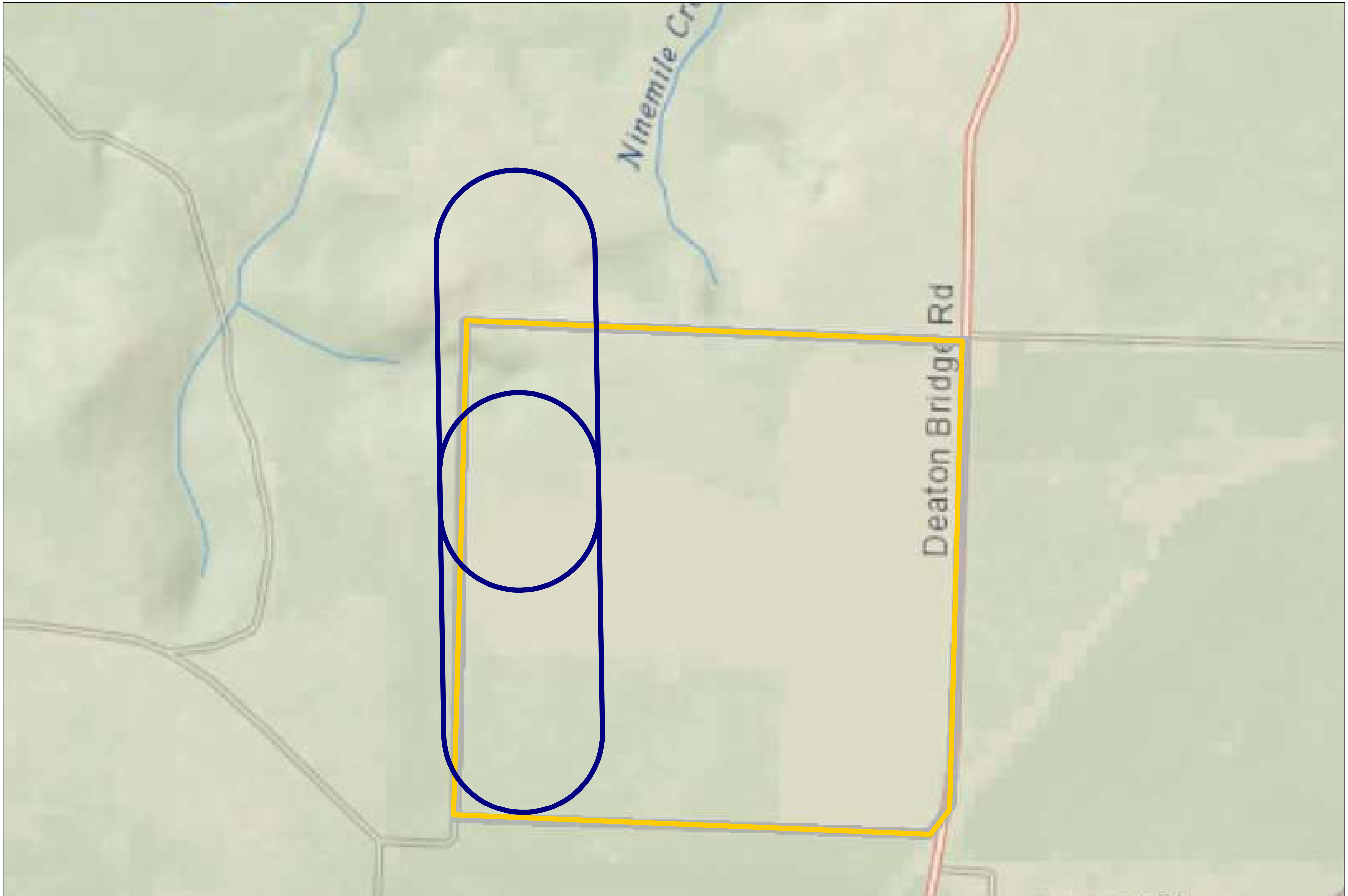


Tactical Pattern Tracks at NOLF Harold
Course 090/270

0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600 4,000 4,400 4,800

Scale in Feet 1:13,600 (1 inch = 1,130 feet)

N

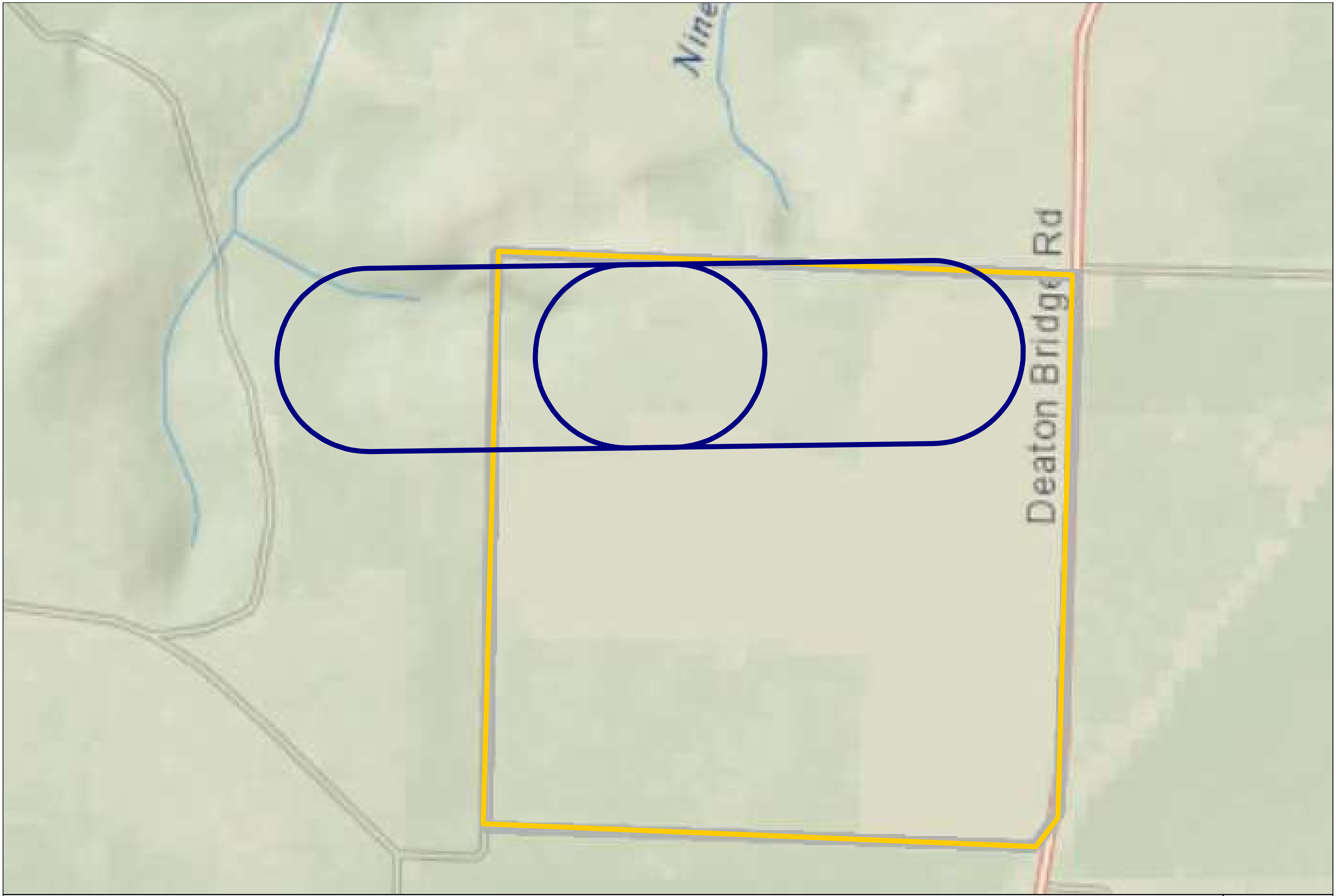


Pinnacle Pattern Tracks at NOLF Harold
Course 180/360

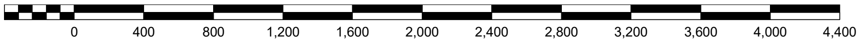
0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600 4,000 4,400 4,800 5,200

Scale in Feet 1:15,500 (1 inch = 1,290 feet)

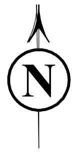
N



Pinnacle Pattern Tracks at NOLF Harold
Course 090/270

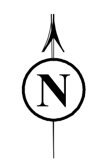


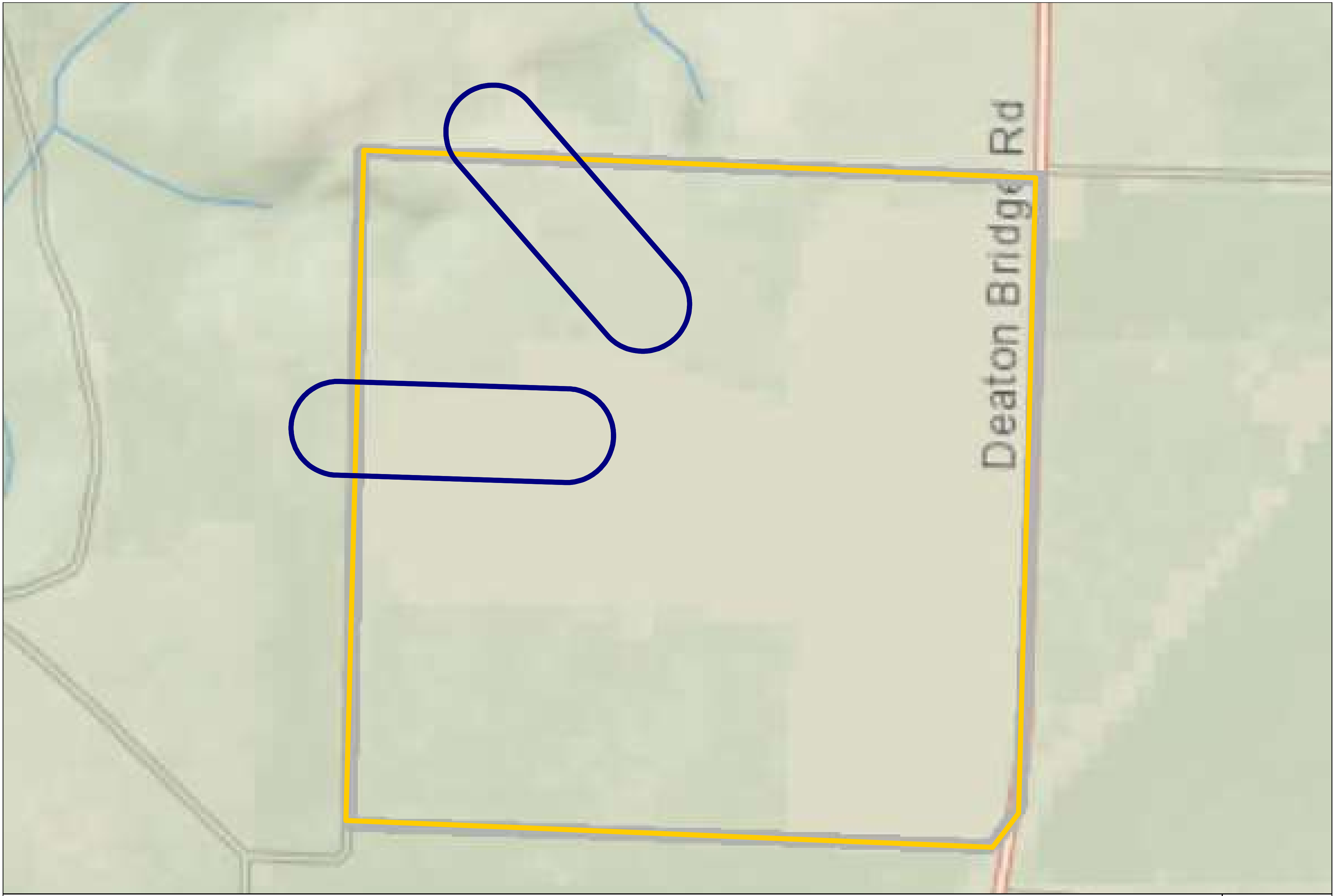
Scale in Feet 1:13,300 (1 inch = 1,110 feet)



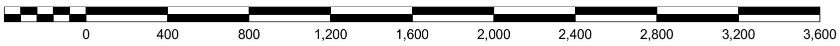
Confined Area Landing Pattern Tracks at NOLF Harold
Course 180/360

Scale in Feet 1:11,400 (1 inch = 953 feet)

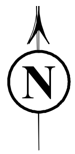


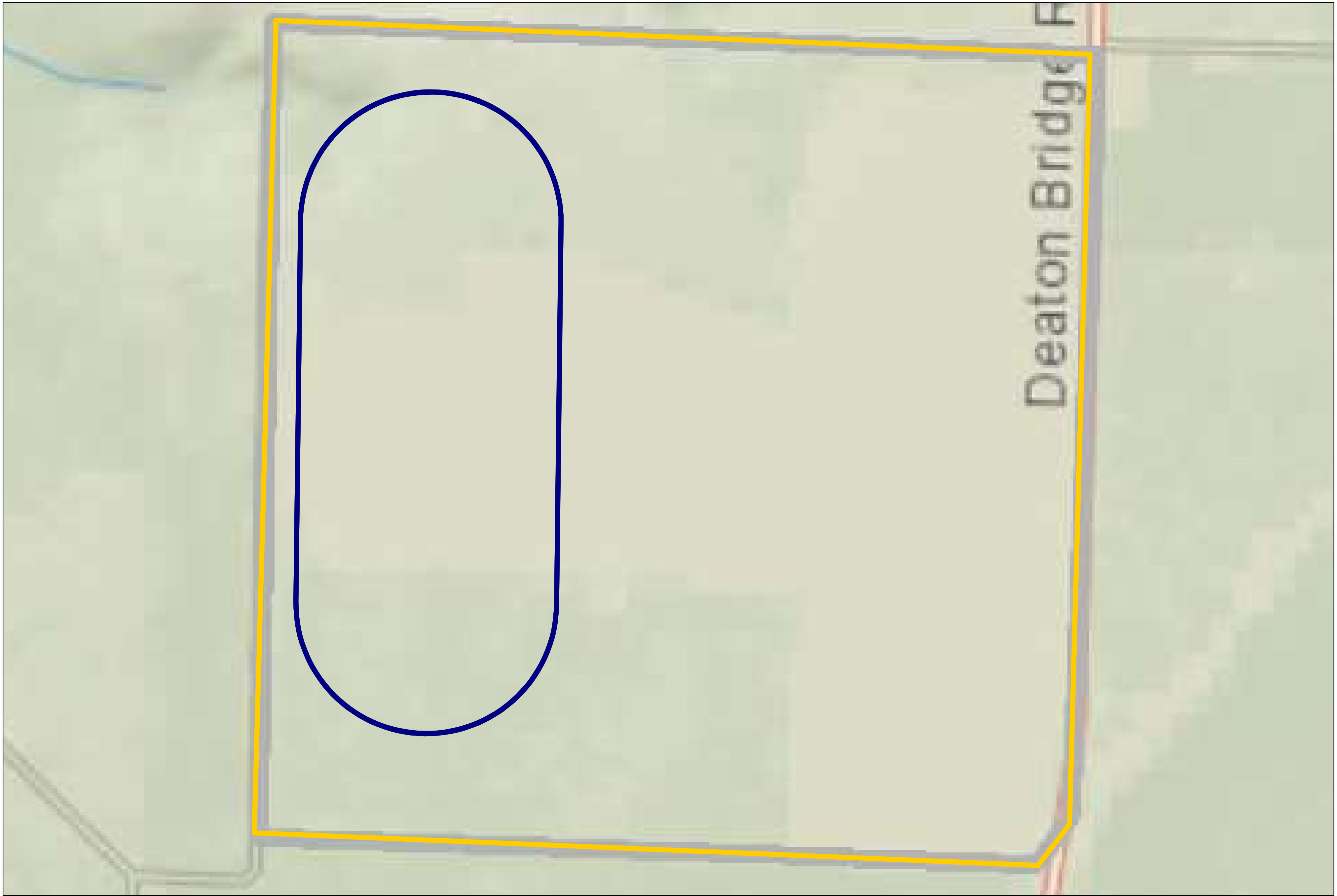


Confined Area Landing Pattern Tracks at NOLF Harold
Course 090/270



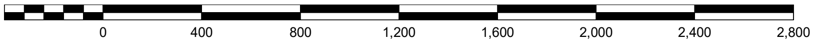
Scale in Feet 1:11,300 (1 inch = 943 feet)



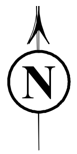


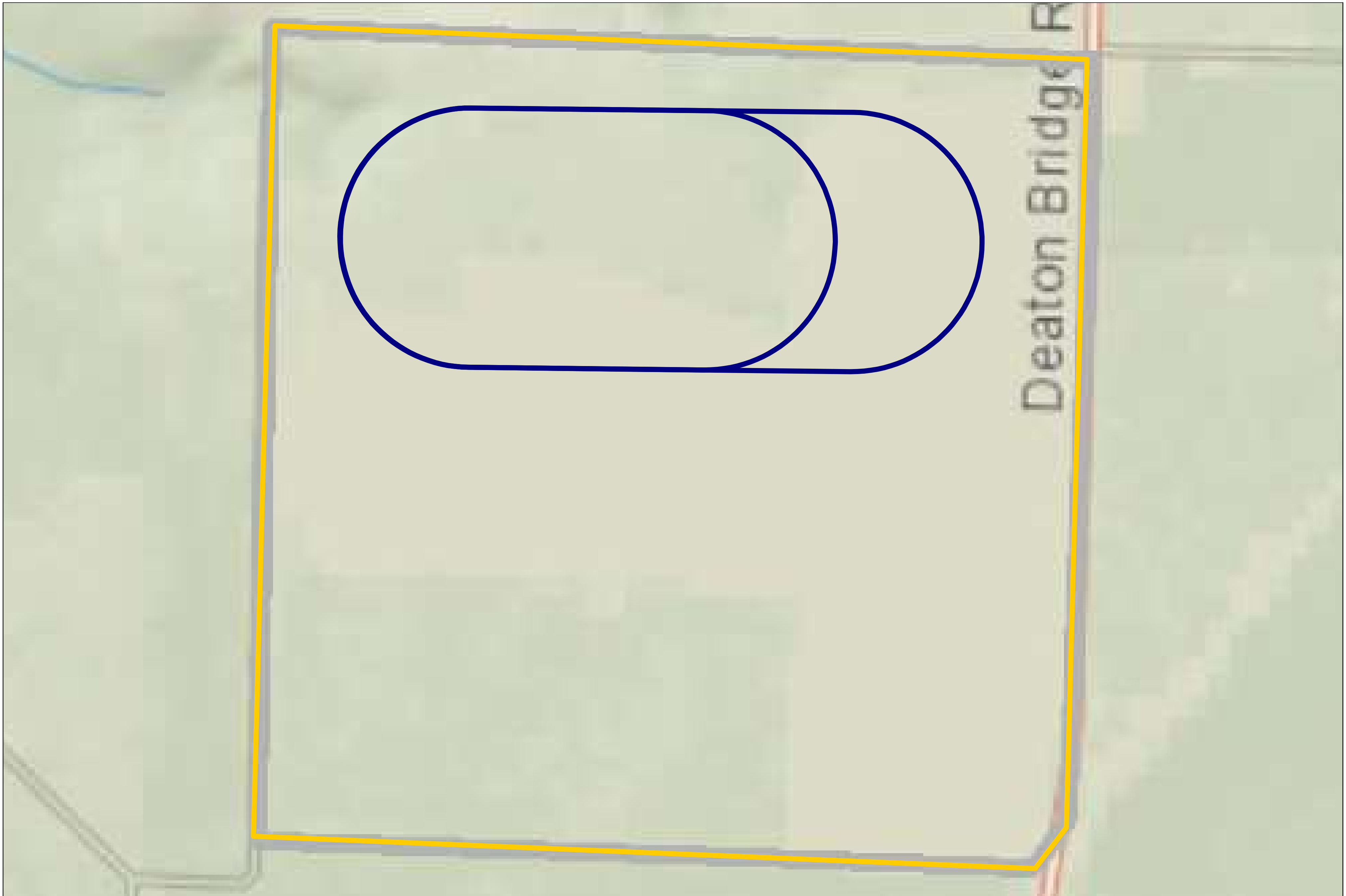
External Load Pattern Tracks at NOLF Harold

Course 180/360



Scale in Feet 1:9,360 (1 inch = 780 feet)

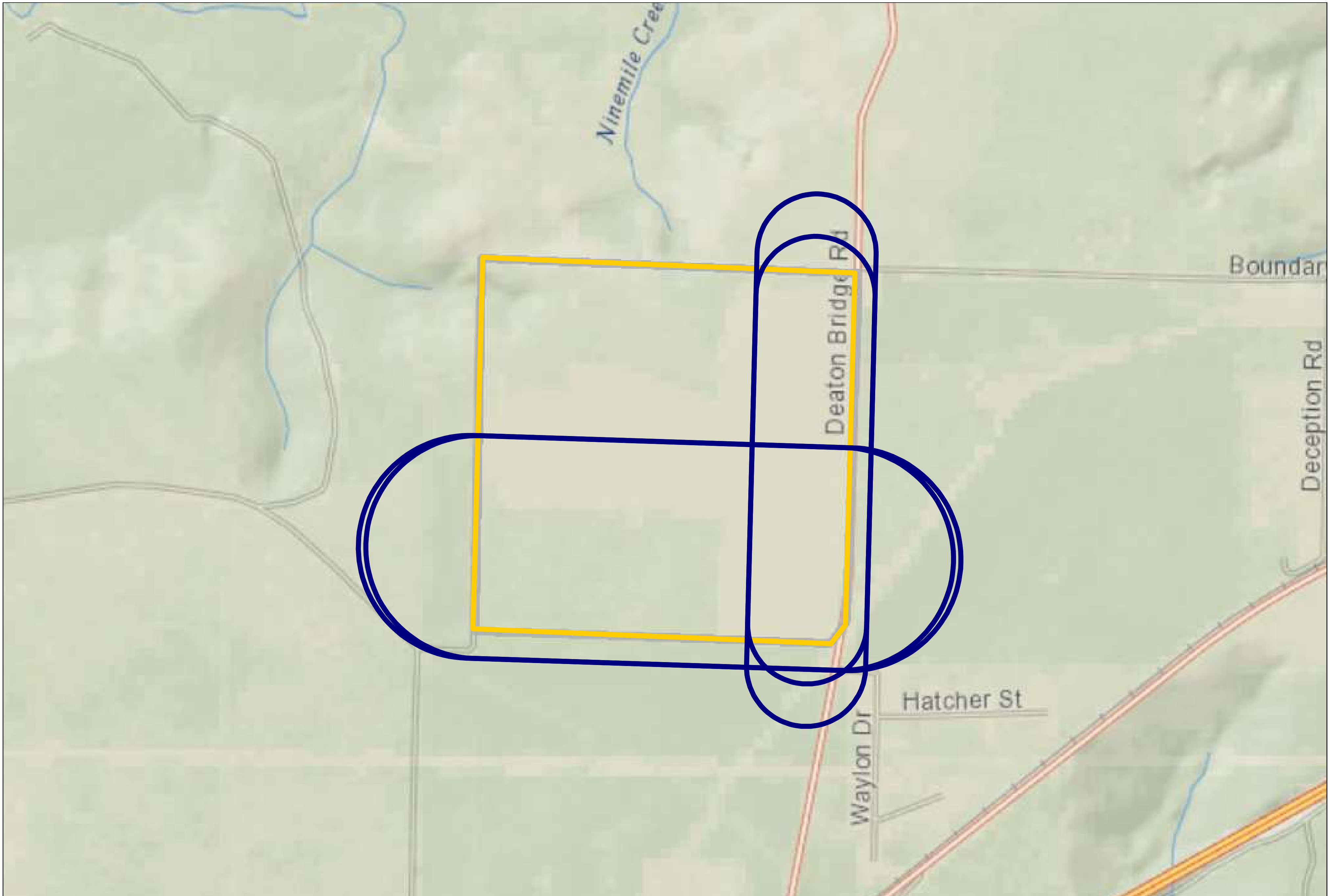




External Load Pattern Tracks at NOLF Harold
Course 090/270

0 400 800 1,200 1,600 2,000 2,400 2,800 3,200
Scale in Feet 1:9,440 (1 inch = 787 feet)

N



High Speed Tactical Pattern Tracks at NOLF Harold

0 1,000 2,000 3,000 4,000 5,000 6,000

Scale in Feet 1:20,400 (1 inch = 1,700 feet)

N

Appendix A-6: NOLF Santa Rosa Flight Tracks

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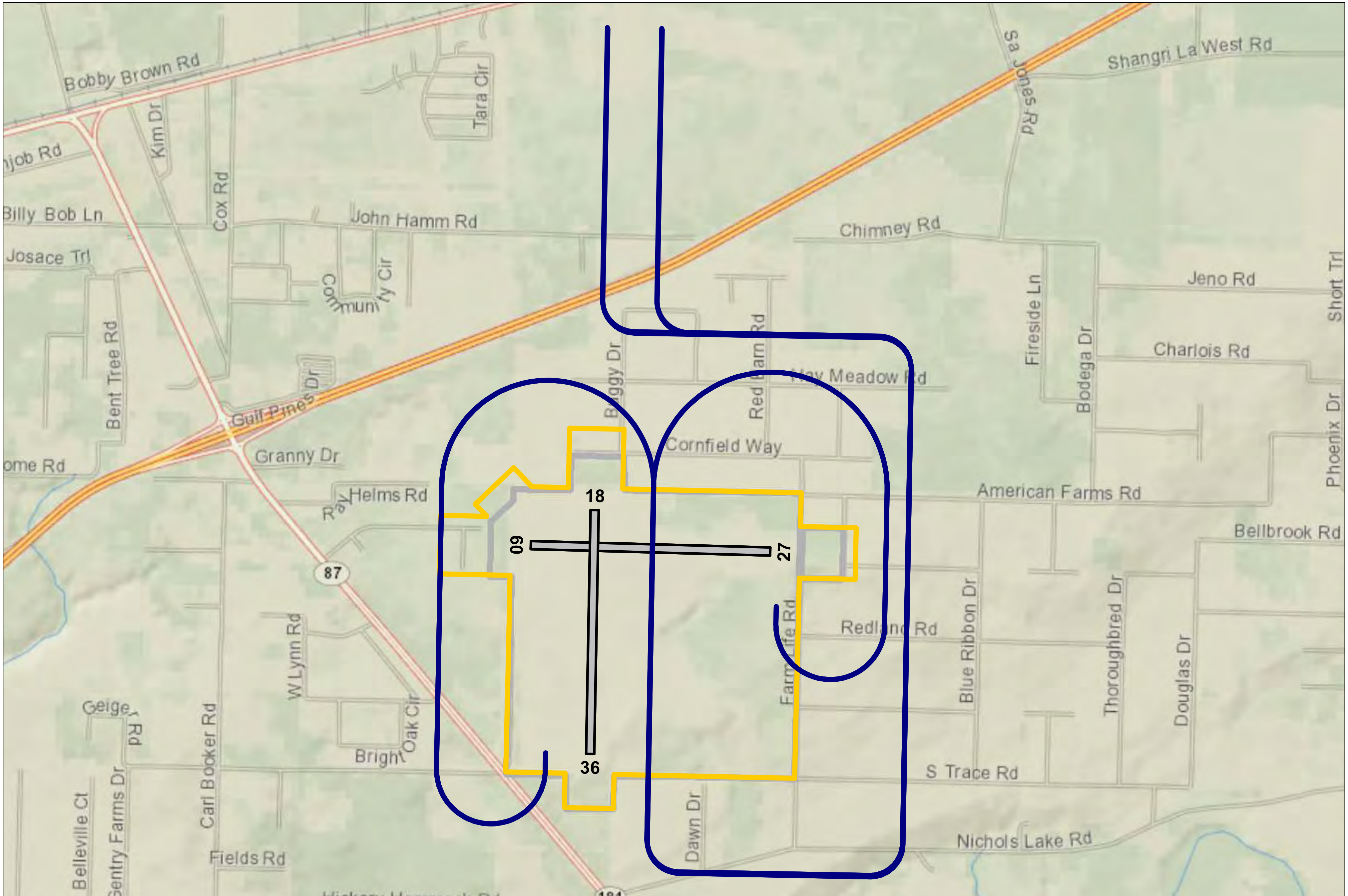
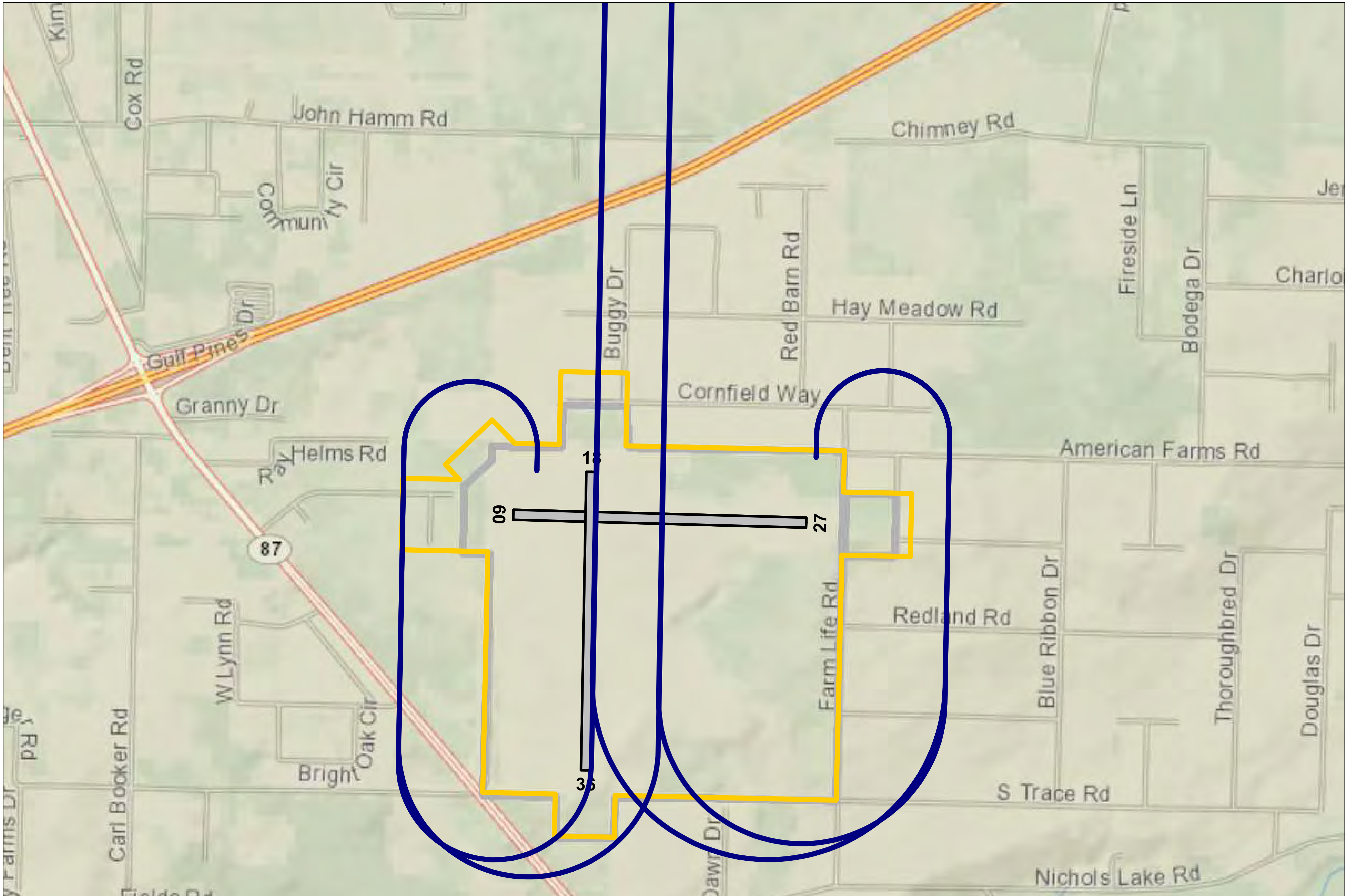


Arrival Tracks at NOLF Santa Rosa
Course 360

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000

Scale in Feet 1:28,300 (1 inch = 2,350 feet)



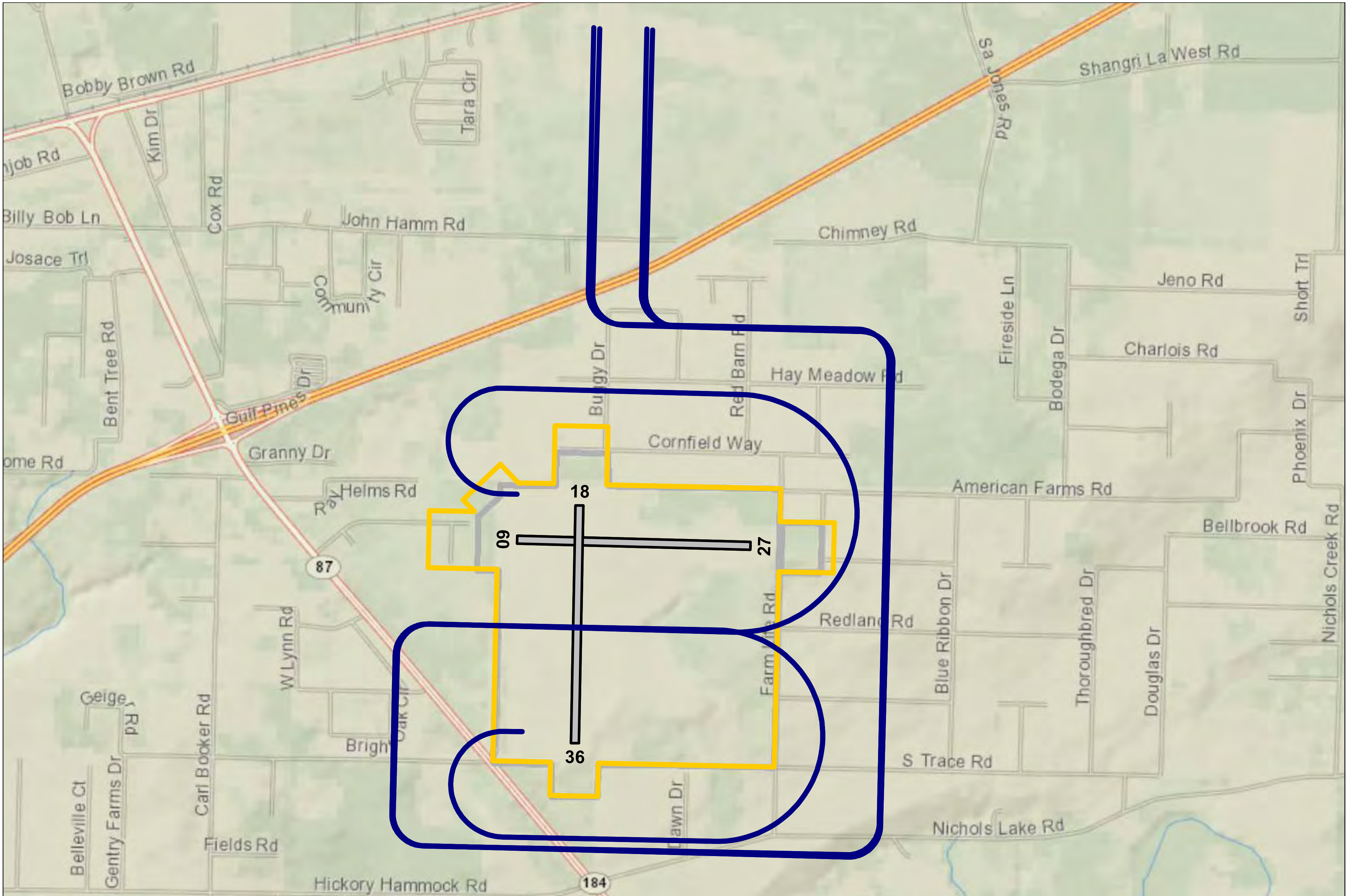
Arrival Tracks at NOLF Santa Rosa

Course 180

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000

Scale in Feet 1:23,100 (1 inch = 1,920 feet)

N

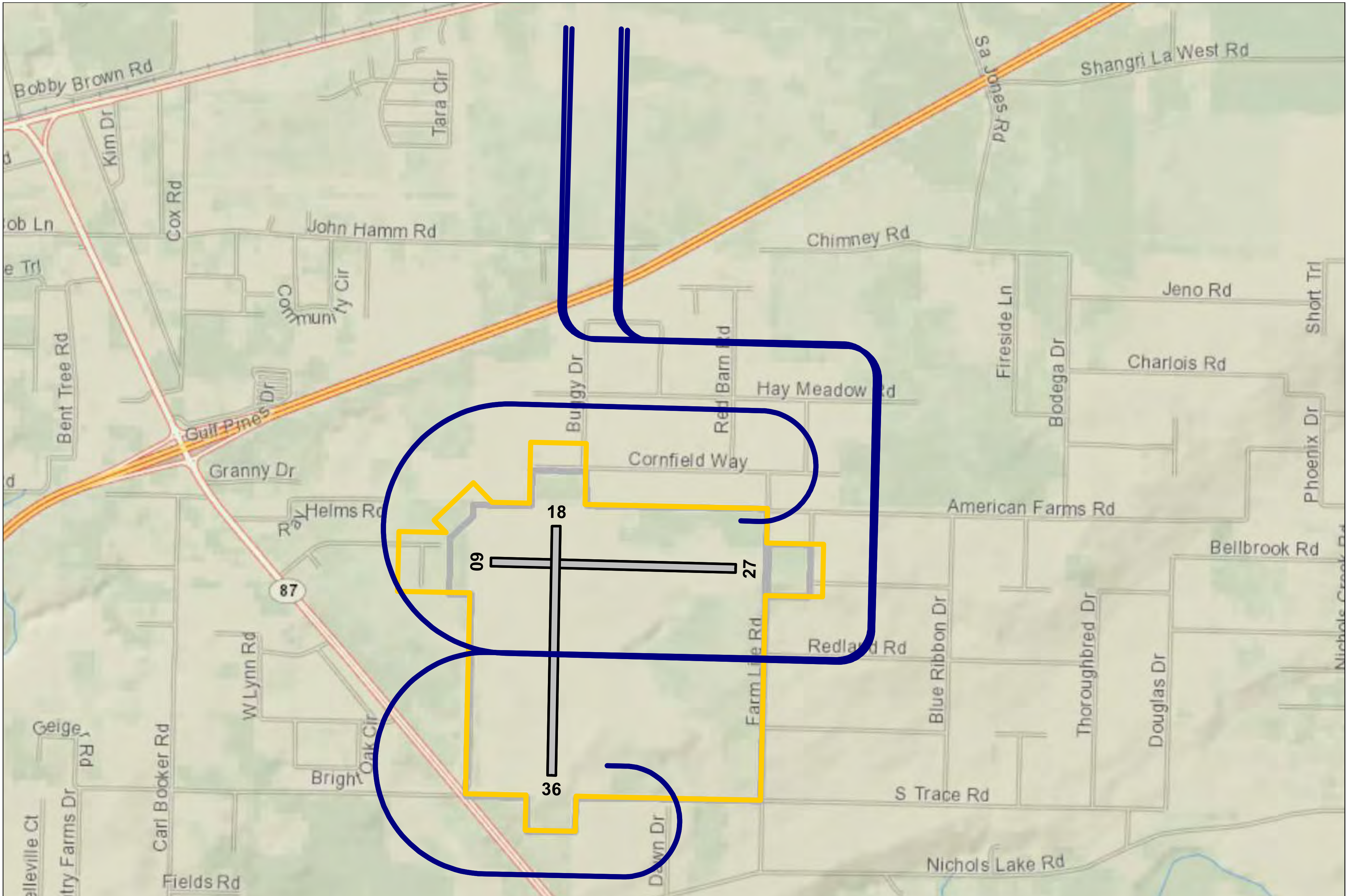


Arrival Tracks at NOLF Santa Rosa

Course 090

0 1,000 2,000 3,000 4,000 5,000 6,000 7,000 8,000 9,000 10,000

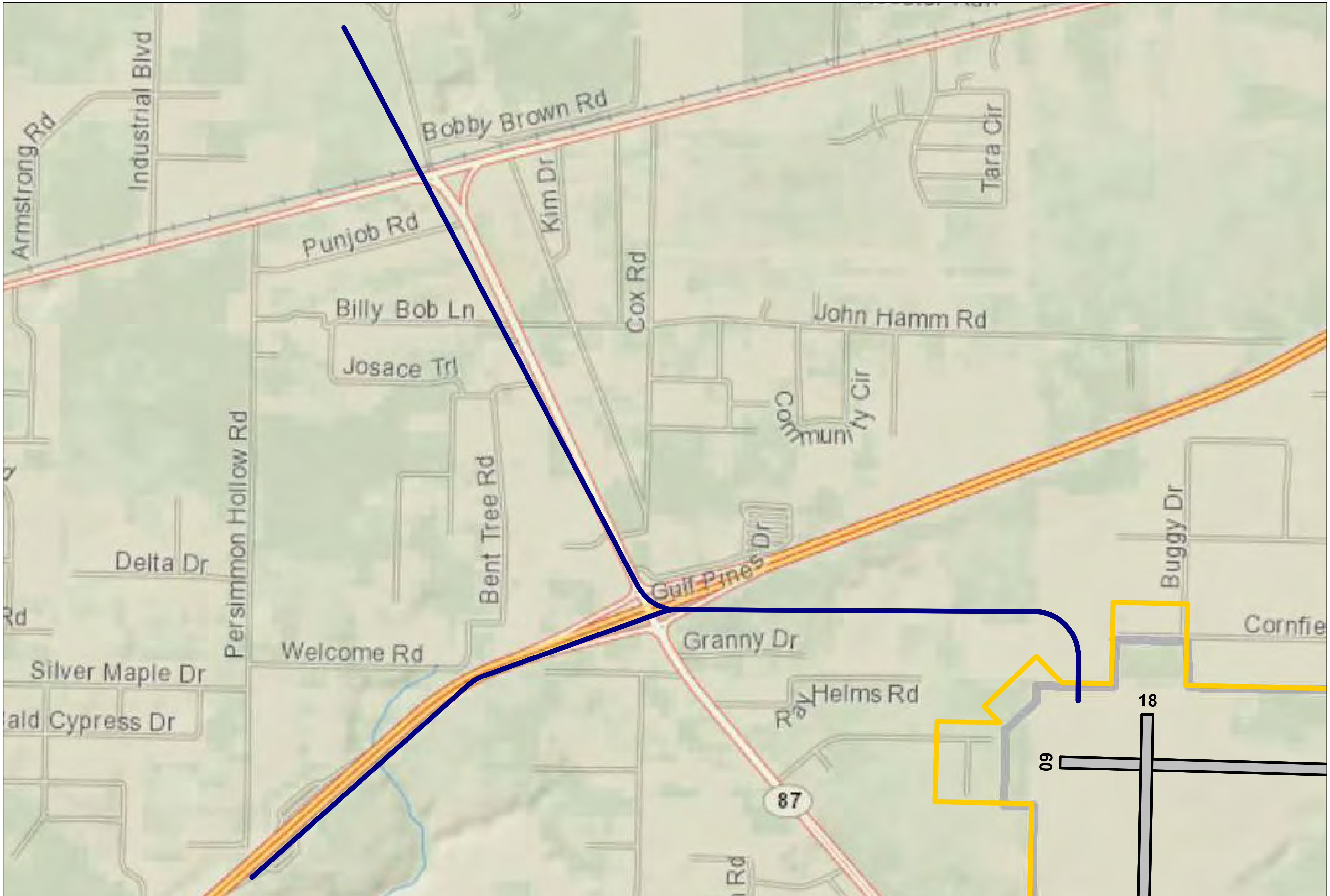
Scale in Feet 1:29,000 (1 inch = 2,420 feet)



Arrival Tracks at NOLF Santa Rosa

Course 270

Scale in Feet 1:27,600 (1 inch = 2,300 feet)

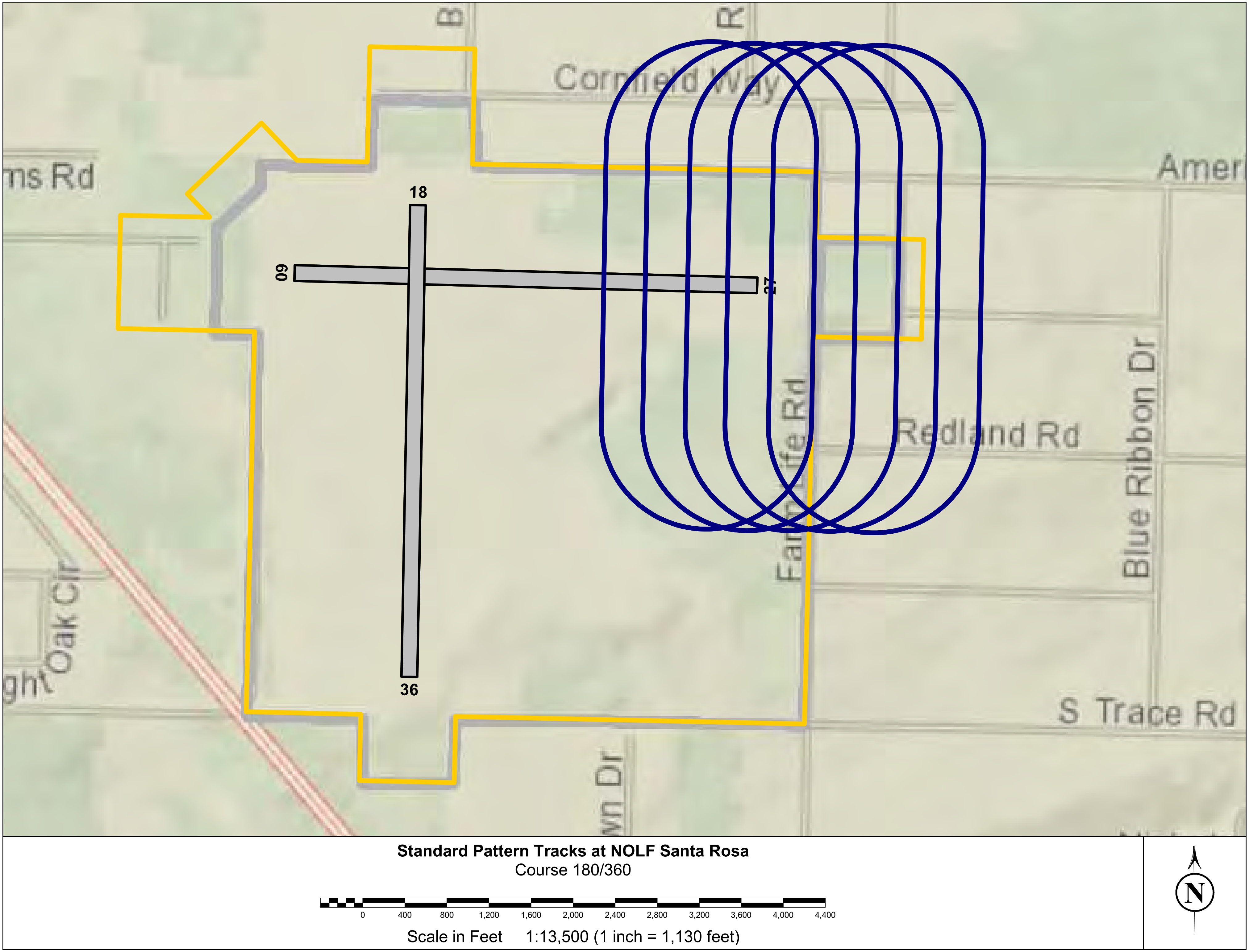


Departure Tracks at NOLF Santa Rosa

0 1,000 2,000 3,000 4,000 5,000 6,000

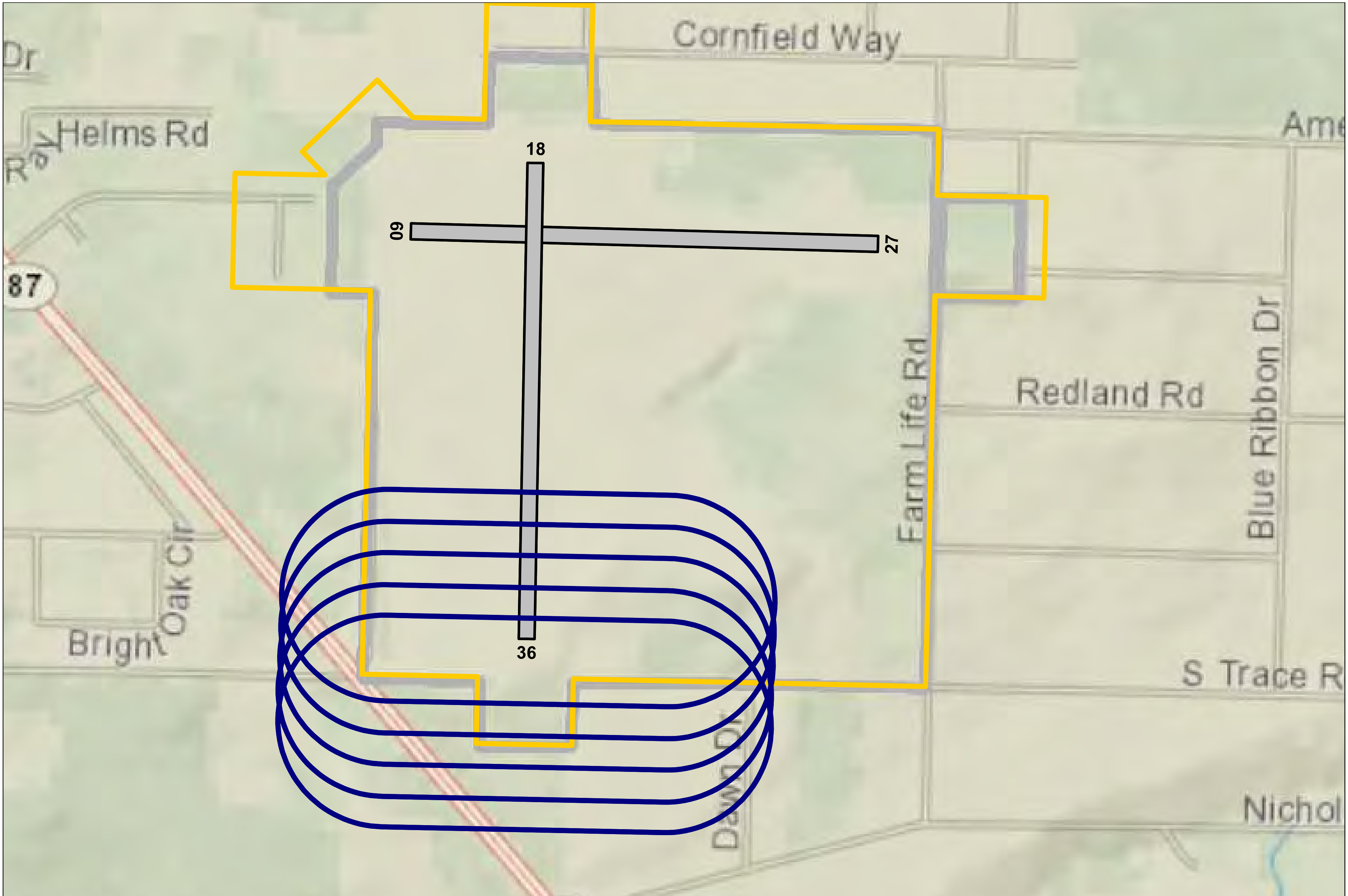
Scale in Feet 1:20,400 (1 inch = 1,700 feet)

N

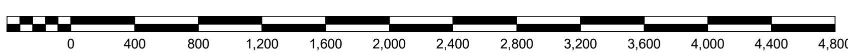


Standard Pattern Tracks at NOLF Santa Rosa
Course 180/360

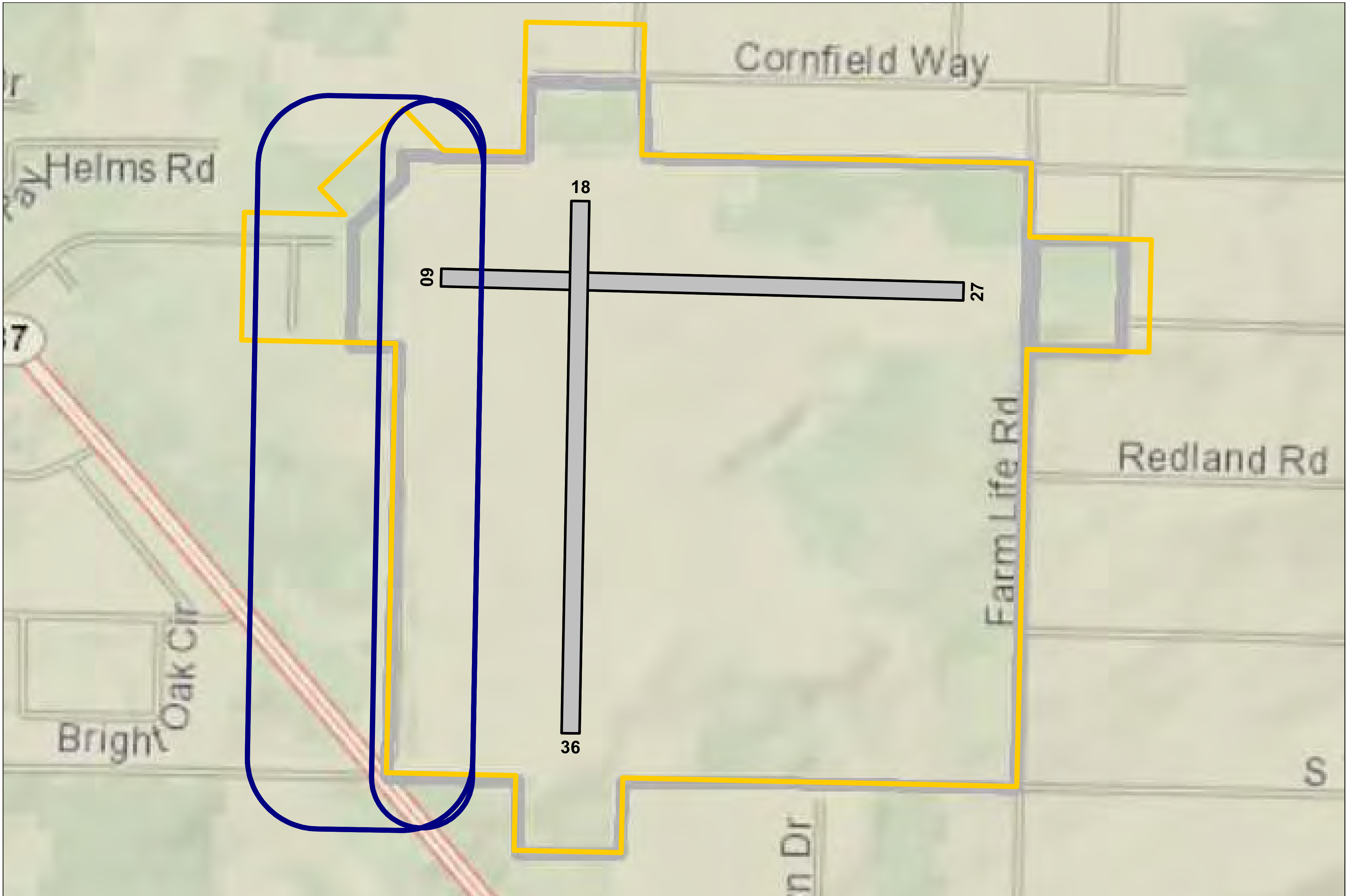
Scale in Feet 1:13,500 (1 inch = 1,130 feet)



Standard Pattern Tracks at NOLF Santa Rosa
Course 090/270



Scale in Feet 1:14,500 (1 inch = 1,210 feet)

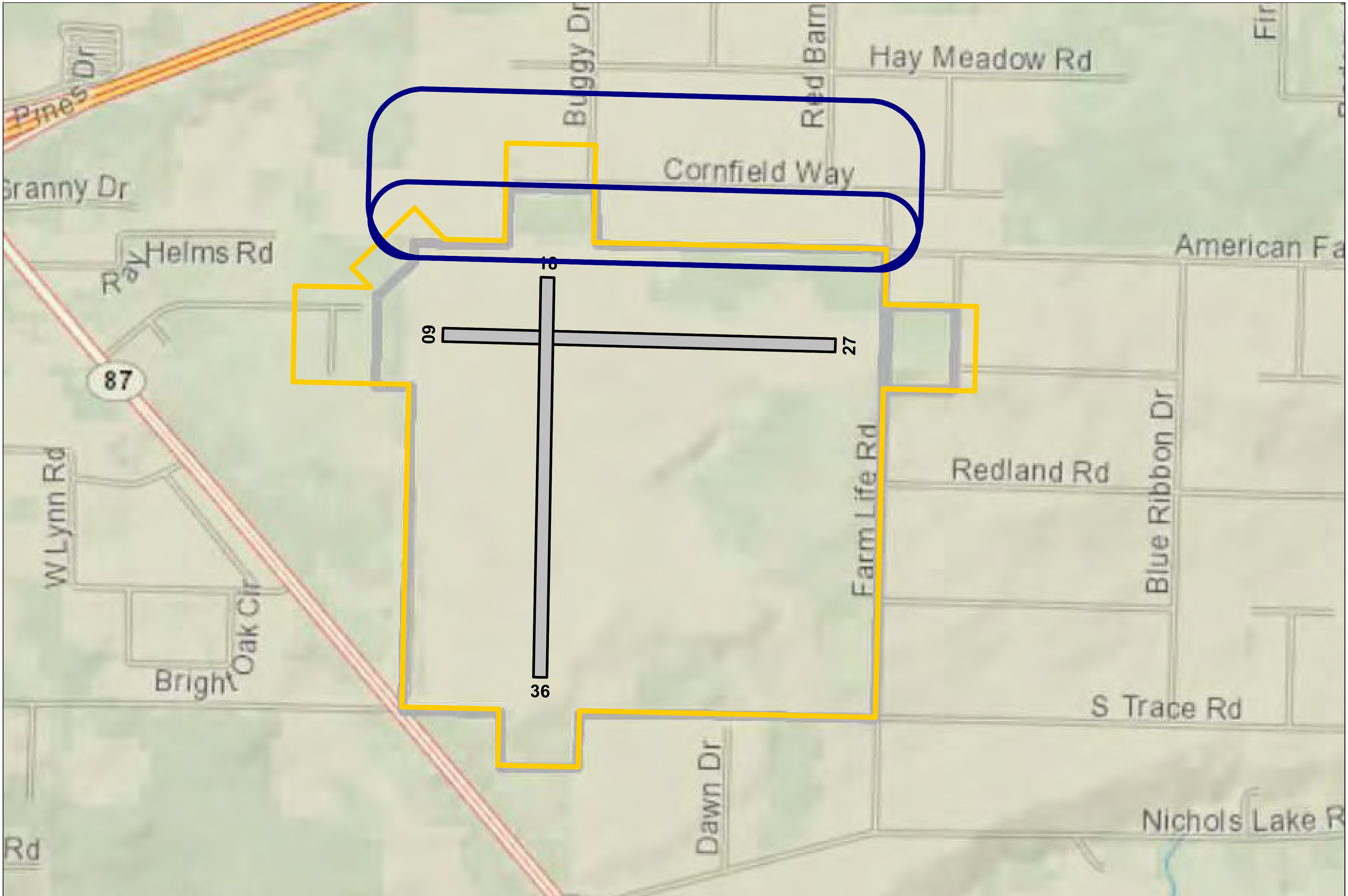


Autorotation Pattern Tracks at NOLF Santa Rosa
Course 180/360

0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600 4,000 4,400

Scale in Feet 1:12,900 (1 inch = 1,080 feet)

N

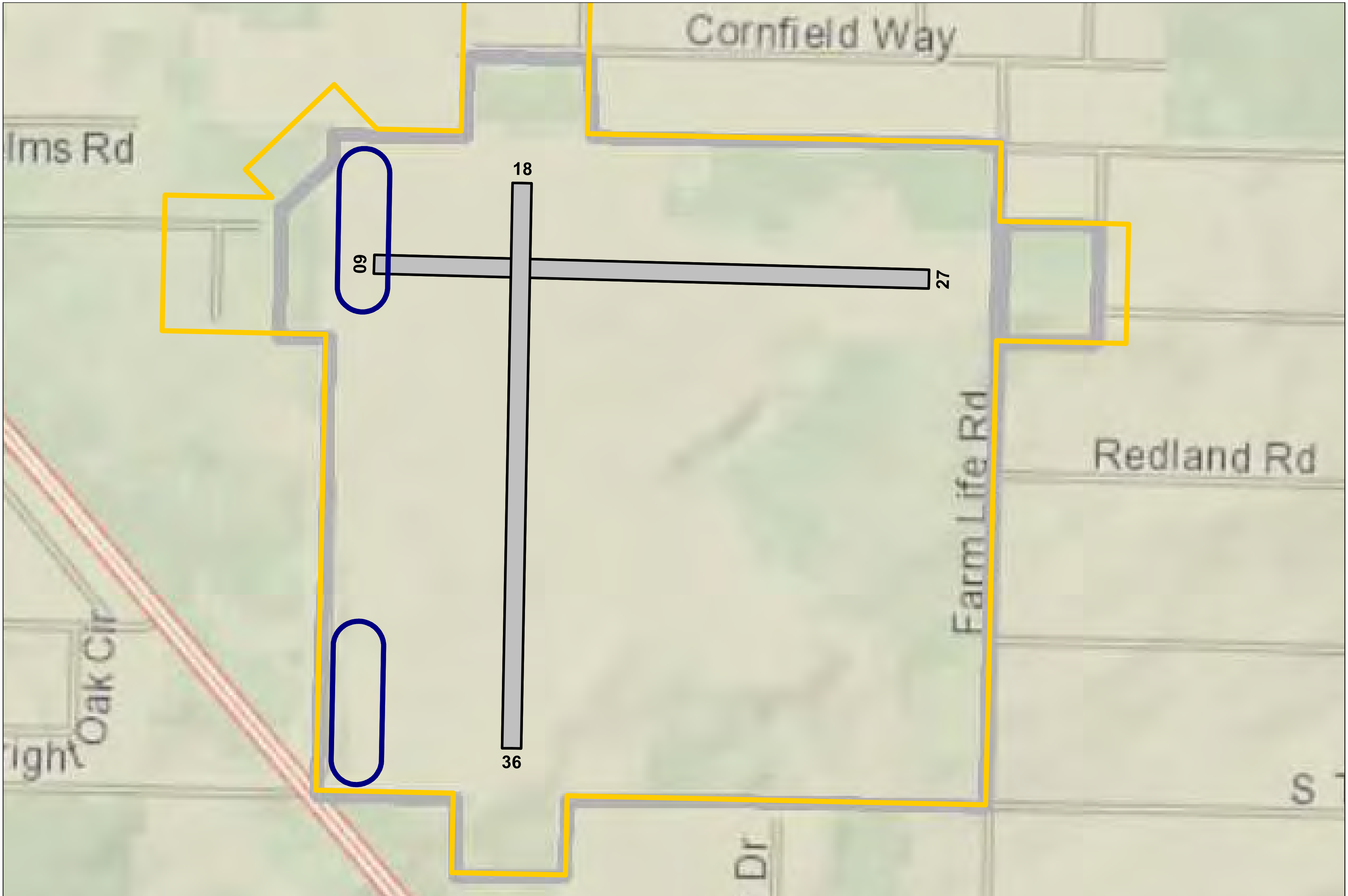


Autorotation Pattern Tracks at NOLF Santa Rosa
Course 090/270

0 1,000 2,000 3,000 4,000 5,000

Scale in Feet 1:17,200 (1 inch = 1,440 feet)

N

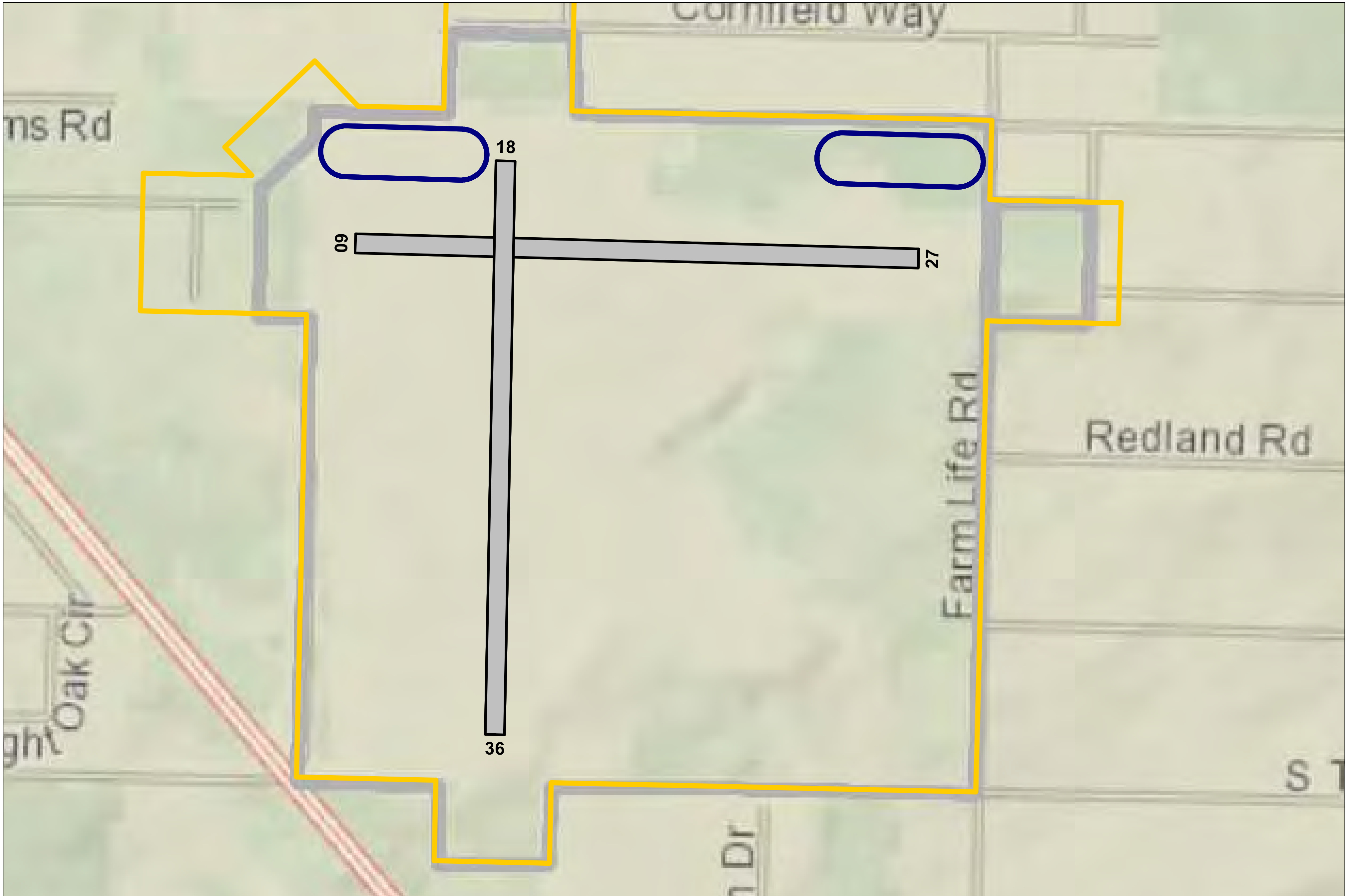


Tactical Pattern Tracks at NOLF Santa Rosa
Course 180/360

0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600 4,000

Scale in Feet 1:12,200 (1 inch = 1,020 feet)

N

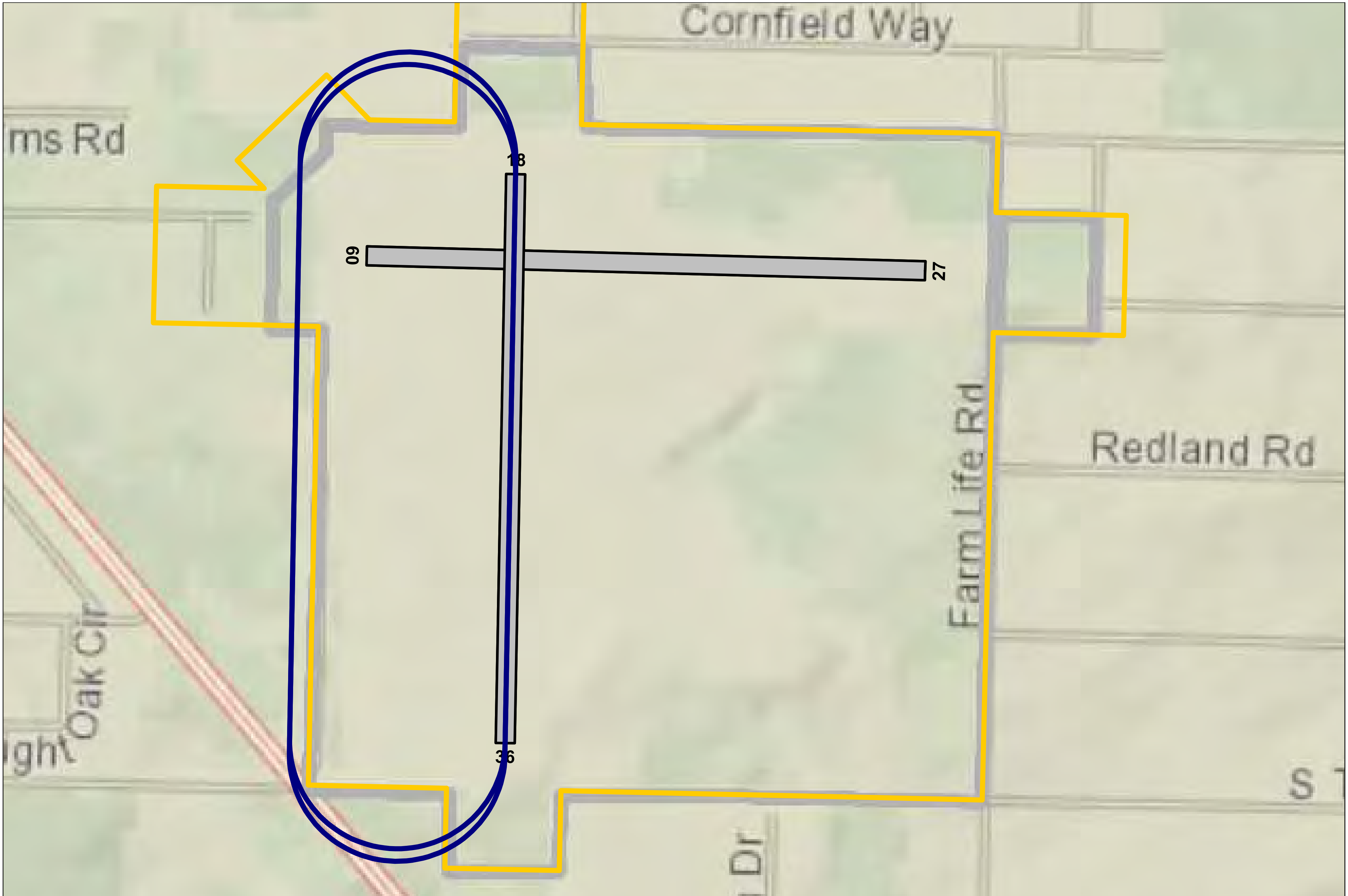


Tactical Pattern Tracks at NOLF Santa Rosa

Course 090/270

0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600 4,000

Scale in Feet 1:12,000 (1 inch = 1,000 feet)

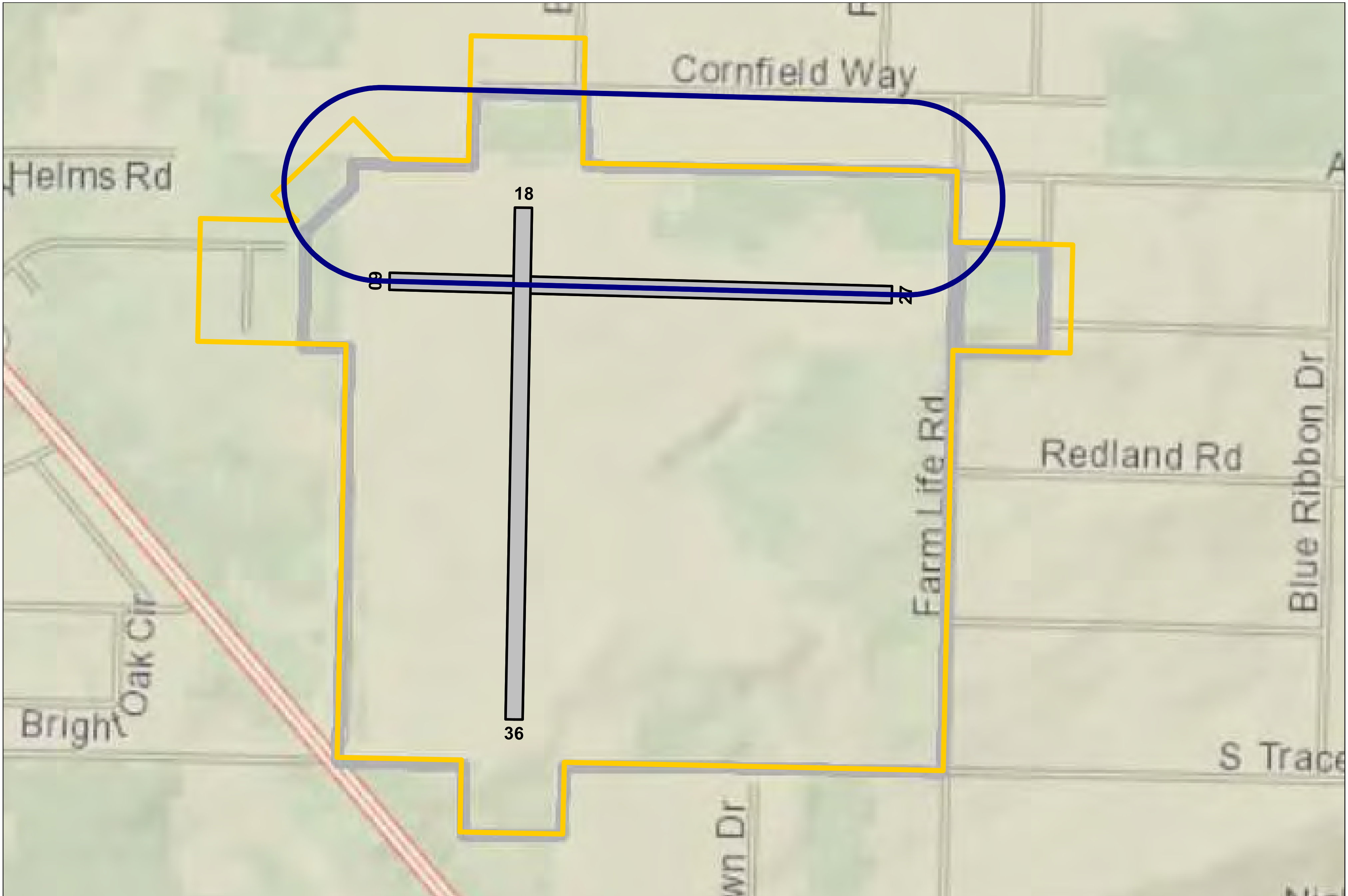


Tail Rotor/Boost Off Pattern Tracks at NOLF Santa Rosa

Course 180/360

0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600 4,000

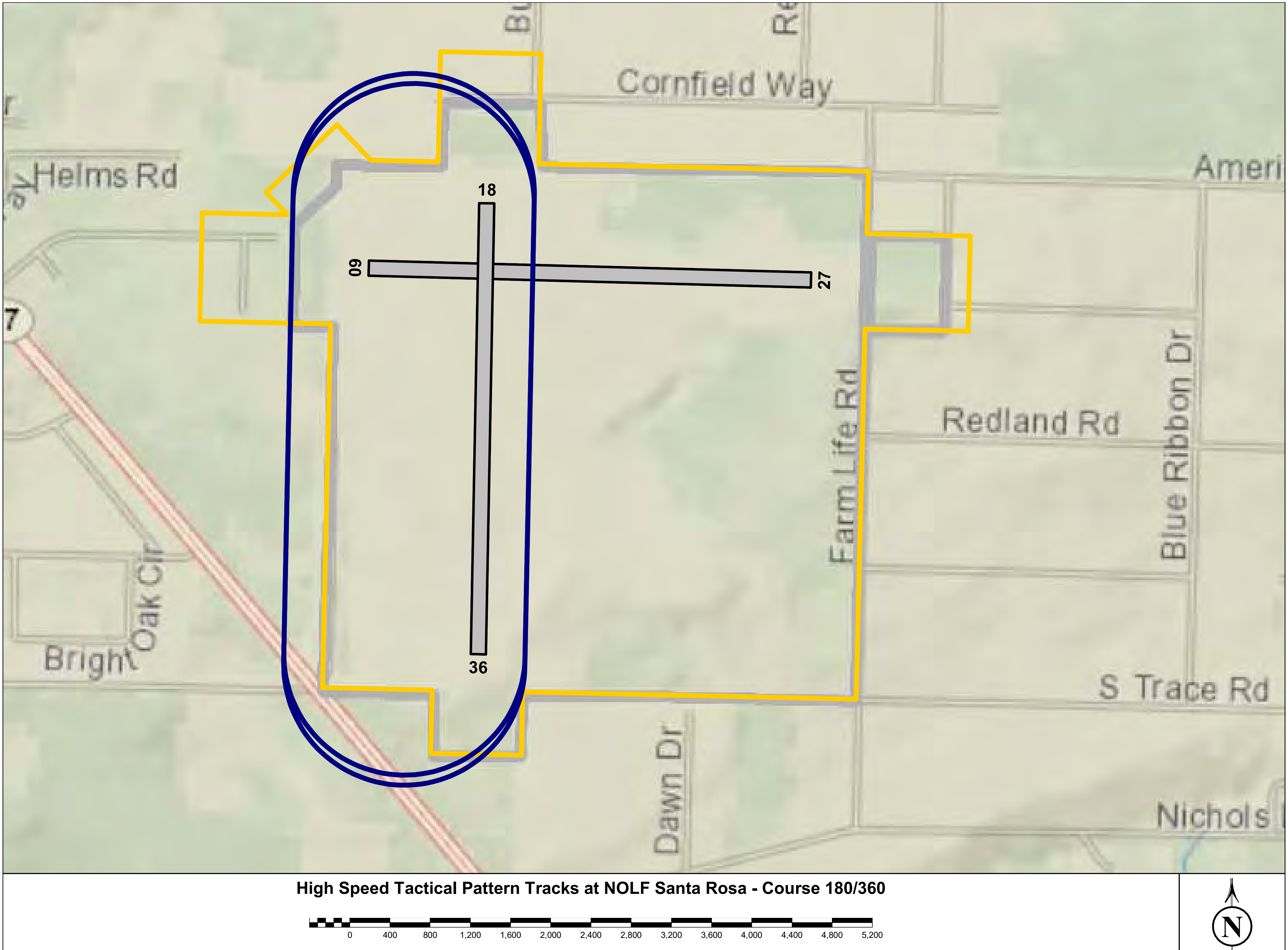
Scale in Feet 1:12,100 (1 inch = 1,010 feet)



Tail Rotor/Boost Off Pattern Tracks at NOLF Santa Rosa
Course 090/270

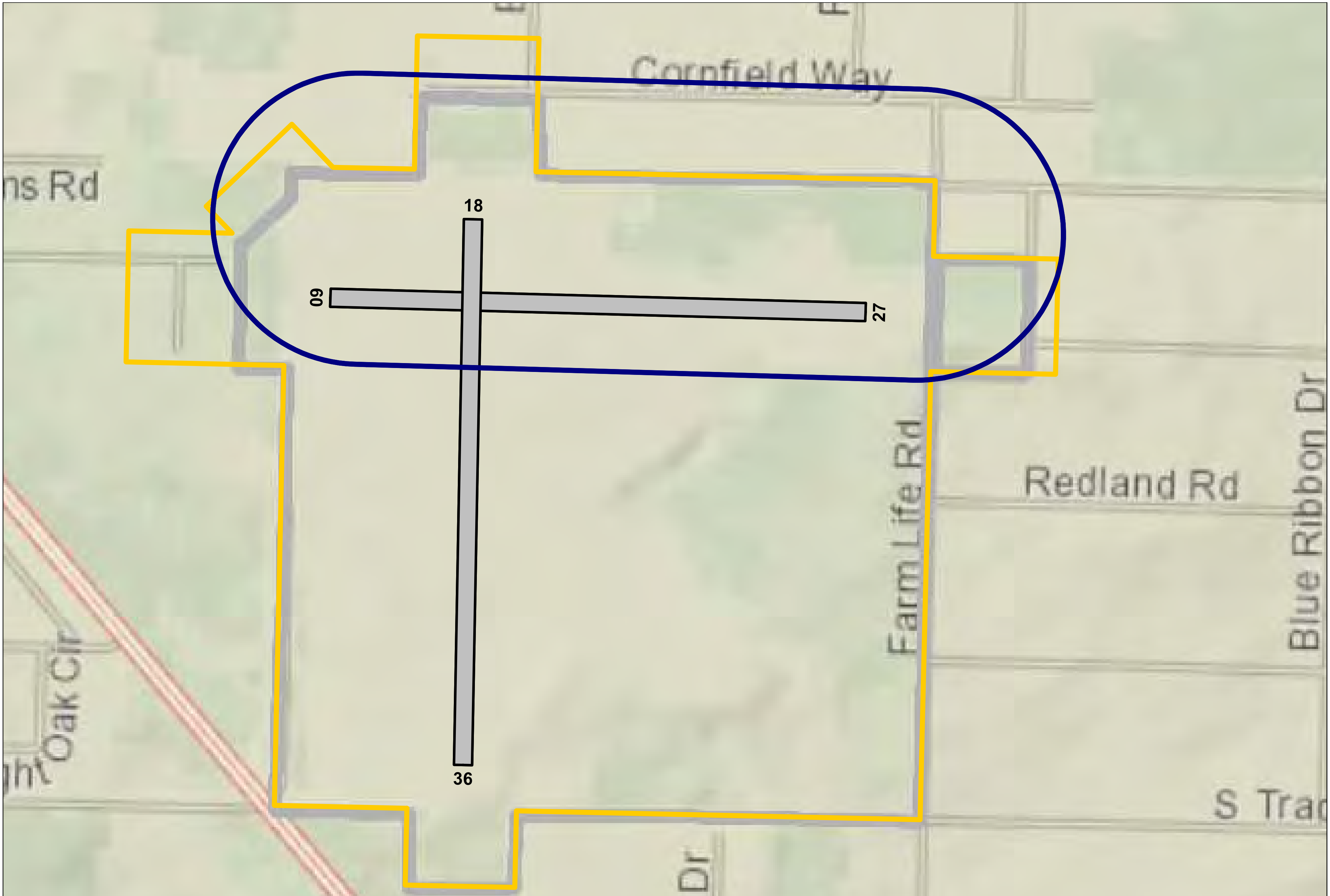
0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600 4,000 4,400

Scale in Feet 1:13,500 (1 inch = 1,120 feet)



High Speed Tactical Pattern Tracks at NOLF Santa Rosa - Course 180/360

Scale in Feet 1:14,600 (1 inch = 1,220 feet)



High Speed Tactical Pattern Tracks at NOLF Santa Rosa - Course 090/270

0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600 4,000

Scale in Feet 1:12,500 (1 inch = 1,040 feet)

N

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Appendix B: Representative Flight Profiles

The representative modeled flight profiles are depicted in the following section for each operational type. The representative profile is applicable to all tracks of the particular category (i.e. IFR Approach). These profiles were developed from the Rotary-Wing Operating Procedures Manual, the Fixed Wing Standard Operating Procedures Manual and pilot interviews. Flight profile descriptions vary between fixed-wing and rotary-wing aircraft. For fixed-wing aircraft, a flight profile consists of changes in aircraft power settings, altitudes above MSL, and airspeeds at defined points along a given flight track. For rotary-wing aircraft, a flight profile consists of changes in altitudes, airspeed, roll, pitch, and yaw angles along a given flight track. Site X is the location chosen for the helicopter flight profiles because all helicopter operation types are performed at Site X.

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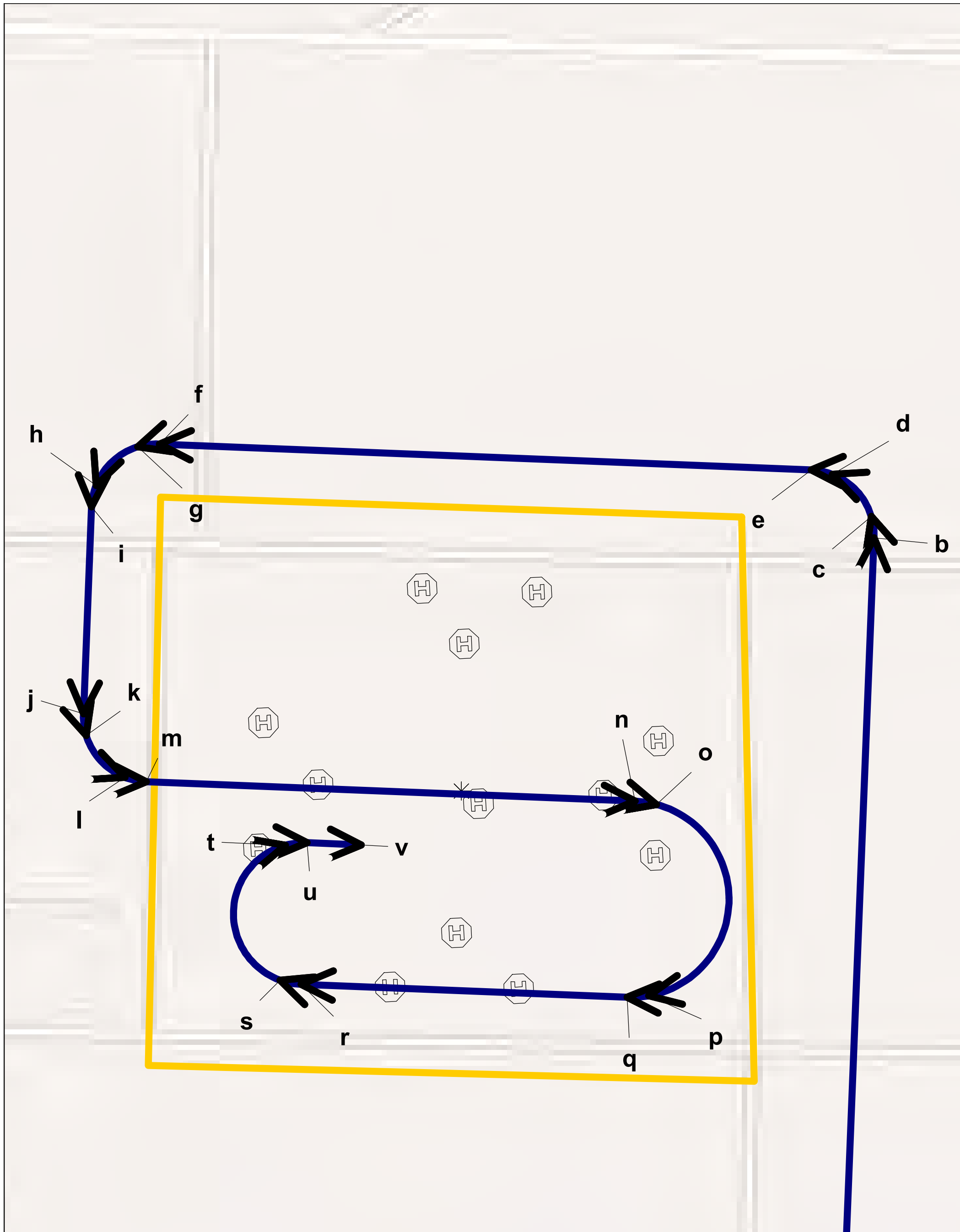


Flight Profile ArrE_090N

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Left Dispersion Width ft	Right Dispersion Width ft
a	38,396	700 AGL	100	0	0	0	0	0
b	23,597	700 AGL	100	0	0	0	0	0
c	23,397	700 AGL	100	0	0	12	0	0
d	22,854	700 AGL	100	0	0	12	0	0
e	22,654	700 AGL	100	0	0	0	0	0
f	16,654	700 AGL	100	0	0	0	0	0
g	16,454	700 AGL	100	0	0	12	0	0
h	15,912	700 AGL	100	0	0	12	0	0
i	15,712	700 AGL	100	0	0	0	0	0
j	13,812	700 AGL	100	0	0	0	0	0
k	13,612	700 AGL	100	0	0	12	0	0
l	13,069	700 AGL	100	0	0	12	0	0
m	12,869	600 AGL	70	0	0	0	0	0
n	8,369	600 AGL	70	0	0	0	0	0
o	8,169	600 AGL	70	0	0	-12	0	0
p	5,742	600 AGL	70	0	0	-12	0	0
q	5,542	600 AGL	70	0	0	0	0	0
r	2,542	600 AGL	70	0	0	0	0	0
s	2,342	554 AGL	65	0	0	-12	0	0
t	700	172 AGL	27	0	0	-12	0	0
u	500	126 AGL	22	0	0	0	0	0
v	0	10 AGL	10	0	0	0	0	0

Modeled Helicopter Flight Profile ArrE_090N

Arrival from East to Normal Side

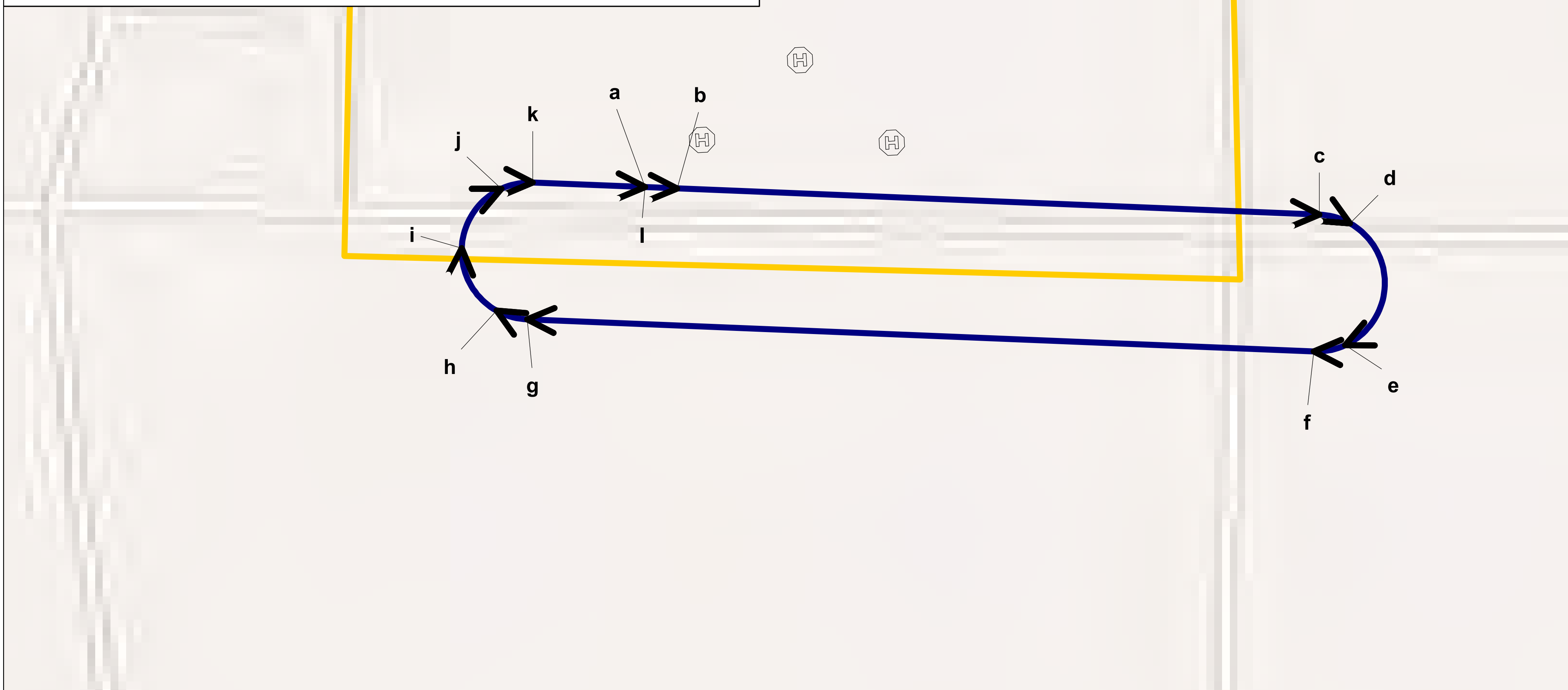
0 1,000 2,000 3,000 4,000 5,000 6,000

Scale in Feet 1:19,400 (1 inch = 1,620 feet)

N

Flight Profile AR90_090

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Left Dispersion Width ft	Right Dispersion Width ft
a	0	10 AGL	10	0	0	0	0	0
b	200	50 AGL	40	0	0	0	0	0
c	4,200	600 AGL	70	0	0	0	0	0
d	4,400	600 AGL	70	0	0	-12	0	0
e	5,335	600 AGL	70	0	0	-12	0	0
f	5,535	600 AGL	70	0	0	0	0	0
g	10,435	600 AGL	70	0	0	0	0	0
h	10,635	600 AGL	70	0	0	-12	0	0
i	11,103	600 AGL	70	0	0	-12	0	0
j	11,570	398 AGL	50	0	0	-12	0	0
k	11,770	312 AGL	41	0	0	0	0	0
l	12,470	10 AGL	10	0	0	0	0	0



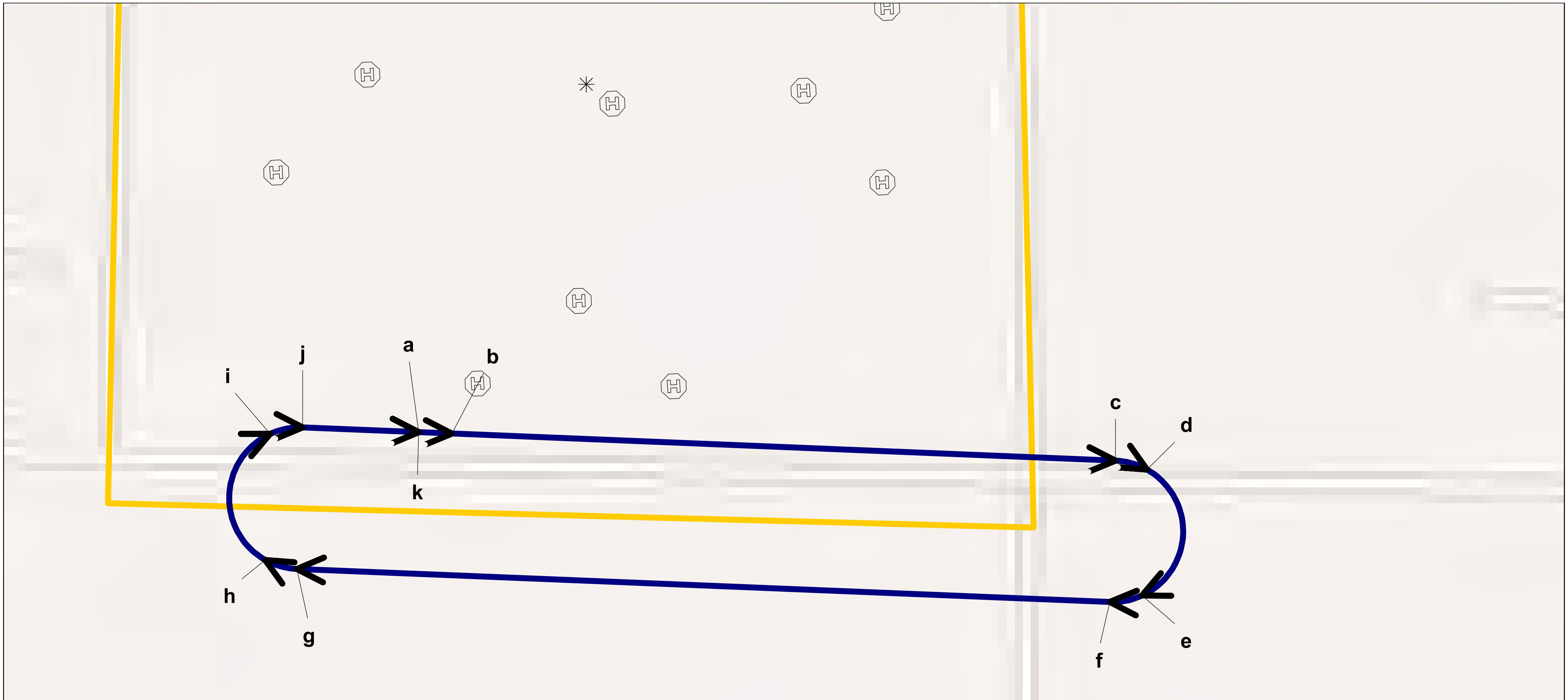
Modeled Helicopter Flight Profile AR90_090

90 Deg Autorotaion

0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600

Scale in Feet 1:11,200 (1 inch = 937 feet)

N



Flight Profile AR180_090

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Left Dispersion Width ft	Right Dispersion Width ft
a	0	10 AGL	10	0	0	0	0	0
b	200	50 AGL	40	0	0	0	0	0
c	4,200	600 AGL	70	0	0	0	0	0
d	4,400	600 AGL	70	0	0	-12	0	0
e	5,335	600 AGL	70	0	0	-12	0	0
f	5,535	600 AGL	70	0	0	0	0	0
g	10,435	600 AGL	70	0	0	0	0	0
h	10,635	542 AGL	64	0	0	-12	0	0
i	11,570	271 AGL	37	0	0	-12	0	0
j	11,770	213 AGL	31	0	0	0	0	0
k	12,470	10 AGL	10	0	0	0	0	0

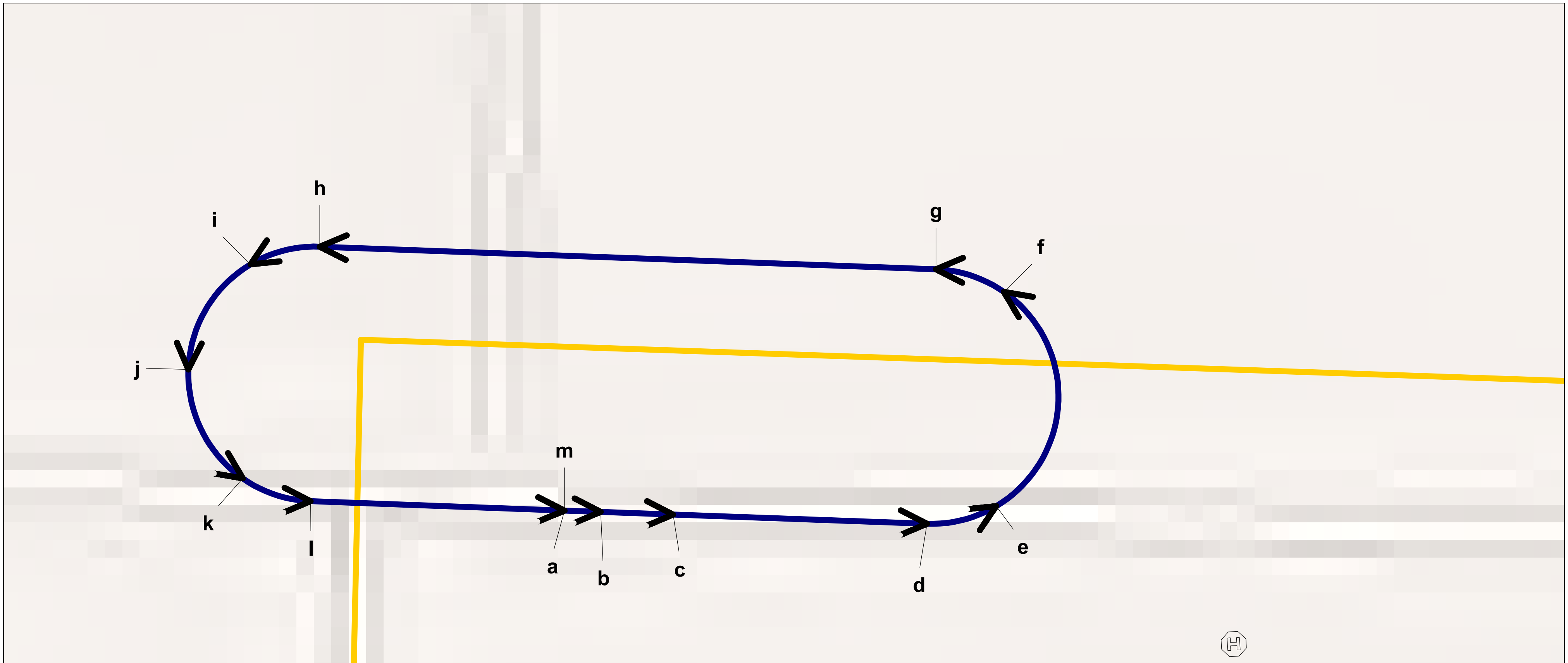
Modeled Helicopter Flight Profile AR180_090

180 Deg Autorotaion

0 400 800 1,200 1,600 2,000 2,400 2,800 3,200 3,600

Scale in Feet 1:10,800 (1 inch = 896 feet)

N



Flight Profile CLA_090

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Left Dispersion Width ft	Right Dispersion Width ft
a	0	10 AGL	10	0	0	0	0	0
b	100	35 AGL	19	0	0	0	0	0
c	300	86 AGL	38	0	0	0	0	0
d	1,000	400 AGL	80	0	0	0	0	0
e	1,200	400 AGL	80	0	0	12	0	0
f	1,900	400 AGL	80	0	0	12	0	0
g	2,100	400 AGL	80	0	0	0	0	0
h	3,800	400 AGL	80	0	0	0	0	0
i	4,000	382 AGL	65	0	0	12	0	0
j	4,350	350 AGL	57	0	0	12	0	0
k	4,699	318 AGL	50	0	0	12	0	0
l	4,899	300 AGL	45	0	0	0	0	0
m	5,599	10 AGL	10	0	0	0	0	0

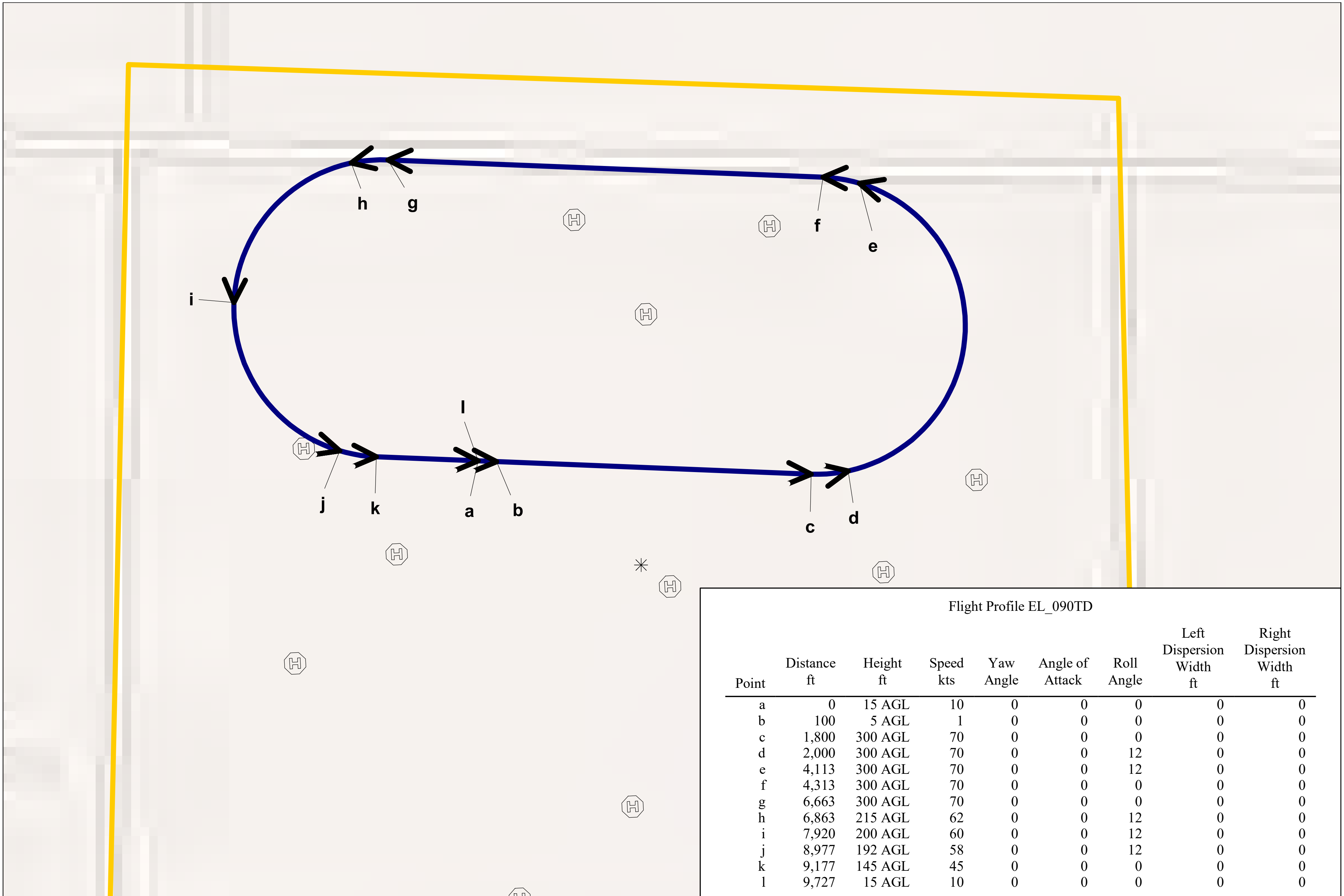
Modeled Helicopter Flight Profile CLA_090

Confined Landing Area

0 200 400 600 800 1,000 1,200 1,400 1,600

Scale in Feet 1:4,920 (1 inch = 410 feet)

N



Flight Profile EL_090TD

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Left Dispersion Width ft	Right Dispersion Width ft
a	0	15 AGL	10	0	0	0	0	0
b	100	5 AGL	1	0	0	0	0	0
c	1,800	300 AGL	70	0	0	0	0	0
d	2,000	300 AGL	70	0	0	12	0	0
e	4,113	300 AGL	70	0	0	12	0	0
f	4,313	300 AGL	70	0	0	0	0	0
g	6,663	300 AGL	70	0	0	0	0	0
h	6,863	215 AGL	62	0	0	12	0	0
i	7,920	200 AGL	60	0	0	12	0	0
j	8,977	192 AGL	58	0	0	12	0	0
k	9,177	145 AGL	45	0	0	0	0	0
l	9,727	15 AGL	10	0	0	0	0	0

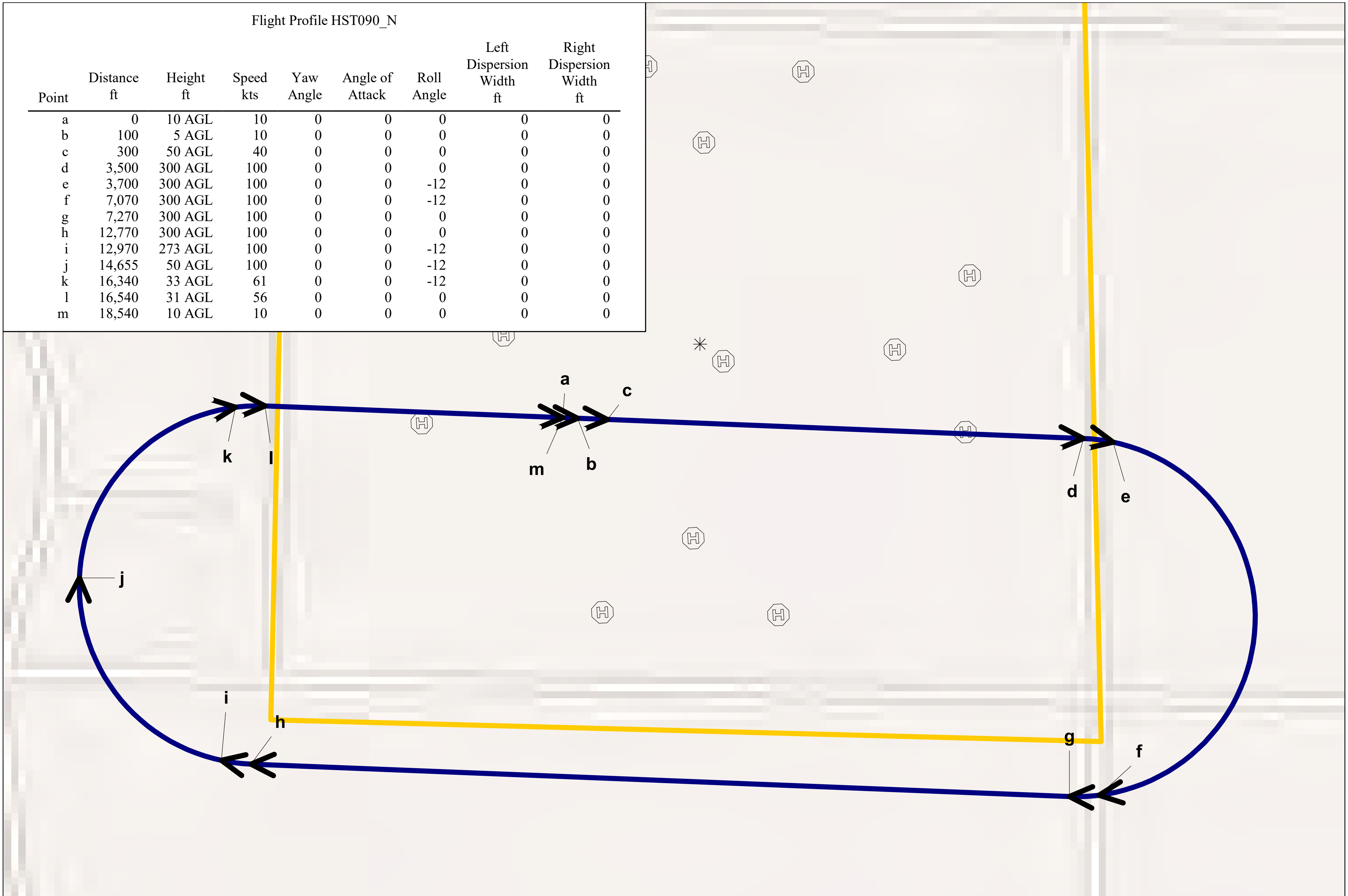
Modeled Helicopter Flight Profile EL_090TD

External Load on Tactical Duty

Scale in Feet 1:8,260 (1 inch = 689 feet)

Flight Profile HST090_N

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Left Dispersion Width ft	Right Dispersion Width ft
a	0	10 AGL	10	0	0	0	0	0
b	100	5 AGL	10	0	0	0	0	0
c	300	50 AGL	40	0	0	0	0	0
d	3,500	300 AGL	100	0	0	0	0	0
e	3,700	300 AGL	100	0	0	-12	0	0
f	7,070	300 AGL	100	0	0	-12	0	0
g	7,270	300 AGL	100	0	0	0	0	0
h	12,770	300 AGL	100	0	0	0	0	0
i	12,970	273 AGL	100	0	0	-12	0	0
j	14,655	50 AGL	100	0	0	-12	0	0
k	16,340	33 AGL	61	0	0	-12	0	0
l	16,540	31 AGL	56	0	0	0	0	0
m	18,540	10 AGL	10	0	0	0	0	0



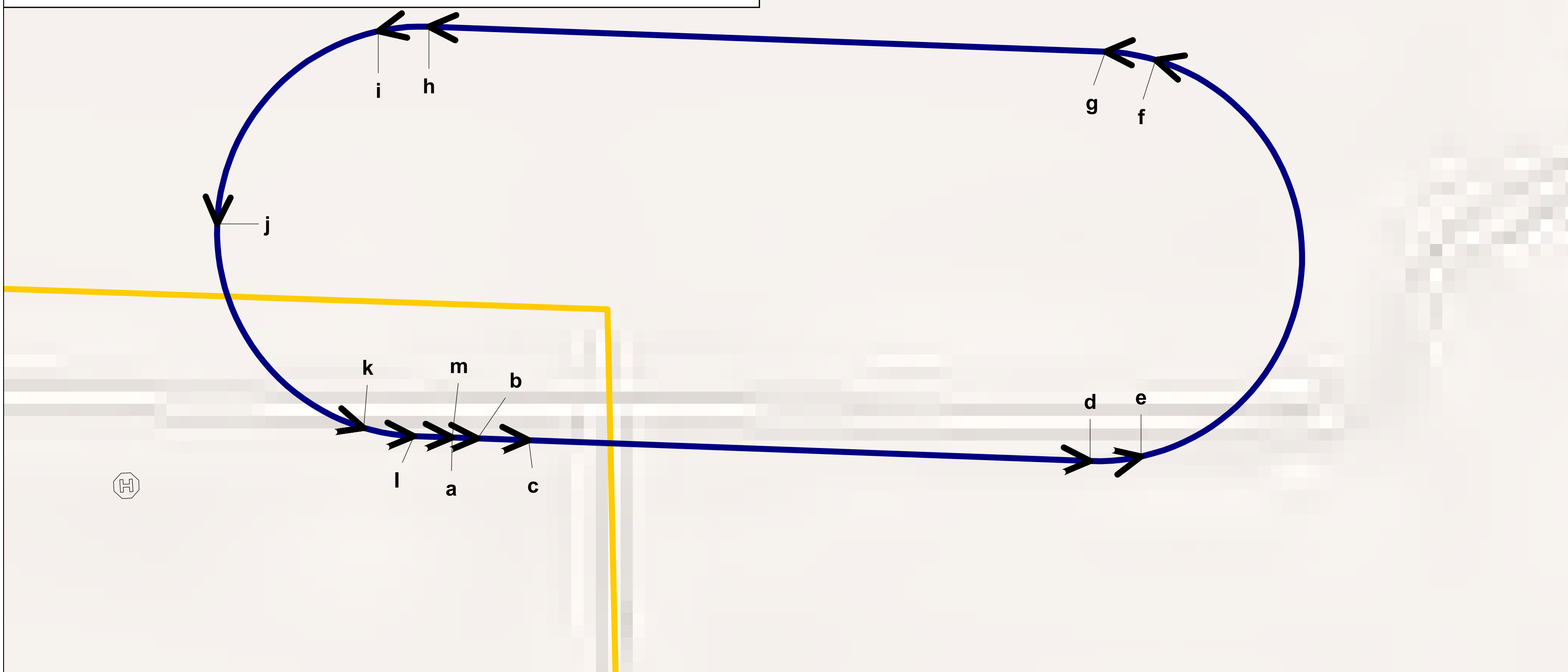
Modeled Helicopter Flight Profile HST090_N

High Speed Tactical Normal Side

Scale in Feet 1:10,300 (1 inch = 859 feet)

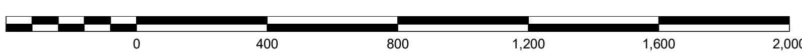
Flight Profile PinnA_090

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Left Dispersion Width ft	Right Dispersion Width ft
a	0	20 AGL	10	0	0	0	0	0
b	100	15 AGL	1	0	0	0	0	0
c	300	50 AGL	40	0	0	0	0	0
d	2,500	400 AGL	70	0	0	0	0	0
e	2,700	400 AGL	70	0	0	12	0	0
f	4,813	400 AGL	70	0	0	12	0	0
g	5,013	400 AGL	70	0	0	0	0	0
h	7,663	400 AGL	70	0	0	0	0	0
i	7,863	384 AGL	68	0	0	12	0	0
j	8,920	300 AGL	60	0	0	12	0	0
k	9,977	216 AGL	52	0	0	12	0	0
l	10,177	200 AGL	50	0	0	0	0	0
m	10,327	20 AGL	10	0	0	0	0	0

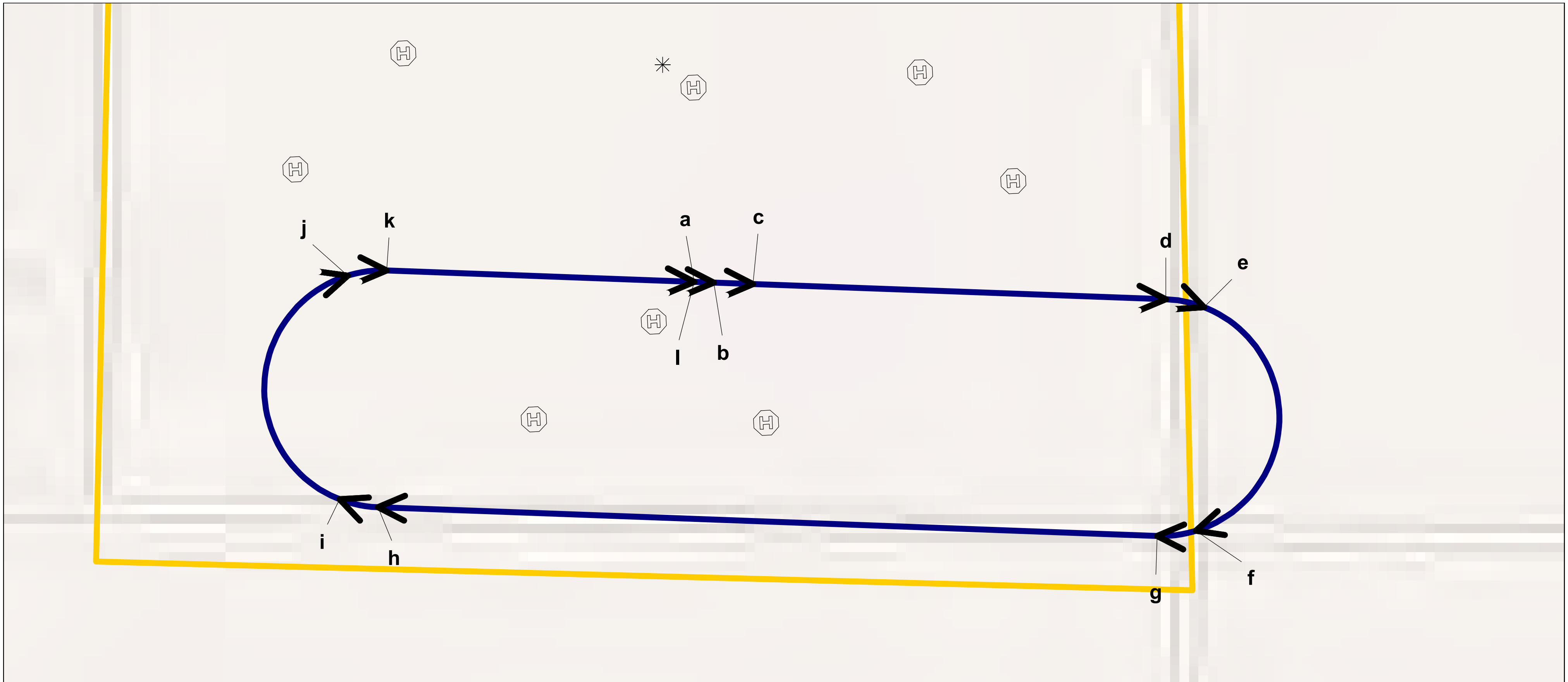


Modeled Helicopter Flight Profile PinnA_090

Pinnacle A



Scale in Feet 1:7,070 (1 inch = 589 feet)

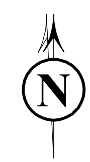


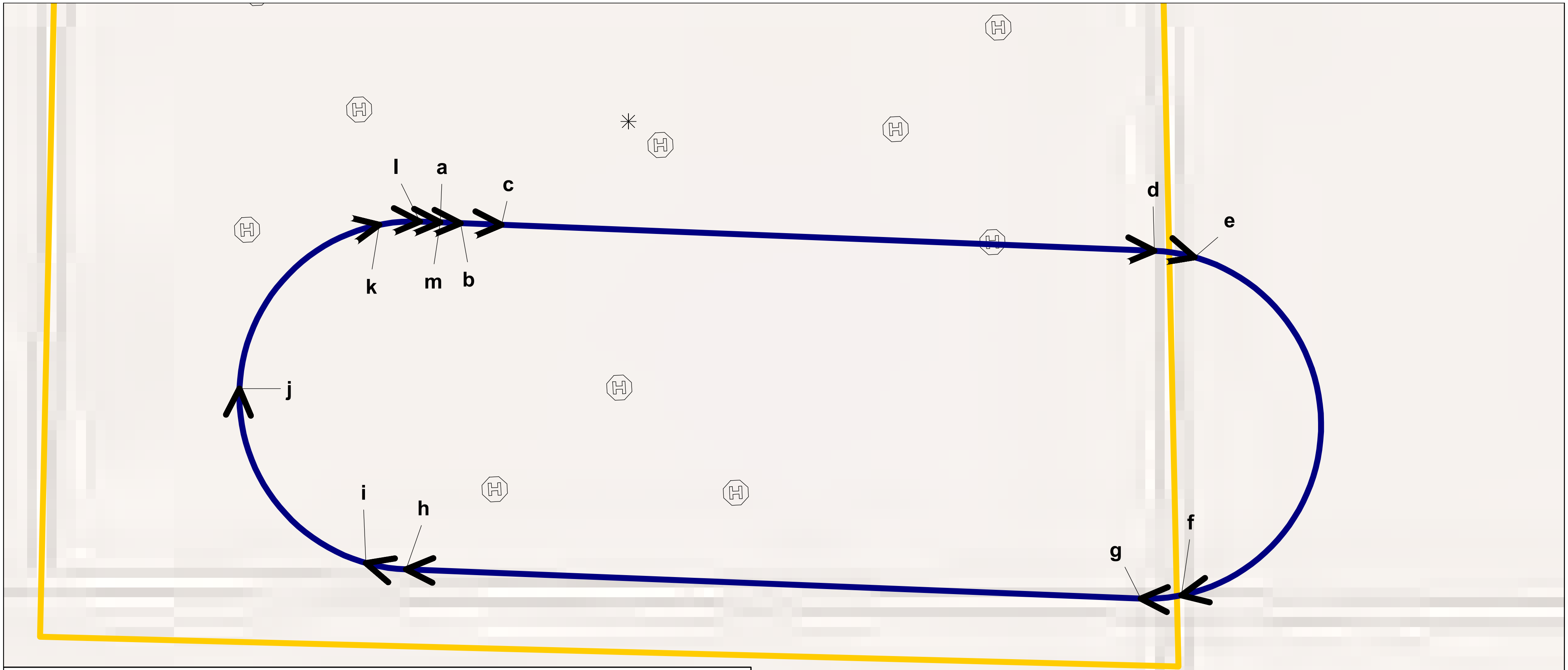
Flight Profile Std090_Sp1

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Left Dispersion Width ft	Right Dispersion Width ft
a	0	10 AGL	10	0	0	0	0	0
b	100	5 AGL	10	0	0	0	0	0
c	300	50 AGL	40	0	0	0	0	0
d	2,400	200 AGL	70	0	0	0	0	0
e	2,600	232 AGL	70	0	0	-12	0	0
f	4,085	468 AGL	70	0	0	-12	0	0
g	4,285	500 AGL	70	0	0	0	0	0
h	8,250	500 AGL	70	0	0	0	0	0
i	8,450	472 AGL	67	0	0	-12	0	0
j	9,935	261 AGL	41	0	0	-12	0	0
k	10,135	232 AGL	37	0	0	0	0	0
l	11,700	10 AGL	10	0	0	0	0	0

Modeled Helicopter Flight Profile Std090_Sp1
Standard Pattern

Scale in Feet 1:9,080 (1 inch = 757 feet)





Flight Profile TRBO_090N

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Left Dispersion Width ft	Right Dispersion Width ft
a	0	10 AGL	10	0	0	0	0	0
b	100	5 AGL	10	0	0	0	0	0
c	300	50 AGL	40	0	0	0	0	0
d	3,500	500 AGL	70	0	0	0	0	0
e	3,700	500 AGL	70	0	0	-12	0	0
f	5,970	500 AGL	70	0	0	-12	0	0
g	6,170	500 AGL	70	0	0	0	0	0
h	9,770	500 AGL	70	0	0	0	0	0
i	9,970	470 AGL	69	0	0	-12	0	0
j	11,106	300 AGL	60	0	0	-12	0	0
k	12,241	71 AGL	20	0	0	-12	0	0
l	12,441	30 AGL	13	0	0	0	0	0
m	12,541	10 AGL	10	0	0	0	0	0

Modeled Helicopter Flight Profile TRBO_090N

Tail Rotor/Boost Off

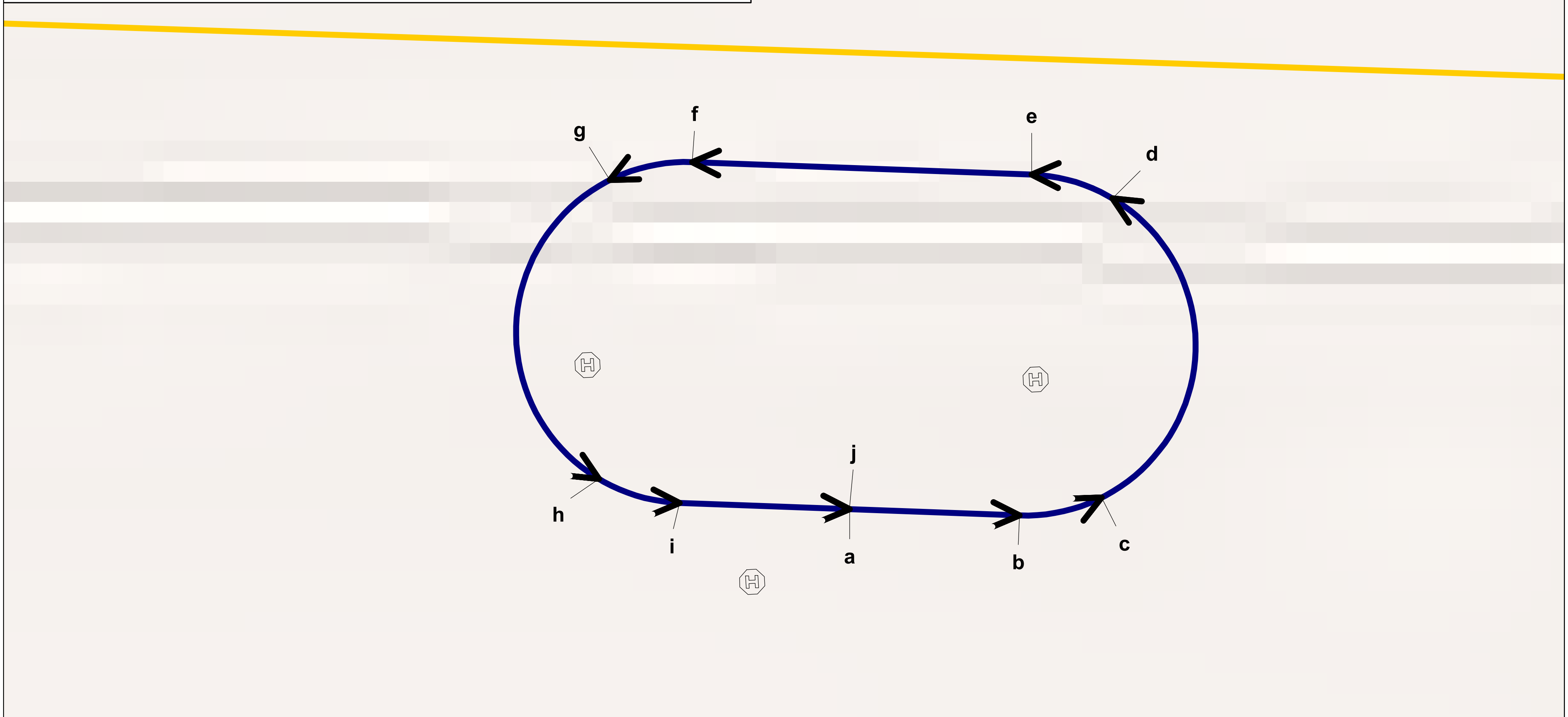
0 400 800 1,200 1,600 2,000 2,400 2,800

Scale in Feet 1:8,750 (1 inch = 729 feet)

N

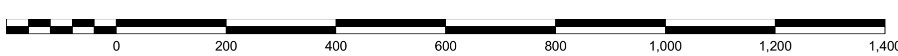
Flight Profile T_09_Sp1W

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Left Dispersion Width ft	Right Dispersion Width ft
a	0	10 AGL	10	0	0	0	0	0
b	400	200 AGL	80	0	0	0	0	0
c	600	200 AGL	80	0	0	12	0	0
d	1,457	200 AGL	80	0	0	12	0	0
e	1,657	200 AGL	80	0	0	0	0	0
f	2,457	200 AGL	80	0	0	0	0	0
g	2,657	177 AGL	72	0	0	12	0	0
h	3,513	79 AGL	35	0	0	12	0	0
i	3,713	56 AGL	27	0	0	0	0	0
j	4,113	10 AGL	10	0	0	0	0	0

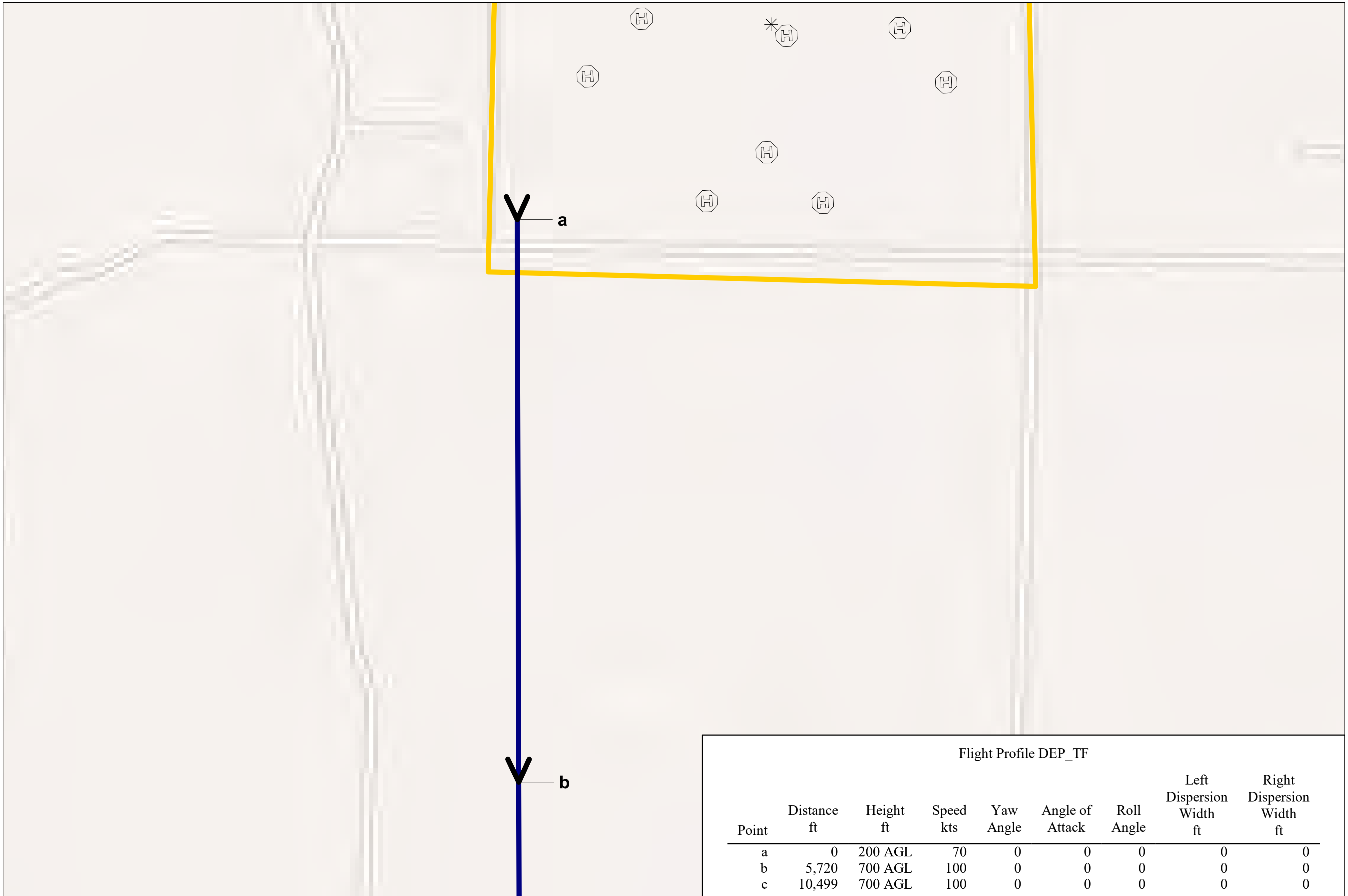


Modeled Helicopter Flight Profile T_09_Sp1W

Tactics Side



Scale in Feet 1:4,200 (1 inch = 350 feet)



Flight Profile DEP_TF

Point	Distance ft	Height ft	Speed kts	Yaw Angle	Angle of Attack	Roll Angle	Left Dispersion Width ft	Right Dispersion Width ft
a	0	200 AGL	70	0	0	0	0	0
b	5,720	700 AGL	100	0	0	0	0	0
c	10,499	700 AGL	100	0	0	0	0	0

Modeled Helicopter Flight Profile DEP_TF

Tree Field Departure

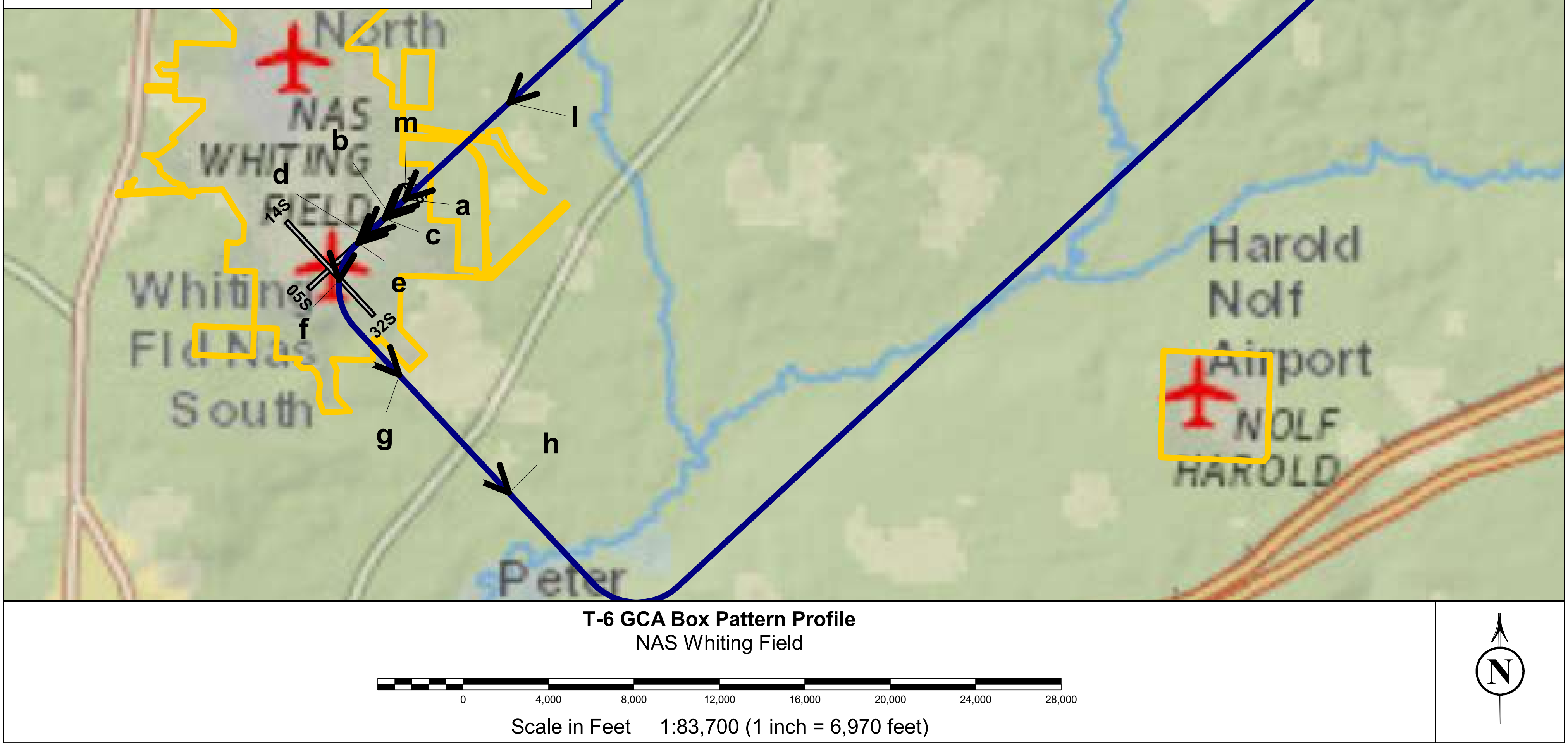
0 1,000 2,000 3,000 4,000 5,000

Scale in Feet 1:15,600 (1 inch = 1,300 feet)

N

Flight Profile 125

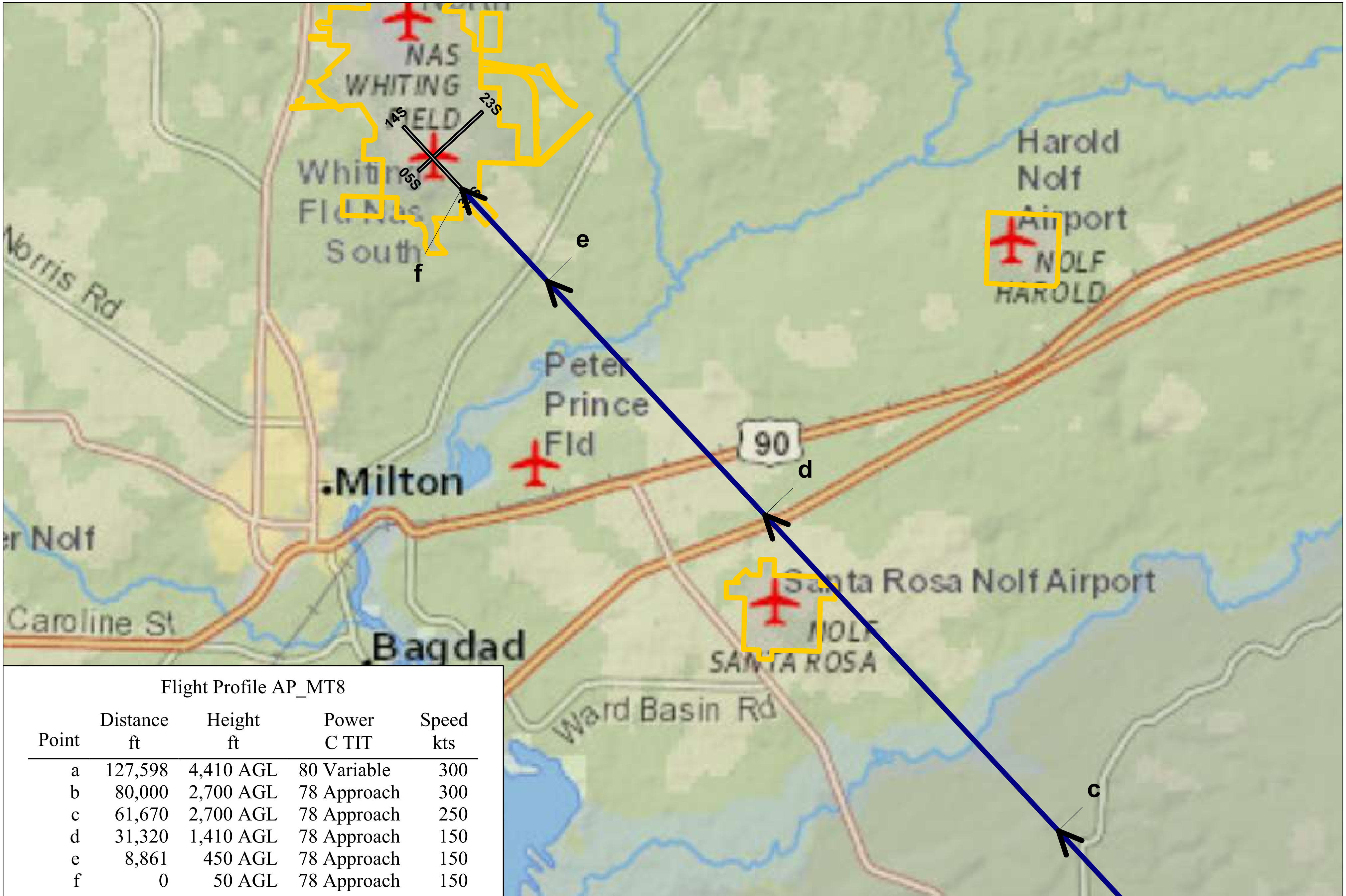
Point	Distance ft	Height ft	Power % Torque	Speed kts
a	0	50 AGL	24 Parallel	100
b	1,000	0 AGL	24 Parallel	80
c	1,300	0 AGL	100 Variable	80
d	2,500	0 AGL	100 Variable	100
e	3,000	100 AGL	100 Variable	120
f	5,000	400 AGL	100 Variable	140
g	10,455	1,000 AGL	100 Variable	140
h	18,000	1,000 AGL	69 Variable	200
i	96,066	1,000 AGL	52 Variable	150
j	106,978	1,000 AGL	34 Variable	110
k	113,126	1,000 AGL	34 Parallel	110
l	134,799	400 AGL	24 Parallel	100
m	141,477	50 AGL	24 Parallel	100



T-6 GCA Box Pattern Profile

NAS Whiting Field

Scale in Feet 1:83,700 (1 inch = 6,970 feet)



Flight Profile AP_MT8

Point	Distance ft	Height ft	Power C TIT	Speed kts
a	127,598	4,410 AGL	80 Variable	300
b	80,000	2,700 AGL	78 Approach	300
c	61,670	2,700 AGL	78 Approach	250
d	31,320	1,410 AGL	78 Approach	150
e	8,861	450 AGL	78 Approach	150
f	0	50 AGL	78 Approach	150

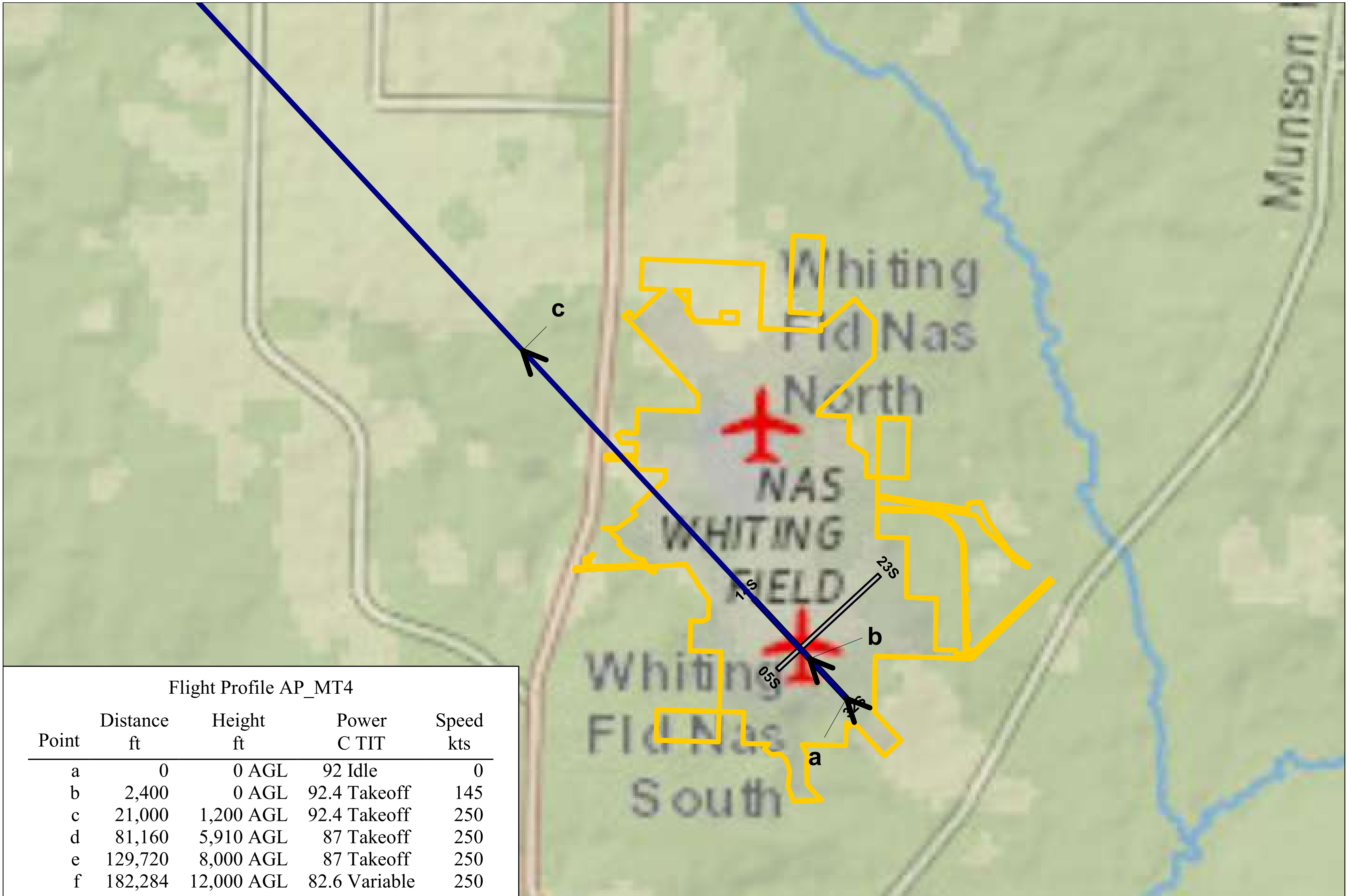
C-130E Straight-in Arrival

NAS Whiting Field

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 = 8,980 feet)

N



Flight Profile AP_MT4

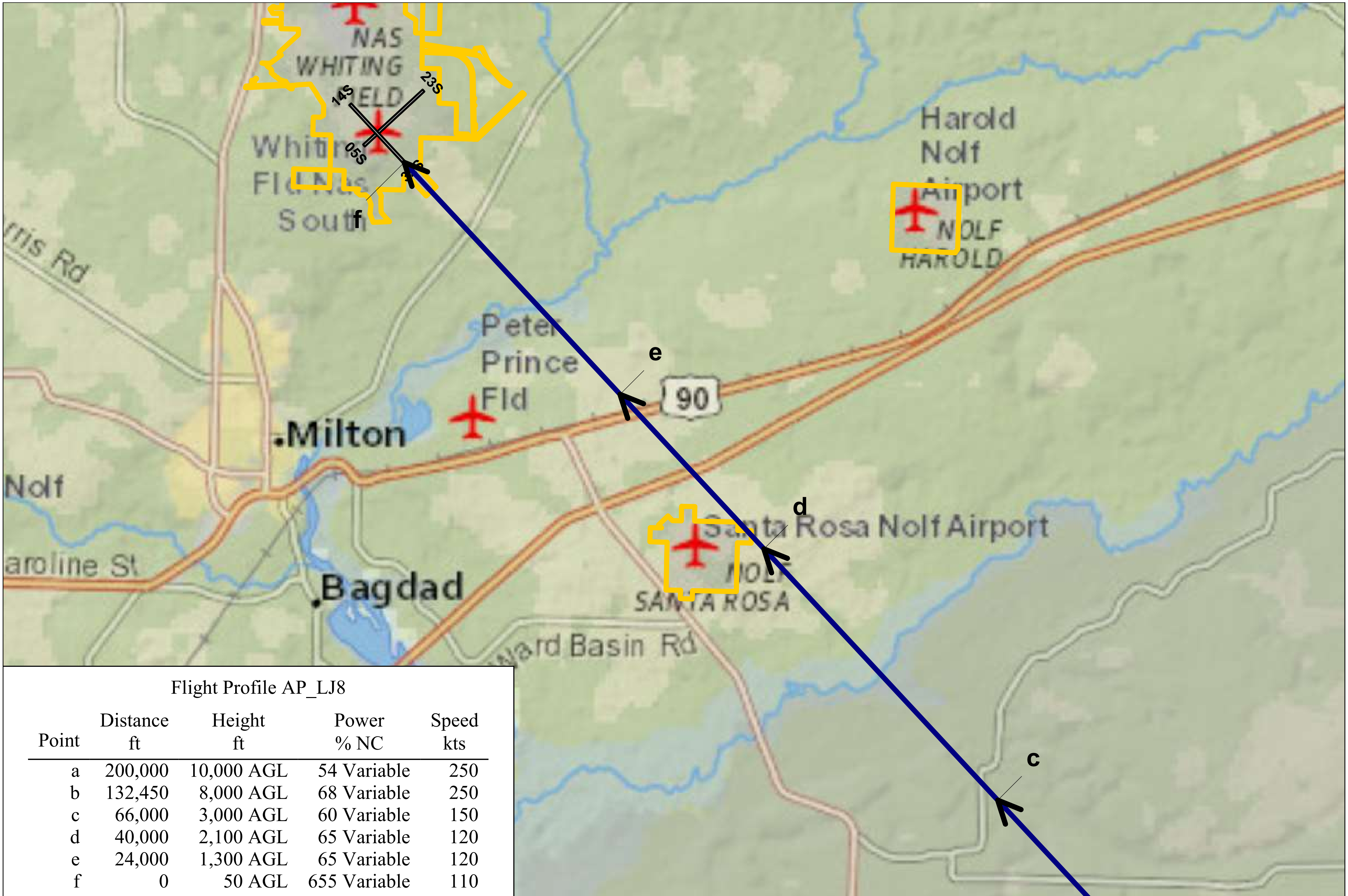
Point	Distance ft	Height ft	Power C TIT	Speed kts
a	0	0 AGL	92 Idle	0
b	2,400	0 AGL	92.4 Takeoff	145
c	21,000	1,200 AGL	92.4 Takeoff	250
d	81,160	5,910 AGL	87 Takeoff	250
e	129,720	8,000 AGL	87 Takeoff	250
f	182,284	12,000 AGL	82.6 Variable	250

C-130E Departure
NAS Whiting Field

0 4,000 8,000 12,000 16,000 20,000

Scale in Feet 1:67,800 (1 inch = 5,650 feet)

N



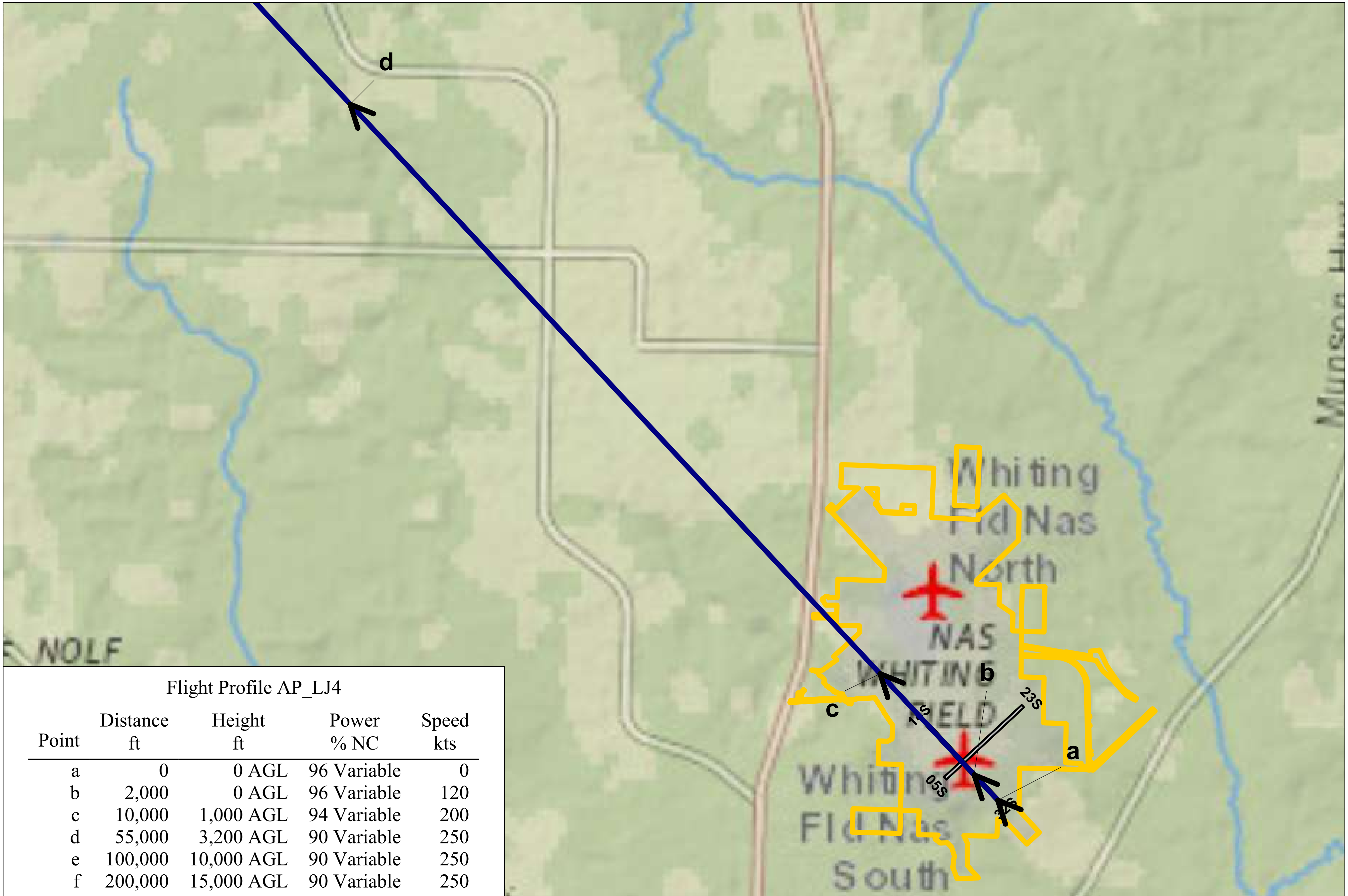
Flight Profile AP_LJ8

Point	Distance ft	Height ft	Power % NC	Speed kts
a	200,000	10,000 AGL	54 Variable	250
b	132,450	8,000 AGL	68 Variable	250
c	66,000	3,000 AGL	60 Variable	150
d	40,000	2,100 AGL	65 Variable	120
e	24,000	1,300 AGL	65 Variable	120
f	0	50 AGL	655 Variable	110

C-21A Straight-in Arrival
NAS Whiting Field

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000 32,000 36,000 40,000

Scale in Feet 1:116,000 (1 inch = 9,680 feet)



Flight Profile AP_LJ4

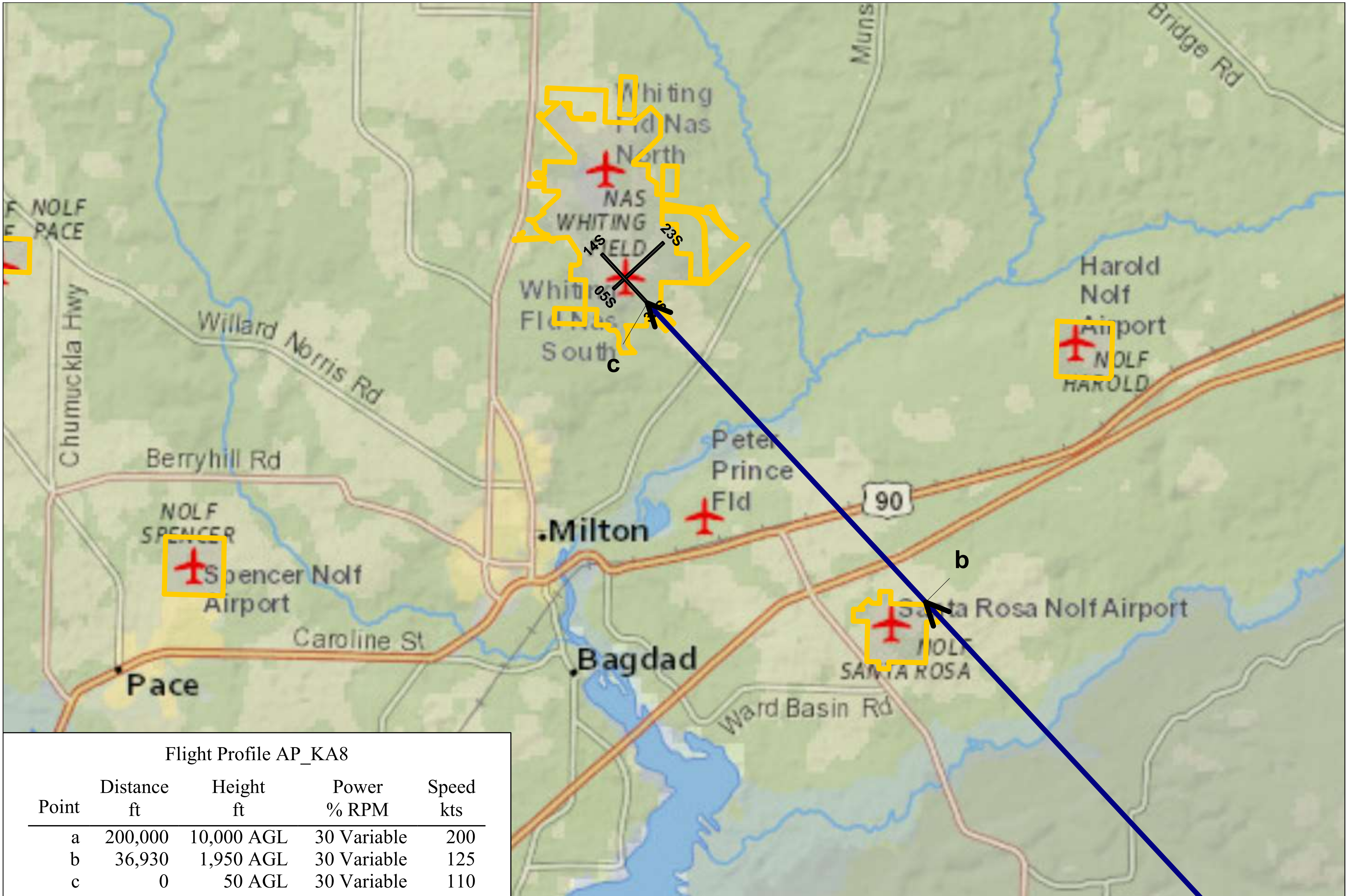
Point	Distance ft	Height ft	Power % NC	Speed kts
a	0	0 AGL	96 Variable	0
b	2,000	0 AGL	96 Variable	120
c	10,000	1,000 AGL	94 Variable	200
d	55,000	3,200 AGL	90 Variable	250
e	100,000	10,000 AGL	90 Variable	250
f	200,000	15,000 AGL	90 Variable	250

C-21A Departure
NAS Whiting Field

0 4,000 8,000 12,000 16,000 20,000 24,000 28,000

Scale in Feet 1:88,700 (1 inch = 7,400 feet)

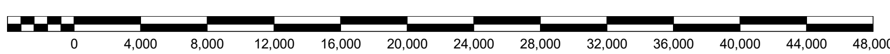
N



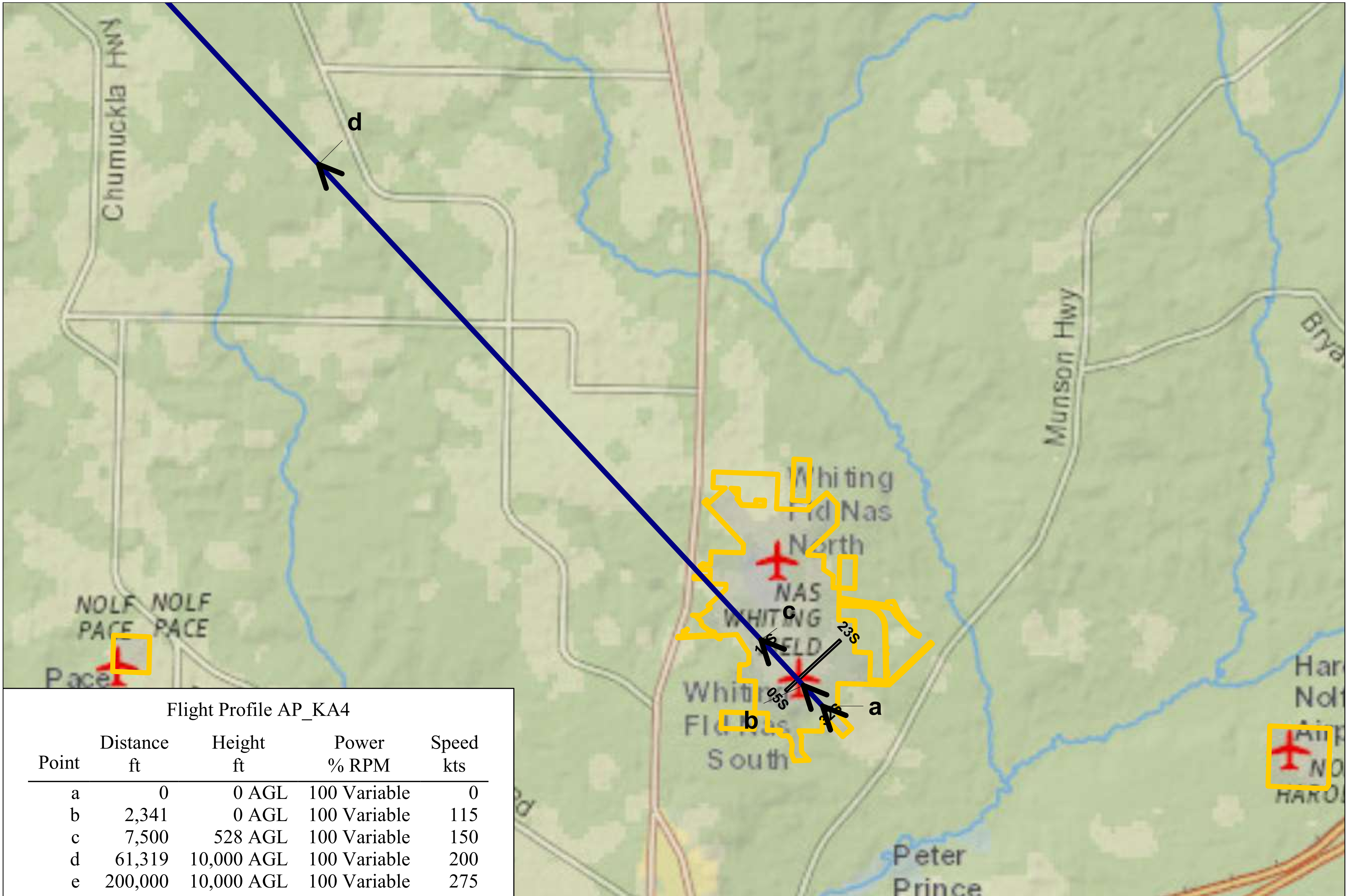
Flight Profile AP_KA8

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	200,000	10,000 AGL	30 Variable	200
b	36,930	1,950 AGL	30 Variable	125
c	0	50 AGL	30 Variable	110

T-44 Straight-in Arrival
NAS Whiting Field



Scale in Feet 1:139,000 (1 inch = 11,500 feet)



Flight Profile AP_KA4

Point	Distance ft	Height ft	Power % RPM	Speed kts
a	0	0 AGL	100 Variable	0
b	2,341	0 AGL	100 Variable	115
c	7,500	528 AGL	100 Variable	150
d	61,319	10,000 AGL	100 Variable	200
e	200,000	10,000 AGL	100 Variable	275

T-44 Departure
NAS Whiting Field

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 1:127,000 (1 inch = 10,600 feet)

N

Appendix C: Distribution of Operations

Flight operation numbers are distributed among the flight tracks and corresponding flight profiles based on operational type frequencies and runway utilizations. Combining these factors together, the average annual tempo of daily flight operations was developed and are provided in the following tables.

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Appendix C-1

NAS Whiting Field South

Distribution of Operations

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South Whiting Field Annual Average Daily Helicopter Flight Events for Baseline and No Action										
Track Type	Runway		Track		Profile			Average Annual Day Events		
	ID	% Use	ID	% Use	ID	% Day	% Night	Acoustic Day	Acoustic Night	Total
Departure	05S	18.3%	Sp1N_DA	40.00%	D01	98.00%	2.00%	5.582	0.114	5.696
			Sp1N_DB	60.00%	D02	98.00%	2.00%	8.374	0.171	8.544
	14S	27.7%	Sp1E_DA	10.00%	D03	98.00%	2.00%	2.112	0.043	2.156
			Sp1E_DB	15.00%	D04	98.00%	2.00%	3.169	0.065	3.233
			Sp2E_DA	30.00%	D05	98.00%	2.00%	6.337	0.129	6.467
			Sp2E_DB	45.00%	D06	98.00%	2.00%	9.506	0.194	9.700
	23S	13.9%	Sp1S_DA	30.00%	D07	98.00%	2.00%	3.180	0.065	3.245
			Sp1S_DB	45.00%	D08	98.00%	2.00%	4.770	0.097	4.868
			Sp2S_DA	10.00%	D09	98.00%	2.00%	1.060	0.022	1.082
			Sp2S_DB	15.00%	D10	98.00%	2.00%	1.590	0.032	1.623
	32S	40.1%	Sp4W_DA	40.00%	D11	98.00%	2.00%	12.232	0.250	12.482
			Sp4W_DB	60.00%	D12	98.00%	2.00%	18.349	0.374	18.723
	05S	18.3%	Sp1N_INST	100.00%	D13	98.00%	2.00%	1.938	0.040	1.978
	14S	27.7%	Sp4E_INST	100.00%	D14	98.00%	2.00%	2.934	0.060	2.994
	23S	13.9%	Sp1S_INST	100.00%	D15	98.00%	2.00%	1.472	0.030	1.502
	32S	40.1%	Sp4W_INST	100.00%	D16	98.00%	2.00%	4.247	0.087	4.334
Departure Total								**86.854**	**1.773**	**88.626**
Arrival	05S	18.3%	SP1N_AB	11.25%	A01	94.00%	6.00%	1.715	0.109	1.825
			SP1N_AC	25.50%	A02	94.00%	6.00%	3.888	0.248	4.136
			SP1N_AI	38.25%	A03	94.00%	6.00%	5.831	0.372	6.204
			SP2N_AB	1.88%	A04	94.00%	6.00%	0.286	0.018	0.304
			SP2N_AC	4.25%	A05	94.00%	6.00%	0.648	0.041	0.689
			SP2N_AI	6.38%	A06	94.00%	6.00%	0.972	0.062	1.034
			SP3N_AB	1.88%	A07	94.00%	6.00%	0.286	0.018	0.304
			SP3N_AC	4.25%	A08	94.00%	6.00%	0.648	0.041	0.689
			SP3N_AI	6.38%	A09	94.00%	6.00%	0.972	0.062	1.034
	14S	27.7%	SP4E_AB	15.00%	A10	94.00%	6.00%	3.461	0.221	3.682
			SP4E_AC	34.00%	A11	94.00%	6.00%	7.846	0.501	8.347
			SP4E_AI	51.00%	A12	94.00%	6.00%	11.769	0.751	12.520
	23S	13.9%	SP4S_AB	15.00%	A13	94.00%	6.00%	1.737	0.111	1.848
			SP4S_AC	34.00%	A14	94.00%	6.00%	3.937	0.251	4.188
			SP4S_AI	51.00%	A15	94.00%	6.00%	5.906	0.377	6.283
	32S	40.1%	SP1W_AB	11.25%	A16	94.00%	6.00%	3.758	0.240	3.998
			SP1W_AC	25.50%	A17	94.00%	6.00%	8.519	0.544	9.062
			SP1W_AI	38.25%	A18	94.00%	6.00%	12.778	0.816	13.594
			SP2W_AB	3.75%	A19	94.00%	6.00%	1.253	0.080	1.333
			SP2W_AC	8.50%	A20	94.00%	6.00%	2.840	0.181	3.021
			SP2W_AI	12.75%	A21	94.00%	6.00%	4.259	0.272	4.531
Arrival Total								**83.308**	**5.318**	**88.626**

South Whiting Field Annual Average Daily Helicopter Flight Events for Baseline and No Action										
Track Type	Runway		Track		Profile			Average Annual Day Events		
	ID	% Use	ID	% Use	ID	% Day	% Night	Acoustic Day	Acoustic Night	Total
Pattern	05S	18.3%	Sp1N_Pat	100.00%	P01	90.00%	10.00%	5.340	0.593	5.934
	14S	27.7%	Sp4E_Pat	100.00%	P02	90.00%	10.00%	8.083	0.898	8.981
	23S	13.9%	Sp1S_Pat	100.00%	P03	90.00%	10.00%	4.056	0.451	4.507
	32S	40.1%	Sp4W_Pat	100.00%	P04	90.00%	10.00%	11.702	1.300	13.002
							Pattern Total	**29.182**	**3.242**	**32.424**
							TOTAL	**199.344**	**10.333**	**209.676**

South Whiting Field Annual Average Daily T-6 Flight Operations for Baseline and No Action										
Track Type	Runway		Track		Profile			Average Annual Day Events		
	ID	% Use	ID	% Use	ID	% Day	% Night	Acoustic Day	Acoustic Night	Total
GCA	23S	50%	SGCA1	100.00%	G01	99.00%	1.00%	3.210	0.032	3.242
	32S	50%	SGCA2	100.00%	G02	99.00%	1.00%	3.210	0.032	3.242
							Pattern Total	**6.420**	**0.065**	**6.485**
							TOTAL	**6.420**	**0.065**	**6.485**

South Whiting Field Annual Average Daily Aviation Park Flight Operations for Baseline and No Action										
Track Type	Runway		Track		Profile			Average Annual Day Events		
	ID	% Use	ID	% Use	ID	% Day	% Night	Acoustic Day	Acoustic Night	Total
Departure	05S	18.3%	D01	100.00%	D01	100.00%	0.00%	4.713	0.000	4.713
	14S	27.7%	D02	100.00%	D02	100.00%	0.00%	7.134	0.000	7.134
	23S	13.9%	D03	100.00%	D03	100.00%	0.00%	3.580	0.000	3.580
	32S	40.1%	D04	100.00%	D04	100.00%	0.00%	10.327	0.000	10.327
							Departure Total	**25.753**	**0.000**	**25.753**
Arrival	05S	18.3%	A01	100.00%	A01	100.00%	0.00%	4.713	0.000	4.713
	14S	27.7%	A02	100.00%	A02	100.00%	0.00%	7.134	0.000	7.134
	23S	13.9%	A03	100.00%	A03	100.00%	0.00%	3.580	0.000	3.580
	32S	40.1%	A04	100.00%	A04	100.00%	0.00%	10.327	0.000	10.327
							Arrival Total	**25.753**	**0.000**	**25.753**
							TOTAL	**51.507**	**0.000**	**51.507**

South Whiting Field Annual Average Daily Helicopter Flight Events for Proposed Action										
Track Type	Runway		Track		Profile			Average Annual Day Events		
	ID	% Use	ID	% Use	ID	% Day	% Night	Acoustic Day	Acoustic Night	Total
Departure	05S	18.3%	Sp1N_DA	40.00%	D01	98.00%	2.00%	6.810	0.139	6.949
			Sp1N_DB	60.00%	D02	98.00%	2.00%	10.216	0.208	10.424
	14S	27.7%	Sp1E_DA	10.00%	D03	98.00%	2.00%	2.577	0.053	2.630
			Sp1E_DB	15.00%	D04	98.00%	2.00%	3.866	0.079	3.945
			Sp2E_DA	30.00%	D05	98.00%	2.00%	7.732	0.158	7.889
			Sp2E_DB	45.00%	D06	98.00%	2.00%	11.597	0.237	11.834
	23S	13.9%	Sp1S_DA	30.00%	D07	98.00%	2.00%	3.880	0.079	3.959
			Sp1S_DB	45.00%	D08	98.00%	2.00%	5.820	0.119	5.938
			Sp2S_DA	10.00%	D09	98.00%	2.00%	1.293	0.026	1.320
			Sp2S_DB	15.00%	D10	98.00%	2.00%	1.940	0.040	1.979
	32S	40.1%	Sp4W_DA	40.00%	D11	98.00%	2.00%	14.923	0.305	15.228
			Sp4W_DB	60.00%	D12	98.00%	2.00%	22.385	0.457	22.842
	05S	18.3%	Sp1N_INST	100.00%	D13	98.00%	2.00%	2.365	0.048	2.413
	14S	27.7%	Sp4E_INST	100.00%	D14	98.00%	2.00%	3.579	0.073	3.652
	23S	13.9%	Sp1S_INST	100.00%	D15	98.00%	2.00%	1.796	0.037	1.833
	32S	40.1%	Sp4W_INST	100.00%	D16	98.00%	2.00%	5.182	0.106	5.288
							Departure Total	**105.961**	**2.162**	**108.124**
Arrival	05S	18.3%	SP1N_AB	11.25%	A01	94.00%	6.00%	2.092	0.134	2.226
			SP1N_AC	25.50%	A02	94.00%	6.00%	4.743	0.303	5.046
			SP1N_AI	38.25%	A03	94.00%	6.00%	7.114	0.454	7.568
			SP2N_AB	1.88%	A04	94.00%	6.00%	0.349	0.022	0.371
			SP2N_AC	4.25%	A05	94.00%	6.00%	0.790	0.050	0.841
			SP2N_AI	6.38%	A06	94.00%	6.00%	1.186	0.076	1.261
			SP3N_AB	1.88%	A07	94.00%	6.00%	0.349	0.022	0.371
			SP3N_AC	4.25%	A08	94.00%	6.00%	0.790	0.050	0.841
			SP3N_AI	6.38%	A09	94.00%	6.00%	1.186	0.076	1.261
	14S	27.7%	SP4E_AB	15.00%	A10	94.00%	6.00%	4.223	0.270	4.493
			SP4E_AC	34.00%	A11	94.00%	6.00%	9.572	0.611	10.183
			SP4E_AI	51.00%	A12	94.00%	6.00%	14.358	0.916	15.275
	23S	13.9%	SP4S_AB	15.00%	A13	94.00%	6.00%	2.119	0.135	2.254
			SP4S_AC	34.00%	A14	94.00%	6.00%	4.803	0.307	5.110
			SP4S_AI	51.00%	A15	94.00%	6.00%	7.205	0.460	7.665
	32S	40.1%	SP1W_AB	11.25%	A16	94.00%	6.00%	4.585	0.293	4.878
			SP1W_AC	25.50%	A17	94.00%	6.00%	10.393	0.663	11.056
			SP1W_AI	38.25%	A18	94.00%	6.00%	15.589	0.995	16.584
			SP2W_AB	3.75%	A19	94.00%	6.00%	1.528	0.098	1.626
			SP2W_AC	8.50%	A20	94.00%	6.00%	3.464	0.221	3.685
			SP2W_AI	12.75%	A21	94.00%	6.00%	5.196	0.332	5.528
							Arrival Total	**101.636**	**6.487**	**108.124**

South Whiting Field Annual Average Daily Helicopter Flight Events for Proposed Action										
Track Type	Runway		Track		Profile			Average Annual Day Events		
	ID	% Use	ID	% Use	ID	% Day	% Night	Acoustic Day	Acoustic Night	Total
Pattern	05S	18.3%	Sp1N_Pat	100.00%	P01	90.00%	10.00%	6.515	0.724	7.239
	14S	27.7%	Sp4E_Pat	100.00%	P02	90.00%	10.00%	9.862	1.096	10.957
	23S	13.9%	Sp1S_Pat	100.00%	P03	90.00%	10.00%	4.949	0.550	5.498
	32S	40.1%	Sp4W_Pat	100.00%	P04	90.00%	10.00%	14.276	1.586	15.863
							Pattern Total	**35.602**	**3.956**	**39.557**
							TOTAL	**243.199**	**12.606**	**255.805**

South Whiting Field Annual Average Daily T-6 Flight Operations for Proposed Action										
Track Type	Runway		Track		Profile			Average Annual Day Events		
	ID	% Use	ID	% Use	ID	% Day	% Night	Acoustic Day	Acoustic Night	Total
GCA	23S	50%	SGCA1	100.00%	G01	99.00%	1.00%	3.916	0.040	3.956
	32S	50%	SGCA2	100.00%	G02	99.00%	1.00%	3.916	0.040	3.956
							Pattern Total	**7.832**	**0.079**	**7.911**
							TOTAL	**7.832**	**0.079**	**7.911**

South Whiting Field Annual Average Daily Aviation Park Flight Operations for Proposed Action										
Track Type	Runway		Track		Profile			Average Annual Day Events		
	ID	% Use	ID	% Use	ID	% Day	% Night	Acoustic Day	Acoustic Night	Total
Departure	05S	18.3%	D01	100.00%	D01	100.00%	0.00%	5.750	0.000	5.750
	14S	27.7%	D02	100.00%	D02	100.00%	0.00%	8.703	0.000	8.703
	23S	13.9%	D03	100.00%	D03	100.00%	0.00%	4.367	0.000	4.367
	32S	40.1%	D04	100.00%	D04	100.00%	0.00%	12.599	0.000	12.599
							Departure Total	**31.419**	**0.000**	**31.419**
Arrival	05S	18.3%	A01	100.00%	A01	100.00%	0.00%	5.750	0.000	5.750
	14S	27.7%	A02	100.00%	A02	100.00%	0.00%	8.703	0.000	8.703
	23S	13.9%	A03	100.00%	A03	100.00%	0.00%	4.367	0.000	4.367
	32S	40.1%	A04	100.00%	A04	100.00%	0.00%	12.599	0.000	12.599
							Arrival Total	**31.419**	**0.000**	**31.419**
							TOTAL	**62.838**	**0.000**	**62.838**

Appendix C-2
NOLF Spencer
Distribution of Operations

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NOLF Spencer Helicopter Annual Average Daily Flight Operations for Baseline									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Arr.	East	28%	ARR_E_01L	40%	100%	0%	1.940	0.000	1.940
			ARR_E_01R	60%	100%	0%	2.910	0.000	2.910
	North	31%	ARR_N_01L	40%	100%	0%	2.165	0.000	2.165
			ARR_N_01R	60%	100%	0%	3.247	0.000	3.247
	South	25%	ARR_S_01L	60%	100%	0%	2.625	0.000	2.625
			ARR_S_01R	40%	100%	0%	1.750	0.000	1.750
	West	17%	ARR_W_01L	60%	100%	0%	1.761	0.000	1.761
			ARR_W_01R	40%	100%	0%	1.174	0.000	1.174
								Arrival Subtotal	17.570
Dep.	ALL	100%	DEP_01	10%	100%	0%	1.757	0.000	1.757
			DEP_02	90%	100%	0%	15.813	0.000	15.813
								Departure Subtotal	17.570
90° Auto-rotation	East	28%	CAR90_E01	40%	100%	0%	7.759	0.000	7.759
			CAR90_E02	60%	100%	0%	11.638	0.000	11.638
	North	31%	CAR90_N01	40%	100%	0%	8.659	0.000	8.659
			CAR90_N02	60%	100%	0%	12.988	0.000	12.988
	South	25%	CAR90_S01	40%	100%	0%	10.500	0.000	10.500
			CAR90_S02	60%	100%	0%	7.000	0.000	7.000
	West	17%	CAR90_W01	40%	100%	0%	7.042	0.000	7.042
			CAR90_W02	60%	100%	0%	4.695	0.000	4.695
								90° Autorotation Subtotal	70.281
180° Auto-rotation	East	28%	CAR180_E01	40%	100%	0%	7.759	0.000	7.759
			CAR180_E02	60%	100%	0%	11.638	0.000	11.638
	North	31%	CAR180_N01	40%	100%	0%	8.659	0.000	8.659
			CAR180_N02	60%	100%	0%	12.988	0.000	12.988
	South	25%	CAR180_S01	40%	100%	0%	10.500	0.000	10.500
			CAR180_S02	60%	100%	0%	7.000	0.000	7.000
	West	17%	CAR180_W01	40%	100%	0%	7.042	0.000	7.042
			CAR180_W02	60%	100%	0%	4.695	0.000	4.695
								180° Autorotation Subtotal	70.281

NOLF Spencer Helicopter Annual Average Daily Flight Operations for Baseline									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Standard	East	28%	CST_E_01	20%	100%	0%	23.277	0.000	23.277
			CST_E_02	20%	100%	0%	23.277	0.000	23.277
			CST_E_03	30%	100%	0%	34.915	0.000	34.915
			CST_E_04	30%	100%	0%	34.915	0.000	34.915
	North	31%	CST_N_01	20%	100%	0%	25.976	0.000	25.976
			CST_N_02	20%	100%	0%	25.976	0.000	25.976
			CST_N_03	30%	100%	0%	38.964	0.000	38.964
			CST_N_04	30%	100%	0%	38.964	0.000	38.964
	South	25%	CST_S_01	20%	100%	0%	21.000	0.000	21.000
			CST_S_02	20%	100%	0%	21.000	0.000	21.000
			CST_S_03	30%	100%	0%	31.500	0.000	31.500
			CST_S_04	30%	100%	0%	31.500	0.000	31.500
	West	17%	CST_W_01	20%	100%	0%	14.084	0.000	14.084
			CST_W_02	20%	100%	0%	14.084	0.000	14.084
			CST_W_03	30%	100%	0%	21.126	0.000	21.126
			CST_W_04	30%	100%	0%	21.126	0.000	21.126
								Standard Subtotal	421.685
Tail Rotor/ Boost Off	East	28%	CTRB_E_01	40%	100%	0%	7.759	0.000	7.759
			CTRB_E_02	60%	100%	0%	11.638	0.000	11.638
	North	31%	CTRB_N_01	40%	100%	0%	8.659	0.000	8.659
			CTRB_N_02	60%	100%	0%	12.988	0.000	12.988
	South	25%	CTRB_S_01	40%	100%	0%	10.500	0.000	10.500
			CTRB_S_02	60%	100%	0%	7.000	0.000	7.000
	West	17%	CTRB_W_01	40%	100%	0%	7.042	0.000	7.042
			CTRB_W_02	60%	100%	0%	4.695	0.000	4.695
								Tail Rotor/Boost Off Subtotal	70.281
High Speed Tactical	East	28%	HST_E1	40%	100%	0%	7.759	0.000	7.759
			HST_E2	40%	100%	0%	11.638	0.000	11.638
	North	31%	HST_N1	40%	100%	0%	8.659	0.000	8.659
			HST_N2	40%	100%	0%	12.988	0.000	12.988
	South	25%	HST_S1	40%	100%	0%	10.500	0.000	10.500
			HST_S2	40%	100%	0%	7.000	0.000	7.000
	West	17%	HST_W1	40%	100%	0%	7.042	0.000	7.042
			HST_W2	40%	100%	0%	4.695	0.000	4.695
								Tail Rotor/Boost Off Subtotal	70.281
								Pattern Subtotal	632.527
								TOTAL	667.667

NOLF Spencer Helicopter Annual Average Daily Flight Operations for Proposed Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Arr.	East	28%	ARR_E_01L	40%	100%	0%	2.207	0.000	2.207
			ARR_E_01R	60%	100%	0%	3.311	0.000	3.311
	North	31%	ARR_N_01L	40%	100%	0%	2.463	0.000	2.463
			ARR_N_01R	60%	100%	0%	3.695	0.000	3.695
	South	25%	ARR_S_01L	60%	100%	0%	2.987	0.000	2.987
			ARR_S_01R	40%	100%	0%	1.991	0.000	1.991
	West	17%	ARR_W_01L	60%	100%	0%	2.003	0.000	2.003
			ARR_W_01R	40%	100%	0%	1.336	0.000	1.336
								Arrival Subtotal	19.993
Dep.	ALL	100%	DEP_01	10%	100%	0%	1.999	0.000	1.999
			DEP_02	90%	100%	0%	17.994	0.000	17.994
								Departure Subtotal	19.993
90° Auto-rotation	East	28%	CAR90_E01	40%	100%	0%	8.829	0.000	8.829
			CAR90_E02	60%	100%	0%	13.243	0.000	13.243
	North	31%	CAR90_N01	40%	100%	0%	9.853	0.000	9.853
			CAR90_N02	60%	100%	0%	14.779	0.000	14.779
	South	25%	CAR90_S01	40%	100%	0%	11.948	0.000	11.948
			CAR90_S02	60%	100%	0%	7.965	0.000	7.965
	West	17%	CAR90_W01	40%	100%	0%	8.013	0.000	8.013
			CAR90_W02	60%	100%	0%	5.342	0.000	5.342
								90° Autorotation Subtotal	79.973
180° Auto-rotation	East	28%	CAR180_E01	40%	100%	0%	8.829	0.000	8.829
			CAR180_E02	60%	100%	0%	13.243	0.000	13.243
	North	31%	CAR180_N01	40%	100%	0%	9.853	0.000	9.853
			CAR180_N02	60%	100%	0%	14.779	0.000	14.779
	South	25%	CAR180_S01	40%	100%	0%	11.948	0.000	11.948
			CAR180_S02	60%	100%	0%	7.965	0.000	7.965
	West	17%	CAR180_W01	40%	100%	0%	8.013	0.000	8.013
			CAR180_W02	60%	100%	0%	5.342	0.000	5.342
								180° Autorotation Subtotal	79.973

NOLF Spencer Helicopter Annual Average Daily Flight Operations for Proposed Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Standard	East	28%	CST_E_01	20%	100%	0%	26.487	0.000	26.487
			CST_E_02	20%	100%	0%	26.487	0.000	26.487
			CST_E_03	30%	100%	0%	39.730	0.000	39.730
			CST_E_04	30%	100%	0%	39.730	0.000	39.730
	North	31%	CST_N_01	20%	100%	0%	29.558	0.000	29.558
			CST_N_02	20%	100%	0%	29.558	0.000	29.558
			CST_N_03	30%	100%	0%	44.337	0.000	44.337
			CST_N_04	30%	100%	0%	44.337	0.000	44.337
	South	25%	CST_S_01	20%	100%	0%	23.896	0.000	23.896
			CST_S_02	20%	100%	0%	23.896	0.000	23.896
			CST_S_03	30%	100%	0%	35.844	0.000	35.844
			CST_S_04	30%	100%	0%	35.844	0.000	35.844
	West	17%	CST_W_01	20%	100%	0%	16.027	0.000	16.027
			CST_W_02	20%	100%	0%	16.027	0.000	16.027
			CST_W_03	30%	100%	0%	24.040	0.000	24.040
			CST_W_04	30%	100%	0%	24.040	0.000	24.040
								Standard Subtotal	479.836
Tail Rotor/ Boost Off	East	28%	CTRB_E_01	40%	100%	0%	8.829	0.000	8.829
			CTRB_E_02	60%	100%	0%	13.243	0.000	13.243
	North	31%	CTRB_N_01	40%	100%	0%	9.853	0.000	9.853
			CTRB_N_02	60%	100%	0%	14.779	0.000	14.779
	South	25%	CTRB_S_01	40%	100%	0%	11.948	0.000	11.948
			CTRB_S_02	60%	100%	0%	7.965	0.000	7.965
	West	17%	CTRB_W_01	40%	100%	0%	8.013	0.000	8.013
			CTRB_W_02	60%	100%	0%	5.342	0.000	5.342
								Tail Rotor/Boost Off Subtotal	79.973
High Speed Tactical	East	28%	HST_E1	40%	100%	0%	8.829	0.000	8.829
			HST_E2	40%	100%	0%	13.243	0.000	13.243
	North	31%	HST_N1	40%	100%	0%	9.853	0.000	9.853
			HST_N2	40%	100%	0%	14.779	0.000	14.779
	South	25%	HST_S1	40%	100%	0%	11.948	0.000	11.948
			HST_S2	40%	100%	0%	7.965	0.000	7.965
	West	17%	HST_W1	40%	100%	0%	8.013	0.000	8.013
			HST_W2	40%	100%	0%	5.342	0.000	5.342
								Tail Rotor/Boost Off Subtotal	79.973
								Pattern Subtotal	719.753
								TOTAL	759.740

NOLF Spencer Helicopter Annual Average Daily Flight Operations for No Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Arr.	East	28%	ARR_E_01L	40%	100%	0%	1.809	0.000	1.809
			ARR_E_01R	60%	100%	0%	2.714	0.000	2.714
	North	31%	ARR_N_01L	40%	100%	0%	2.019	0.000	2.019
			ARR_N_01R	60%	100%	0%	3.028	0.000	3.028
	South	25%	ARR_S_01L	60%	100%	0%	2.448	0.000	2.448
			ARR_S_01R	40%	100%	0%	1.632	0.000	1.632
	West	17%	ARR_W_01L	60%	100%	0%	1.642	0.000	1.642
			ARR_W_01R	40%	100%	0%	1.095	0.000	1.095
								Arrival Subtotal	16.388
Dep.	ALL	100%	DEP_01	10%	100%	0%	1.639	0.000	1.639
			DEP_02	90%	100%	0%	14.749	0.000	14.749
								Departure Subtotal	16.388
90° Auto-rotation	East	28%	CAR90_E01	40%	100%	0%	7.237	0.000	7.237
			CAR90_E02	60%	100%	0%	10.855	0.000	10.855
	North	31%	CAR90_N01	40%	100%	0%	8.076	0.000	8.076
			CAR90_N02	60%	100%	0%	12.114	0.000	12.114
	South	25%	CAR90_S01	40%	100%	0%	9.793	0.000	9.793
			CAR90_S02	60%	100%	0%	6.529	0.000	6.529
	West	17%	CAR90_W01	40%	100%	0%	6.568	0.000	6.568
			CAR90_W02	60%	100%	0%	4.379	0.000	4.379
								90° Autorotation Subtotal	65.550
180° Auto-rotation	East	28%	CAR180_E01	40%	100%	0%	7.237	0.000	7.237
			CAR180_E02	60%	100%	0%	10.855	0.000	10.855
	North	31%	CAR180_N01	40%	100%	0%	8.076	0.000	8.076
			CAR180_N02	60%	100%	0%	12.114	0.000	12.114
	South	25%	CAR180_S01	40%	100%	0%	9.793	0.000	9.793
			CAR180_S02	60%	100%	0%	6.529	0.000	6.529
	West	17%	CAR180_W01	40%	100%	0%	6.568	0.000	6.568
			CAR180_W02	60%	100%	0%	4.379	0.000	4.379
								180° Autorotation Subtotal	65.550

NOLF Spencer Helicopter Annual Average Daily Flight Operations for No Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Standard	East	28%	CST_E_01	20%	100%	0%	21.710	0.000	21.710
			CST_E_02	20%	100%	0%	21.710	0.000	21.710
			CST_E_03	30%	100%	0%	32.565	0.000	32.565
			CST_E_04	30%	100%	0%	32.565	0.000	32.565
	North	31%	CST_N_01	20%	100%	0%	24.227	0.000	24.227
			CST_N_02	20%	100%	0%	24.227	0.000	24.227
			CST_N_03	30%	100%	0%	36.341	0.000	36.341
			CST_N_04	30%	100%	0%	36.341	0.000	36.341
	South	25%	CST_S_01	20%	100%	0%	19.586	0.000	19.586
			CST_S_02	20%	100%	0%	19.586	0.000	19.586
			CST_S_03	30%	100%	0%	29.380	0.000	29.380
			CST_S_04	30%	100%	0%	29.380	0.000	29.380
	West	17%	CST_W_01	20%	100%	0%	13.136	0.000	13.136
			CST_W_02	20%	100%	0%	13.136	0.000	13.136
			CST_W_03	30%	100%	0%	19.704	0.000	19.704
			CST_W_04	30%	100%	0%	19.704	0.000	19.704
								Standard Subtotal	393.301
Tail Rotor/ Boost Off	East	28%	CTRB_E_01	40%	100%	0%	7.237	0.000	7.237
			CTRB_E_02	60%	100%	0%	10.855	0.000	10.855
	North	31%	CTRB_N_01	40%	100%	0%	8.076	0.000	8.076
			CTRB_N_02	60%	100%	0%	12.114	0.000	12.114
	South	25%	CTRB_S_01	40%	100%	0%	9.793	0.000	9.793
			CTRB_S_02	60%	100%	0%	6.529	0.000	6.529
	West	17%	CTRB_W_01	40%	100%	0%	6.568	0.000	6.568
			CTRB_W_02	60%	100%	0%	4.379	0.000	4.379
								Tail Rotor/Boost Off Subtotal	65.550
High Speed Tactical	East	28%	HST_E1	40%	100%	0%	7.237	0.000	7.237
			HST_E2	40%	100%	0%	10.855	0.000	10.855
	North	31%	HST_N1	40%	100%	0%	8.076	0.000	8.076
			HST_N2	40%	100%	0%	12.114	0.000	12.114
	South	25%	HST_S1	40%	100%	0%	9.793	0.000	9.793
			HST_S2	40%	100%	0%	6.529	0.000	6.529
	West	17%	HST_W1	40%	100%	0%	6.568	0.000	6.568
			HST_W2	40%	100%	0%	4.379	0.000	4.379
								Tail Rotor/Boost Off Subtotal	65.550
								Pattern Subtotal	589.952
								TOTAL	622.727

Appendix C-3

NOLF Pace

Distribution of Operations

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NOLF Pace Helicopter Annual Average Daily Flight Operations for Baseline									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Arr.	East	28%	ARR_E_01L	40%	100%	0%	0.936	0.000	0.936
			ARR_E_01R	60%	100%	0%	1.404	0.000	1.404
	North	31%	ARR_N_01L	40%	100%	0%	1.044	0.000	1.044
			ARR_N_01R	60%	100%	0%	1.566	0.000	1.566
	South	25%	ARR_S_01L	60%	100%	0%	1.266	0.000	1.266
			ARR_S_01R	40%	100%	0%	0.844	0.000	0.844
	West	17%	ARR_W_01L	60%	100%	0%	0.849	0.000	0.849
			ARR_W_01R	40%	100%	0%	0.566	0.000	0.566
								Arrival Subtotal	8.477
Dep.	North	31%	CTRB_N_01	100%	100%	0%	1.044	0.000	1.044
								Departure Subtotal	1.566
90° Auto-rotation	East	28%	CAR90_E01	40%	100%	0%	3.743	0.000	3.743
			CAR90_E02	60%	100%	0%	5.615	0.000	5.615
	North	31%	CAR90_N01	40%	100%	0%	4.177	0.000	4.177
			CAR90_N02	60%	100%	0%	6.266	0.000	6.266
	South	25%	CAR90_S01	40%	100%	0%	3.377	0.000	3.377
			CAR90_S02	60%	100%	0%	5.066	0.000	5.066
	West	17%	CAR90_W01	40%	100%	0%	2.265	0.000	2.265
			CAR90_W02	60%	100%	0%	3.397	0.000	3.397
								90° Autorotation Subtotal	33.907
180° Auto-rotation	East	28%	CAR180_E01	40%	100%	0%	3.743	0.000	3.743
			CAR180_E02	60%	100%	0%	5.615	0.000	5.615
	North	31%	CAR180_N01	40%	100%	0%	4.177	0.000	4.177
			CAR180_N02	60%	100%	0%	6.266	0.000	6.266
	South	25%	CAR180_S01	40%	100%	0%	3.377	0.000	3.377
			CAR180_S02	60%	100%	0%	5.066	0.000	5.066
	West	17%	CAR180_W01	40%	100%	0%	2.265	0.000	2.265
			CAR180_W02	60%	100%	0%	3.397	0.000	3.397
								180° Autorotation Subtotal	33.907
Standard	East	28%	CST_E_01	40%	100%	0%	28.075	0.000	28.075
			CST_E_02	60%	100%	0%	42.112	0.000	42.112
	North	31%	CST_N_01	40%	100%	0%	31.330	0.000	31.330
			CST_N_02	60%	100%	0%	46.995	0.000	46.995
	South	25%	CST_S_01	40%	100%	0%	25.328	0.000	25.328
			CST_S_02	60%	100%	0%	37.992	0.000	37.992
	West	17%	CST_W_01	40%	100%	0%	16.987	0.000	16.987
			CST_W_02	60%	100%	0%	25.481	0.000	25.481
								Standard Subtotal	254.299
Tail Rotor / Boost Off	East	28%	CTRB_E_01	40%	100%	0%	1.872	0.000	1.872
			CTRB_E_02	60%	100%	0%	2.807	0.000	2.807
	North	31%	CTRB_N_01	40%	100%	0%	2.089	0.000	2.089
			CTRB_N_02	60%	100%	0%	3.133	0.000	3.133
	South	25%	CTRB_S_01	40%	100%	0%	1.689	0.000	1.689
			CTRB_S_02	60%	100%	0%	2.533	0.000	2.533
	West	17%	CTRB_W_01	40%	100%	0%	1.132	0.000	1.132
			CTRB_W_02	60%	100%	0%	1.699	0.000	1.699
								Tail Rotor/Boost Off Subtotal	16.953
								Pattern Subtotal	339.066
								TOTAL	349.109

NOLF Pace Helicopter Annual Average Daily Flight Operations for Proposed Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Arr.	East	28%	ARR_E_01L	40%	100%	0%	1.104	0.000	1.104
			ARR_E_01R	60%	100%	0%	1.655	0.000	1.655
	North	31%	ARR_N_01L	40%	100%	0%	1.232	0.000	1.232
			ARR_N_01R	60%	100%	0%	1.847	0.000	1.847
	South	25%	ARR_S_01L	60%	100%	0%	1.493	0.000	1.493
			ARR_S_01R	40%	100%	0%	0.996	0.000	0.996
	West	17%	ARR_W_01L	60%	100%	0%	1.002	0.000	1.002
			ARR_W_01R	40%	100%	0%	0.668	0.000	0.668
								Arrival Subtotal	9.997
Dep.	North	31%	CTRB_N_01	100%	100%	0%	1.232	0.000	1.232
								Departure Subtotal	1.847
90° Auto-rotation	East	28%	CAR90_E01	40%	100%	0%	4.414	0.000	4.414
			CAR90_E02	60%	100%	0%	6.622	0.000	6.622
	North	31%	CAR90_N01	40%	100%	0%	4.926	0.000	4.926
			CAR90_N02	60%	100%	0%	7.389	0.000	7.389
	South	25%	CAR90_S01	40%	100%	0%	3.983	0.000	3.983
			CAR90_S02	60%	100%	0%	5.974	0.000	5.974
	West	17%	CAR90_W01	40%	100%	0%	2.671	0.000	2.671
			CAR90_W02	60%	100%	0%	4.007	0.000	4.007
								90° Autorotation Subtotal	39.986
180° Auto-rotation	East	28%	CAR180_E01	40%	100%	0%	4.414	0.000	4.414
			CAR180_E02	60%	100%	0%	6.622	0.000	6.622
	North	31%	CAR180_N01	40%	100%	0%	4.926	0.000	4.926
			CAR180_N02	60%	100%	0%	7.389	0.000	7.389
	South	25%	CAR180_S01	40%	100%	0%	3.983	0.000	3.983
			CAR180_S02	60%	100%	0%	5.974	0.000	5.974
	West	17%	CAR180_W01	40%	100%	0%	2.671	0.000	2.671
			CAR180_W02	60%	100%	0%	4.007	0.000	4.007
								180° Autorotation Subtotal	39.986
Standard	East	28%	CST_E_01	40%	100%	0%	33.109	0.000	33.109
			CST_E_02	60%	100%	0%	49.663	0.000	49.663
	North	31%	CST_N_01	40%	100%	0%	36.947	0.000	36.947
			CST_N_02	60%	100%	0%	55.421	0.000	55.421
	South	25%	CST_S_01	40%	100%	0%	29.870	0.000	29.870
			CST_S_02	60%	100%	0%	44.805	0.000	44.805
	West	17%	CST_W_01	40%	100%	0%	20.033	0.000	20.033
			CST_W_02	60%	100%	0%	30.050	0.000	30.050
								Standard Subtotal	299.897
Tail Rotor / Boost Off	East	28%	CTRB_E_01	40%	100%	0%	2.207	0.000	2.207
			CTRB_E_02	60%	100%	0%	3.311	0.000	3.311
	North	31%	CTRB_N_01	40%	100%	0%	2.463	0.000	2.463
			CTRB_N_02	60%	100%	0%	3.695	0.000	3.695
	South	25%	CTRB_S_01	40%	100%	0%	1.991	0.000	1.991
			CTRB_S_02	60%	100%	0%	2.987	0.000	2.987
	West	17%	CTRB_W_01	40%	100%	0%	1.336	0.000	1.336
			CTRB_W_02	60%	100%	0%	2.003	0.000	2.003
								Tail Rotor/Boost Off Subtotal	19.993
								Pattern Subtotal	399.863
								TOTAL	411.707

NOLF Pace Helicopter Annual Average Daily Flight Operations for No Action

Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Arr.	East	28%	ARR_E_01L	40%	100%	0%	0.905	0.000	0.905
			ARR_E_01R	60%	100%	0%	1.357	0.000	1.357
	North	31%	ARR_N_01L	40%	100%	0%	1.009	0.000	1.009
			ARR_N_01R	60%	100%	0%	1.514	0.000	1.514
	South	25%	ARR_S_01L	60%	100%	0%	1.224	0.000	1.224
			ARR_S_01R	40%	100%	0%	0.816	0.000	0.816
	West	17%	ARR_W_01L	60%	100%	0%	0.821	0.000	0.821
			ARR_W_01R	40%	100%	0%	0.547	0.000	0.547
								Arrival Subtotal	8.194
Dep.	North	31%	CTRB_N_01	100%	100%	0%	1.009	0.000	1.009
								Departure Subtotal	1.514
90° Auto-rotation	East	28%	CAR90_E01	40%	100%	0%	3.618	0.000	3.618
			CAR90_E02	60%	100%	0%	5.428	0.000	5.428
	North	31%	CAR90_N01	40%	100%	0%	4.038	0.000	4.038
			CAR90_N02	60%	100%	0%	6.057	0.000	6.057
	South	25%	CAR90_S01	40%	100%	0%	3.264	0.000	3.264
			CAR90_S02	60%	100%	0%	4.897	0.000	4.897
	West	17%	CAR90_W01	40%	100%	0%	2.189	0.000	2.189
			CAR90_W02	60%	100%	0%	3.284	0.000	3.284
								90° Autorotation Subtotal	32.775
180° Auto-rotation	East	28%	CAR180_E01	40%	100%	0%	3.618	0.000	3.618
			CAR180_E02	60%	100%	0%	5.428	0.000	5.428
	North	31%	CAR180_N01	40%	100%	0%	4.038	0.000	4.038
			CAR180_N02	60%	100%	0%	6.057	0.000	6.057
	South	25%	CAR180_S01	40%	100%	0%	3.264	0.000	3.264
			CAR180_S02	60%	100%	0%	4.897	0.000	4.897
	West	17%	CAR180_W01	40%	100%	0%	2.189	0.000	2.189
			CAR180_W02	60%	100%	0%	3.284	0.000	3.284
								180° Autorotation Subtotal	32.775
Standard	East	28%	CST_E_01	40%	100%	0%	27.138	0.000	27.138
			CST_E_02	60%	100%	0%	40.707	0.000	40.707
	North	31%	CST_N_01	40%	100%	0%	30.284	0.000	30.284
			CST_N_02	60%	100%	0%	45.426	0.000	45.426
	South	25%	CST_S_01	40%	100%	0%	24.483	0.000	24.483
			CST_S_02	60%	100%	0%	36.725	0.000	36.725
	West	17%	CST_W_01	40%	100%	0%	16.420	0.000	16.420
			CST_W_02	60%	100%	0%	24.631	0.000	24.631
								Standard Subtotal	245.813
Tail Rotor / Boost Off	East	28%	CTRB_E_01	40%	100%	0%	1.809	0.000	1.809
			CTRB_E_02	60%	100%	0%	2.714	0.000	2.714
	North	31%	CTRB_N_01	40%	100%	0%	2.019	0.000	2.019
			CTRB_N_02	60%	100%	0%	3.028	0.000	3.028
	South	25%	CTRB_S_01	40%	100%	0%	1.632	0.000	1.632
			CTRB_S_02	60%	100%	0%	2.448	0.000	2.448
	West	17%	CTRB_W_01	40%	100%	0%	1.095	0.000	1.095
			CTRB_W_02	60%	100%	0%	1.642	0.000	1.642
								Tail Rotor/Boost Off Subtotal	16.388
								Pattern Subtotal	327.751
								TOTAL	337.459

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Appendix C-4

NOLF Site X

Distribution of Operations

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NOLF Site X Helicopter Annual Average Daily Flight Operations for No Action										
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Arr. from East	East	28%	ArrE_090N	60%	94%	6%	0.384	0.023	0.407
			ArrE_090T	40%	94%	6%	0.256	0.016	0.271
	South	25%	ArrE_180N	60%	94%	6%	0.346	0.021	0.367
			ArrE_180T	40%	94%	6%	0.231	0.014	0.245
	West	17%	ArrE_270N	60%	94%	6%	0.232	0.014	0.246
			ArrE_270T	40%	94%	6%	0.155	0.009	0.164
	North	31%	ArrE_360N	60%	94%	6%	0.428	0.026	0.454
			ArrE_360T	40%	94%	6%	0.285	0.017	0.303
								Arrival from East Subtotal	2.458
Arr. from West	East	28%	ArrW_090N	60%	94%	6%	1.151	0.070	1.221
			ArrW_090T	40%	94%	6%	0.767	0.047	0.814
	South	25%	ArrW_180N	60%	94%	6%	1.038	0.063	1.102
			ArrW_180T	40%	94%	6%	0.692	0.042	0.735
	West	17%	ArrW_270N	60%	94%	6%	0.696	0.042	0.739
			ArrW_270T	40%	94%	6%	0.464	0.028	0.493
	North	31%	ArrW_360N	60%	94%	6%	1.284	0.078	1.363
			ArrW_360T	40%	94%	6%	0.856	0.052	0.909
								Arrival from West Subtotal	7.375
								Arrival Subtotal	9.833
Dep.	ALL	100%	DEP_TF	50%	94%	6%	4.634	0.283	4.916
			DEP_WOA	50%	94%	6%	4.634	0.283	4.916
								Departure Subtotal	9.833
90° Auto-rotation	East	28%	AR90_090	100%	94%	6%	2.813	0.172	2.985
	South	25%	AR90_180	100%	94%	6%	2.538	0.155	2.693
	West	17%	AR90_270	100%	94%	6%	1.702	0.104	1.806
	North	31%	AR90_360	100%	94%	6%	3.139	0.192	3.331
								90° Autorotation Subtotal	10.814
180° Auto-rotation	East	28%	AR180_090	100%	94%	6%	2.813	0.172	2.985
	South	25%	AR180_180	100%	94%	6%	2.538	0.155	2.693
	West	17%	AR180_270	100%	94%	6%	1.702	0.104	1.806
	North	31%	AR180_360	100%	94%	6%	3.139	0.192	3.331
								180° Autorotation Subtotal	10.814

NOLF Site X Helicopter Annual Average Daily Flight Operations for No Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Confined Landing Area	East	28%	CLA_090	100%	94%	6%	1.460	0.089	1.549
	South	25%	CLA_180	100%	94%	6%	1.317	0.080	1.397
	West	17%	CLA_270	100%	94%	6%	0.883	0.054	0.937
	North	31%	CLA_360	100%	94%	6%	1.629	0.099	1.728
							Confined Landing Area Subtotal		5.611
External Load on Tactical Duty	East	28%	EL_090TD	100%	94%	6%	0.073	0.004	0.078
	South	25%	EL_180TD	100%	94%	6%	0.066	0.004	0.070
	West	17%	EL_270TD	100%	94%	6%	0.044	0.003	0.047
	North	31%	EL_360TD	100%	94%	6%	0.082	0.005	0.086
							External Load Subtutal		0.281
High Speed Tactical	East	28%	HST090_N	60%	94%	6%	0.657	0.040	0.697
			HST090_T	40%	94%	6%	0.438	0.027	0.465
	South	25%	HST180_N	60%	94%	6%	0.593	0.036	0.629
			HST180_T	40%	94%	6%	0.395	0.024	0.419
	West	17%	HST270_N	60%	94%	6%	0.397	0.024	0.422
			HST270_T	40%	94%	6%	0.265	0.016	0.281
	North	31%	HST360_N	60%	94%	6%	0.733	0.045	0.778
			HST360_T	40%	94%	6%	0.489	0.030	0.518
							High Speed Tactical Subtotal		4.208
Pinnacle A	East	28%	PinnA_090	50%	94%	6%	0.730	0.045	0.774
	South	25%	PinnA_180	50%	94%	6%	0.658	0.040	0.699
	West	17%	PinnA_270	50%	94%	6%	0.442	0.027	0.469
	North	31%	PinnA_360	50%	94%	6%	0.814	0.050	0.864
Pinnacle B	East	28%	PinnB_090	50%	94%	6%	0.730	0.045	0.774
	South	25%	PinnB_180	50%	94%	6%	0.658	0.040	0.699
	West	17%	PinnB_270	50%	94%	6%	0.442	0.027	0.469
	North	31%	PinnB_360	50%	94%	6%	0.814	0.050	0.864
							Pinnacle Subtotal		5.611

NOLF Site X Helicopter Annual Average Daily Flight Operations for No Action									
Track Type	Course Flow		Profile				Acoustic	Acoustic	Total
	Dir	Use	ID	% Use	% Day	% Night	Day	Night	
Standard	East	28%	Std090_Sp1	25%	94%	6%	5.076	0.310	5.385
			Std090_Sp2	25%	94%	6%	5.076	0.310	5.385
			Std090_Sp3	25%	94%	6%	5.076	0.310	5.385
			Std090_Sp4	25%	94%	6%	5.076	0.310	5.385
	South	25%	Std180_Sp1	25%	94%	6%	4.579	0.279	4.858
			Std180_Sp2	25%	94%	6%	4.579	0.279	4.858
			Std180_Sp3	25%	94%	6%	4.579	0.279	4.858
			Std180_Sp4	25%	94%	6%	4.579	0.279	4.858
	West	17%	Std270_Sp1	25%	94%	6%	3.071	0.187	3.259
			Std270_Sp2	25%	94%	6%	3.071	0.187	3.259
			Std270_Sp3	25%	94%	6%	3.071	0.187	3.259
			Std270_Sp4	25%	94%	6%	3.071	0.187	3.259
	North	31%	Std360_Sp1	25%	94%	6%	5.664	0.346	6.010
			Std360_Sp2	25%	94%	6%	5.664	0.346	6.010
			Std360_Sp3	25%	94%	6%	5.664	0.346	6.010
			Std360_Sp4	25%	94%	6%	5.664	0.346	6.010
								Standard Subtotal	78.048
Tail Rotor / Boost Off	East	28%	TRBO_090N	100%	94%	6%	2.813	0.172	2.985
	South	25%	TRBO_180N	100%	94%	6%	2.538	0.155	2.693
	West	17%	TRBO_270N	100%	94%	6%	1.702	0.104	1.806
	North	31%	TRBO_360N	100%	94%	6%	3.139	0.192	3.331
								External Load Subtutal	10.814
TLA: Tactics Side	East	28%	T_09_Sp1W	70%	94%	6%	3.065	0.187	3.252
			T_09_SpNM	5%	94%	6%	0.219	0.013	0.232
	South	25%	T_18_Sp1W	70%	94%	6%	2.765	0.169	2.934
			T_18_SpNM	5%	94%	6%	0.198	0.012	0.210
	West	17%	T_27_Sp2W	70%	94%	6%	1.855	0.113	1.968
			T_27_SpNM	5%	94%	6%	0.132	0.008	0.141
	North	31%	T_36_Sp2W	70%	94%	6%	3.421	0.209	3.629
			T_36_SpNM	5%	94%	6%	0.244	0.015	0.259
TLA: Normal Side	East	28%	T_NA09_Dw	12.5%	94%	6%	0.547	0.033	0.581
			T_NA09_Up	12.5%	94%	6%	0.547	0.033	0.581
	South	25%	T_NA18_Dw	12.5%	94%	6%	0.494	0.030	0.524
			T_NA18_Up	12.5%	94%	6%	0.494	0.030	0.524
	West	17%	T_NA27_Dw	12.5%	94%	6%	0.331	0.020	0.351
			T_NA27_Up	12.5%	94%	6%	0.331	0.020	0.351
	North	31%	T_NA36_Dw	12.5%	94%	6%	0.611	0.037	0.648
			T_NA36_Up	12.5%	94%	6%	0.611	0.037	0.648
								TLA Subtotal	16.834
								Pattern Subtotal	143.034
								TOTAL	162.700

NOLF Site X Helicopter Annual Average Daily Flight Operations for Proposed Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Arr. from East	East	28%	ArrE_090N	60%	94%	6%	0.468	0.029	0.497
			ArrE_090T	40%	94%	6%	0.312	0.019	0.331
	South	25%	ArrE_180N	60%	94%	6%	0.422	0.026	0.448
			ArrE_180T	40%	94%	6%	0.282	0.017	0.299
	West	17%	ArrE_270N	60%	94%	6%	0.283	0.017	0.301
			ArrE_270T	40%	94%	6%	0.189	0.012	0.200
	North	31%	ArrE_360N	60%	94%	6%	0.522	0.032	0.554
			ArrE_360T	40%	94%	6%	0.348	0.021	0.369
Arrival from East Subtotal									2.999
Arr. from West	East	28%	ArrW_090N	60%	94%	6%	1.404	0.086	1.490
			ArrW_090T	40%	94%	6%	0.936	0.057	0.993
	South	25%	ArrW_180N	60%	94%	6%	1.267	0.077	1.344
			ArrW_180T	40%	94%	6%	0.845	0.052	0.896
	West	17%	ArrW_270N	60%	94%	6%	0.850	0.052	0.902
			ArrW_270T	40%	94%	6%	0.566	0.035	0.601
	North	31%	ArrW_360N	60%	94%	6%	1.567	0.096	1.663
			ArrW_360T	40%	94%	6%	1.045	0.064	1.108
Arrival from West Subtotal									8.997
Arrival Subtotal									11.996
Dep.	ALL	100%	DEP_TF	50%	94%	6%	5.653	0.345	5.998
			DEP_WOA	50%	94%	6%	5.653	0.345	5.998
Departure Subtotal									11.996
90° Auto-rotation	East	28%	AR90_090	100%	94%	6%	3.432	0.209	3.641
	South	25%	AR90_180	100%	94%	6%	3.096	0.189	3.285
	West	17%	AR90_270	100%	94%	6%	2.077	0.127	2.203
	North	31%	AR90_360	100%	94%	6%	3.830	0.234	4.063
90° Autorotation Subtotal									13.193
180° Auto-rotation	East	28%	AR180_090	100%	94%	6%	3.432	0.209	3.641
	South	25%	AR180_180	100%	94%	6%	3.096	0.189	3.285
	West	17%	AR180_270	100%	94%	6%	2.077	0.127	2.203
	North	31%	AR180_360	100%	94%	6%	3.830	0.234	4.063
180° Autorotation Subtotal									13.193

NOLF Site X Helicopter Annual Average Daily Flight Operations for Proposed Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Confined Landing Area	East	28%	CLA_090	100%	94%	6%	1.781	0.109	1.889
	South	25%	CLA_180	100%	94%	6%	1.607	0.098	1.705
	West	17%	CLA_270	100%	94%	6%	1.077	0.066	1.143
	North	31%	CLA_360	100%	94%	6%	1.987	0.121	2.108
Confined Landing Area Subtotal									**6.845**
External Load on Tactical Duty	East	28%	EL_090TD	100%	94%	6%	0.089	0.005	0.095
	South	25%	EL_180TD	100%	94%	6%	0.080	0.005	0.085
	West	17%	EL_270TD	100%	94%	6%	0.054	0.003	0.057
	North	31%	EL_360TD	100%	94%	6%	0.099	0.006	0.106
External Load Subtutal									**0.343**
High Speed Tactical	East	28%	HST090_N	60%	94%	6%	0.801	0.049	0.850
			HST090_T	40%	94%	6%	0.534	0.033	0.567
	South	25%	HST180_N	60%	94%	6%	0.723	0.044	0.767
			HST180_T	40%	94%	6%	0.482	0.029	0.511
	West	17%	HST270_N	60%	94%	6%	0.485	0.030	0.514
			HST270_T	40%	94%	6%	0.323	0.020	0.343
	North	31%	HST360_N	60%	94%	6%	0.894	0.055	0.949
			HST360_T	40%	94%	6%	0.596	0.036	0.633
High Speed Tactical Subtotal									**5.134**
Pinnacle A	East	28%	PinnA_090	50%	94%	6%	0.890	0.054	0.945
	South	25%	PinnA_180	50%	94%	6%	0.803	0.049	0.852
	West	17%	PinnA_270	50%	94%	6%	0.539	0.033	0.572
	North	31%	PinnA_360	50%	94%	6%	0.994	0.061	1.054
Pinnacle B	East	28%	PinnB_090	50%	94%	6%	0.890	0.054	0.945
	South	25%	PinnB_180	50%	94%	6%	0.803	0.049	0.852
	West	17%	PinnB_270	50%	94%	6%	0.539	0.033	0.572
	North	31%	PinnB_360	50%	94%	6%	0.994	0.061	1.054
Pinnacle Subtotal									**6.845**

NOLF Site X Helicopter Annual Average Daily Flight Operations for Proposed Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Standard	East	28%	Std090_Sp1	25%	94%	6%	6.192	0.378	6.570
			Std090_Sp2	25%	94%	6%	6.192	0.378	6.570
			Std090_Sp3	25%	94%	6%	6.192	0.378	6.570
			Std090_Sp4	25%	94%	6%	6.192	0.378	6.570
	South	25%	Std180_Sp1	25%	94%	6%	5.587	0.341	5.927
			Std180_Sp2	25%	94%	6%	5.587	0.341	5.927
			Std180_Sp3	25%	94%	6%	5.587	0.341	5.927
			Std180_Sp4	25%	94%	6%	5.587	0.341	5.927
	West	17%	Std270_Sp1	25%	94%	6%	3.747	0.229	3.975
			Std270_Sp2	25%	94%	6%	3.747	0.229	3.975
			Std270_Sp3	25%	94%	6%	3.747	0.229	3.975
			Std270_Sp4	25%	94%	6%	3.747	0.229	3.975
	North	31%	Std360_Sp1	25%	94%	6%	6.910	0.422	7.332
			Std360_Sp2	25%	94%	6%	6.910	0.422	7.332
			Std360_Sp3	25%	94%	6%	6.910	0.422	7.332
			Std360_Sp4	25%	94%	6%	6.910	0.422	7.332
								Standard Subtotal	95.220
Tail Rotor / Boost Off	East	28%	TRBO_090N	100%	94%	6%	3.432	0.209	3.641
	South	25%	TRBO_180N	100%	94%	6%	3.096	0.189	3.285
	West	17%	TRBO_270N	100%	94%	6%	2.077	0.127	2.203
	North	31%	TRBO_360N	100%	94%	6%	3.830	0.234	4.063
								External Load Subtutal	13.193
TLA: Tactics Side	East	28%	T_09_Sp1W	70%	94%	6%	3.740	0.228	3.968
			T_09_SpNM	5%	94%	6%	0.267	0.016	0.283
	South	25%	T_18_Sp1W	70%	94%	6%	3.374	0.206	3.580
			T_18_SpNM	5%	94%	6%	0.241	0.015	0.256
	West	17%	T_27_Sp2W	70%	94%	6%	2.263	0.138	2.401
			T_27_SpNM	5%	94%	6%	0.162	0.010	0.171
	North	31%	T_36_Sp2W	70%	94%	6%	4.173	0.255	4.428
			T_36_SpNM	5%	94%	6%	0.298	0.018	0.316
TLA: Normal Side	East	28%	T_NA09_Dw	12.5%	94%	6%	0.668	0.041	0.709
			T_NA09_Up	12.5%	94%	6%	0.668	0.041	0.709
	South	25%	T_NA18_Dw	12.5%	94%	6%	0.602	0.037	0.639
			T_NA18_Up	12.5%	94%	6%	0.602	0.037	0.639
	West	17%	T_NA27_Dw	12.5%	94%	6%	0.404	0.025	0.429
			T_NA27_Up	12.5%	94%	6%	0.404	0.025	0.429
	North	31%	T_NA36_Dw	12.5%	94%	6%	0.745	0.045	0.791
			T_NA36_Up	12.5%	94%	6%	0.745	0.045	0.791
								TLA Subtotal	20.538
								Pattern Subtotal	174.504
								TOTAL	198.497

Appendix C-5

NOLF Harold

Distribution of Operations

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NOLF Harold Helicopter Annual Average Daily Flight Operations for Baseline									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Arr.	East	17%	ARR_E_01L	25%	99%	1%	0.321	0.003	0.323
			ARR_E_02L	25%	99%	1%	0.321	0.003	0.323
			ARR_E_01R	25%	99%	1%	0.321	0.003	0.323
			ARR_E_02R	25%	99%	1%	0.321	0.003	0.323
	North	31%	ARR_N_01L	25%	99%	1%	0.592	0.005	0.596
			ARR_N_02R	25%	99%	1%	0.592	0.005	0.596
			ARR_N_01R	25%	99%	1%	0.592	0.005	0.596
			ARR_N_02L	25%	99%	1%	0.592	0.005	0.596
	South	25%	ARR_S_01L	25%	99%	1%	0.478	0.004	0.482
			ARR_S_02L	25%	99%	1%	0.478	0.004	0.482
			ARR_S_01R	25%	99%	1%	0.478	0.004	0.482
			ARR_S_02R	25%	99%	1%	0.478	0.004	0.482
	West	28%	ARR_W_01L	25%	99%	1%	0.530	0.004	0.534
			ARR_W_02L	25%	99%	1%	0.530	0.004	0.534
			ARR_W_01R	25%	99%	1%	0.530	0.004	0.534
			ARR_W_02R	25%	99%	1%	0.530	0.004	0.534
								Arrival Subtotal	7.745
Dep.	West	28%	HST270	100%	100%	0%	0.643	0.000	0.643
								Departure Subtotal	0.718
Confined Air Landing	East	17%	CAL_E_01	50%	100%	0%	0.519	0.000	0.519
			CAL_E_02	50%	100%	0%	0.519	0.000	0.519
	North	31%	CAL_N_01	50%	100%	0%	0.957	0.000	0.957
			CAL_N_02	50%	100%	0%	0.957	0.000	0.957
	South	25%	CAL_S_01	50%	100%	0%	0.774	0.000	0.774
			CAL_S_02	50%	100%	0%	0.774	0.000	0.774
	West	28%	CAL_W_01	50%	100%	0%	0.858	0.000	0.858
			CAL_W_02	50%	100%	0%	0.858	0.000	0.858
								CAL Subtotal	6.216
90° Auto-rotation	East	17%	CAR90_E01	33%	100%	0%	0.998	0.000	0.998
			CAR90_E02	33%	100%	0%	0.998	0.000	0.998
			CAR90_E03	33%	100%	0%	0.998	0.000	0.998
	North	31%	CAR90_N01	10%	100%	0%	0.552	0.000	0.552
			CAR90_N02	10%	100%	0%	0.552	0.000	0.552
			CAR90_N03	40%	100%	0%	2.209	0.000	2.209
			CAR90_N04	40%	100%	0%	2.209	0.000	2.209
	South	25%	CAR90_S01	10%	100%	0%	0.446	0.000	0.446
			CAR90_S02	10%	100%	0%	0.446	0.000	0.446
			CAR90_S03	40%	100%	0%	1.786	0.000	1.786
			CAR90_S04	40%	100%	0%	1.786	0.000	1.786
	West	28%	CAR90_W01	33%	100%	0%	1.650	0.000	1.650
			CAR90_W02	33%	100%	0%	1.650	0.000	1.650
			CAR90_W03	33%	100%	0%	1.650	0.000	1.650
								90° Autorotation Subtotal	17.932

NOLF Harold Helicopter Annual Average Daily Flight Operations for Baseline									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
180° Auto-rotation	East	17%	CAR180_E01	33%	100%	0%	0.998	0.000	0.998
			CAR180_E02	33%	100%	0%	0.998	0.000	0.998
			CAR180_E03	33%	100%	0%	0.998	0.000	0.998
	North	31%	CAR180_N01	10%	100%	0%	0.552	0.000	0.552
			CAR180_N02	10%	100%	0%	0.552	0.000	0.552
			CAR180_N03	40%	100%	0%	2.209	0.000	2.209
			CAR180_N04	40%	100%	0%	2.209	0.000	2.209
	South	25%	CAR180_S01	10%	100%	0%	0.446	0.000	0.446
			CAR180_S02	10%	100%	0%	0.446	0.000	0.446
			CAR180_S03	40%	100%	0%	1.786	0.000	1.786
			CAR180_S04	40%	100%	0%	1.786	0.000	1.786
	West	28%	CAR180_W01	33%	100%	0%	1.650	0.000	1.650
			CAR180_W02	33%	100%	0%	1.650	0.000	1.650
			CAR180_W03	33%	100%	0%	1.650	0.000	1.650
180° Autorotation Subtotal									**17.932**
External Load	East	17%	CEL_E_01	100%	100%	0%	1.038	0.000	1.038
	North	31%	CEL_N_01	100%	100%	0%	1.915	0.000	1.915
	South	25%	CEL_S_01	100%	100%	0%	1.548	0.000	1.548
	West	28%	CEL_W_01	100%	100%	0%	1.716	0.000	1.716
External Load Subtotal									**6.216**
Pinnacle	East	17%	CPN_E_01	100%	100%	0%	1.038	0.000	1.038
	North	31%	CPN_N_01	100%	100%	0%	1.915	0.000	1.915
	South	25%	CPN_S_01	100%	100%	0%	1.548	0.000	1.548
	West	28%	CPN_W_01	100%	100%	0%	1.716	0.000	1.716
Pinnacle Subtotal									**6.216**
Standard	East	17%	CST_E_01	33%	99%	1%	8.152	0.111	8.262
			CST_E_02	33%	99%	1%	8.152	0.111	8.262
			CST_E_03	33%	99%	1%	8.152	0.111	8.262
	North	31%	CST_N_01	10%	99%	1%	4.510	0.061	4.572
			CST_N_02	10%	99%	1%	4.510	0.061	4.572
			CST_N_03	40%	99%	1%	18.041	0.245	18.286
			CST_N_04	40%	99%	1%	18.041	0.245	18.286
	South	25%	CST_S_01	10%	99%	1%	3.646	0.050	3.696
			CST_S_02	10%	99%	1%	3.646	0.050	3.696
			CST_S_03	40%	99%	1%	14.585	0.198	14.783
			CST_S_04	40%	99%	1%	14.585	0.198	14.783
	West	28%	CST_W_01	33%	99%	1%	13.472	0.183	13.655
			CST_W_02	33%	99%	1%	13.472	0.183	13.655
			CST_W_03	33%	99%	1%	13.472	0.183	13.655
Standard Subtotal									**148.427**

NOLF Harold Helicopter Annual Average Daily Flight Operations for Baseline									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Tactical	East	17%	CTL_E_01	33%	100%	0%	1.038	0.000	1.038
			CTL_E_02	33%	100%	0%	1.038	0.000	1.038
			CTL_E_03	33%	100%	0%	1.038	0.000	1.038
	North	31%	CTL_N_01	33%	100%	0%	1.915	0.000	1.915
			CTL_N_02	33%	100%	0%	1.915	0.000	1.915
			CTL_N_03	33%	100%	0%	1.915	0.000	1.915
	South	25%	CTL_S_01	33%	100%	0%	1.548	0.000	1.548
			CTL_S_02	33%	100%	0%	1.548	0.000	1.548
			CTL_S_03	33%	100%	0%	1.548	0.000	1.548
	West	28%	CTL_W_01	33%	100%	0%	1.716	0.000	1.716
			CTL_W_02	33%	100%	0%	1.716	0.000	1.716
			CTL_W_03	33%	100%	0%	1.716	0.000	1.716
								Tactical Subtotal	18.649
High Speed Tactical	East	17%	HST090	100%	100%	0%	0.779	0.000	0.779
	South	25%	HST180	100%	100%	0%	1.161	0.000	1.161
	West	28%	HST270	100%	100%	0%	1.287	0.000	1.287
	North	31%	HST360	100%	100%	0%	1.436	0.000	1.436
								High Speed Tactical Subtotal	4.663
								Pattern Subtotal	226.252
								TOTAL	234.715

NOLF Harold Helicopter Annual Average Daily Flight Operations for Proposed Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Arr.	East	17%	ARR_E_01L	25%	99%	1%	0.276	0.002	0.278
			ARR_E_02L	25%	99%	1%	0.276	0.002	0.278
			ARR_E_01R	25%	99%	1%	0.276	0.002	0.278
			ARR_E_02R	25%	99%	1%	0.276	0.002	0.278
	North	31%	ARR_N_01L	25%	99%	1%	0.509	0.004	0.513
			ARR_N_02R	25%	99%	1%	0.509	0.004	0.513
			ARR_N_01R	25%	99%	1%	0.509	0.004	0.513
			ARR_N_02L	25%	99%	1%	0.509	0.004	0.513
	South	25%	ARR_S_01L	25%	99%	1%	0.411	0.003	0.415
			ARR_S_02L	25%	99%	1%	0.411	0.003	0.415
			ARR_S_01R	25%	99%	1%	0.411	0.003	0.415
			ARR_S_02R	25%	99%	1%	0.411	0.003	0.415
	West	28%	ARR_W_01L	25%	99%	1%	0.456	0.004	0.460
			ARR_W_02L	25%	99%	1%	0.456	0.004	0.460
			ARR_W_01R	25%	99%	1%	0.456	0.004	0.460
			ARR_W_02R	25%	99%	1%	0.456	0.004	0.460
								Arrival Subtotal	6.663
Dep.	West	28%	HST270	100%	100%	0%	0.554	0.000	0.554
								Departure Subtotal	0.618
Confined Air Landing	East	17%	CAL_E_01	50%	100%	0%	0.447	0.000	0.447
			CAL_E_02	50%	100%	0%	0.447	0.000	0.447
	North	31%	CAL_N_01	50%	100%	0%	0.824	0.000	0.824
			CAL_N_02	50%	100%	0%	0.824	0.000	0.824
	South	25%	CAL_S_01	50%	100%	0%	0.666	0.000	0.666
			CAL_S_02	50%	100%	0%	0.666	0.000	0.666
	West	28%	CAL_W_01	50%	100%	0%	0.738	0.000	0.738
			CAL_W_02	50%	100%	0%	0.738	0.000	0.738
								CAL Subtotal	5.348
90° Auto-rotation	East	17%	CAR90_E01	33%	100%	0%	0.859	0.000	0.859
			CAR90_E02	33%	100%	0%	0.859	0.000	0.859
			CAR90_E03	33%	100%	0%	0.859	0.000	0.859
	North	31%	CAR90_N01	10%	100%	0%	0.475	0.000	0.475
			CAR90_N02	10%	100%	0%	0.475	0.000	0.475
			CAR90_N03	40%	100%	0%	1.901	0.000	1.901
			CAR90_N04	40%	100%	0%	1.901	0.000	1.901
	South	25%	CAR90_S01	10%	100%	0%	0.384	0.000	0.384
			CAR90_S02	10%	100%	0%	0.384	0.000	0.384
			CAR90_S03	40%	100%	0%	1.536	0.000	1.536
			CAR90_S04	40%	100%	0%	1.536	0.000	1.536
	West	28%	CAR90_W01	33%	100%	0%	1.419	0.000	1.419
			CAR90_W02	33%	100%	0%	1.419	0.000	1.419
			CAR90_W03	33%	100%	0%	1.419	0.000	1.419
								90° Autorotation Subtotal	15.427

NOLF Harold Helicopter Annual Average Daily Flight Operations for Proposed Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
180° Auto-rotation	East	17%	CAR180_E01	33%	100%	0%	0.859	0.000	0.859
			CAR180_E02	33%	100%	0%	0.859	0.000	0.859
			CAR180_E03	33%	100%	0%	0.859	0.000	0.859
	North	31%	CAR180_N01	10%	100%	0%	0.475	0.000	0.475
			CAR180_N02	10%	100%	0%	0.475	0.000	0.475
			CAR180_N03	40%	100%	0%	1.901	0.000	1.901
			CAR180_N04	40%	100%	0%	1.901	0.000	1.901
	South	25%	CAR180_S01	10%	100%	0%	0.384	0.000	0.384
			CAR180_S02	10%	100%	0%	0.384	0.000	0.384
			CAR180_S03	40%	100%	0%	1.536	0.000	1.536
			CAR180_S04	40%	100%	0%	1.536	0.000	1.536
	West	28%	CAR180_W01	33%	100%	0%	1.419	0.000	1.419
			CAR180_W02	33%	100%	0%	1.419	0.000	1.419
			CAR180_W03	33%	100%	0%	1.419	0.000	1.419
								180° Autorotation Subtotal	15.427
External Load	East	17%	CEL_E_01	100%	100%	0%	0.893	0.000	0.893
	North	31%	CEL_N_01	100%	100%	0%	1.647	0.000	1.647
	South	25%	CEL_S_01	100%	100%	0%	1.332	0.000	1.332
	West	28%	CEL_W_01	100%	100%	0%	1.476	0.000	1.476
								External Load Subtotal	5.348
Pinnacle	East	17%	CPN_E_01	100%	100%	0%	0.893	0.000	0.893
	North	31%	CPN_N_01	100%	100%	0%	1.647	0.000	1.647
	South	25%	CPN_S_01	100%	100%	0%	1.332	0.000	1.332
	West	28%	CPN_W_01	100%	100%	0%	1.476	0.000	1.476
								Pinnacle Subtotal	5.348
Standard	East	17%	CST_E_01	33%	99%	1%	7.013	0.095	7.108
			CST_E_02	33%	99%	1%	7.013	0.095	7.108
			CST_E_03	33%	99%	1%	7.013	0.095	7.108
	North	31%	CST_N_01	10%	99%	1%	3.880	0.053	3.933
			CST_N_02	10%	99%	1%	3.880	0.053	3.933
			CST_N_03	40%	99%	1%	15.521	0.211	15.732
			CST_N_04	40%	99%	1%	15.521	0.211	15.732
	South	25%	CST_S_01	10%	99%	1%	3.137	0.043	3.180
			CST_S_02	10%	99%	1%	3.137	0.043	3.180
			CST_S_03	40%	99%	1%	12.548	0.170	12.718
			CST_S_04	40%	99%	1%	12.548	0.170	12.718
	West	28%	CST_W_01	33%	99%	1%	11.590	0.157	11.748
			CST_W_02	33%	99%	1%	11.590	0.157	11.748
			CST_W_03	33%	99%	1%	11.590	0.157	11.748
								Standard Subtotal	127.693

NOLF Harold Helicopter Annual Average Daily Flight Operations for Proposed Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Tactical	East	17%	CTL_E_01	33%	100%	0%	0.893	0.000	0.893
			CTL_E_02	33%	100%	0%	0.893	0.000	0.893
			CTL_E_03	33%	100%	0%	0.893	0.000	0.893
	North	31%	CTL_N_01	33%	100%	0%	1.647	0.000	1.647
			CTL_N_02	33%	100%	0%	1.647	0.000	1.647
			CTL_N_03	33%	100%	0%	1.647	0.000	1.647
	South	25%	CTL_S_01	33%	100%	0%	1.332	0.000	1.332
			CTL_S_02	33%	100%	0%	1.332	0.000	1.332
			CTL_S_03	33%	100%	0%	1.332	0.000	1.332
	West	28%	CTL_W_01	33%	100%	0%	1.476	0.000	1.476
			CTL_W_02	33%	100%	0%	1.476	0.000	1.476
			CTL_W_03	33%	100%	0%	1.476	0.000	1.476
								Tactical Subtotal	16.044
High Speed Tactical	East	17%	HST090	100%	100%	0%	0.670	0.000	0.670
	South	25%	HST180	100%	100%	0%	0.999	0.000	0.999
	West	28%	HST270	100%	100%	0%	1.107	0.000	1.107
	North	31%	HST360	100%	100%	0%	1.236	0.000	1.236
								High Speed Tactical Subtotal	4.012
								Pattern Subtotal	194.647
								TOTAL	201.928

NOLF Harold Helicopter Annual Average Daily Flight Operations for No Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Arr.	East	17%	ARR_E_01L	25%	99%	1%	0.226	0.002	0.228
			ARR_E_02L	25%	99%	1%	0.226	0.002	0.228
			ARR_E_01R	25%	99%	1%	0.226	0.002	0.228
			ARR_E_02R	25%	99%	1%	0.226	0.002	0.228
	North	31%	ARR_N_01L	25%	99%	1%	0.417	0.003	0.421
			ARR_N_02R	25%	99%	1%	0.417	0.003	0.421
			ARR_N_01R	25%	99%	1%	0.417	0.003	0.421
			ARR_N_02L	25%	99%	1%	0.417	0.003	0.421
	South	25%	ARR_S_01L	25%	99%	1%	0.337	0.003	0.340
			ARR_S_02L	25%	99%	1%	0.337	0.003	0.340
			ARR_S_01R	25%	99%	1%	0.337	0.003	0.340
			ARR_S_02R	25%	99%	1%	0.337	0.003	0.340
	West	28%	ARR_W_01L	25%	99%	1%	0.374	0.003	0.377
			ARR_W_02L	25%	99%	1%	0.374	0.003	0.377
			ARR_W_01R	25%	99%	1%	0.374	0.003	0.377
			ARR_W_02R	25%	99%	1%	0.374	0.003	0.377
								Arrival Subtotal	5.462
Dep.	West	28%	HST270	100%	100%	0%	0.454	0.000	0.454
								Departure Subtotal	0.506
Confined Air Landing	East	17%	CAL_E_01	50%	100%	0%	0.366	0.000	0.366
			CAL_E_02	50%	100%	0%	0.366	0.000	0.366
	North	31%	CAL_N_01	50%	100%	0%	0.675	0.000	0.675
			CAL_N_02	50%	100%	0%	0.675	0.000	0.675
	South	25%	CAL_S_01	50%	100%	0%	0.546	0.000	0.546
			CAL_S_02	50%	100%	0%	0.546	0.000	0.546
	West	28%	CAL_W_01	50%	100%	0%	0.605	0.000	0.605
			CAL_W_02	50%	100%	0%	0.605	0.000	0.605
								CAL Subtotal	4.384
90° Auto-rotation	East	17%	CAR90_E01	33%	100%	0%	0.704	0.000	0.704
			CAR90_E02	33%	100%	0%	0.704	0.000	0.704
			CAR90_E03	33%	100%	0%	0.704	0.000	0.704
	North	31%	CAR90_N01	10%	100%	0%	0.389	0.000	0.389
			CAR90_N02	10%	100%	0%	0.389	0.000	0.389
			CAR90_N03	40%	100%	0%	1.558	0.000	1.558
			CAR90_N04	40%	100%	0%	1.558	0.000	1.558
	South	25%	CAR90_S01	10%	100%	0%	0.315	0.000	0.315
			CAR90_S02	10%	100%	0%	0.315	0.000	0.315
			CAR90_S03	40%	100%	0%	1.259	0.000	1.259
			CAR90_S04	40%	100%	0%	1.259	0.000	1.259
	West	28%	CAR90_W01	33%	100%	0%	1.163	0.000	1.163
			CAR90_W02	33%	100%	0%	1.163	0.000	1.163
			CAR90_W03	33%	100%	0%	1.163	0.000	1.163
								90° Autorotation Subtotal	12.645

NOLF Harold Helicopter Annual Average Daily Flight Operations for No Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
180° Auto-rotation	East	17%	CAR180_E01	33%	100%	0%	0.704	0.000	0.704
			CAR180_E02	33%	100%	0%	0.704	0.000	0.704
			CAR180_E03	33%	100%	0%	0.704	0.000	0.704
	North	31%	CAR180_N01	10%	100%	0%	0.389	0.000	0.389
			CAR180_N02	10%	100%	0%	0.389	0.000	0.389
			CAR180_N03	40%	100%	0%	1.558	0.000	1.558
			CAR180_N04	40%	100%	0%	1.558	0.000	1.558
	South	25%	CAR180_S01	10%	100%	0%	0.315	0.000	0.315
			CAR180_S02	10%	100%	0%	0.315	0.000	0.315
			CAR180_S03	40%	100%	0%	1.259	0.000	1.259
			CAR180_S04	40%	100%	0%	1.259	0.000	1.259
	West	28%	CAR180_W01	33%	100%	0%	1.163	0.000	1.163
			CAR180_W02	33%	100%	0%	1.163	0.000	1.163
			CAR180_W03	33%	100%	0%	1.163	0.000	1.163
180° Autorotation Subtotal									**12.645**
External Load	East	17%	CEL_E_01	100%	100%	0%	0.732	0.000	0.732
	North	31%	CEL_N_01	100%	100%	0%	1.350	0.000	1.350
	South	25%	CEL_S_01	100%	100%	0%	1.092	0.000	1.092
	West	28%	CEL_W_01	100%	100%	0%	1.210	0.000	1.210
External Load Subtotal									**4.384**
Pinnacle	East	17%	CPN_E_01	100%	100%	0%	0.732	0.000	0.732
	North	31%	CPN_N_01	100%	100%	0%	1.350	0.000	1.350
	South	25%	CPN_S_01	100%	100%	0%	1.092	0.000	1.092
	West	28%	CPN_W_01	100%	100%	0%	1.210	0.000	1.210
Pinnacle Subtotal									**4.384**
Standard	East	17%	CST_E_01	33%	99%	1%	5.748	0.078	5.826
			CST_E_02	33%	99%	1%	5.748	0.078	5.826
			CST_E_03	33%	99%	1%	5.748	0.078	5.826
	North	31%	CST_N_01	10%	99%	1%	3.180	0.043	3.224
			CST_N_02	10%	99%	1%	3.180	0.043	3.224
			CST_N_03	40%	99%	1%	12.722	0.173	12.895
			CST_N_04	40%	99%	1%	12.722	0.173	12.895
	South	25%	CST_S_01	10%	99%	1%	2.571	0.035	2.606
			CST_S_02	10%	99%	1%	2.571	0.035	2.606
			CST_S_03	40%	99%	1%	10.285	0.140	10.425
			CST_S_04	40%	99%	1%	10.285	0.140	10.425
	West	28%	CST_W_01	33%	99%	1%	9.500	0.129	9.629
			CST_W_02	33%	99%	1%	9.500	0.129	9.629
			CST_W_03	33%	99%	1%	9.500	0.129	9.629
Standard Subtotal									**104.665**

NOLF Harold Helicopter Annual Average Daily Flight Operations for No Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Tactical	East	17%	CTL_E_01	33%	100%	0%	0.732	0.000	0.732
			CTL_E_02	33%	100%	0%	0.732	0.000	0.732
			CTL_E_03	33%	100%	0%	0.732	0.000	0.732
	North	31%	CTL_N_01	33%	100%	0%	1.350	0.000	1.350
			CTL_N_02	33%	100%	0%	1.350	0.000	1.350
			CTL_N_03	33%	100%	0%	1.350	0.000	1.350
	South	25%	CTL_S_01	33%	100%	0%	1.092	0.000	1.092
			CTL_S_02	33%	100%	0%	1.092	0.000	1.092
			CTL_S_03	33%	100%	0%	1.092	0.000	1.092
	West	28%	CTL_W_01	33%	100%	0%	1.210	0.000	1.210
			CTL_W_02	33%	100%	0%	1.210	0.000	1.210
			CTL_W_03	33%	100%	0%	1.210	0.000	1.210
								Tactical Subtotal	13.151
High Speed Tactical	East	17%	HST090	100%	100%	0%	0.549	0.000	0.549
	South	25%	HST180	100%	100%	0%	0.819	0.000	0.819
	West	28%	HST270	100%	100%	0%	0.908	0.000	0.908
	North	31%	HST360	100%	100%	0%	1.013	0.000	1.013
								High Speed Tactical Subtotal	3.288
								Pattern Subtotal	159.544
								TOTAL	165.512

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Appendix C-6

NOLF Santa Rosa

Distribution of Operations

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NOLF Santa Rosa Helicopter Annual Average Daily Flight Operations for Baseline									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Day Arr.	East	17%	ARR_E_01L	50%	100%	0%	1.110	0.000	1.110
			ARR_E_01R	50%	100%	0%	1.110	0.000	1.110
	North	31%	ARR_N_01L	50%	100%	0%	2.048	0.000	2.048
			ARR_N_01R	50%	100%	0%	2.048	0.000	2.048
	South	25%	ARR_S_01L	50%	100%	0%	1.655	0.000	1.655
			ARR_S_01R	50%	100%	0%	1.655	0.000	1.655
	West	28%	ARR_W_01L	50%	100%	0%	1.835	0.000	1.835
			ARR_W_01R	50%	100%	0%	1.835	0.000	1.835
								Daytime Arrival Subtotal	**13.297**
Night Arr.	East	17%	ARR_E_02L	50%	0%	100%	0.000	0.042	0.042
			ARR_E_02R	50%	0%	100%	0.000	0.042	0.042
	North	31%	ARR_N_02L	50%	0%	100%	0.000	0.078	0.078
			ARR_N_02R	50%	0%	100%	0.000	0.078	0.078
	South	25%	ARR_S_02L	50%	0%	100%	0.000	0.063	0.063
			ARR_S_02R	50%	0%	100%	0.000	0.063	0.063
	West	28%	ARR_W_02L	50%	0%	100%	0.000	0.070	0.070
			ARR_W_02R	50%	0%	100%	0.000	0.070	0.070
								Nighttime Arrival Subtotal	**0.509**
								Arrival Subtotal	**13.806**
Dep.	South	25%	HST_S	25%	100%	0%	0.939	0.000	0.939
			HST_W	75%	100%	0%	1.041	0.000	1.041
								Departure Subtotal	**266.775**
90° Auto-rotation	East	17%	CAR90_E01	100%	100%	0%	8.043	0.000	8.043
	North	31%	CAR90_N01	100%	100%	0%	14.833	0.000	14.833
	South	25%	CAR90_S01	100%	100%	0%	11.992	0.000	11.992
	West	28%	CAR90_W01	100%	100%	0%	13.292	0.000	13.292
								90° Autorotation Subtotal	**48.159**
180° Auto-rotation	East	17%	CAR180_E01	100%	100%	0%	8.043	0.000	8.043
	North	31%	CAR180_N01	100%	100%	0%	14.833	0.000	14.833
	South	25%	CAR180_S01	100%	100%	0%	11.992	0.000	11.992
	West	28%	CAR180_W01	100%	100%	0%	13.292	0.000	13.292
								180° Autorotation Subtotal	**48.159**

NOLF Santa Rosa Helicopter Annual Average Daily Flight Operations for Baseline									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Standard	East	17%	CST_E_01	20%	98%	2%	11.545	0.190	11.735
			CST_E_02	20%	98%	2%	11.545	0.190	11.735
			CST_E_03	20%	98%	2%	11.545	0.190	11.735
			CST_E_04	20%	98%	2%	11.545	0.190	11.735
			CST_E_05	20%	98%	2%	11.545	0.190	11.735
	North	31%	CST_N_01	20%	98%	2%	21.293	0.351	21.644
			CST_N_02	20%	98%	2%	21.293	0.351	21.644
			CST_N_03	20%	98%	2%	21.293	0.351	21.644
			CST_N_04	20%	98%	2%	21.293	0.351	21.644
			CST_N_05	20%	98%	2%	21.293	0.351	21.644
	South	25%	CST_S_01	20%	98%	2%	17.214	0.284	17.498
			CST_S_02	20%	98%	2%	17.214	0.284	17.498
			CST_S_03	20%	98%	2%	17.214	0.284	17.498
			CST_S_04	20%	98%	2%	17.214	0.284	17.498
			CST_S_05	20%	98%	2%	17.214	0.284	17.498
	West	28%	CST_W_01	20%	98%	2%	19.080	0.315	19.395
			CST_W_02	20%	98%	2%	19.080	0.315	19.395
			CST_W_03	20%	98%	2%	19.080	0.315	19.395
			CST_W_04	20%	98%	2%	19.080	0.315	19.395
			CST_W_05	20%	98%	2%	19.080	0.315	19.395
								Standard Subtotal	351.359
Tactical	East	17%	CTL_E_01	50%	100%	0%	2.519	0.000	2.519
			CTL_E_02	50%	100%	0%	2.519	0.000	2.519
	North	31%	CTL_N_01	50%	100%	0%	4.647	0.000	4.647
			CTL_N_02	50%	100%	0%	4.647	0.000	4.647
	South	25%	CTL_S_01	50%	100%	0%	3.756	0.000	3.756
			CTL_S_02	50%	100%	0%	3.756	0.000	3.756
	West	28%	CTL_W_01	50%	100%	0%	4.164	0.000	4.164
			CTL_W_02	50%	100%	0%	4.164	0.000	4.164
								Tactical Subtotal	30.173
Tail Rotor/ Boost Off	East	17%	CTRB_E_01	100%	100%	0%	8.043	0.000	8.043
	North	31%	CTRB_N_01	100%	100%	0%	14.833	0.000	14.833
	South	25%	CTRB_S_01	100%	100%	0%	11.992	0.000	11.992
	West	28%	CTRB_W_01	100%	100%	0%	13.292	0.000	13.292
								Tail Rotor/Boost Off Subtotal	48.159
High Speed Tactical	East	17%	HST_E	100%	100%	0%	1.260	0.000	1.260
	North	31%	HST_N	100%	100%	0%	2.323	0.000	2.323
	South	25%	HST_S	100%	100%	0%	1.878	0.000	1.878
	West	28%	HST_W	100%	100%	0%	2.082	0.000	2.082
								High Speed Tactical Subtotal	7.542
								Pattern Subtotal	533.550
								TOTAL	814.131

NOLF Santa Rosa Helicopter Annual Average Daily Flight Operations for Proposed Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Day Arr.	East	17%	ARR_E_01L	50%	100%	0%	1.339	0.000	1.339
			ARR_E_01R	50%	100%	0%	1.339	0.000	1.339
	North	31%	ARR_N_01L	50%	100%	0%	2.470	0.000	2.470
			ARR_N_01R	50%	100%	0%	2.470	0.000	2.470
	South	25%	ARR_S_01L	50%	100%	0%	1.997	0.000	1.997
			ARR_S_01R	50%	100%	0%	1.997	0.000	1.997
	West	28%	ARR_W_01L	50%	100%	0%	2.213	0.000	2.213
			ARR_W_01R	50%	100%	0%	2.213	0.000	2.213
Daytime Arrival Subtotal									16.036
Night Arr.	East	17%	ARR_E_02L	50%	0%	100%	0.000	0.051	0.051
			ARR_E_02R	50%	0%	100%	0.000	0.051	0.051
	North	31%	ARR_N_02L	50%	0%	100%	0.000	0.095	0.095
			ARR_N_02R	50%	0%	100%	0.000	0.095	0.095
	South	25%	ARR_S_02L	50%	0%	100%	0.000	0.076	0.076
			ARR_S_02R	50%	0%	100%	0.000	0.076	0.076
	West	28%	ARR_W_02L	50%	0%	100%	0.000	0.085	0.085
			ARR_W_02R	50%	0%	100%	0.000	0.085	0.085
Nighttime Arrival Subtotal									0.614
Arrival Subtotal									16.650
Dep.	South	25%	HST_S	25%	100%	0%	1.132	0.000	1.132
			HST_W	75%	100%	0%	1.255	0.000	1.255
Departure Subtotal									321.734
90° Auto-rotation	East	17%	CAR90_E01	100%	100%	0%	9.699	0.000	9.699
	North	31%	CAR90_N01	100%	100%	0%	17.889	0.000	17.889
	South	25%	CAR90_S01	100%	100%	0%	14.462	0.000	14.462
	West	28%	CAR90_W01	100%	100%	0%	16.030	0.000	16.030
90° Autorotation Subtotal									58.080
180° Auto-rotation	East	17%	CAR180_E01	100%	100%	0%	9.699	0.000	9.699
	North	31%	CAR180_N01	100%	100%	0%	17.889	0.000	17.889
	South	25%	CAR180_S01	100%	100%	0%	14.462	0.000	14.462
	West	28%	CAR180_W01	100%	100%	0%	16.030	0.000	16.030
180° Autorotation Subtotal									58.080

NOLF Santa Rosa Helicopter Annual Average Daily Flight Operations for Proposed Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Standard	East	17%	CST_E_01	20%	98%	2%	13.923	0.230	14.153
			CST_E_02	20%	98%	2%	13.923	0.230	14.153
			CST_E_03	20%	98%	2%	13.923	0.230	14.153
			CST_E_04	20%	98%	2%	13.923	0.230	14.153
			CST_E_05	20%	98%	2%	13.923	0.230	14.153
	North	31%	CST_N_01	20%	98%	2%	25.679	0.423	26.103
			CST_N_02	20%	98%	2%	25.679	0.423	26.103
			CST_N_03	20%	98%	2%	25.679	0.423	26.103
			CST_N_04	20%	98%	2%	25.679	0.423	26.103
			CST_N_05	20%	98%	2%	25.679	0.423	26.103
	South	25%	CST_S_01	20%	98%	2%	20.760	0.342	21.102
			CST_S_02	20%	98%	2%	20.760	0.342	21.102
			CST_S_03	20%	98%	2%	20.760	0.342	21.102
			CST_S_04	20%	98%	2%	20.760	0.342	21.102
			CST_S_05	20%	98%	2%	20.760	0.342	21.102
	West	28%	CST_W_01	20%	98%	2%	23.011	0.379	23.391
			CST_W_02	20%	98%	2%	23.011	0.379	23.391
			CST_W_03	20%	98%	2%	23.011	0.379	23.391
			CST_W_04	20%	98%	2%	23.011	0.379	23.391
			CST_W_05	20%	98%	2%	23.011	0.379	23.391
								Standard Subtotal	**423.743**
Tactical	East	17%	CTL_E_01	50%	100%	0%	3.038	0.000	3.038
			CTL_E_02	50%	100%	0%	3.038	0.000	3.038
	North	31%	CTL_N_01	50%	100%	0%	5.604	0.000	5.604
			CTL_N_02	50%	100%	0%	5.604	0.000	5.604
	South	25%	CTL_S_01	50%	100%	0%	4.530	0.000	4.530
			CTL_S_02	50%	100%	0%	4.530	0.000	4.530
	West	28%	CTL_W_01	50%	100%	0%	5.022	0.000	5.022
			CTL_W_02	50%	100%	0%	5.022	0.000	5.022
								Tactical Subtotal	**36.389**
Tail Rotor/ Boost Off	East	17%	CTRB_E_01	100%	100%	0%	9.699	0.000	9.699
	North	31%	CTRB_N_01	100%	100%	0%	17.889	0.000	17.889
	South	25%	CTRB_S_01	100%	100%	0%	14.462	0.000	14.462
	West	28%	CTRB_W_01	100%	100%	0%	16.030	0.000	16.030
								Tail Rotor/Boost Off Subtotal	**58.080**
High Speed Tactical	East	17%	HST_E	100%	100%	0%	1.519	0.000	1.519
	North	31%	HST_N	100%	100%	0%	2.802	0.000	2.802
	South	25%	HST_S	100%	100%	0%	2.265	0.000	2.265
	West	28%	HST_W	100%	100%	0%	2.511	0.000	2.511
								High Speed Tactical Subtotal	**9.096**
								Pattern Subtotal	**643.469**
								TOTAL	**981.853**

NOLF Santa Rosa Helicopter Annual Average Daily Flight Operations for No Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Day Arr.	East	17%	ARR_E_01L	50%	100%	0%	1.098	0.000	1.098
			ARR_E_01R	50%	100%	0%	1.098	0.000	1.098
	North	31%	ARR_N_01L	50%	100%	0%	2.024	0.000	2.024
			ARR_N_01R	50%	100%	0%	2.024	0.000	2.024
	South	25%	ARR_S_01L	50%	100%	0%	1.636	0.000	1.636
			ARR_S_01R	50%	100%	0%	1.636	0.000	1.636
	West	28%	ARR_W_01L	50%	100%	0%	1.814	0.000	1.814
			ARR_W_01R	50%	100%	0%	1.814	0.000	1.814
								Daytime Arrival Subtotal	13.144
Night Arr.	East	17%	ARR_E_02L	50%	0%	100%	0.000	0.042	0.042
			ARR_E_02R	50%	0%	100%	0.000	0.042	0.042
	North	31%	ARR_N_02L	50%	0%	100%	0.000	0.077	0.077
			ARR_N_02R	50%	0%	100%	0.000	0.077	0.077
	South	25%	ARR_S_02L	50%	0%	100%	0.000	0.063	0.063
			ARR_S_02R	50%	0%	100%	0.000	0.063	0.063
	West	28%	ARR_W_02L	50%	0%	100%	0.000	0.069	0.069
			ARR_W_02R	50%	0%	100%	0.000	0.069	0.069
								Nighttime Arrival Subtotal	0.503
								Arrival Subtotal	13.647
Dep.	South	25%	HST_S	25%	100%	0%	0.928	0.000	0.928
			HST_W	75%	100%	0%	1.029	0.000	1.029
								Departure Subtotal	263.712
90° Auto-rotation	East	17%	CAR90_E01	100%	100%	0%	7.950	0.000	7.950
	North	31%	CAR90_N01	100%	100%	0%	14.663	0.000	14.663
	South	25%	CAR90_S01	100%	100%	0%	11.854	0.000	11.854
	West	28%	CAR90_W01	100%	100%	0%	13.139	0.000	13.139
								90° Autorotation Subtotal	47.606
180° Auto-rotation	East	17%	CAR180_E01	100%	100%	0%	7.950	0.000	7.950
	North	31%	CAR180_N01	100%	100%	0%	14.663	0.000	14.663
	South	25%	CAR180_S01	100%	100%	0%	11.854	0.000	11.854
	West	28%	CAR180_W01	100%	100%	0%	13.139	0.000	13.139
								180° Autorotation Subtotal	47.606

NOLF Santa Rosa Helicopter Annual Average Daily Flight Operations for No Action									
Track Type	Course Flow		Profile				Acoustic Day	Acoustic Night	Total
	Dir	Use	ID	% Use	% Day	% Night			
Standard	East	17%	CST_E_01	20%	98%	2%	11.412	0.188	11.601
			CST_E_02	20%	98%	2%	11.412	0.188	11.601
			CST_E_03	20%	98%	2%	11.412	0.188	11.601
			CST_E_04	20%	98%	2%	11.412	0.188	11.601
			CST_E_05	20%	98%	2%	11.412	0.188	11.601
	North	31%	CST_N_01	20%	98%	2%	21.048	0.347	21.395
			CST_N_02	20%	98%	2%	21.048	0.347	21.395
			CST_N_03	20%	98%	2%	21.048	0.347	21.395
			CST_N_04	20%	98%	2%	21.048	0.347	21.395
			CST_N_05	20%	98%	2%	21.048	0.347	21.395
	South	25%	CST_S_01	20%	98%	2%	17.016	0.281	17.297
			CST_S_02	20%	98%	2%	17.016	0.281	17.297
			CST_S_03	20%	98%	2%	17.016	0.281	17.297
			CST_S_04	20%	98%	2%	17.016	0.281	17.297
			CST_S_05	20%	98%	2%	17.016	0.281	17.297
	West	28%	CST_W_01	20%	98%	2%	18.861	0.311	19.172
			CST_W_02	20%	98%	2%	18.861	0.311	19.172
			CST_W_03	20%	98%	2%	18.861	0.311	19.172
			CST_W_04	20%	98%	2%	18.861	0.311	19.172
			CST_W_05	20%	98%	2%	18.861	0.311	19.172
								Standard Subtotal	347.325
Tactical	East	17%	CTL_E_01	50%	100%	0%	2.490	0.000	2.490
			CTL_E_02	50%	100%	0%	2.490	0.000	2.490
	North	31%	CTL_N_01	50%	100%	0%	4.593	0.000	4.593
			CTL_N_02	50%	100%	0%	4.593	0.000	4.593
	South	25%	CTL_S_01	50%	100%	0%	3.713	0.000	3.713
			CTL_S_02	50%	100%	0%	3.713	0.000	3.713
	West	28%	CTL_W_01	50%	100%	0%	4.116	0.000	4.116
			CTL_W_02	50%	100%	0%	4.116	0.000	4.116
								Tactical Subtotal	29.826
Tail Rotor/ Boost Off	East	17%	CTRB_E_01	100%	100%	0%	7.950	0.000	7.950
	North	31%	CTRB_N_01	100%	100%	0%	14.663	0.000	14.663
	South	25%	CTRB_S_01	100%	100%	0%	11.854	0.000	11.854
	West	28%	CTRB_W_01	100%	100%	0%	13.139	0.000	13.139
								Tail Rotor/Boost Off Subtotal	47.606
High Speed Tactical	East	17%	HST_E	100%	100%	0%	1.245	0.000	1.245
	North	31%	HST_N	100%	100%	0%	2.296	0.000	2.296
	South	25%	HST_S	100%	100%	0%	1.857	0.000	1.857
	West	28%	HST_W	100%	100%	0%	2.058	0.000	2.058
								High Speed Tactical Subtotal	7.456
								Pattern Subtotal	527.425
								TOTAL	804.784

Appendix A1
Discussion of Noise and Its Effects on the Environment

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Acknowledgements

This review of noise and its effects on the environment was prepared by Wyle Laboratories, Inc., with contributions from Blue Ridge Research and Consulting LLC and Ecology and Environment, Inc.

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TABLE OF CONTENTS

List of Figures

List of Tables

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Abbreviations and Acronyms

Acronym	Definition
AGL	Above Ground Level
ANSI	American National Standards Institute
CHABA	Committee on Hearing, Bioacoustics, and Biomechanics
CNEL	Community Noise Equivalent Level
dB	Decibel
dBA or dB(A)	A-Weighted Decibel
DLR	German Aerospace Center (*Deutsches Zentrum für Luft- und Raumfahrt e.V.*)
DNL	Day-Night Average Sound Level
DNWG	Defense Noise Working Group
DoD	Department of Defense
EU	European Union
FAA	(U.S.) Federal Aviation Administration
FICAN	Federal Interagency Committee on Aviation Noise
FICON	Federal Interagency Committee on Noise
HYENA	Hypertension and Exposure to Noise near Airports
Hz	Hertz
IHD	Ischemic heart disease
IRR	Incidence Rate Ratio
ISO	International Organization for Standardization
L	Sound Level
LAX	Los Angeles International Airport
L_{ct}	Community Tolerance Level
L_{dn}	Day-Night Average Sound Level

Acronym	Definition
L_{dnmr}	Onset-Rate Adjusted Monthly Day-Night Average Sound Level
L_{eq}	Equivalent Sound Level
$L_{eq(24)}$	Equivalent Sound Level over 24 hours
$L_{eq(30min)}$	Equivalent Sound Level over 30 minutes
$L_{eq(8)}$	Equivalent Sound Level over 8 hours
$L_{eq(h)}$	Hourly Equivalent Sound Level
L_{max}	Maximum Sound Level
L_{pk}	Peak Sound Pressure Level
mmHg	millimeters of mercury
NA	Number of Events Above
NAL	Number of Events Above a Threshold Level
NDI	Noise Depreciation Index
NIPTS	Noise-induced Permanent Threshold Shift
NORAH	Noise-Related Annoyance, Cognition, and Health
OSHA	United States Occupational Safety and Health Administration
PHL	Potential Hearing Loss
PTS	Permanent Threshold Shift
RANCH	Road Traffic and Aircraft Noise Exposure and Children's Cognition and Health
SEL	Sound Exposure Level
SIL	Speech Interference Level
SUA	Special Use Airspace
TA	Time Above
TTS	Temporary Threshold Shift

Acronym	Definition
U.S.	United States
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
WHO	World Health Organization

A1 Discussion of Noise and its Effects on the Environment

This appendix discusses sound and noise, and the potential effects of noise, particularly aircraft noise, on the human and natural environment. Section A1.1 provides an overview of the basics of sound and noise. Section A1.2 defines and describes the various metrics used to describe noise. Section A1.3 reviews the potential effects of aircraft noise, focusing on effects on humans but also addressing effects on property values, terrain, structures, and animals. Section A1.4 contains the list of references cited.

A1.1 Basics of Sound

Section A1.1 describes sound waves and decibels, and Section A1.2 describes sound levels and types of sounds.

A1.1.1 Sound Waves and Decibels

Sound consists of minute vibrations that travel through the air and are sensed by the human ear. Figure A-1 depicts how sound waves emanate from a tuning fork. As shown, the waves move outward as a series of crests, in which the air is compressed, and troughs, in which the air is expanded. The height of the crests and the depth of the troughs determines the *amplitude* of the wave. The sound *pressure* determines the sound wave's energy, or intensity. The number of crests or troughs that pass a given point each second is called the *frequency* of the sound wave.

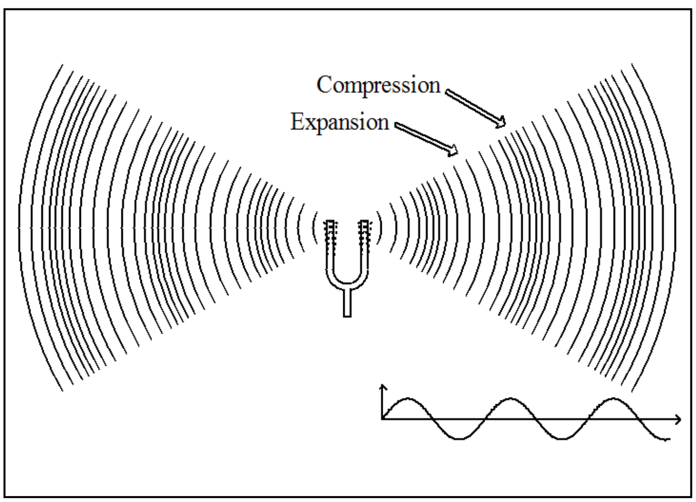


Figure A-1 Sound Waves from a Vibrating Tuning Fork

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 a sound and is related to sound pressure. The greater the sound pressure, the more energy is carried by the sound and the louder the perception of that sound will be.
- *Frequency* determines how the pitch of a sound is perceived. Low-frequency sounds are characterized as rumbles or roars, while high-frequency sounds are often described as sounding like sirens or screeches.

- *Duration* is the length of time a 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 (dB) is used to represent the intensity of a sound. Such a representation is called a sound level and is abbreviated as L. A sound level of 0 dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels above 120 dB would be uncomfortable for the average person, and levels of 130 to 140 dB would start to be felt as pain (Berglund and Lindvall, 1995). It is important to realize some people will be more sensitive to sound and some less sensitive; therefore, the level at which sound becomes uncomfortable or painful will vary across the population.

As shown in Figure A-1, the sound from a tuning fork spreads out uniformly as it travels from its source. This spreading causes the sound's intensity to decrease with distance from the source. For a point source of a sound, such as an air conditioning unit, the sound level will decrease by about 6 dB for every doubling of its distance from a receptor. For a busy highway, which creates a linear distribution of noise sources, the sound level will decrease by 3 to 4.5 dB for every doubling of distance.

As sound travels from its source, it is also absorbed by the air. The amount of absorption depends on the frequency composition of the sound and the temperature and humidity of the air. Sound with high-frequency content, such as a human voice, gets absorbed by the air more readily than sound with low-frequency content, such as a military jet. More sound is absorbed in colder and drier air than in hot and wet air. Sound is also affected by wind and temperature gradients, terrain (elevation and ground cover), and structures.

Because of the logarithmic nature of the dB unit, sound levels cannot simply be added or subtracted and are somewhat cumbersome to handle mathematically. However, some simple rules are useful in understanding 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 greater than the higher of the two. For example:

60.0 dB + 70.0 dB = 70.4 dB.

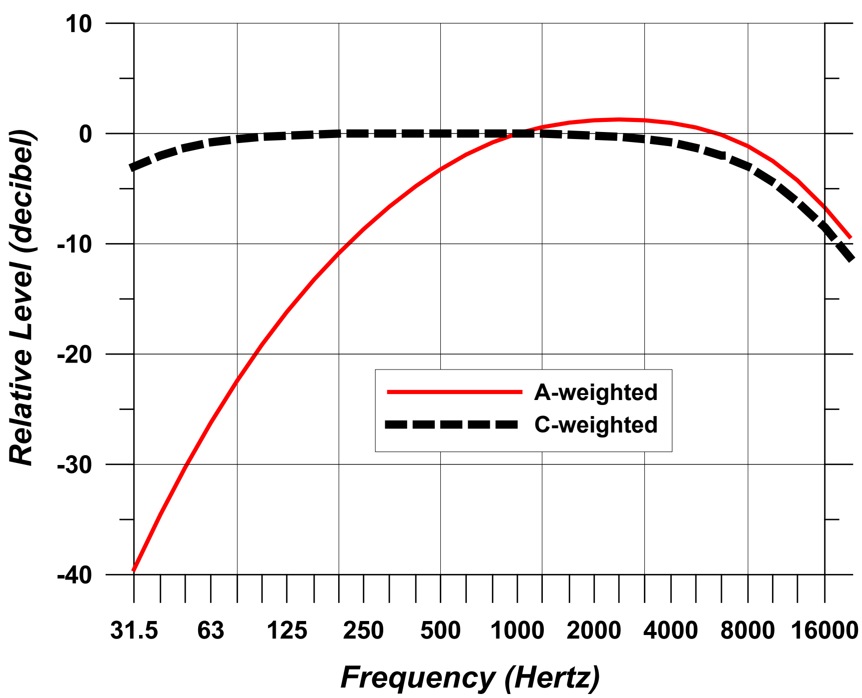
Because the addition of sounds of differing levels is different than that of simply adding numbers, this process is often referred to as "decibel addition."

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 that sound's loudness. This relation holds true for both 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 to sound linearly. Intensity of a sound is the physical measure of the stimulus, and loudness of a sound is the perceptual measure of a listener's response to it.

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 Hz to 20,000 Hz. 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, and as we get older, we lose the ability to hear high-frequency sounds. The notes on a piano range in frequency from just over 27 Hz to 4,186 Hz, with middle C equal to 261.6 Hz. Most sounds (including a single note on a piano) are not simply pure tones like those produced by the tuning fork in Figure A-1 but instead contain a mix, or spectrum, of many frequencies.

Sounds with different frequency 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 frequencies of sound. A-weighting and C-weighting are the two most common frequency weightings. These two curves, shown in Figure A-2, are adequate to quantify most environmental sounds. A-weighting puts emphasis on the 1,000 to 4,000 Hz frequency range.

Very loud or impulsive sounds, such as explosions or sonic booms, can sometimes be felt and can 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. For example, using the A-weighted curve, a 125 Hz tone at moderate sound levels (around 50 dB) is perceived to be about 17 dB lower than a 1,000 Hz tone. However, using the C-weighted curve, if the sound level is increased to 100 dB, the two tones are perceived to be the same level.



Source: ANSI S1.4A -1985 "Specification of Sound Level Meters"

Figure A-2 Frequency Characteristics of A- and C-Weighting

A1.1.2 Sound Levels and Types of Sounds

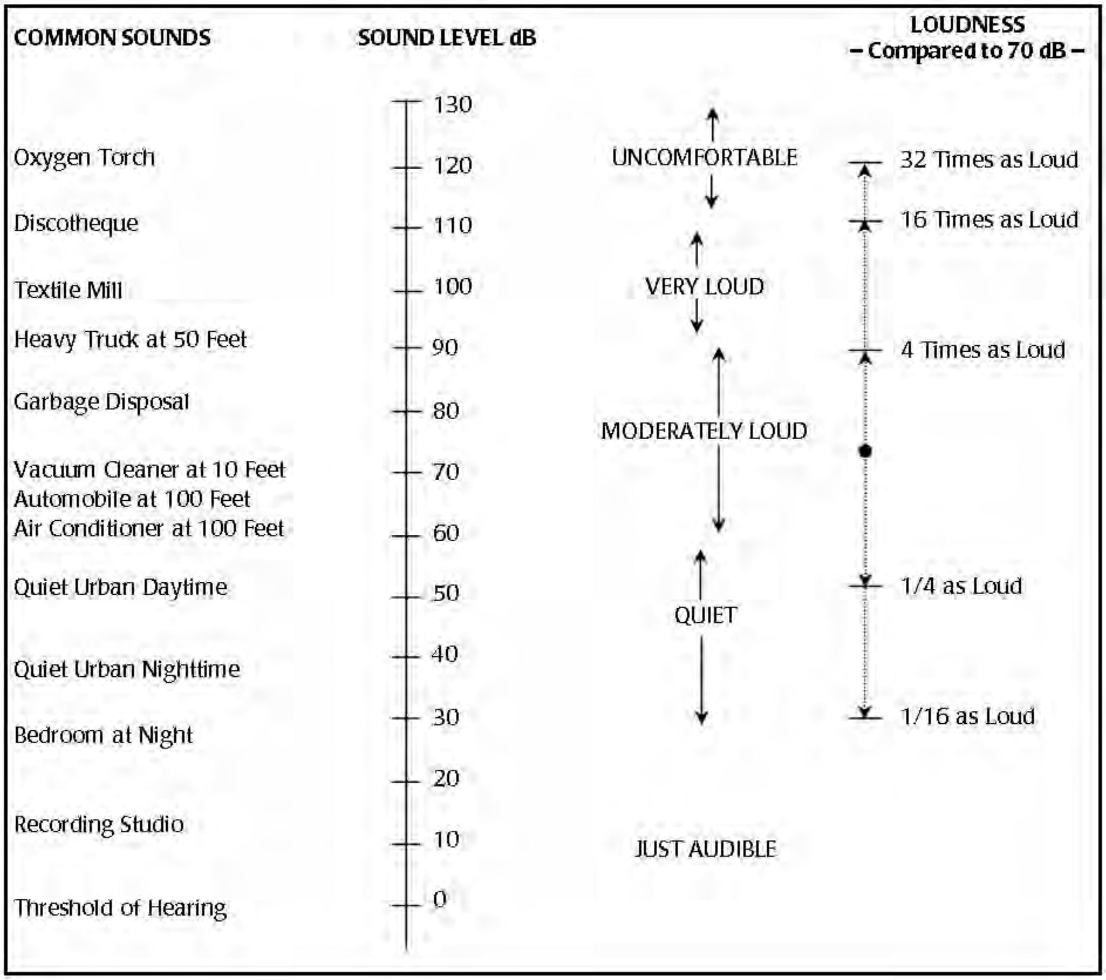
Most environmental sounds are measured and described as A-weighted sound levels, and they may be labeled as dBA or dB(A) rather than dB. When the use of A-weighting is understood, the term "A-weighted" is often omitted, and the unit dB is used. Unless otherwise stated, dB units refer to A-weighted sound levels.

Sound becomes noise when it is unwelcome and interferes with normal activities, such as sleep or conversation. Noise is unwanted sound and can become an issue when its level exceeds the ambient or background sound level. Ambient sound levels in urban areas typically vary 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 sound levels around 45 to 50 dB (USEPA [U.S. Environmental Protection Agency], 1978).

Figure A-3 is a chart of dBA sound levels emitted from common sources. For some sources depicted on the figure, such as the air conditioner and vacuum cleaner, the sound levels shown are continuous sounds, and these sound levels are constant for some time. For other sources depicted on the figure, such as the automobile and heavy truck, the sound levels shown are the maximum sound level emitted during an intermittent event such as a vehicle pass-by. Some sound levels shown, for sources such as "urban daytime" and "urban nighttime," are average sound levels 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 A1.2.

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 are intermittent and the latter primarily continuous. Noise from aircraft overflights typically occurs beneath main approach and departure paths at an airfield, 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, with a single-event duration that is usually less than 1 second. Examples of impulsive noises are small-arms gunfire, hammering, pile driving, metal impacts during rail-yard shunting operations, and riveting. Examples of high-energy impulsive sounds are explosions associated with quarrying or mining operations; sonic booms; demolition explosions; and industrial processes that use high explosives; military ordnance use (e.g., armor, artillery, and mortar fire, and bomb detonation); explosive ignition of rockets and missiles; and any other explosive source where the equivalent mass of dynamite exceeds 25 grams (ANSI [American National Standards Institute], 1996).



Source: Harris 1979.

Figure A-3 Typical A-weighted Sound Levels of Common Sounds

A1.1.3 Low-Frequency Noise

Normally, the components of a structure most sensitive to airborne noise are the windows and, infrequently, the plastered walls and ceilings. An evaluation of the sound pressures impinging on the structure may be used to assess the risk for damage. In general, sound pressure levels below 130 dB (unweighted) are unlikely to pose a risk to structures. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, conservatively, only sounds lasting more than one second and at a sound pressure level above 130 dB (unweighted) are potentially damaging to structural components (CHABA [Committee on Hearing, Bioacoustics, and Biomechanics] 1977).

Noise-induced structural vibration may result from aircraft operating at low altitudes, which would occur during takeoff and landing operations. Such vibrations are likely to cause annoyance to dwelling occupants because of induced secondary vibrations or rattling of objects within the dwelling such as hanging pictures, dishes, plaques, and bric-a-brac. Window panes may also vibrate noticeably when exposed to high levels of airborne noise. In general, such noise-induced vibrations occur at sound pressure levels of 110 dB (unweighted) or greater.

Aside from concerns about potential structural damage from low-frequency noise, the perception of low-frequency sound may differ considerably when compared with mid- or high-frequency sound. Laboratory measurements of annoyance from low-frequency noise each use different spectra and levels, making comparisons difficult, but the majority share the same conclusion that annoyance caused by low-frequency sound increases rapidly with level and that dBA sound level alone can underestimate the effects of low-frequency noises (Leventhall, 2004). The most recent update to the International Organization for Standardization (ISO) standard (ISO 1996:1 [2016]) describes the main causes for these differences as:

- a weakening of pitch sensation as the frequency of the sound decreases below 60 Hz;
- a perception of sounds as pulsations and fluctuations;
- a much more rapid increase in loudness and annoyance with increasing sound pressure levels at low frequencies than at middle or high frequencies;
- complaints about feelings of ear pressure;
- an annoyance caused by secondary effects such as rattling of buildings elements, windows, and doors, or the tinkling of bric-a-brac;
- less building sound-transmission loss at low frequencies than at middle or high frequencies.

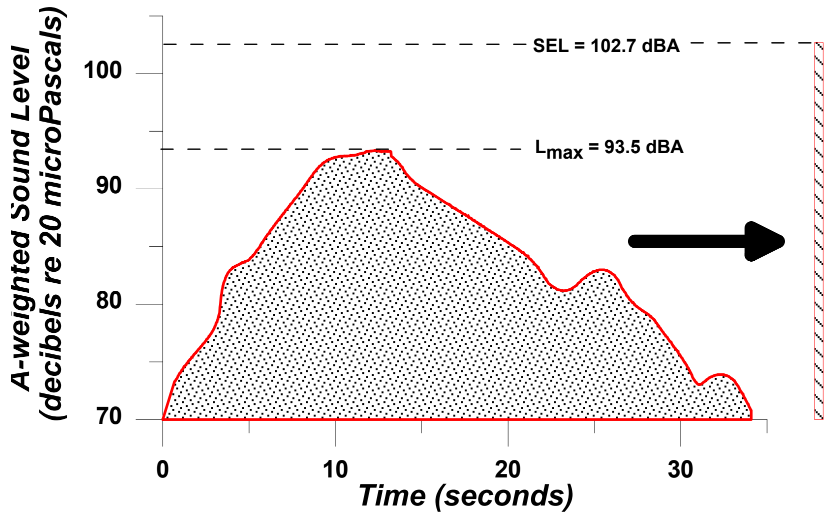
While the Federal Interagency Committee of Noise (FICON) recommends the use of the dBA Day-Night Average Sound Level (DNL) metric as the primary basis of both commercial and military aircraft noise impacts (FICON, 1992), in a recent update to a research needs statement, the Federal Interagency Committee on Aviation Noise (FICAN) stated the following for low-frequency noise concerns:

> FICAN finds that additional research needs to be conducted before a [low-frequency noise] metric and an associated dose-response relationship can be recommended. For airports with low-frequency noise concerns, supplemental noise analysis--possibly including vibration measurements--should be considered (FICAN, 2018).

A1.2 Noise Metrics

Noise metrics quantify sounds so they can be compared with each other, and with their effects, in a standard way. The simplest metric is the overall dBA sound level, which is appropriate by itself for quantifying constant noise such as that generated by an air conditioner. However, unlike noise from an air conditioning unit, aircraft flyover 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 receptor, and then returns to the background as the aircraft recedes into the distance. An example graph of the resulting sound levels from a flyover is provided in Figure A-4, which also indicates two metrics (Maximum Sound Level [L_{max}] and Sound Exposure Level [SEL]), that are described in Section A1.2.1 below.

A number of metrics can be used to describe a range of situations--from the effect of a particular individual noise event to the cumulative effect of all noise events over a long time. This section describes the metrics relevant to environmental noise analysis of aircraft operations.



Source: Wyle Laboratories

Figure A-4 Sample Time History of Noise Generated by an Aircraft Flyover Event

A1.2.1 Single Events

Maximum Sound Level

The highest dBA sound level measured during a single event in which the sound changes with time, such as a flyover, is called the maximum dBA sound level, or Maximum Sound Level, and is abbreviated L_{max}. The L_{max} is depicted for a sample event in Figure A-4.

L_{max} is the maximum sound level that occurs over a fraction of a second. For aircraft noise, this "fraction of a second" is one-eighth of a second, denoted as "fast" response on a sound-level measurement meter (ANSI, 1988). Slowly varying or steady sounds are generally measured over 1 second and denoted as "slow" response. L_{max} is important in determining whether a noise event will interfere with conversation, television or radio listening, or other common activities. Although L_{max} provides some measure of a given sound 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 it is usually based on unweighted or linear response of the meter. L_{pk} is used to describe individual impulsive events, such as blast noise. Because blast noise varies from explosion to explosion and with meteorological (weather) conditions, the United States (U.S.) Department of Defense (DoD) usually characterizes L_{pk} by the metric PK 15(met), which is the L_{pk} that is exceeded 15 percent of the time. The "met" notation refers to the metric accounting for varied meteorological or weather conditions.

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. SEL represents the total sound energy in the event. Figure A-4 indicates the SEL for a sample flyover event, representing it as if all the sound energy were contained within 1 second.

Because aircraft noise events last more than a few seconds, the SEL value is larger than L_{max}. SEL does not directly represent the sound level heard at any given time during the event but rather during the entire event. SEL provides a much better measure of aircraft flyover noise exposure than L_{max} alone.

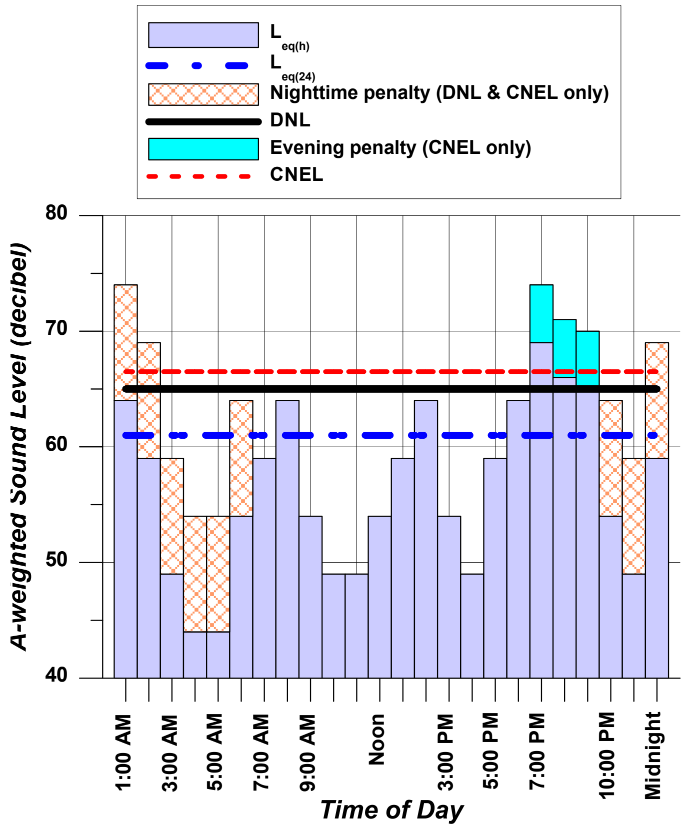
A1.2.2 Cumulative Events

Equivalent Sound Level

Equivalent Sound Level (L_{eq}) is a "cumulative" metric that combines a series of noise events, such as aircraft operations, over a period of time. L_{eq} is the sound level that represents the dB average SEL of all sounds in a specific 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 a 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., $L_{eq(24)}$, or the equivalent sound level 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 and would be represented as $L_{eq(8)}$, or the equivalent sound level for 8 hours.

Figure A-5 provides an example of $L_{eq(24)}$ using notional hourly equivalent sound 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, Inc.

Figure A-5 Example of $L_{eq(24)}$, DNL, and CNEL Computed from Hourly Equivalent Sound Levels

Day-Night Average Sound Level and Community Noise Equivalent Level

DNL, or L_{dn}, is a cumulative metric that accounts for all noise events, such as aircraft operations, in a 24-hour period. However, unlike $L_{eq(24)}$, DNL contains a nighttime noise adjustment. To account for humans' increased sensitivity to noise at night, DNL applies a 10 dB adjustment to noise events that occur 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 adjustment for noise events that occur between 10:00 P.M. and 7:00 A.M. but also includes a 4.8 dB adjustment for events occurring during the evening period of 7:00 P.M. to 10:00 P.M. This evening adjustment included in CNEL accounts for the added intrusiveness of sounds occurring during that period.

For airports and military airfields, DNL and CNEL represent the average sound level for an average annual day.

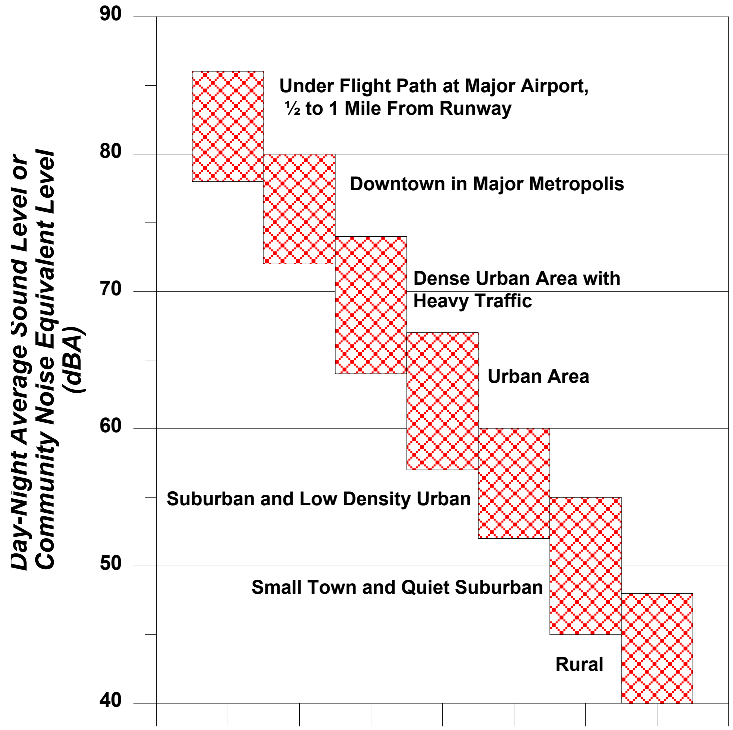
Figure A-5 provides an example of DNL and CNEL using notional $L_{eq(h)}$ for each hour of the day. Note the $L_{eq(h)}$ for the hours between 10:00 P.M. and 7:00 A.M. have a 10 dB adjustment assigned. For CNEL, the hours between 7:00 P.M. and 10:00 P.M. have a 4.8 dB adjustment assigned. The DNL for this example is 65 dB and the CNEL is 66 dB.

The dB 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 that 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 and 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.

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, a single overflight at 90 dB creates the same DNL as 10 overflights at 80 dB.

DNL or CNEL do not represent a sound level heard at any given time, but they represent long-term sound exposure. Scientific studies have found good correlation between the percentages of groups of people highly annoyed by noise and their level of average noise exposure measured in DNL (Schultz, 1978; USEPA, 1978).

DNL or CNEL can be used to measure sound levels in a variety of types of communities. Figure A-6 shows the ranges of DNL or CNEL that occur in various types of communities. For example, under a flight path at a major airport, the DNL may exceed 80 dB, while rural areas not near a major airport may experience DNL less than 45 dB. Sound levels in a downtown area of a major metropolis may be equivalent to the sound levels under a flight path of a major airport.



Source: DOD 1978

Figure A-6 Typical DNL or CNEL Ranges in Various Types of Communities

Onset-Rate Adjusted Monthly Day-Night Average Sound Level (L_{dnmr}) 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/Ranges, generate a noise environment that is somewhat different from that generated around airfields. Rather than regularly occurring operations such as those conducted at airfields, activity in SUAs is highly sporadic. SUA activity is often seasonal, ranging from 10 operations per hour to less than one 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 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 L_{dnmr} includes an adjustment for evening operations (7:00 P.M. to 10:00 P.M.) and is referred to as the Onset-Rate Adjusted Monthly CNEL.

A1.2.3 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 threshold level (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 or CNEL, but it is valuable in helping to describe the number of noise events the community may hear. 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) flyover events will occur on average at 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 dBA noise level is at or above a threshold. Combined with the threshold L, it is denoted TAL. TA can be calculated over a full 24-hour average annual day, the 15-hour daytime and 9-hour nighttime periods, a school day, or any other time period of interest, provided there are 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 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.

A1.3 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

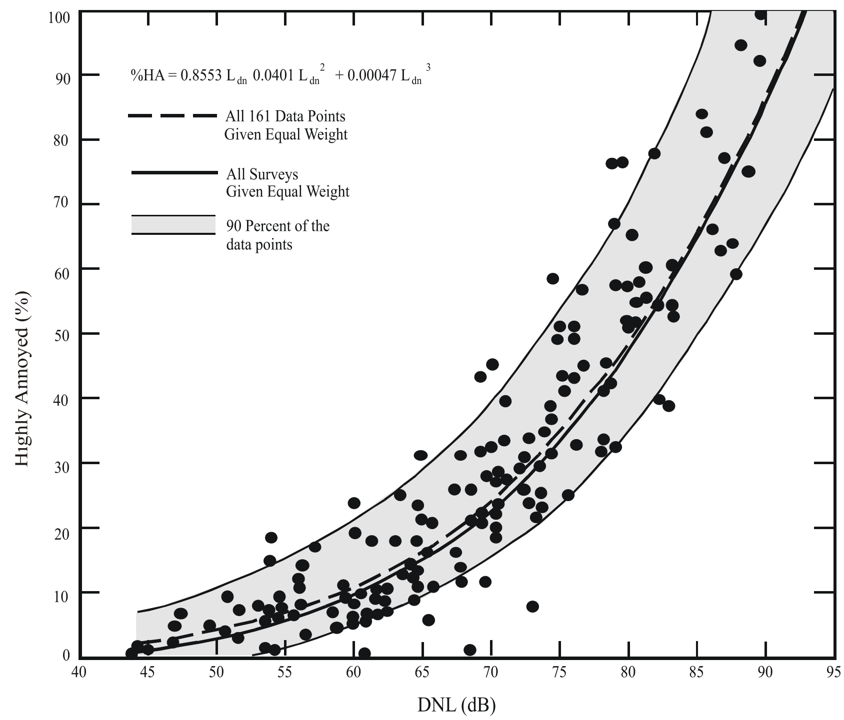
- noise-induced hearing impairment
- non-auditory health effects
- performance effects
- noise effects on children
- property values
- noise-induced vibration effects on structures and humans
- noise effects on terrain
- noise effects on historical and archaeological sites
- noise effects on domestic animals and wildlife

A1.3.1 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), which reviewed the noise factors that affected communities. DNL (or L_{dn}) was identified as an appropriate noise metric, and threshold criteria were recommended.

Threshold criteria for annoyance were identified from social surveys, in which people exposed to noise were asked how noise affected 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 they 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, Schultz was able to show a remarkable consistency among the majority of the surveys for which data were available. Figure A-7 shows the result of his study relating DNL to individual annoyance as measured by percent highly annoyed.



Source: Schultz 1978

Figure A-7 Schultz Curve Relating Noise Annoyance to DNL

Schultz's original synthesis included 161 data points. Figure A-8 compares revised fits of the Schultz data set with an expanded set of 400 data points collected through 1989 (Finegold et al., 1994). The new form of the curve is the preferred form in the U.S., endorsed by FICAN (1997). Other forms have been proposed, such as that of Fidell and Silvati (2004), but these 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 finding is not surprising, given the personal differences between individuals, with some people more sensitive to noise than others. The surveys underlying the Schultz curve include results that show that annoyance from noise is also affected by non-acoustical factors. The influence of non-acoustical factors is a complex interaction influencing an individual's annoyance response to noise (Brisbane Airport Corporation, 2007). Newman and Beattie (1985) divided the non-acoustic factors into the emotional and physical variables shown in Table A-1.

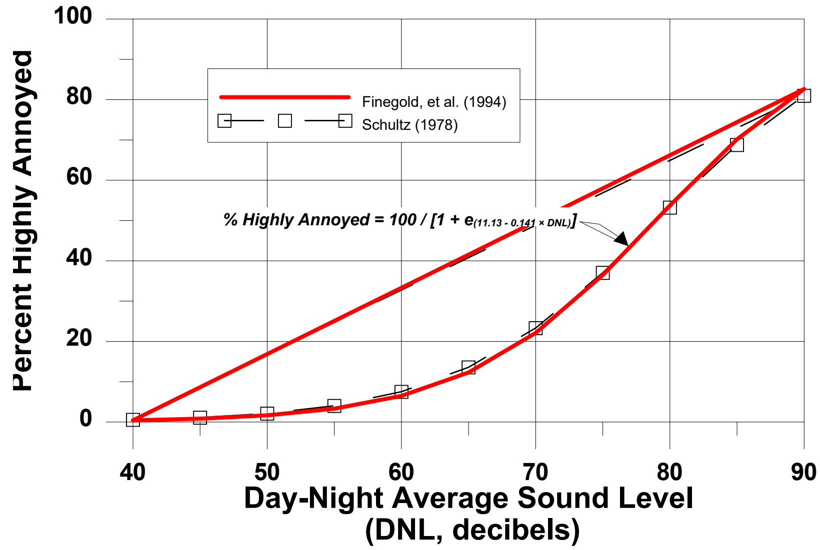


Figure A-8 Response of Communities to Noise: A Comparison of Original Schultz (1978) Curve to Finegold et al (1994) Curve

Table A-1 Non-Acoustic Variables Influencing Aircraft Noise Annoyance

Emotional Variables	*Physical Variables*
Feeling about the necessity or preventability of the noise	Type of neighborhood
Judgement of the importance and value of the activity that is producing the noise	Time of day
Activity at the time an individual hears the noise	Season
Attitude about the environment	Predictability of the noise
General sensitivity to noise	Control over the noise source
Belief about the effect of noise on one's health	Length of time an individual is exposed to a noise
Feeling of fear associated with the noise	

Schreckenberg and Schuemer (2010) and Laszlo et al. (2012) 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, L_{eq} was found to be more important than attitude. Similarly, a series of studies conducted by Marki (2013) at three European airports showed that less than 20 percent of the variance in annoyance can be explained by noise alone (Marki, 2013). Miedema and Voss (1998) found that fear and noise sensitivity have a significant influence on an individual annoyance response. Moreover, in another study, they demonstrated that noise sensitivity is not a function of noise exposure and that noise-sensitive individuals have a steeper annoyance response to increasing noise levels compared to people who are not noise sensitive (Miedema and Vos, 2003).

A study by Plotkin et al. (2011) examined updating DNL to account for these non-acoustic variables. Plotkin et al. (2011) 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 the metric 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 non-acoustical 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 A-2 summarizes their results. Comparing the updated Schultz curve to these results suggests that the percentage of people highly annoyed by aircraft noise may be higher than previously thought. Authors Miedema and Oudshoorn (2001) supplemented that investigation with further derivation of percentage of population highly annoyed as a function of either DNL or DENL[1], along with the corresponding 95-percent confidence intervals, and obtained similar results.

Table A-2 Percent Highly Annoyed by Different Transportation-Noise Sources

	Percent Highly Annoyed (%HA)			
	Miedema and Vos			
DNL (dB)	*Air*	*Road*	*Rail*	*Schultz Combined*
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 noise, caution should be exercised when interpreting synthesized data from different studies (WHO, 1999).

Consistent with the WHO's recommendations, FICON 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 (FICON, 1992).

The ISO update (ISO 1996-1 [2016]) introduced the concept of Community Tolerance Level (L_{ct}) as the DNL 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 traffic noise. The previous edition suggested a +3 dB to +6 dB adjustment range for aircraft noise relative to road traffic noise, while the latest edition recommends an adjustment range of +5 dB 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 65 dB DNL by approximately 2 percent to 5 percent greater than the previous ISO definition. Figure A-9 depicts the estimated percentage of people highly annoyed for a given DNL using both the ISO 1996-1 estimation

[1] DENL is the Day-Evening-Night Average Sound Level, which is similar to CNEL except it has a 5.0 dB adjustment to the evening period. DENL is not used in the U.S.

and the older FICON 1992 method. The results suggest that the percentage of people highly annoyed may be greater for aircraft noise than previously thought.

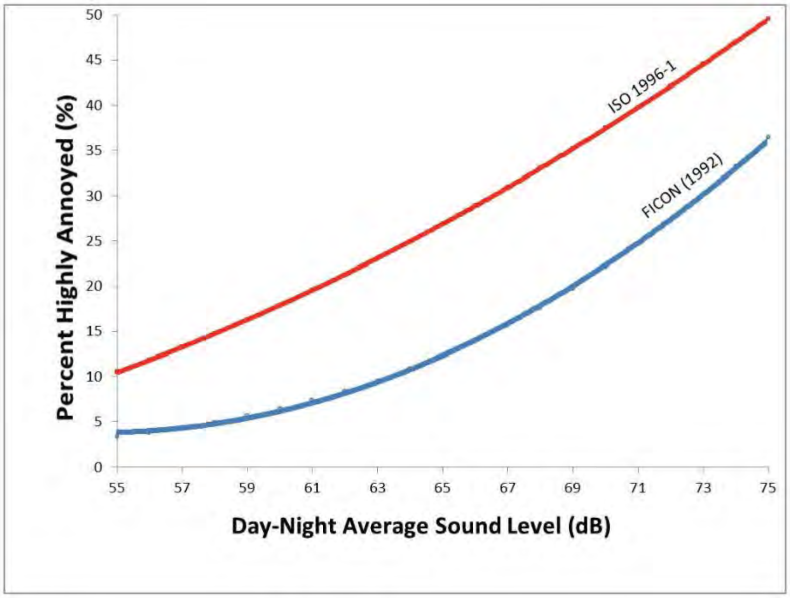


Figure A-9 Percent Highly Annoyed: A Comparison of ISO 1996-1 to FICON 1992

In the 2008 Hypertension and Exposure to Noise near Airports (HYENA) study, annoyance levels due to aircraft noise and road traffic noise were assessed in subjects who lived in the vicinity of six major European airports using the 11-point International Commission on Biological Effects of Noise scale. Exposure-response curves for road noise were congruent with the European Union (EU) standard curves used for predicting the number of highly noise-annoyed subjects, but ratings of annoyance due to aircraft noise were higher than predicted. The study supports findings that people's attitude toward aircraft noise has changed over the years and that the EU standard curve for aircraft noise should be modified (Babisch et al., 2009).

The U.S. Federal Aviation Administration (FAA) is currently conducting a major airport community noise survey at approximately 20 U.S. airports in order to update the relationship between aircraft noise and annoyance (Miller et al., 2014). Results from this study are expected to be released in late 2018.

In a study related to assessing aircraft noise exposure for people in the surrounding community, the Brisbane Airport in Queensland, Australia, assembled a Health Impact Assessment (Volume D7), which discussed, among other noise effects, annoyance and human response to changes in noise exposure versus steady-state response (Section 7.9 of the report) (Brisbane Airport Corporation, 2007). The authors suggest there is a difference between the gradual increase in noise exposure and the additive property of increasing noise levels from a particular event. The latter is called a "step change." The Brisbane Health Impact Assessment references Brown and Kamp (2005), who have reviewed the literature available on human response to such changes. They observe:

> "Most information on the relationship between transport noise exposure and subjective reaction (annoyance/dissatisfaction) comes from steady state surveys at sites where there have not been step changes in noise exposure. Environmental appraisals often need to assess the

> effects of such step changes in exposure and there is growing evidence that when noise exposure is changed, annoyance-ratings may change more than would be predicted from steady state relationships.
>
> "Conventional wisdom is that human response to a step change in exposure to transport noise can be predicted from exposure-response curves that have been derived from studies where human response has been assessed over a range of steady-state noise conditions. However, in situations where a step change in transport noise exposure has occurred, various surveys suggest that human response may be different, usually greater, as a result of the increase/decrease in noise, to what would be predicted from exposure-response curves derived under steady-state conditions. Further, there are suggestions that such (over)reaction may be more than a short-term effect. (Brown and Kamp, 2005)."

Guski (2004) describes this change effect in a hypothetical model and also notes that where the noise situation is permanently changed, the annoyance of residents usually changes in a way that cannot be predicted by steady-state dose/response relationships. Most studies show an "over reaction" of the residents: with increasing noise levels, people are much more annoyed than would be predicted by steady-state curves, and, with a decrease of noise levels, people are much less annoyed. Guski also notes that the annoyance may change prematurely before the change of levels, with residents expecting an increase in noise levels reacting more annoyed, and residents expecting a decrease in noise levels less annoyed than would be predicted in the steady-state condition.

Brown and Kamp (2005) conclude:

> "Our review of the literature on response to changes in noise leads us to the conclusion that we cannot discount the possibility that overreaction to a step change in transport noise may occur, and that this effect may not attenuate over time. However, evidence is still inconclusive and based on limited studies that tend not to be comparable in terms of method, size, design and context. Further, our view is that most explanations given in the literature for an overreaction are only partly supported, in some cases not at all, and generally there is conflicting evidence for them. There is still also no accepted view on the mechanism by which annoyance changes in response to a change in exposure. In particular, most explanations are usually post-hoc and the noise change studies have not been designed to test them. (Brown and Kamp, 2005)."

The Brisbane Airport Corporation Health Impact Assessment suggests that the potential for "over-reaction" to stepped changes in noise exists and needs to be recognized; people subject to an increase in noise may experience more annoyance than predicted, while people subject to a decrease in noise may experience less annoyance than predicted. Further, any such over-reaction should not necessarily be assumed to be a temporary phenomenon; evidence from existing studies suggests that it could persist for years after the exposure changes (Brisbane Airport Corporation, 2007).

An individual with an increased sensitivity to sounds may have hyperacusis, which results in a lower tolerance of everyday sound (Aazh et al., 2018). A person with hyperacusis reacts differently to sounds due to reactions of increased distress and discomfort from everyday sounds. This condition arises from a problem with the auditory processes within an afflicted individual's brain. The causes and diagnosis are not well understood (Aazh et al., 2018). Physical causes of hyperacusis may range from head injury, ear damage, or viral diseases, to temporomandibular joint disorders (TMJ). Neurologic causes may range from Post-Traumatic Stress Disorder (PTSD), chronic fatigue syndrome, depression, to migraine headaches (American Academy of Otolaryngology--Head and Neck Surgery, 2018). An individual with hyperacusis will also likely have tinnitus, which may lead to further discomfort. Hyperacusis can lead to misophonia, which may cause an individual to react with abnormally strong emotions and behaviors to specific sounds, but hyperacusis does not cause this reaction. Studies of misphonia are very limited at this time.

Another condition that falls under the condition of hyperacusis is noise sensitivity (Aazh et al., 2018). A noise-sensitive individual is characteristically more prone to being annoyed by environmental noise compared to a non-noise-sensitive person regardless of the overall noise exposure (Kishikawa et al., 2006). This result indicates that the annoyance response for noise-sensitive people is not a direct function of noise exposure levels.

A1.3.2 Speech Interference

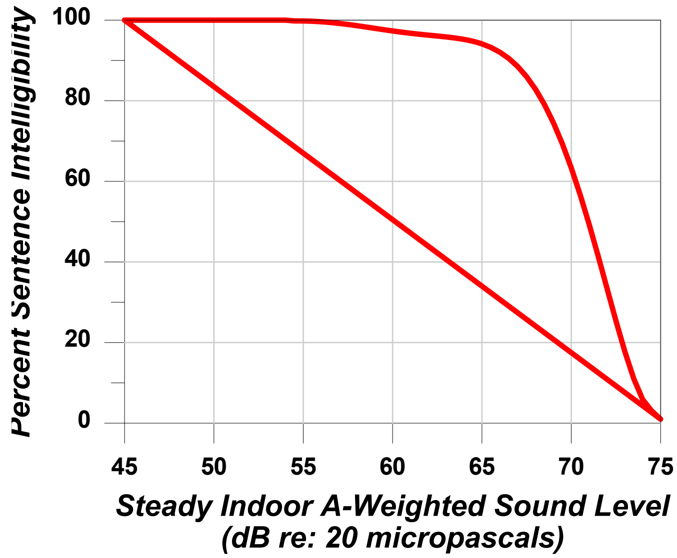
Speech interference from noise is a primary cause of annoyance for communities. Disruption of routine activities such as radio or television listening, telephone use, or conversation leads to frustration and annoyance. The quality of speech communication is also important in classrooms and offices. In 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.

Speech comprehension is measured in two ways:

1. *Word Intelligibility,* or the percentage of words spoken and understood. This might be especially important for students in the lower grades who are learning the English language and particularly important for students who are studying English as a Second Language.
2. *Sentence Intelligibility*, or the percentage of sentences spoken and understood. This might be especially important for high-school students and adults who are familiar with the language and who do not necessarily have to understand each word spoken in order to understand sentences.

U.S. 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 A-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 45 dB L_{eq} are expected to allow 100-percent sentence intelligibility.



Source: USEPA, 1974

Figure A-10 Speech Intelligibility Curve

The curve in Figure A-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.

Classroom Criteria

For teachers to be understood, their regular voice must be clear and uninterrupted. Background noise must 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 noise level, the level of voice communication, and the single-event noise level from 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 American National Standards Institute (ANSI) classroom noise standard (ANSI, 2010) and American Speech-Language-Hearing Association (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 the 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 45 dB L_{eq} during normal school hours (FAA, 1985).

Most aircraft noise is not continuous. Instead, it consists of individual events like the one depicted by the graph in Figure A-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 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, a level that would provide 90-percent word intelligibility for the short time periods during aircraft overflights. While SIL is technically the best metric for measuring speech interference, it can be approximated by an L_{max} value. An SIL of 45 dB is equivalent to an L_{max} of 50 dBA 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 a typical single aircraft overflight, this corresponds to an L_{max} of 50 dB. While the WHO (1999) only specifies a background L_{max} criterion, the organization also notes the SIL frequencies and that interference can begin at around 50 dB.

The Airport Cooperative Research Program (ACRP) conducted a study to assess aircraft noise conditions affecting student learning by analyzing the interior and exterior sound levels while observing students and teachers at 11 schools surrounding Los Angeles International Airport (LAX). The five schools located under the LAX flight paths experienced frequent overflight events, while the six schools further south of the airport experienced minimal LAX aircraft noise exposure events. The study found a positive correlation between teacher voice-masking or voice-raising and fluctuations in interior noise events. A majority of teachers reported that they felt aircraft noise interfered with teacher-student communication and caused students to lose concentration. However, the student observations were unable to identify any aircraft-noise-related events that caused a distraction in a child. Other students caused the majority of distractions while playing with various items and daydreaming, and were found to be the significant sources of distractions. The authors, as well as the teachers' opinions gathered in the teacher surveys, concluded that even moderate levels of aircraft noise exposure can impact children's learning due to the correlation between voice-masking events and measured interior sound events (National Academies of Sciences, Engineering, and Medicine, 2017).

The United Kingdom Department for Education and Skills established in its classroom acoustics guide a 30-minute time-averaged metric of $L_{eq(30min)}$ for background levels and the metric of $L_{A1,30min}$ for intermittent noises, at thresholds of 30 to 35 dB and 55 dB, respectively. $L_{A1,30min}$ represents the dBA 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 (United Kingdom Department for Education and Skills, 2003).

Table A-3 summarizes the criteria discussed. Other than the FAA (1985) 45 dB L_{max} criterion, the criteria 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 the limits listed in Table A-3 were set based on students with normal hearing capability and no special needs. At-risk students may be adversely affected at lower sound levels.

Table A-3 Indoor Noise Level Criteria Based on Speech Intelligibility

Source	Metric/Level (dB)	Effects and Notes
U.S. FAA (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 / SIL 45	Single-event level permissible in the classroom.
WHO (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.
U.S. ANSI (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.

A1.3.3 Sleep Disturbance

Sleep disturbance is a major concern for communities exposed to aircraft noise at night. A large amount of research developed in the laboratory during the past 30 years has produced variable results, suggesting a complex interaction of factors including the noise characteristics and individual sensitivity, rather than a clear dose-effect relationship (Muzet, 2007; Kwak et al., 2016). Sleep disorders may cause negative health effects such as cardiovascular problems, neuroendocrine abnormalities, and changes in cognition, mood, and memory. The causal relationships between noise exposure, effects on sleep, and contribution to health disturbances, both behavioral and physical, are not yet firmly established (Zaharna, 2010; Perron et al., 2012). 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 U.S. federal noise policy. The studies have been separated into two groups:

1. Initial studies, conducted in the 1960s and 1970s, in which the research was focused on sleep observations performed under laboratory conditions.
2. Later studies, conducted from the 1990s up to the present, in which the research was focused on field observations.

Initial Studies

The relationship 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 non-acoustic factors cited for annoyance. The easiest effect to measure is the number of arousals or awakenings caused by noise events. Much of the literature has therefore focused on predicting the percentage of the population that will be awakened at various noise levels.

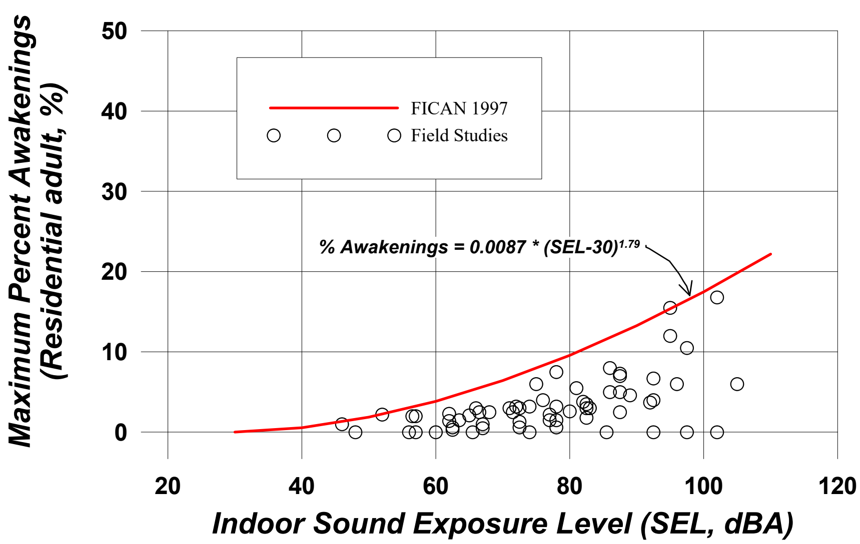
FICON's 1992 review of airport noise issues (FICON, 1992) included an overview of relevant research conducted through the 1970s. Literature reviews and analyses were conducted from 1978 through 1989 using existing data (Griefahn, 1978; Griefahn and Muzet, 1978; Lukas, 1978; Pearsons et. al., 1989). Because 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 percentage of the population expected to be awakened as a function of the exposure to SEL. This curve was based on research conducted for the U.S. Air Force (Finegold et al., 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

As noted above, early sleep laboratory studies did not account for some important factors, including 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 et al., 1994) found that 80 to 90 percent of sleep disturbances were not related to outdoor noise events but rather to indoor noises and non-noise factors. The results showed that, in real life conditions, noise had less of an effect on sleep than had been previously reported from laboratory studies. Laboratory sleep studies tend to show more sleep disturbance than field studies show because people who sleep in their own homes are accustomed to their environment and, therefore, do not wake up as easily (FICAN, 1997).

Based on this new information, FICAN in 1997 recommended a dose-response curve to use instead of the earlier 1992 FICON curve (FICAN, 1997). Figure A-11 shows FICAN's curve, the red line, which is based on the results of three field studies, which are also shown in the figure (Ollerhead et al., 1992; Fidell et al., 1994; Fidell et al., 1995a; Fidell et al., 1995b) along with the data from six previous field studies.



Source: FICAN 1997

Figure A-11 FICAN 1997 Recommended Sleep Disturbance Dose-Response Relationship

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) conducted an extensive study focused on the effects of nighttime aircraft noise on sleep and related factors (Basner et al., 2004). The DLR study was one of the largest studies to examine the link between aircraft noise and sleep disturbance, and it involved both laboratory and in-home field research phases. The DLR 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 conducted in the laboratory comparing the probability of awakenings from noise generated by different modes of transportation showed that aircraft noise led to significantly lower awakening probabilities than either road traffic 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.

A different approach was taken by an ANSI standards committee (ANSI, 2008), which used the average of the data on field studies shown in Figure A-11 rather than the upper envelope (i.e., the red line), to predict average probability of 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 and 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 and sleeping in bedrooms with their windows closed, and 2 to 3 percent for those sleeping in bedrooms with their windows open. The probability of the exposed population awakening at least once from multiple aircraft events at noise levels of 90 dB SEL is shown in Table A-4.

Table A-4 Probability of Awakening from NA90SEL

Number of Aircraft Events at 90 dB SEL 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 standard. FICAN also recognized that more research is underway by various organizations and that work may result in changes to FICAN's position.

FICAN reaffirmed its recommendation for the use of the ANSI (2008) standard (FICAN, 2008). However, it is noted that this standard has been withdrawn, but it will be used until further recommendations are made by FICAN.

A recent study further examined the relationship between self-reported sleep insufficiency and airport noise using the U.S. Behavioral Risk Factor Surveillance System data and DNL contours generated by the FAA's Integrated Noise Model software for 95 airports (Holt et al., 2015). The survey data comprise the results of a random-digit-dialed telephone survey of non-institutionalized U.S. civilians 18 years or older covering all 50 states. Responses that included sleep insufficiency questions were included in this study totaling more than 700,000 respondents for 2008 and 2009 year datasets. The authors found that, once controlled for individual sociodemographic characteristics and ZIP Code-level socioeconomic status, there were no significant associations between airport noise exposure levels and self-reported sleep insufficiency. These results are consistent with a study that found aircraft-noise-induced awakening are more reasonably predicted from relative rather than absolute SELs (Fidell et al., 2013). However, Kim et al. (2014) found a response relationship between aircraft noise and sleep quality in a community-based cross-sectional study when controlling for a mental health condition (Kim et al., 2014).

The WHO recommends the use of the dBA long-term average sound level L_{night}, measured outside the home, for sleep disturbance and related effects, with an interim target of 55 dB $L_{night, outside}$ and a night noise guideline of 40 dB (WHO, 2009).

The choice of a noise metric for policy-making purposes depends on both the particular type of noise source and the particular effect being studied. Even for sleep disturbance caused by aircraft noise, there is no single noise exposure metric or measurement approach that is generally agreed upon (Finegold, 2010).

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.

A1.3.4 Noise-Induced Hearing Impairment

Residents in communities surrounding airfields express concerns regarding the effects of aircraft noise on hearing. This section provides a brief overview of hearing loss caused by noise exposure. The goal is to provide a sense of perspective as to how aircraft noise (as experienced on the ground) compares to other activities that are often linked with hearing loss.

The *Noise-Induced Hearing Impairment* bulletin is one of a series of technical bulletins issued by the DoD Defense Noise Working Group (DNWG) under the initiative to educate and train DoD military, civilian, and contractor personnel, and the public on noise issues. "The ability to convey the effects of military aircraft noise exposure should facilitate both the public discussions and the environmental assessment process," according to DNWG (2013). In its background discussion on the topic of noise-induced hearing impairment, DNWG (2013) states:

> "Considerable data have been collected and analyzed by the scientific/medical community on the effects of noise on workers in industrial settings, and it has been well established that

> continuous exposure to high noise levels from any source will damage human hearing and result in noise induced hearing loss (USEPA, 1974). The scientific community has concluded that there is little likelihood of hearing damage resulting from exposure to aircraft noise at commercial airports. Until recently, the same was thought true for military airbases, but the introduction of new generation fighter aircraft with high thrust to weight ratio and correspondingly high noise levels has required a re-analysis of the risk of hearing damage for those communities close to military airbases. Residents in surrounding communities are expressing concerns regarding the effects of these new aircraft on hearing."

DNWG goes on to define the major components of hearing loss, temporary versus permanent loss, and threshold shift in hearing, and how they can be differentiated:

> "Hearing loss is generally interpreted as a decrease in the ear's sensitivity or acuity to perceive sound, i.e. a shift in the hearing threshold to a higher level. This change can either be a Temporary Threshold Shift or a Permanent Threshold Shift.
>
> "A Temporary Threshold Shift (TTS) can result from exposure to loud noise over a given amount of time, yet the hearing loss is not necessarily permanent. An example of TTS might be a person attending a loud music concert. After the concert is over, the person may experience a threshold shift that may last several hours, depending upon the level and duration of exposure. While experiencing TTS, the person becomes less sensitive to low-level sounds, particularly at certain frequencies in the speech range (typically near 2,000 and 4,000 Hertz). Normal hearing ability eventually returns, as long as the person has enough time to recover in a relatively quiet environment.
>
> "A Permanent Threshold Shift (PTS) usually results from repeated exposure to high noise levels, where the ears are not given adequate time to recover from the strain and fatigue of exposure. A common example of PTS is the result of working in a very noisy environment such as a factory. It is important to note that TTS can eventually become PTS over time. Thus, even if the ear is given time to recover from TTS, repeated occurrence of TTS may eventually lead to permanent hearing loss. The point at which a Temporary Threshold Shift results in a Permanent Threshold Shift is difficult to identify and varies with a person's sensitivity. In general, hearing loss (be it TTS or PTS) is determined by the duration and level of the sound exposure (DNWG, 2013)."

On the topic of noise-induced hearing loss and its specific components, DNWG (2013) provides the following overview:

> "The 1982 EPA Guidelines for Noise Impact Analysis presents the risk of hearing loss from exposure to noise in the workplace in terms of the Noise-Induced Permanent Threshold Shift (NIPTS), a quantity that defines the permanent change in hearing level, or threshold, caused by exposure to noise (USEPA, 1982). It represents the difference in PTS between workers exposed to noise and those who are not exposed. Numerically, the NIPTS is the change in threshold averaged over the frequencies 0.5, 1, 2, and 4 kHz that can be expected from daily exposure to noise over a normal working lifetime of 40 years, with the exposure beginning at an age of 20 years. A grand average of the NIPTS over time (40 years) and hearing sensitivity (10 to 90 percentiles of the exposed population) is termed the Average NIPTS, or Ave. NIPTS for short. The Ave. NIPTS that can be expected for noise exposure as measured by the 24-hour average noise level, Leq24, is given in Table A-5 (USEPA, 1982).

Table A-5 Average (Ave.) NIPTS and 10th Percentile NIPTS as a Function of $L_{eq(24)}$

$L_{eq(24)}$	*Ave. NIPTS (dB)**	*10th Percentile NIPTS (dB)**
75-76	1.0	4.0
76-77	1.0	4.5
77-78	1.6	5.0
78-79	2.0	5.5
79-80	2.5	6.0
80-81	3.0	7.0
81-82	3.5	8.0
82-83	4.0	9.0
83-84	4.5	10.0
84-85	5.5	11.0
85-86	6.0	12.0
86-87	7.0	13.5
87-88	7.5	15.0
88-89	8.5	16.5
89-90	9.5	18.0

Source: DoD, 2012

* rounded to the nearest 0.5 dB

> "Thus, for a noise exposure of 80 Leq24, the expected lifetime average value of NIPTS is 3 dB. The Ave. NIPTS is estimated as an average over all people exposed to the noise. The actual value of NIPTS for any given person will depend on their physical sensitivity to noise – some will experience more hearing loss than others. The EPA Guidelines provide information on this variation in sensitivity in the form of the NIPTS exceeded by 10 percent of the population, which is included in Table A-5 in the '10th Percentile NIPTS' column (USEPA, 1982). As in the example above, for individuals exposed to 80 Leq24, the most sensitive of the population would be expected to show a degradation to their hearing of 7 dB over time. To put these numbers in perspective, changes in hearing level of less than 5 dB are generally not considered noticeable or significant. Furthermore, there is no known evidence that a NIPTS of 5 dB is perceptible or has any practical significance for the individual. Lastly, the variability in audiometric testing is generally assumed to be ±5 dB (USEPA, 1974). (DNWG, 2013)."

According to DNWG, applying these measurement tools for NIPTS to a specific population is the next step in the process of fully understanding noise impacts on a community (DNWG, 2013):

> "In order to quantify the overall impact of noise on a community it is necessary to include the numbers of people who are exposed. This is accomplished by calculating the population average value of Ave. NIPTS, known as the Potential Hearing Loss (PHL), using the following equation:

$$\text{PHL} = \frac{\sum_i NIPTS_i \times P_i}{\sum_i P_i} \quad (1)$$

where NIPTSi is the Ave. NIPTS for people within the *ith* noise level band (see Table A-5), and Pi is the total population living within the *ith* noise level band. The quantity PHL represents the average change in hearing threshold, or the average hearing loss, for the local community exposed to the noise.

The actual noise exposure is determined by the portion of the time the population is outdoors and the outdoor noise levels to which they are exposed. The EPA Guidelines allows for calculating the exposure taking into account the length of time the population is indoors and exposed to lower levels. If the outdoor exposure exceeds 3 hours per day, the contribution of the indoor levels can usually be neglected. (DNWG, 2013)."

The criteria for measuring permanent hearing loss in the workplace are similar but more complex, according to DNWG (2013):

"The database from which the risk of hearing loss in Table A-5 was developed is based almost entirely on extensive audiometric measurements of workers in industrial settings. A considerable amount of hearing loss data have been collected and analyzed, including measurements of hearing loss in people with known histories of noise exposure. The available evidence consists of statistical distributions of hearing levels for populations at various exposure levels. Much of the analysis consists of grouping these measurements into populations of the same age with the same history of noise exposure and determining the percentile distribution of hearing loss for populations with the same noise exposure. Thus, the evidence for noise-induced permanent threshold shift can be clearly seen by comparing the distribution of a noise-exposed population with that of a relatively non-noise-exposed population (USEPA, 1974).

"Most of these data are drawn from cross-sectional rather than longitudinal studies. That is, individuals or populations have been tested at only one point in time. Because complete noise exposure histories do not exist, many conclusions are limited by the need to make certain assumptions about the onset and progression of noise-induced hearing loss. (DNWG, 2013)."

The USEPA , National Academy of Sciences, WHO, the Occupational Safety and Health Administration (OSHA), National Institute for Occupational Safety and Health, and DoD have each established their own criteria for measuring hearing loss within the workplace, according to DNWG (2013):

"Using this database, the EPA established 75 dB for an 8-hour exposure and 70 dB for a 24-hour exposure as the average noise level standard requisite to protect the most sensitive (approximately 1 percent) of the population from greater than a 5 dB permanent threshold shift in hearing. The EPA document explains that the requirement for an adequate margin of safety necessitates a highly conservative approach which dictates the prevention of any effect on hearing, defined here as an essentially insignificant and not measurable NIPTS of less than 5 dB. (USEPA, 1974).

"The National Academy of Sciences Committee on Hearing, Bioacoustics, and Biomechanics (CHABA) identified 75 dB as the minimum level at which hearing loss may occur from continuous, long-term (40 years) exposure (CHABA, 1965).

"The World Health Organization has concluded that environmental and leisure-time noise below a Leq24 value of 70 dB 'will not cause hearing loss in the large majority of the population, even after a lifetime of exposure (WHO, 2000).'

"The OSHA regulation of 1971 standardizes the limits on workplace noise exposure for protection from hearing loss as an average level of 90 dB over an 8-hour work period, or 85 dB over a 16-hour period (U.S. Department of Labor, 1971). The standard is based on a 5 dB decrease in allowable noise level per doubling of exposure time. Exposure at levels greater than this require a hearing conservation program to be implemented. The maximum level for workplace exposure to continuous noise is 115 dB, and exposure to this level is limited to 15 minutes. A maximum level of 140 dB is specified for impulsive noise.

"The National Institute for Occupational Safety and Health recommends a maximum exposure of 85 dB for a period of 8 hours, with a recommended exchange rate of 3 dB per doubling of exposure time (NIOSH, 1998). The maximum allowable exposure level is 140 dB for both continuous and impulsive noise.

"The Department of Defense requirements for hearing conservation specify that a hearing conservation program should be implemented if the 8-hour average noise level (Leq8) is greater than 85 decibels (DoD, 2004). The recommended exchange rate is a decrease of 3 dB per doubling of exposure time, although an alternative rate of 4 dB is allowed. (DNWG, 2013)."

The DoD has issued guidelines for hearing risk assessment in local communities, according to DNWG (2013):

"The current DoD policy for assessing hearing loss risk as part of the EIS process is stated in the June 16, 2009 memorandum "Methodology for Assessing Hearing Loss Risk and Impacts in DoD Environmental Impact Analysis" issued by the Under Secretary of Defense (DoD, 2009c). The memorandum defines the conditions under which assessments are required, references the methodology from the 1982 EPA report, and describes how the assessments are to be calculated.

> 'Current and future high performance aircraft create a noise environment in which the current impact analysis based primarily on annoyance may be insufficient to capture the full range of impacts on humans. As part of the noise analysis in all future environmental impact statements, DoD components will use the 80 Day-Night A-Weighted (DNL) noise contour to identify populations at the most risk of potential hearing loss. DoD components will use as part of the analysis, as appropriate, a calculation of the Potential Hearing Loss (PHL) of the at risk population. The PHL (sometimes referred to as Population Hearing Loss) methodology is defined in EPA Report No. 550/9-82-105, *Guidelines for Noise Impact Analysis* (USEPA, 1982).' (DoD, 2009c).

"The 2009 DoD policy directive requires that hearing loss risk be estimated for the population most at risk, defined as the population exposed to a Day-Night Average Noise Level (DNL) greater than or equal to 80 dB, including residents of on-base housing. Limiting the analysis to the 80 DNL contour area does not necessarily imply that populations outside this contour, i.e. at lower exposure levels, are not at some degree of risk of hearing loss, but it is generally considered that this risk is small. The exposure of workers inside the base boundary area should be considered occupational and evaluated using the appropriate DoD component regulations for occupational noise exposure.

"Environmental noise assessments normally estimate the number of people exposed to noise expressed in terms of the DNL noise metric, which contains a 10 dB weighting factor for aircraft operations occurring between the hours of 2200 and 0700 to account for people's increased sensitivity to noise during the normal sleeping period. However, the mechanism by which high noise levels may cause hearing impairment is physical in nature (by damaging the hair cells in the cochlear) and has no such temporal effects – noise is noise as far as the potential for hearing loss is concerned, regardless of the time of day the exposure occurs. Thus, even though the population most at risk is identified in terms of the 80 DNL contour, it is not appropriate to estimate risk using the DNL metric. The actual assessment of hearing loss risk should be conducted using 24-hour average noise levels (Leq24). (DNWG, 2013)."

Regarding community hearing loss and aircraft noise, DNWG (2013) provides this overview:

"The preponderance of available information on hearing loss risk upon which Table A-5 is based is from the workplace with continuous exposure throughout the day for many years. Community exposure to aircraft noise is not continuous but consists of individual events where the sound level exceeds the background level for a limited time period as the aircraft flies past the observer. The maximum noise levels experienced from military aircraft may be very high, and the exposure could result in a temporary threshold shift (TTS). But unless the flights are continuous, the ear may have adequate time to recover from the strain and fatigue of individual exposures, and normal hearing ability may eventually return.

"There is very limited data on the effect of aircraft noise on hearing. From a civilian airport perspective, the scientific community has concluded that there is little likelihood that the resulting noise exposure from aircraft noise could result in either a temporary or permanent hearing loss (Newman and Beattie, 1985). The EPA criterion (Leq24 = 70 dB) can be exceeded in some areas located near airports, but that is only the case outdoors. Inside a building, where people are more likely to spend most of their time, the average noise level will be much less than 70 dB (Eldred and von Gierke, 1993). Eldred and von Gierke (1993) also report that 'several studies in the U.S., Japan, and the U.K. have confirmed the predictions that the possibility for permanent hearing loss in communities, even under the most intense commercial take-off and landing patterns, is remote.' (DNWG, 2013)."

DNWG (2013) then provides a closer look at military aircraft noise specifically:

"Military aircraft are in general much noisier than their civilian counterparts, but the available data, while sometimes contradictory, appears to indicate a similar lack of significant effects of noise on hearing. A laboratory study (Nixon et al., 1993) measured changes in human hearing from noise representative of low-flying aircraft on Military Training Routes (MTRs). The potential effects of aircraft flying along MTRs are of particular concern as the maximum overflight noise levels can exceed 115 dB, with a rapid increase in noise level exceeding 30 dB/sec. In this study, participants were first subjected to four overflight noise exposures at A-weighted levels of 115 dB to 130 dB. One-half of the subjects showed no change in hearing levels, one-fourth had a temporary 5 dB increase in sensitivity, and one-fourth had a temporary 5 dB decrease in sensitivity. In the next phase, participants were subjected to up to eight successive overflights, separated by 90 second intervals, at a maximum level of 130 dB until a temporary shift in hearing was observed. The temporary hearing threshold shift showed a decrease in sensitivity of up to 10 dB.

"In another study of 115 test subjects between 18 and 50 years old, TTSs were measured after laboratory exposure to military low-altitude flight (MLAF) noise (Ising et al., 1999). The results indicate that repeated exposure to MLAF noise with maximum noise levels greater than 114 dB, may have the potential to cause permanent noise induced hearing loss, especially if the noise level increases rapidly (Ising et al., 1999).

"A report prepared by researchers at the University of Southampton (Lawton and Robinson, 1991) summarized the state of knowledge as of 1991. Their review of the literature indicated that the main body of information with which comparisons can be made of the hearing damage risk from military overflight noise is to be found in standards and regulatory documents published by various organizations. It was concluded that the risk of hearing loss due to a single event of 125 dB maximum level and equivalent duration of the order 0.5 seconds is small, even after repeated daily occurrences over several years. Supplementary experimental evidence, involving TTS, showed that a small amount of TTS might be engendered by military overflight noise at the levels in question, but that this would have no significant long-term effect even on the more susceptible ears. The literature search did uncover a small number of population surveys of hearing loss related to noise, but the quantitative results were rare and only one investigation produced audiometric results linked to noise measurements.

"The report concluded that there is little evidence of hearing loss risk from military overflights, either for adults or children. 'Whether in the case of TTS or PTS, laboratory or field studies, adults or children, there appear to be no reports of significant hearing damage attributable to the noise of aircraft overflights (Lawton and Robinson, 1991).'

"In Japan, audiological tests were conducted on a sample of residents who had lived near Kadena Air Base for periods ranging from 19 to 43 years (Yamamoto, 1999). The sample had been exposed (not necessarily continuously) to noise levels ranging from DNL 75 to 88 dB. Examinations showed that there was a one in ten chance of a NIPTS of 20 dB at 4 kHz. However, the NIPTS at 2 kHz and lower was much less, so that the value of Ave. NIPTS was on the order of 10 dB or so. These results are consistent with the '10th Percentile NIPTS' figures in Table A-5.

"Ludlow and Sixsmith (Ludlow and Sixsmith, 1999) conducted a cross-sectional pilot study to examine the hypothesis that military jet noise exposure early in life is associated with raised hearing thresholds. The authors concluded that there were no significant differences in audiometric test results between military personnel who as children had lived in or near stations where fast jet operations were based, and a similar group who had no such exposure as children. (DNWG, 2013)."

According to DNWG's (2013) conclusions, noise levels at commercial and military airfields have important distinguishing characteristics:

"Aviation noise levels near commercial airports are not comparable to the occupational or recreational noise exposures associated with hearing loss, and studies of aircraft noise levels have not definitively correlated permanent hearing impairment with aircraft activity. It is unlikely that airport neighbors will remain outside their homes 24 hours per day, so there is little likelihood of hearing loss below an average sound level of 75 dB.

"Near military airbases, average noise levels above 75 dB may occur, and while new DoD policy dictates that NIPTS should be evaluated, research results to date have not found a definitive relationship between significant permanent hearing impairment (greater than 10 dB) and prolonged exposure to aviation noise. (DNWG, 2013)."

A1.3.5 Nonauditory Health Effects

The general understanding of the possible effects of aircraft noise has been hindered by the publication of overly sensational and misleading articles in the popular press and by similarly sensational statements from reputed scientists, who are calling attention to their work. These statements have proven less than useful in the research and understanding of potential health effects from aircraft noise exposures. Moreover, the sensational statements have disturbing consequences because they provide misleading information, create unfounded worry and negative bias, distort certain facts, and add to a growing mistrust of science. These sensational statements have been firmly criticized by other researchers as lacking in rigor because they do not consider other known factors that cause health problems and because they analyze only a selection of the available data (ANR, 2010). The following discussion attempts to summarize the research into the possible nonauditory effects of aircraft noise based on a review of peer-reviewed research. The research reviewed ranges from general stress-related effects on health to specific individual studies on effects such as heart disease and stroke. In addition to these individual studies, there are summaries of meta-analyses of pooled results from individual studies addressing the same issue. The meta-analyses evaluate the studies for consistent results among the smaller individual studies, and they derive effect estimates from the different studies for a quantitative risk assessment (Babisch, 2013). Meta-analysis is an analytical technique designed to summarize the results of multiple smaller studies in order to increase the sample size and to identify patterns among the several smaller studies. The validity of meta-analysis is highly dependent on the quality of the included smaller studies because it cannot correct the poor design and/or bias of the original studies. Because of these limitations, a meta-analysis of several smaller studies cannot predict the results of a single large study and may result in misleading information for the general public.

A1.3.5.1 Overview

The potential for aircraft noise to impair one's health deserves special attention and accordingly has been the subject of numerous epidemiological studies and meta-analyses of the gathered data. The basic premise is that noise can cause annoyance, annoyance can cause stress, and prolonged stress is known to be a contributor to a number of health disorders, such as hypertension, myocardial infarction (heart attack), cardiovascular disease, and stroke (Munzel et al., 2014). According to Kryter and Poza (1980), "It is more likely that noise-related general ill-health effects are due to the psychological annoyance from the noise interfering with normal everyday behavior than it is from the noise eliciting, because of its intensity, reflexive response in the autonomic or other physiological systems of the body."

The connection between annoyance and stress and health issues requires careful experimental design because of the large number of confounding issues, such as heredity, medical history, smoking, diet, lack of exercise, and air pollution. Some highly publicized reports on health effects have, in fact, been rooted in poor science. Meecham and Shaw (1979) apparently found a relation between noise levels and mortality rates in neighborhoods located under the approach path to LAX. When the same data were analyzed by others (Frerichs et al., 1980), no relationship was found. Jones and Tauscher (1978) found a high rate of birth defects for the same neighborhoods. But when the Centers for Disease Control performed a more thorough study near Atlanta's Hartsfield International Airport, no relationships were found for DNL greater than 65 dB (Edmonds et al., 1979).

An early study by Cantrell (1974) confirmed that noise can provoke stress, but it noted that results on its effect on cardiovascular health were contradictory. Some studies in the 1990s found a connection between aircraft noise and increased blood pressure (Michalak et al., 1990; Ising et al., 1990; Rosenlund et al., 2001), while others did not (Pulles et al., 1990). This inconsistency in results led the WHO in 2000 to conclude that there was only a weak association between long-term noise exposure and hypertension and cardiovascular effects, and that a dose-response relationship could not be established (WHO, 2000). Later, van Kempen concluded that "Whereas noise exposure can contribute to the prevalence of cardiovascular disease, the evidence for a relation between noise exposure and ischemic heart disease is still inconclusive" (van Kempen et al., 2002).

> To put the Odds Ratio (OR) number in context, an OR of 1.5 would be considered a weak relationship between noise and health; 3.5 would be a moderate relationship; 9.0 would be a strong relationship; and 32 a very strong relationship (Cohen, 1988).

More recently, major studies have been conducted in an attempt to identify an association between noise and health effects, develop a dose-response relationship, and identify a threshold below which the effects are minimal. The most important of these are briefly described below. In these studies, researchers usually present their results in terms of the Odds Ratio, which is the ratio of the odds that health will be impaired by an increase in noise level of 10 dB to the odds that health would be impaired without any noise exposure. An OR of 1.25 means that there is a 25-percent increase in likelihood that noise will impair health. To put the OR number in context, an OR of 1.5 would be considered a weak relationship between noise and health; 3.5 would be a moderate relationship; 9.0 would be a strong relationship; and 32 a very strong relationship (Cohen, 1988). For examples, the OR for the relationship between obesity and hypertension is 3.4 (Pikilidou et al., 2013), and the OR for the relationship between smoking and coronary heart disease is 4.4 (Rosengren et al., 1992). The summary of these studies shows that the relationship between noise and impaired health is a very weak one because none of the statistically significant ORs were greater than 1.5. Most of the ORs were less than 1.2.

A1.3.5.2 Blood Pressure and Hypertension

- The carefully designed HYENA study was conducted around six European airports from 2002 through 2006 (Jarup et al., 2005, 2007, 2008; Babisch et al., 2008). The study covered 4,861 subjects, aged between 45 and 70. Blood pressure was measured, and questionnaires were administered for health, socioeconomic, and lifestyle factors, including diet and physical exercise. Noise from aircraft and highways was predicted from models.

  HYENA study results showed an OR less than 1 for the association between daytime aircraft noise and hypertension, which was not statistically significant[2] and indicated no positive association. The OR for the relationship between nighttime aircraft noise and hypertension was 1.14--a result that was marginally significant statistically. For daytime road traffic noise, the OR

[2] In many of the studies reported above, the researchers use the word "significant" to describe a relationship between noise and health, conjuring up the idea that the relationship is strong and that the effect is large. But this is an inappropriate and misleading use of the word in statistical analysis. What the researchers really mean is that the relationship is "statistically significant" in that they are sure that it is real. It does not mean that the effect is large or important, or that it has any decision-making utility. A relationship can be statistically significant, i.e. real, while being weak, or small and insignificant.

was 1.1 and not significant. The measured effects were small and not necessarily distinct from other events. A close review of the data for nighttime aircraft noise raised some questions about the data and the methods employed (ACRP, 2008). Using data from the HYENA study, Haralabidis et al. (2008) reported an increase in systolic blood pressure of 6.2 millimeters of mercury (mmHg) for aircraft noise events (about 6 percent) and an increase of 7.4 mmHg (about 7 percent) for other indoor noises, such as snoring; a snoring partner and road traffic had similar impacts on blood pressure.

- Ancona et al. (2010) reported a study on a randomly selected sample of subjects aged 45 to 70 years who had lived in the study area for at least 5 years. Personal data were collected via interview, and blood pressure measurements were taken for a study population of 578 subjects. No statistically significant association was found between aircraft noise levels and hypertension for noise levels above 75 dB $L_{eq(24)}$ compared to levels below 65 dB. However, there was an increase in nocturnal systolic pressure of 5.4 mmHg (about 5 percent) for subjects in the highest exposure category (greater than or equal to 75 dB).
- Eriksson et al. (2007) found that for subjects exposed to energy-averaged levels above 50 dBA, the adjusted relative risk for hypertension was 1.19 (95-percent CI = 1.03 to 1.37). Maximum aircraft noise levels presented similar results, with a relative risk of 1.20 (1.03 to 1.40) for those exposed above 70 dBA. Stronger associations were suggested among older subjects, those with a normal glucose tolerance, nonsmokers, and subjects not annoyed by noise from other sources. The study comprised a cohort of 2,754 men in four municipalities around Stockholm Arlanda airport who were followed from 1992 to 1994 and 2002 to 2004.
- Matsui et al. (2008) reported higher OR for noise levels greater than L_{den} 70 dB, but not altogether statistically significant, for hypertension from the effects of military aircraft noise at Kadena Air Base in Okinawa, Japan. The study was conducted in 1995 and 1996 but used older noise data that were not necessarily appropriate for the same time period.
- A study of Noise-Related Annoyance, Cognition and Health (NORAH), designed to identify transportation noise effects in communities around German airports, has reported results of self-monitoring of blood pressure of approximately 2,000 residents near Frankfurt Airport exposed to aircraft $L_{eq(24)}$ in the range of 40 to 65 dB during the period 2012 to 2014 after the opening of a new runway (Shreckenberg and Guski, 2015). The results showed small positive effects of noise on blood pressure without statistical significance. No statistically significant effect was determined between aircraft noise and hypertension as defined by the WHO.
- A meta-analysis of Huang el al. (2015) examined four research studies comprising a total of 16,784 residents. The overall OR for hypertension in residents with aircraft noise exposure was 1.36 for men and statistically significant, and 1.31 and not statistically significant for women. No account was taken for any confounding factors. The meta-analysis suggests that aircraft noise could contribute to the prevalence of hypertension, but the evidence for a relationship between aircraft noise exposure and hypertension is still inconclusive because of limitations in study populations, exposure characterization, and adjustment for important confounders.
    - The four studies in Huang's meta-analysis include one by Black et al. (2007) that purports to show relatively high OR values for self-reported hypertension, but these results only applied to a select subset of those surveyed that reported high noise stress. When this data set is excluded, Huang's meta-analysis yields results similar to those obtained in the HYENA and NORAH studies. Furthermore, the longitudinal

study included in the analysis that followed 4,721 people for 8 years (Eriksson et al., 2010) reported an OR of 1.02, which was not statistically significant.

- Rhee et al. (2008) found that subjects exposed to helicopter noise had a significantly higher prevalence of hypertension than the unexposed control group. Although a source-specific difference in the risk of cardiovascular disease by environmental noise exposure is suggested, no other study has evaluated whether or not exposure to noise from helicopters differs from exposure to noise from fighter jets in their influence on the prevalence of hypertension.
- Hwang et al. (2012) conducted a 20-year prospective cohort study of 1,301 aviation workers in Taiwan to follow AGT genotypes (TT, TM, and MM) across four exposure categories according to the levels of noise representing high (>80 dBA), medium (80-65 dBA), and low exposure (64-50 dBA) and the reference level (49-40 dBA). AGT (TT vs MM adjusted incidence rate ratio [IRR] 1.77, 95-percent CI 1.24 to 2.51) and noise exposure (high and medium combined) during 3 to 15 years (adjusted IRR 2.35, 95-percent CI 1.42 to 3.88) were independent determinants of hypertension. Furthermore, the risk of hypertension increased with noise exposure (adjusted IRR 3.73, 95-percent CI 1.84 to 7.56) among TT homozygotes but not among those with at least one M allele (Rothman synergy index = 1.05).
- Haralabidis et al. (2011) studied the association between exposure to transportation noise and blood pressure reduction during nighttime sleep utilizing 24-hour ambulatory blood pressure measurements at 15-minute intervals carried out on 149 persons living near four major European airports. Although road traffic noise exposure was found to decrease blood pressure dipping in diastolic blood pressure, no associated decrease in dipping was found for aircraft noise exposure.

A1.3.5.3 Heart Disease and Stroke

- Huss et al. (2010) examined the risk of mortality from myocardial infarction (heart attack) resulting from exposure to aircraft noise using the Swiss National database of mortality records for the period 2000 to 2005. The analysis was conducted on a total of 4.6 million people, with 15,500 deaths from acute myocardial infarction. The results showed that the risk of death from all circulatory diseases combined was not associated with aircraft noise, and there was not any association between noise and the risk of death from stroke. The overall risk of death from myocardial infarction alone was 1.07 and not statistically significant, but it was higher (OR = 1.3 and not statistically significant) in people exposed to aircraft noise of 60 dB DNL or greater for 15 years or more. The risk of death from myocardial infarction was also higher (OR = 1.10), and statistically significant, for those living near a major road. Cardiovascular risk factors, such as smoking, were not directly taken into account in this study.
- Floud (2013) used the HYENA data to examine the relationship between noise levels and self-reported heart disease and stroke. There was no association for daytime noise and no statistically significant association for nighttime noise. However, for those exposed to nighttime aircraft noise for more than 20 years, the OR was 1.25 per 10 dB increase in noise (L_{night}) and marginally significant.
- Correia et al. (2013) evaluated the risk of hospitalization for cardiovascular diseases in older people (65 years of age and older) residing in areas exposed to a DNL of at least 45 dB around U.S. airports. Health insurance data from 2009 Medicare records were examined for approximately 6 million people living in neighborhoods around 89 airports in the U.S. The

potential confounding effect of socioeconomic status was extracted from several zip-code-level variables from the 2000 U.S. Census. No controls were included for smoking or diet, both of which are strong risk factors for cardiovascular disease. Noise levels were calculated at census block centroids. Taking into account the potential effects of air pollution, they report an OR of 1.035, which was marginally significant statistically. While the overall results show a link between increased noise and increased health risk, some of the individual airport data show a decreased health risk with increased aircraft noise exposure.

- Hansell et al. (2013) investigated the association of aircraft noise with risk of hospital admission for, and mortality from, stroke, coronary heart disease, and cardiovascular disease in neighborhoods around London's Heathrow airport exposed to an equivalent sound level over 16 hours of at least 50 dB. The data were adjusted for age, sex, ethnicity, deprivation, and a smoking proxy (lung cancer mortality) at the census area level but not at the individual level. It was important to consider the effect of ethnicity (in particular, South Asian ethnicity, which is itself strongly associated with risk of coronary heart disease). The reported ORs for stroke, heart disease, and cardiovascular disease were 1.24, 1.21, and 1.14, respectively. Similar results were reported for mortality. The results suggest a higher risk of mortality from coronary heart disease than cardiovascular disease, which seems counter-intuitive given that cardiovascular disease encompasses all the diseases of the heart and circulation, including coronary heart disease and stroke along with heart failure and congenital heart disease (ERCD, 2014).
- Evrard et al. (2015) studied mortality rates for 1.9 million residents living in 161 communes near three major French airports (Paris-Charles de Gaulle, Lyon Saint-Exupéry, and Toulouse-Blagnac) for the period 2007 to 2010. Noise levels in the communes ranged from 42 to 64 dB L_{den}. Lung cancer mortality at the commune level was used as a proxy measure for smoking because data on individual smoking or smoking prevalence were not available. Noise exposure was expressed in terms of a population-weighted level for each commune. After adjustment for concentration of nitrogen dioxide, Risk Ratios (similar to Odds Ratios) per 10 dB increase in noise were found to be 1.18 for mortality from cardiovascular disease, 1.23 for mortality from coronary heart disease, and 1.31 for mortality from myocardial infarction. There was no association between mortality from stroke and aircraft noise. As the author notes, results at the commune level may not be applicable to the individual level.
- Seidler et al. (2016) found a statistically significant linear exposure-risk relationship with heart failure or hypertensive heart disease for aircraft traffic noise (1.6-percent risk increase per 10 dB increase in the 24-hour continuous noise level; 95-percent CI 0.3 to 3.0 percent), road traffic noise (2.4 percent per 10 dB; 95-percent CI 1.6 to 3.2 percent), and railway noise (3.1 percent per 10 dB; 95-percent CI 2.2 to 4.1 percent). For individuals with 24-hour continuous aircraft noise levels less than 40 dB and nightly maximum aircraft noise levels exceeding 50 dB six or more times, a significantly increased risk was observed. In general, risks of hypertensive heart disease were considerably higher than the risks of heart failure.
- The NORAH study also included an examination of the effect of aircraft noise on cardiovascular disease (heart attack and stroke) based on examination of health insurance data between 2006 and 2010 for approximately 1 million people over the age of 40 exposed to aircraft $L_{eq(24)}$ in the range of 40 to 65 dB (Shreckenberg and Guski, 2015). A questionnaire was used to obtain information on confounding factors. The results showed a non-statistically significant increase in risk for heart attack and stroke, and there was no apparent linear relationship between noise

level and either effect. There was, however, a marginally significant but small increase in risk for heart failure (OR of 1.016). The risk of cardiovascular disease was found to be greater for road and rail noise than for aircraft noise.

- Meta-analyses from Babisch and Kamp (2009), Babisch et al. (2013), and Babisch (2013) focused on epidemiological studies or surveys directly related to associations between aircraft noise and cardiovascular disease outcomes. Considering studies at 10 airports covering over 45,000 people, the pooled effect estimate of the relative risk for hypertension was 1.13 per 10 dBA and only marginally significant (WHO, 2011). One of the studies included in the analysis was for military aircraft noise at Okinawa (see Matsui et al., 2008) for which the OR was 1.27 but not statistically significant. The authors conclude that "No single, generalized and empirically supported exposure-response relationship can be established yet for the association between aircraft noise and cardiovascular risk due to methodological differences between studies." The pooled results show different slopes from different studies with different noise level ranges and methods being used.
- A meta-analysis of 11 studies on road and aircraft noise exposure in relation to incident cases of ischemic heart disease (IHD) was transformed into risk estimates per 10 dB increase in exposure by Vienneau et al. (2013). Pooled relative risk for IHD was 1.08 (1.03 to 1.14) per 10 dB increase in noise exposure, with the linear exposure-response starting at 50 dB.
- Passchier-Vermeer and Passchier (2000) reviewed studies on noise exposure and health effects and found sufficient evidence to support observation thresholds for hearing impairment, hypertension, IHD, annoyance, performance, and sleep disturbance due to noise exposure. The intent of the article was not to quantify impacts necessarily but instead to show that noise exposure can have a major effect in industrial societies in general, and it should be up to policy-makers and regulators to address this potential public health problem. In addition, the article recommended prioritizing additional study in two topic areas: 1) cardiovascular effects, and 2) the underlying mechanisms and the study of the effects of noise on children.
- Seidler et al. (2016) studied myocardial infarction risk due to aircraft, rail, and road noise by investigating patients of the Rhine-Main region of Germany who were diagnosed with myocardial infarction in the years 2006 through 2010. The linear model revealed a statistically significant risk increase due to road noise (2.8 percent per 10 dB rise, 95-percent CI [1.2; 4.5]) and railroad noise (2.3 percent per 10 dB rise [0.5; 4.2]) but not airplane noise. Airplane noise levels of 60 dB and above were associated with a higher risk of myocardial infarction (OR 1.42 [0.62; 3.25]). This higher risk is statistically significant if the analysis is restricted to patients who had died of myocardial infarction by 2014/2015 (OR 2.70 [1.08; 6.74]. In this subgroup, the risk estimators for all three types of traffic noise were of comparable magnitude (3.2 percent to 3.9 percent per 10 dB rise in noise level).
- Floud et al. (2011) examined the health effects of aircraft and road traffic noise exposure and the association with medication use. The cross-sectional study measured the use of prescribed antihypertensives, antacids, anxiolytics, hypnotics, antidepressants, and antiasthmatics in 4,861 persons living near seven airports in six European countries. Differences were found between countries in the effect of aircraft noise on antihypertensive use; for nighttime aircraft noise, a 10 dB increase in exposure was associated with ORs of 1.34 (95-percent CI, 1.14 to 1.57) for the UK and 1.19 (1.02 to 1.38) for the Netherlands, but no significant associations were found for other countries. For daytime aircraft noise, excess risks were found for the UK (OR 1.35; CI: 1.13 to

1.60), but a risk deficit was found for Italy (OR 0.82; CI: 0.71 to 0.96). There was an excess risk of taking anxiolytic medication in relation to aircraft noise (OR 1.28; CI: 1.04 to 1.57 for daytime and OR 1.27; CI: 1.01 to 1.59 for nighttime) that held across countries. The authors also found an association between exposure to 24-hour road traffic noise and the use of antacids by men (OR 1.39; CI 1.11 to 1.74).

A1.3.5.4 Mental Health Issues

- The NORAH study found a risk for unipolar depression to increase with exposure to aircraft noise (OR of 1.09), but the relationship was not linear, with the risk decreasing at the higher noise levels, so this result was not considered reliable (Schreckenberg and Guski, 2015).
- A survey study around Frankfurt Airport explored the relationship between aircraft, road traffic, and railway noise with Quality-of-Life (QoL) concerns for both health and environmental views (Schreckenberg et al., 2010). Aircraft noise affected environmental QoL and, to a lesser extent, health QoL. However, one of the study's observations concerned vulnerable groups, such as people with pre-existing illness and/or high noise sensitivities. This group may have limited resources to deal with noise, which can result in increased health problems.
- A study of the effect of aircraft noise around a large international airport, Schiphol Airport, near Amsterdam, found an association between the use of non-prescribed sleep medication or sedatives with aircraft noise during the late evening (10:00 P.M. to 11:00 P.M.). However, the correlation between L_{den} and L_{eq} (10:00 P.M. to 11:00 P.M.) to sleep aids (ORs 1.25 and 1.26, respectively) was not statistically significant (Franssen et al., 2004).
- Beutel et al. (2016) assessed the association of day and night noise annoyance from road traffic, aircraft, railways, industrial, and neighborhood indoor and outdoor noise to anxiety and depression in 15,000 people ages 35 to 74 living in the Rhein-Main Region of Germany. The source and magnitude of noise annoyance was measured by a self-administered questionnaire. Depression and anxiety were also assessed based on established questionnaires. In this study, aircraft noise was the most commonly reported source of annoyance, followed by road noise annoyance. Depression and anxiety increased with the degree of overall noise annoyance. Compared to no annoyance, prevalence ratios for depression and anxiety, respectively, increased from moderate (PR depression 1.20; 95-percent CI 1.00 to 1.45; PR anxiety 1.42; 95-percent CI 1.15 to 1.74) to extreme annoyance (PR depression 1.97; 95-percent CI 1.62 to 2.39; PR anxiety 2.14; 95-percent CI 1.71 to 2.67). Compared to other sources, aircraft noise annoyance was prominent, affecting almost 60 percent of the population. More simply stated, strong noise annoyance was associated with a two-fold higher prevalence of depression and anxiety in the general population. The authors admit that the identified association of annoyance, particularly with aircraft noise, to depression and anxiety is suggestive of a cause but that more study is needed to identify causal relationships. The authors recognized that pre-existing anxiety and depression could contribute to increased susceptibility to noise annoyance. Also, the focus of this paper was on subjective annoyance, which is not related to objective measures of noise exposition.
- Van den Berg et al. (2015) conducted a study that explored the suggested limitation in the Beutel (2016) study: the relationship between pre-existing concern and annoyance. More specifically, they sought insight in the relation between worry about a noise source and annoyance from that source. The motivation for the study was the longstanding important

public concern for noise at a political level in Amsterdam, despite implementation of several measures to reduce noise exposure, and the desire to find other variables such as reducing fear and worry that might also help the situation. Using questionnaires from 1,968 respondents and modeling flight-related noise levels in a greater cosmopolitan area around Amsterdam, the researchers found that respondents with a high risk of anxiety/depression are significantly more likely to be highly worried about living close to the airport or an air route compared to those with a low risk (all $p < 0.05$). Also, respondents who report to have bad/moderate health are significantly more likely to be highly worried about living close to the airport or an air route compared to those with good/excellent health. More generally, the results show there is a strong correlation between annoyance from aircraft or airport noise and worry about the risk for health and/or safety associated with living close to an air route or airport. Also, for aircraft noise, worry increases with both the subjective exposure (annoyance) and the objective exposure (sound level). The authors conclude "that more noise or odor is related to more worry, and this has more effect on persons that have a higher personal risk for being worried and annoyed." When considered within the context of other studies, such as Beutel (2016), it would seem that those who are predisposed to worry are more susceptible to both annoyance and the negative health effects associated with anxiety and depression.

An individual with an increased sensitivity to sounds may have hyperacusis, which results in a lower tolerance of everyday sound (Aazh et al., 2018). A person with hyperacusis reacts differently to sounds due to reactions of increased distress and discomfort from everyday sounds. This condition arises from a problem with the auditory processes within an afflicted individual's brain. The causes and diagnosis are not well understood (Aazh et al., 2018). Physical causes of hyperacusis may range from head injury, ear damage, or viral diseases, to TMJ. Neurologic causes may range from PTSD, chronic fatigue syndrome, depression, to migraine headaches (American Academy of Otolaryngology--Head and Neck Surgery, 2018). An individual with hyperacusis will also likely have tinnitus, which may lead to further discomfort. Hyperacusis can lead to misophonia, which may cause an individual to react with abnormally strong emotions and behaviors to specific sounds, but hyperacusis does not cause this reaction. Studies of misphonia are very limited at this time. Another condition that falls under the condition of hyperacusis is noise sensitivity (Aazh et al., 2018). A noise-sensitive individual is characteristically more prone to being annoyed by environmental noise compared to a non-noise-sensitive person regardless of the overall noise exposure (Kishikawa et al., 2006). This result indicates that the annoyance response for noise-sensitive people is not a direct function of noise exposure levels.

A1.3.5.5 Hospital and Care Facilities

The ACRP (ACRP, 2008) reviewed the literature available at that time to draw the following conclusions regarding noise impacts on patients in hospitals and care facilities:

> "A careful search of recent research regarding aviation noise and hospitals and care facilities identified no studies that addressed this specific issue. It is common for airport noise/land-use compatibility guidelines to list hospitals and care facilities as noise-sensitive uses, although there are no studies that have identified health effects associated with aviation noise. There are numerous studies that identify problems with internal hospital noises such as warning alarms,

pagers, gurney collisions with doors, talking, etc.; however, none that addressed aviation or roadway noise."

The WHO (2000), in its Guidelines for Community Noise (Section 4.3.3), applies available information on noise to derive the following general guidance. However, the guidance is not informed by research on hospital and care facility effects from aircraft noise.

> "For most spaces in hospitals, the critical effects of noise are on sleep disturbance, annoyance and communication interference, including interference with warning signals. The L_{Amax} of sound events during the night should not exceed 40 dB indoors. For wardrooms in hospitals, the guideline values indoors are 30 dB L_{Aeq}, together with 40 dB L_{Amax} during the night. During the day and evening the guideline value indoors is 30 dB L_{Aeq}. The maximum level should be measured with the instrument set at '*fast*'.
>
> Since patients have less ability to cope with stress, the equivalent sound pressure level should not exceed 35 dB L_{Aeq} in most rooms in which patients are being treated or observed. Particular attention should be given to the sound pressure levels in intensive care units and operating theatres. Sound inside incubators may result in health problems, including sleep disturbance, and may lead to hearing impairment in neonates. Guideline values for sound pressure levels in incubators must await future research."

A1.3.5.6 Summary of Nonauditory Effects

Research studies seem to indicate that aircraft noise may contribute to the risk of health disorders, along with other factors such as heredity, medical history, smoking, alcohol use, diet, lack of exercise, and air pollution, but that the measured effect is small compared to these other factors and often not statistically significant--i.e., not necessarily real. Despite some sensational articles purporting otherwise and the intuitive feeling that noise in some way must impair health, there are no studies that definitively show a causal and significant relationship between aircraft noise and health. Such studies are notoriously difficult to conduct and interpret because of the large number of confounding factors that have to be considered for their effects to be excluded from the analysis. The WHO notes that there is still considerable variation among studies (WHO, 2011). And, almost without exception, research studies conclude that additional research is needed to determine whether such a causal relationship exists. The European Network on Noise and Health (ENNAH, 2013), in its summary report of 2013, concludes that "…..while the literature on non-auditory health effects of environmental noise is extensive, the scientific evidence of the relationship between noise and non-auditory effects is still contradictory."

As a result, it is not possible to state that there is sound scientific evidence that aircraft noise is a significant contributor to health disorders.

A1.3.6 Performance Effects

The effect of noise on the performance of activities or tasks has been the subject of many studies. Some of these studies have found links between continuous high noise levels and performance loss. Noise-induced performance losses are most frequently reported in studies where noise levels are above 85 dB. Moderate noise levels appear to act as a stressor for more sensitive individuals performing a difficult psychomotor task. Little change has typically been found in low-noise cases; however, cognitive learning differences were measured in subjects exposed to noise of passing aircraft with maximum amplitudes of 48 dBA, presented once per minute, while performing text learning compared to a control group exposed to 35 dBA (Trimmel et al., 2012). The findings suggest that background noise below 50 dBA results in impaired and changed structures of learning, as indicated by reproduction scores, because test persons are less able to switch between strategies

While the results of research on the general effect of periodic aircraft noise on performance have yet to yield definitive criteria, several general trends have been noted, including:

- A periodic intermittent noise is more likely to disrupt performance than a steady-state continuous noise of the same level. Flyover noise, due to its intermittent nature, might be more likely to disrupt performance than a steady-state noise of equal level.
- Noise is more inclined to affect the quality than the quantity of work.
- Noise is more likely to impair the performance of tasks that place extreme physical and/or mental demands on workers.

A1.3.7 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 of particular concern for children who are already scholastically challenged.

A1.3.7.1 Effects on Learning and Cognitive Abilities

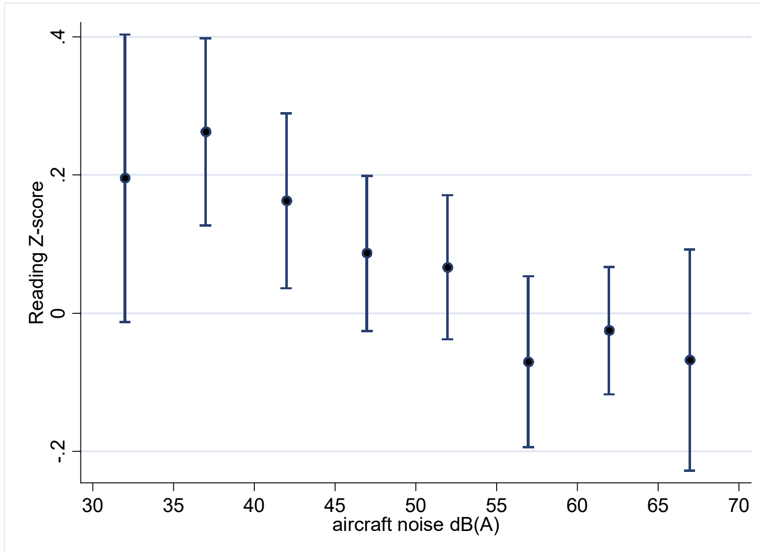
Early studies in several countries (Cohen et al., 1973, 1980, 1981; Bronzaft and McCarthy, 1975; Green et al., 1982; Evans et al., 1998; Haines et al., 2002; Lercher et al., 2003) showed lower reading scores for children living or attending school in noisy areas than for children away from those areas. In some studies, noise-exposed children were less likely to solve difficult puzzles or more likely to give up while attempting to do so.

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 two-year follow-up for children who became newly noise exposed near the new airport.

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 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., 2005).

Figure A-12 shows RANCH's result relating noise to reading comprehension. It shows that reading falls below average (a z-score of 0) at L_{eq} 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. 2005

Figure A-12 RANCH Study Reading Scores Varying with L_{eq}

The RANCH study observed 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 is 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, the FICAN study was not expected to obtain final answers, but it 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 U.S. elementary schools, 917 of which were exposed to aircraft noise at 46 airports and with noise exposures exceeding 55 dB 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. Recent evidence suggests that potential negative effects on classroom performance can be due to chronic ambient noise exposure. A study of French 8- and 9-year-old children found a significant association between ambient noise levels in urban environments due primarily to road noise (Pujol et al., 2014). The study estimated noise levels at children's bedrooms (L_{den}) and found a modest effect of lower scores on French tests, and these lower scores were associated with higher L_{den} at children's homes. Once adjusted for classroom $L_{Aeq,day}$, the association between L_{den} and math test scores became borderline significant.

As part of the NORAH 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 LAX 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 (National Academies of Sciences, Engineering, and Medicine, 2017).

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 the WHO and a North Atlantic Treaty Organization 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 (North Atlantic Treaty Organization, 2000; WHO, 1999). The awareness has also led to the classroom noise standard discussed earlier (ANSI, 2010).

A1.3.7.2 Health Effects on Children

A number of studies, including some of the cognitive studies discussed above, have examined the potential for effects on children's health. Health effects include annoyance, psychological health impacts, coronary risk, stress hormones, sleep disturbance, and hearing loss.

Annoyance. Chronic noise exposure causes annoyance in children (Bronzaft and McCarthy, 1975; Evans et al., 1995). Annoyance among children tends to be higher than among adults, and there is little habituation (Haines et al., 2001a). The RANCH study found annoyance may play a role in how noise affects reading comprehension (Clark et al., 2005).

Psychological Health. The available literature on psychological health impacts of noise exposure reveals inconsistent findings that are perhaps suggestive of highly situational-specific factors. Lercher et al. (2002) found an association between noise and teacher ratings of psychological health, but only for children with biological risk defined by low birth weight and/or premature birth. Haines et al. (2001b) found that children exposed to aircraft noise had higher levels of psychological distress and hyperactivity. Stansfeld et al. (2009) replicated the hyperactivity result, but not the result for distress. Crombie et al. (2011) found similar hyperactivity results but no significant associations between aircraft noise at school and later mental health issues in children at risk at birth--i.e., those with low birth weight.

Dreger et al. (2015) investigated the influence of different environmental noise sources at children's homes on the incidence of mental health problems in school-aged children. Using a survey of reported level of day and night annoyance by parents as the metric of noise level, the study identified an association between exposure to noise at home and mental health problems such as emotional symptoms, conduct problems, and hyperactivity. Road noise was the most common exposure and was significantly associated with the total difficulties score, emotional symptoms, and conduct problems. Noise by neighbors was associated with conduct problems and hyperactivity. However, aircraft noise (by day) and construction work (by day) were not associated with any of the SDQ categories at a significant level. More generally, and perhaps more importantly, the study found that children who were in the group of constant high exposure, and therefore were continuously exposed for a long time, had higher risk for mental health problems. The authors recognized the lack of quantitative noise measurements as an important study limitation but provide evidence from prior studies indicating reported annoyance as a good proxy.

Hjortebjerg et al. (2016) used noise models to determine average time-weighted road and railroad noise exposure for 46,940 children from birth to age 7 years. Airfield noise was similarly determined but only evaluated as a confounding variable, as was air pollution. A 10 dB increase in average time-weighted road traffic noise exposure from birth to 7 years of age was associated with a 7-percent increase in abnormal versus normal total difficulties scores; 5-percent increases in borderline and abnormal hyperactivity/inattention subscale scores, respectively; and 5-percent and 6-percent increases in abnormal conduct problem and peer relationship problem subscale scores, respectively. Exposure to road traffic noise during pregnancy was not associated with child behavioral problems at 7 years of age. While this study is quantitative, its application to airfield noise is limited due to the different nature of road versus airfield noise.

As with studies of adults, the available evidence suggests that chronic noise exposure is probably not associated with serious psychological illness, but there may be effects on well-being and quality of life. Further research is needed.

Coronary Risk. The HYENA study discussed earlier indicated a possible relation between noise and hypertension in older adults. Cohen et al. (1980, 1981) found some increase in blood pressure among school children, but this increase was within the normal range and not indicating hypertension. Hygge et al. (2002) found mixed effects. The RANCH study found some effect for children at home and at night but not at school (van Kempen, 2006). In the Munich study (Evans et al., 1998), chronic noise exposure was found to be associated with both baseline systolic blood pressure and lower reactivity of systolic blood pressure to a cognitive task presented under acute noise. After the new airport opened, a significant increase in systolic blood pressure was observed, providing evidence for a causal link between chronic noise exposure and raised blood pressure. No association was found between noise and diastolic blood pressure or reactivity (Stansfeld and Crombie, 2011; Stansfeld, 2015).

However, the relationship between aircraft noise and blood pressure was not fully consistent between surveys in different countries. These findings, taken together with those from previous studies, suggest that no unequivocal conclusions can be drawn about the association between aircraft noise exposure and blood pressure. Overall, the evidence for noise effects on children's blood pressure is mixed and less certain than for noise effects on older adults.

Stress Hormones. Some studies investigated hormonal levels between groups of children exposed to aircraft noise and those in a control group. Two studies analyzed cortisol and urinary catecholamine levels in school children as measurements of stress response to aircraft noise (Haines et al., 2001a, 2001b, 2001c). In both instances, there were no differences between the aircraft-noise-exposed children and the control groups.

Sleep Disturbance. A sub-study of RANCH in a Swedish sample used sleep logs and the monitoring of rest/activity cycles to compare the effect of road traffic noise on child and parent sleep (Ohrstrom et al., 2006). An exposure-response relationship was found for sleep quality and daytime sleepiness for children. While this suggests effects of noise on children's sleep disturbance, it is difficult to generalize from one study. Davies (2012) discusses how a study in France among 10-year-old schoolchildren showed that school noise exposure was associated with higher cortisol levels, indicative of a stress reaction; these finding are supported by a Swedish study that found increased prevalence of reduced diurnal cortisol variability in relation with classroom L_{eq} during school day noise levels of between 59 and 87 dBA.

A1.3.8 Property Values

Noise, along with many other conditions, (i.e. location, number of rooms, crime rate, school district) can affect the value of homes. Economic studies of property values based on selling prices and noise have been conducted to find a direct relation. Studies of the effects of aviation noise on property values are highly complex due to differing community environments, market conditions, and methodological approaches, so study results generally range from some negative impacts to significant negative impacts. However, studies that considered positive aspects of airport accessibility have found net positive impacts on property values, while others found poorly informed buyers often bid higher prices in noise-impacted areas, only to potentially be disappointed after purchase (ACRP, 2008). The value-noise relation is usually presented as the Noise Depreciation Index (NDI), or Noise Sensitivity Depreciation Index, for the percent loss of value per dB (measured by the DNL metric). An early study by Nelson (1978) at three airports found an NDI of 1.8 to 2.3 percent per dB. Nelson also noted a decline in NDI over time, which he theorized could be due to either a change in population or the increase in commercial value of the property near airports. Crowley (1973) reached a similar conclusion. A larger study by Nelson (1980) studying property values near 18 airports found an NDI from 0.5 to 0.6 percent per dB.

In a review of property value studies, Newman and Beattie (1985) found a range of NDI from 0.2 to 2 percent per dB. They noted that many factors other than noise affected values. These socioeconomic factors include size of house, number of rooms per house, repair of the house, distance from amenities and business districts, and demographics.

Frankel (1991) conducted surveys of 200 realtors and 70 appraisers in 35 suburban communities near Chicago O'Hare International Airport and found that a significant segment of buyers lacked adequate information about the noise environment and often overbid, only to be disappointed after purchase. Frankel classified noise-affected property owners into two groups: one that moved to the location while the environment was quiet but later became noise-impacted and another that purchased from a previous owner while the property was already noise impacted. Frankel concluded that the former group members bore the true financial burden of airport noise.

Fidell et al. (1996) studied the influence of aircraft noise on actual sale prices of residential properties in the vicinity of a military base in Virginia and one in Arizona. They found no meaningful effect on home values. Their results may have been affected by non-noise factors, especially the wide differences in homes between the two study areas.

Tomkins (1998) conducted a study of the residential areas near Manchester Airport, England, and showed that when using the Noise and Number Index (no longer used but similar to DNL), there was no significant negative relationship between noise and property values. When L_{eq} measure was analyzed, fewer properties are included, but the most noise-blighted are identified. Ultimately, the proximity to the airport had a significant impact and was found to be a more important factor of property values than noise. This could be that potential buyers were more likely to be aware of potentially negative noise impacts when properties were closest to airports and much less aware at further distances.

Lipscomb (2003) analyzed the City of College Park, Georgia, and found that noise did not significantly affect the values of residential properties. Lipscomb concluded that local residents were more accepting of noise because many were employed in airport-related occupations, so the proximity provided offsetting benefits, such as short work commutes.

Recent studies of noise effects on property values have recognized the need to account for non-noise factors. Nelson (2004) analyzed data from 33 airports and discussed the need to account for those factors and the need for careful statistics. His analysis showed NDI from 0.3 to 1.5 percent per dB, with an average of about 0.65 percent per dB. Nelson (2007) and Andersson et al. (2013) discuss statistical modeling in more detail.

Enough data are available to conclude that aircraft noise has a real effect on property values. This effect falls in the range of 0.2 to 2.0 percent per dB, with the average on the order of 0.5 percent per dB. The actual value varies from location to location, and it is very often small compared to non-noise factors such as location, market conditions, neighborhood characteristics, and property age, size, and amenities.

A1.3.9 Noise-Induced Vibration Effects on Structures and Humans

The sound from an aircraft overflight travels from the exterior to the interior of a house in one of two ways: through the solid structural elements or directly through the air. Figure A-13 illustrates the sound transmission through a wall constructed with a brick exterior, stud framing, interior finished wall, and absorbent material in the cavity. The sound transmission starts with noise impinging on the wall exterior. Some of this sound energy will be reflected away, and some will make the wall vibrate. The vibrating wall radiates sound into the airspace, which in turn sets the interior finished surface vibrating, with some energy lost in the airspace. This surface then radiates sound into the dwelling interior. As the figure shows, vibrational energy also bypasses the air cavity by traveling through the studs and edge connections.

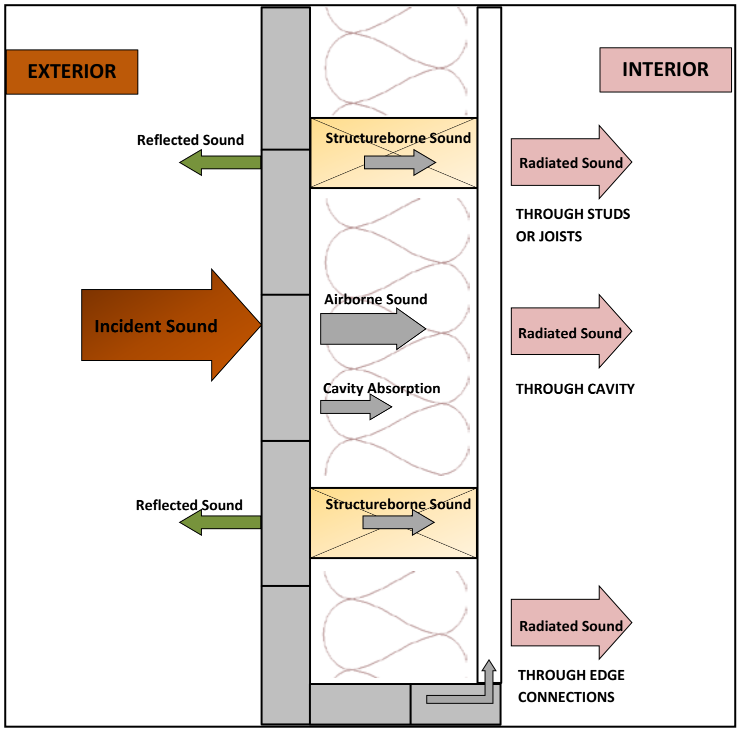


Figure A-13 Depiction of Sound Transmission through Built Construction

High noise levels can cause buildings to vibrate. If noise levels are high enough, building components can be damaged. The most sensitive components of a building are the windows, followed by plaster walls and ceilings. Possibility of damage depends on the sound pressures levels and the resonances of the building. While certain frequencies (such as 30 Hz for window breakage) may be of more concern than other frequencies, in general, only sounds lasting more than one second at greater than an unweighted sound level of 130 dB in the 1 Hz to 1,000 Hz frequency range are potentially damaging to structural components (CHABA, 1977; von Gierke and Ward, 1991). Sound levels from normal aircraft operations are typically much less than 130 dB. Even sounds from low-altitude flyovers of heavy aircraft do not reach the potential for damage (Sutherland, 1990).

Noise-induced structural vibration may cause annoyance to dwelling occupants because of induced secondary vibrations, or "rattle," of objects--hanging pictures, dishes, plaques, and bric-a-brac--within the dwelling. Loose window panes may also vibrate noticeably when exposed to high levels of airborne noise, causing homeowners to fear breakage. In general, rattling occurs at unweighted sound levels that last for several seconds at greater than 110 dB.

A field study conducted by Schomer and Neathammer (1985, 1987) examined the role of structural vibration and rattle in human response to helicopter noise. It showed that human response is strongly and negatively influenced when the noise induces noticeable vibration and rattles in the house structure. The A-frequency weighting was adequate to assess community response to helicopter noise when no vibration or rattle was induced. When rattle or vibrations were induced by the helicopter noise, however, A-weighting alone did not assess the community response adequately, such that significant corrections from 12 dB (for little vibration or rattles) to 20 dB (high level of vibration or rattles) needed to be applied for subjects indoors. It was also found that the presence or absence of high-level noise-induced vibration and rattles was strongly dependent on the helicopter's slant distance. It was recommended that no housing or noise-sensitive land uses be located in zones where high levels of vibration or rattle are induced by helicopter noise.

Community reactions to conventional helicopter noise from low numbers of operations for two helicopter types were studied by Fields and Powell (1987). Using resident interviews in combination with controlled helicopter operations, the authors obtained relations between the annoyance score and noise exposure for short-term (9-hour daytime) periods. It was determined that annoyance increased steadily with noise exposure measured in L_{eq} from 45 to 60 dBA for that period. Annoyance response in terms of percentage annoyed was also presented on this scale for various annoyance rating values. The shape of these curves is similar to the well-known dose-response relationship (Schultz curve) for general transportation noise but relates to only the 9-hour daytime period and with no direct comparison with long-term noise exposure.

In a later review of human response to aircraft noise and induced building vibration, Powell and Shepherd (1989) also indicate that in aircraft noise surveys, the annoyance scores are on average greater when vibration is detected than with no vibration detected. Based on the results of the study by Fields and Powell (1987), they conclude, however, that no effect of increased annoyance was found for cases where the helicopter noise level and slant distance were such that appreciable rattle was expected to occur, in contrast to the results of Schomer and Neathammer (1987). Powell and Shepherd (1989) also quote a laboratory study (Cawthorn et al., 1978) in which the sound of rattling glassware added to the aircraft flyover noises but did not increase the level of annoyance.

Community annoyance in the vicinity of airports due to noise-induced vibration and rattle resulting from aircraft ground operations was studied by Fidell et al. (1999) and summarized in the Minneapolis-St. Paul International Airport Low Frequency Noise (LFN) Expert Panel Report (Sutherland et al., 2000). These field surveys of operations in the vicinity of a major international airport indicated that low-frequency aircraft noise can lead to secondary vibration and rattle in residential structures, which may significantly increase annoyance. These studies, however, have been criticized (FICAN, 2002) due to the absence of direct measurements of vibration in support of the findings on the presence of perceptible vibration and rattle. These issues were further addressed by Hodgdon et al. (2007). It was confirmed that the highest levels of noise near the runway during start-of-takeoff-roll and acceleration and during thrust reversal are at frequencies below 200 Hz. It was also found that aircraft noise exposures that contained audible rattling were not the most annoying, likely because the rattle content was audible but not loud compared to the overall noise content. This result is consistent with an earlier study of human response to aircraft noise and induced building vibration (Powell and Shepherd, 1989).

In the assessment of vibration on humans, the following factors determine whether a person will perceive and possibly react to building vibrations:

1. Type of excitation: steady state, intermittent, or impulsive vibration.
2. Frequency of the excitation. ISO standard 2631-2 (ISO, 1989) recommends a frequency range of 1 to 80 Hz for the assessment of vibration on humans.
3. Orientation of the body with respect to the vibration.

4. The use of the occupied space (i.e., residential, workshop, hospital).
5. Time of day.

Table A-6 lists the whole-body vibration criteria from ISO 2631-2 for one-third octave frequency bands from 1 to 80 Hz.

Table A-6 Vibration Criteria for the Evaluation of Human Exposure to Whole-Body Vibration

	RMS Acceleration (m/s/s)		
Frequency (Hz)	***Combined Criteria Base Curve***	***Residential Night***	***Residential Day***
1.00	0.0036	0.0050	0.0072
1.25	0.0036	0.0050	0.0072
1.60	0.0036	0.0050	0.0072
2.00	0.0036	0.0050	0.0072
2.50	0.0037	0.0052	0.0074
3.15	0.0039	0.0054	0.0077
4.00	0.0041	0.0057	0.0081
5.00	0.0043	0.0060	0.0086
6.30	0.0046	0.0064	0.0092
8.00	0.0050	0.0070	0.0100
10.00	0.0063	0.0088	0.0126
12.50	0.0078	0.0109	0.0156
16.00	0.0100	0.0140	0.0200
20.00	0.0125	0.0175	0.0250
25.00	0.0156	0.0218	0.0312
31.50	0.0197	0.0276	0.0394
40.00	0.0250	0.0350	0.0500
50.00	0.0313	0.0438	0.0626
63.00	0.0394	0.0552	0.0788
80.00	0.0500	0.0700	0.1000

Source: ISO, 1989

A1.3.10 Noise Effects on Terrain

It has been suggested that noise levels associated with low-flying aircraft may affect the terrain under the flight path by disturbing fragile soil or snow, especially in mountainous areas, thereby causing landslides or avalanches. There are no known instances of such events. It is improbable that such effects would result from routine subsonic aircraft operations.

A1.3.11 Noise Effects on Historical and Archaeological Sites

Historic buildings and sites can have elements that are more structurally fragile than conventional buildings. Aircraft noise may affect such sites more severely than newer, modern structures. In older structures, seemingly insignificant surface cracks caused by vibrations from aircraft noise may lead to greater damage from natural forces (Hanson et al., 1991). There are few scientific studies of such effects to provide guidance for their assessment.

One study involved measurements of noise and vibration in a restored plantation house, originally built in 1795. It is located 1,500 feet from the centerline at the departure end of Runway 19L at Washington

Dulles International Airport. The aircraft generating the sound measured was the Concorde. There was special concern for the building's windows because roughly half of the house's 324 panes were original. No instances of structural damage were found. Interestingly, despite the high levels of noise during Concorde takeoffs, the induced structural vibration levels were actually less than those induced by touring groups and vacuum cleaning (Wesler, 1977).

As for conventional structures, noise exposure levels for normally compatible land uses should also be protective of historic and archaeological sites. Unique sites should, of course, be analyzed for specific exposure.

A1.3.12 Effects on Domestic 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, has 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 intra-inter specific 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 to 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 these 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 temporary, 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 non-auditory 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 these 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, especially with respect to habituation and ability to adapt to change.

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 a group or an individual is exposed, 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.

A1.3.12.1 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.

Cattle

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

A majority of the studies reviewed suggest that there is little or no effect of aircraft noise on cattle. Studies presenting adverse effects to domestic animals have been limited. A number of studies (Parker and Bayley, 1960; Casady and Lehmann, 1967; Kovalcik and Sottnik, 1971) investigated the effects of jet aircraft noise and sonic booms on the milk production of dairy cows. Through the compilation and examination of milk production data from areas exposed to jet aircraft noise and sonic boom events, it was determined that milk yields were not affected. This was particularly evident in those cows that had been previously exposed to jet aircraft noise.

A study examined the causes of 1,763 abortions in Wisconsin dairy cattle over a 1-year time period, and none were associated with aircraft disturbances (U.S. Air Force, 1993). In 1987, researchers contacted seven livestock operators for production data, and no effects of low-altitude and supersonic flights were noted. Of the 43 cattle previously exposed to low-altitude flights, three showed a startle response to an F/A-18 aircraft flying overhead at 500 feet above ground level (AGL) and 400 knots by running less than 10 meters. They resumed normal activity within 1 minute (U.S. Air Force, 1994a). Beyer (1983) found that helicopters caused more reaction than other low-aircraft overflights and that helicopters at 30 to 60 feet overhead did not affect milk production and pregnancies of 44 cows in a 1964 study (U.S. Air Force, 1994a).

Additionally, Beyer (1983) reported that five pregnant dairy cows in a pasture did not exhibit fright-flight tendencies or disturb their pregnancies after being overflown by 79 low-altitude helicopter flights and four low-altitude, subsonic jet aircraft flights. A 1956 study found that the reactions of dairy and beef cattle to noise from low-altitude, subsonic aircraft were similar to those caused by paper blowing about, unfamiliar persons, or other moving objects (U.S. Air Force, 1994a).

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

Horses

Horses have also been observed to react to overflights of jet aircraft. Several of the studies reviewed reported a varied response of horses to low-altitude aircraft overflights. Observations made in 1966 and 1968 noted that horses galloped in response to jet flyovers (U.S. Air Force, 1993). Bowles (1995) cites Kruger and Erath as observing horses exhibiting intensive flight reactions, random movements, and biting/kicking behavior. However, no injuries or abortions occurred, and there was evidence that the mares adapted somewhat to the flyovers over the course of a month (U.S. Air Force, 1994a). Although horses were observed noticing the overflights, it did not appear to affect either survivability or reproductive success. There was also some indication that habituation to these types of disturbances was occurring.

LeBlanc et al. (1991) studied the effects of F-14 jet aircraft noise on pregnant mares. They specifically focused on any changes in pregnancy success, behavior, cardiac function, hormone production, and rate of habituation. Their findings reported observations of "flight-fright" reactions, which caused increases in heart rates and serum cortisol concentrations. The mares, however, did habituate to the noise. Levels of anxiety and mass body movements were the highest after initial exposure, with intensities of responses decreasing thereafter. There were no differences in pregnancy success when compared to a control group.

Swine

Generally, the literature findings for swine appear to be similar to those reported for cows and horses. While there are some effects from aircraft noise reported in the literature, these effects are minor. Studies of continuous noise exposure (i.e., 6 hours and 72 hours of constant exposure) reported influences on short-term hormonal production and release. Additional constant exposure studies indicated the observation of stress reactions, hypertension, and electrolyte imbalances (Dufour, 1980). A study by Bond et al. (1963) demonstrated no adverse effects on the feeding efficiency, weight gain, ear physiology, or thyroid and adrenal gland condition of pigs subjected to observed aircraft noise. Observations of heart rate increase were recorded, noting that cessation of the noise resulted in the return to normal heart rates. Conception rates and offspring survivorship did not appear to be influenced by exposure to aircraft noise.

Similarly, simulated aircraft noise at levels of 100 to 135 dB had only minor effects on the rate of feed utilization, weight gain, food intake, or reproduction rates of boars and sows exposed, and there were no injuries or inner ear changes observed (Gladwin et al., 1988; Manci et al., 1988).

Domestic Fowl

According to a 1994 position paper by the U.S. Air Force on effects of low-altitude overflights (below 1,000 feet) on domestic fowl, overflight activity has negligible effects (U.S. Air Force, 1994b). The paper did recognize that given certain circumstances, adverse effects can be serious. Some of the effects can be panic reactions, reduced productivity, and effects on marketability (e.g., bruising of the meat caused during "pile-up" situations).

The typical reaction of domestic fowl after exposure to sudden, intense noise is a short-term startle response. The reaction ceases as soon as the stimulus is ended, and within a few minutes all activity returns to normal. More severe responses are possible depending on the number of birds, the frequency of exposure, and environmental conditions. Large flocks of birds, and birds not previously exposed, are more likely to pile up in response to a noise stimulus (U.S. Air Force, 1994b). According to studies and interviews with growers, it is typically the previously unexposed birds that incite panic crowding, and the tendency to do so is markedly reduced within five exposures to the stimulus (U.S. Air Force, 1994b). This suggests that the birds habituate relatively quickly. Egg productivity was not adversely affected by infrequent noise bursts, even at exposure levels as high as 120 to 130 dB.

Between 1956 and 1988, there were 100 recorded claims against the Navy for alleged damage to domestic fowl. The number of claims averaged three per year, with peak numbers of claims following publications of studies on the topic in the early 1960s. Many of the claims were disproved or did not have sufficient supporting evidence. The claims were filed for the following alleged damages: 55 percent for panic reactions, 31 percent for decreased production, 6 percent for reduced hatchability, 6 percent for weight loss, and less than 1 percent for reduced fertility (U.S. Air Force, 1994b).

The review of the existing literature suggests that there has not been a concerted or widespread effort to study the effects of aircraft noise on commercial turkeys. One study involving turkeys examined the differences between simulated versus actual overflight aircraft noise, turkey responses to the noise, weight gain, and evidence of habituation (Bowles et al., 1990). Findings from the study suggested that turkeys habituated to jet aircraft noise quickly, that there were no growth-rate differences between the experimental and control groups, and that there were some behavioral differences that increased the difficulty in handling individuals within the experimental group.

Low-altitude overflights were shown to cause turkey flocks that were kept inside turkey houses to occasionally pile up and experience high mortality rates due to the aircraft noise and a variety of disturbances unrelated to aircraft (U.S. Air Force, 1994b).

A1.3.12.2 Wildlife

Studies on the effects of overflights and sonic booms on wildlife have been focused mostly on avian species and on ungulates such as caribou (*Rangifer tarandus*) and bighorn sheep (*Ovis canadensis*). 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).

Mammals

<u>Terrestrial Mammals</u>

Studies of terrestrial mammals have shown that noise levels of 120 dB can damage mammals' ears, and levels at 95 dB can cause temporary loss of hearing acuity. Noise from aircraft has affected other large carnivores by causing changes in home ranges, foraging patterns, and breeding behavior. One study recommended that aircraft not be allowed to fly at altitudes below 2,000 feet AGL over important grizzly bear (*Ursus arctos horribilis*) and polar bear (*Ursus maritimus*) habitat. Wolves (*Canis lupus*) have been frightened by low-altitude flights that were 25 to 1,000 feet AGL. However, wolves have been found to adapt to aircraft overflights and noise as long as they were not being hunted from aircraft (Dufour, 1980).

Wild ungulates (American bison [*Bison bison*], caribou, bighorn sheep) appear to be much more sensitive to noise disturbance than domestic livestock (Weisenberger et al., 1996). Behavioral reactions may be related to the past history of disturbances by humans and aircraft. Common reactions of reindeer kept in an enclosure exposed to aircraft noise disturbance were a slight startle response, rising of the head, pricking ears, and scenting of the air. Panic reactions and extensive changes in behavior of individual animals were not observed. Caribou in Alaska exposed to fixed-wing aircraft and helicopters exhibited running and panic reactions when overflights were at an altitude of 200 feet or less. The reactions decreased with increased altitude of overflights, and, with more than 500 feet in altitude, the panic reactions stopped. Also, smaller groups reacted less strongly than larger groups. One negative effect of the running and avoidance behavior is increased expenditure of energy. For a 90-kilogram animal, the calculated expenditure due to aircraft harassment is 64 kilocalories per minute when running and 20 kilocalories per minute when walking. When conditions are favorable, this expenditure can be counteracted with increased feeding; however, during harsh winter conditions, this may not be possible. Incidental observations of wolves and bears exposed to fixed-wing aircraft and helicopters in the northern regions suggested that wolves are less disturbed than wild ungulates, while grizzly bears showed the greatest response of any animal species observed (Weisenberger et al., 1996).

It has been proven that low-altitude overflights do induce stress in animals. Increased heart rates, an indicator of excitement or stress, have been found in pronghorn antelope (*Antilocapra Americana*), elk (*Cervus Canadensis*), and bighorn sheep. As such reactions occur naturally as a response to predation, infrequent overflights may not, in and of themselves, be detrimental. However, flights at high frequencies over a long period of time may cause harmful effects. The consequences of this disturbance, while cumulative, are not additive. It may be that aircraft disturbance may not cause obvious and serious health effects, but coupled with a harsh winter, it may have an adverse impact. Research has shown that stress induced by other types of disturbances produces long-term decreases in metabolism and hormone balances in wild ungulates.

Behavioral responses can range from mild to severe. Mild responses include head raising, body shifting, or turning to orient toward the aircraft. Moderate disturbance may be nervous behaviors, such as trotting a short distance. Escape is the typical severe response.

<u>Marine Mammals</u>

The physiological composition of the ear in aquatic and marine mammals exhibits adaptation to the aqueous environment. These differences (relative to terrestrial species) manifest themselves in the auricle and middle ear (Manci et al., 1988). Some mammals use echolocation to perceive objects in their surroundings and to determine the directions and locations of sound sources (Simmons, 1983 in Manci et al. 1988).

In 1980, the Acoustical Society of America held a workshop to assess the potential hazard of manmade noise associated with proposed Alaska arctic (North Slope-Outer Continental Shelf) petroleum operations on marine wildlife and to prepare a research plan to secure the knowledge necessary for proper assessment of noise impacts (Acoustical Society of America, 1980). Since 1980, it appears that research on responses of aquatic mammals to aircraft noise and sonic booms has been limited. Research conducted on northern fur seals (*Callorhinus ursinus*), sea lions, and ringed seals (*Pusa hispida*) indicated that there are some differences in how various animal groups receive frequencies of sound. It was observed that these species exhibited varying intensities of a startle response to airborne noise, and this response was habituated over time. The rates of habituation appeared to vary with species, populations, and demographics (age, sex). Time of day of exposure was also a factor (Myrberg, 1978 in Manci et al., 1988).

Studies were conducted near the Channel Islands near the area where the space shuttle launches occur. It was found that there were some response differences between species relative to the loudness of sonic booms. Those booms that were between 80 and 89 dB caused a greater intensity of startle reactions than lower-intensity booms at 72 to 79 dB. However, the duration of the startle responses to louder sonic booms was shorter (Jehl and Cooper, 1980).

Jehl and Cooper (1980) indicated that low-flying helicopters, loud boat noises, and humans were the most disturbing to pinnipeds. According to the research, while the space shuttle launch and associated operational activity noises have not had a measurable effect on the pinniped population, it also suggests that there was a greater "disturbance level" exhibited during launch activities. There was a recommendation to continue observations for behavioral effects and to perform long-term population monitoring (Jehl and Cooper, 1980).

The continued presence of single or multiple noise sources could cause marine mammals to leave a preferred habitat. However, it does not appear likely that overflights could cause migration from suitable habitats because aircraft noise over water is mobile and would not persist over any particular area. Aircraft noise, including supersonic noise, currently occurs in the overwater airspace of Eglin, Tyndall, and Langley Air Force bases from sorties predominantly involving jet aircraft. Survey results reported in Davis et al. (2000) indicate that cetaceans (i.e., dolphins) occur under all of the Eglin and Tyndall marine airspace. The continuing presence of dolphins (family Delphinidae) indicates that aircraft noise does not discourage use of the area and apparently does not harm the locally occurring population.

In a summary by the National Park Service (1994) on the effects of noise on marine mammals, it was determined that gray whales (*Eschrichtius robustus*) and harbor porpoises (*Phocoena phocoena*) showed no outward behavioral response to aircraft noise or overflights. Bottlenose dolphins (*Tursiops truncatus*) showed no obvious reaction in a study involving helicopter overflights at 1,200 to 1,800 feet above the water. Neither did they show any reaction to survey aircraft unless the shadow of the aircraft passed over them, at which point there was some observed tendency to dive (Richardson et al., 1995). Other anthropogenic noises in the marine environment from ships and pleasure craft may have more of an effect on marine mammals than aircraft noise (U.S. Air Force, 2000). The noise effects on cetaceans appear to be somewhat attenuated by the air/water interface. The cetacean fauna along the coast of California have been subjected to sonic booms from military aircraft for many years without apparent adverse effects (Tetra Tech, Inc., 1997).

Manatees (*Trichechus spp.*) appear relatively unresponsive to human-generated noise to the point that they are often suspected of being deaf to oncoming boats (although their hearing is actually similar to that of pinnipeds [Bullock et al., 1980]). Little is known about the importance of acoustic communication to manatees, although they are known to produce at least 10 different types of sounds and are thought to have sensitive hearing (Richardson et al., 1995). Manatees continue to occupy canals near Miami International Airport, which suggests they have become habituated to human disturbance and noise (Metro-Dade County, 1995). Since manatees spend most of their time below the surface and do not startle readily, no effect of aircraft overflights on manatees would be expected (Bowles et al., 1993).

Birds

Auditory research conducted on birds indicates that they fall between reptiles and mammals relative to hearing sensitivity. According to Dooling (1978), within the range of 1,000 to 5,000 Hz, birds show a level of hearing sensitivity similar to that of the more sensitive mammals. In contrast to mammals, bird sensitivity falls off at a greater rate with increasing and decreasing frequencies. Passive observations and studies examining aircraft bird strikes indicate that birds nest and forage near airports. Aircraft noise in the vicinity of commercial airports apparently does not inhibit bird presence and use.

High-noise events (like a low-altitude aircraft overflight) may cause birds to engage in escape or avoidance behaviors, such as flushing from perches or nests (Ellis et al., 1991). These activities impose an energy cost on the birds that, over the long term, may affect survival or growth. In addition, the birds may spend less time engaged in necessary activities like feeding, preening, or caring for their young because they spend time in noise-avoidance activity. However, the long-term significance of noise-related impacts is less clear. Several studies on nesting raptors have indicated that birds become habituated to aircraft overflights and that long-term reproductive success is not affected (Ellis et al., 1991; Grubb and King, 1991). Threshold noise levels for significant responses range from 62 dB for the Pacific black brant (*Branta bernicla nigricans*) to 85 dB for the crested tern (*Thalasseus bergii*) (Brown, 1990; Ward and Stehn, 1990).

Songbirds were observed to become silent prior to the onset of a sonic boom event (F-111 jets), followed by "raucous discordant cries." There was a return to normal singing within 10 seconds after the boom (Higgins, 1974 in Manci et al., 1988). Ravens (*Corvus corax*) responded by emitting protestation calls, flapping their wings, and soaring.

Manci et al. (1988) reported a reduction in reproductive success in some small territorial passerines (i.e., perching birds or songbirds) after exposure to low-altitude overflights. However, it has been observed that passerines are not driven any great distance from a favored food source by a nonspecific disturbance, such as aircraft overflights (U.S. Forest Service, 1992). Further study may be warranted.

A cooperative study between the DoD and the U.S. Fish and Wildlife Service (USFWS) assessed the response of the red-cockaded woodpecker (*Leuconotopicus borealis*) to a range of military training noise events, including artillery, small arms, helicopter, and maneuver noise (Pater et al., 1999). The project findings show that the red-cockaded woodpecker successfully acclimates to military noise events. Depending on the noise level that ranged from innocuous to very loud, the birds responded by flushing from their nest cavities. When the noise source was closer and the noise level was higher, the number of flushes increased proportionately. In all cases, however, the birds returned to their nests within a relatively short period of time (usually within 12 minutes). Additionally, the noise exposure did not result in any mortality or statistically detectable changes in reproductive success (Pater et al., 1999). Red-cockaded woodpeckers did not flush when artillery simulators were more than 122 meters away and SELs were 70 dB.

Lynch and Speake (1978) studied the effects of both real and simulated sonic booms on the nesting and brooding eastern wild turkey (*Meleagris gallopavo silvestris*) in Alabama. Hens at four nest sites were subjected to between eight and 11 combined real and simulated sonic booms. All tests elicited similar responses, including quick lifting of the head and apparent alertness for 10 to 20 seconds. No apparent nest failure occurred as a result of the sonic booms. Twenty-one brood groups were also subjected to simulated sonic booms. Reactions varied slightly between groups, but the largest percentage of groups reacted by standing motionless after the initial blast. Upon the sound of the boom, the hens and poults fled until reaching the edge of the woods (approximately 4 to 8 meters). Afterward, the poults resumed feeding activities while the hens remained alert for a short period of time (approximately 15 to 20 seconds). In no instances were poults abandoned, and they did not scatter and become lost. Every observation group returned to normal activities within a maximum of 30 seconds after a blast.

Bald Eagle

A study by Grubb and King (1991) on the reactions of the bald eagle (*Haliaeetus leucocephalus*) to human disturbances showed that terrestrial disturbances elicited the greatest response, followed by aquatic (i.e., boats) and aerial disturbances. The disturbance regime of the area where the study occurred was predominantly characterized by aircraft noise. The study found that pedestrians consistently caused responses that were greater in both frequency and duration. Helicopters elicited the highest level of aircraft-related responses. Aircraft disturbances, although the most common form of disturbance, resulted in the lowest levels of response. This low response level may have been due to habituation; however, flights less than 170 meters away caused reactions similar to other disturbance types. Ellis et al. (1991) showed that eagles typically respond to the proximity of a disturbance, such as a pedestrian or aircraft within 100 meters, rather than the noise level. Fleischner and Weisberg (1986) stated that reactions of bald eagles to commercial jet flights, although minor (e.g., looking), were twice as likely to occur when the jets passed at a distance of 0.5 mile or less. They also noted that helicopters were four times more likely to cause a reaction than a commercial jet and 20 times more likely to cause a reaction than a propeller plane.

The USFWS advised Cannon Air Force Base that flights at or below 2,000 feet AGL from October 1 through March 1 could result in adverse impacts to wintering bald eagles (USFWS, 1998). However, Fraser et al. (1985) suggested that raptors habituate to overflights rapidly, sometimes tolerating aircraft approaches of 65 feet or less.

Golden Eagle

In its guidelines for aerial surveys, USFWS (Pagel et al., 2010) summarized past studies by stating that most golden eagles (*Aquila chrysaetos*) respond to survey aircraft (fixed- and rotary-wing) by remaining on their nests and continuing to incubate or roost. Surveys take place generally as close as 10 to 20 meters from cliffs (including hovering less than 30 seconds if necessary to count eggs) and no farther than 200 meters from cliffs, depending on safety considerations (Pagel et al., 2010).

Grubb et al. (2007) experimented with multiple exposure to two helicopter types and concluded that flights with a variety of approach distances (800, 400, 200, and 100 meters) had no effect on golden eagle nesting success or productivity rates within the same year or on rates of renewed nesting activity the following year when compared to the corresponding data for the larger population of non-manipulated nest sites (Grubb et al., 2007). They found no significant, detrimental, or disruptive responses in 303 helicopter passes near eagles. In 227 AH-64 Apache helicopter experimental passes (considered twice as loud as a civilian helicopter also tested) at test distances of 0 to 800 meters from nesting golden eagles, 96 percent resulted in no more response than watching the helicopter pass. No greater reactions occurred until after hatching, when individual golden eagles exhibited five flatten and three fly behaviors at three nest sites. The flight responses occurred at approach distances of 200 meters or less. No evidence was found of an effect on subsequent nesting activity or success, despite many of the helicopter flights occurring during early courtship and nest repair. None of these responding pairs failed to successfully fledge young, except for one nest that fell later in the season. Excited, startled, or avoidance reactions were never observed. Non-attending eagles or those perched away from the nests were more likely to fly than attending eagles but also with less potential consequence to nesting success (Grubb et al., 2007). Golden eagles appeared to become less responsive with successive exposures. Much of helicopter sound energy may be at a lower frequency than golden eagles can hear, thus reducing expected impacts. Grubb et al. (2007) found no relationship between helicopter sound levels and corresponding eagle ambient behaviors or limited responses, which occurred throughout recorded test levels (76.7 to 108.8 dB, unweighted). The authors thought that the lower than expected behavioral responses may be partially due to the fact that the golden eagles in the area appear acclimated to the current high levels of outdoor recreational, including aviation, activities. Based on the results of this study, the authors recommended reduction of existing buffers around nest sites to 100 meters (325 feet) for helicopter activity.

Richardson and Miller (1997) reviewed buffers as protection for raptors against disturbance from ground-based human activities. No consideration of aircraft activity was included. They stressed a clear line of sight as an important factor in a raptor's response to a particular disturbance, with visual screening allowing a closer approach of humans without disturbing a raptor. A Geographical Information Systems (GIS)-assisted viewshed approach combined with a designated buffer zone distance was found to be an effective tool for reducing potential disturbance to golden eagles from ground-based activities (Richardson and Miller, 1997). They summarized recommendations that included a median 0.5-mile (800-meter) buffer (range = 200 to 1,600 m, n = 3) to reduce human disturbances (from ground-based activities such as rock climbing, shooting, vehicular activity) around active golden eagle nests from February 1 to August 1 based on an extensive review of other studies (Richardson and Miller, 1997). Physical characteristics (i.e., screening by topography or vegetation) are important variables to consider when establishing buffer zones based on raptors' visual- and auditory-detection distances (Richardson and Miller, 1997).

Osprey

A study by Trimper et al. (1998), in Goose Bay, Labrador, Canada, focused on the reactions of nesting osprey (*Pandion haliaetus*) to military overflights by CF-18 Hornets. Reactions varied from increased alertness and focused observation of planes to adjustments in incubation posture. No overt reactions (e.g., startle response, rapid nest departure) were observed as a result of an overflight. Young nestlings crouched as a result of any disturbance until 1 to 2 weeks prior to fledging. Helicopters, human presence, float planes, and other ospreys elicited the strongest reactions from nesting ospreys. These responses included flushing, agitation, and aggressive displays. Adult osprey showed high nest occupancy rates during incubation regardless of external influences. The osprey observed occasionally stared in the direction of the flight before the flight was audible to the observers. The birds may have been habituated to the noise of the flights; however, overflights were strictly controlled during the experimental period. Strong reactions to float planes and helicopters may have been due to the slower flight and therefore longer duration of visual rather than noise-related stimuli.

Red-tailed Hawk

Anderson et al. (1989) conducted a study that investigated the effects of low-level helicopter overflights on 35 red-tailed hawk (*Buteo jamaicensis*) nests. Some of the nests had not been flown over prior to the study. The hawks that were naïve (i.e., not previously exposed) to helicopter flights exhibited stronger avoidance behavior (nine of 17 birds flushed from their nests) than those that had experienced prior overflights. The overflights did not appear to affect nesting success in either study group. These findings were consistent with the belief that red-tailed hawks habituate to low-level air traffic, even during the nesting period.

Upland Game Birds

Greater Sage-grouse

The greater sage-grouse (*Centrocercus urophasianus*) was recently designated as a candidate species for protection under the Endangered Species Act after many years of scrutiny and research (USFWS, 2010). This species is a widespread and characteristic species of the sagebrush ecosystems in the Intermountain West. Greater sage-grouse, like most bird species, rely on auditory signals as part of mating. Sage-grouse are known to select their leks based on acoustic properties and depend on auditory communication for mating behavior (Braun, 2006). Although little specific research has been completed to determine what, if any, effects aircraft overflight and sonic booms would have on the breeding behavior of this species, factors that may be important include season and time of day, altitude, frequency and duration of overflights, and frequency and loudness of sonic booms.

Booth et al. (2009) found, while attempting to count sage-grouse at leks (breeding grounds) using light sport aircraft at 150 meters (492 feet) to 200 meters (650 feet) AGL, that sage-grouse flushed from leks on 12 of 14 approaches when the airplane was within 656 to 984 feet (200 to 300 meters) of the lek. In the other two instances, male grouse stopped exhibiting breeding behavior and crouched but stayed on the lek. The time to resumption of normal behavior after disturbance was not provided in this study. Strutting ceased around the time when observers on the ground heard the aircraft. The light sport aircraft could be safely operated at very low speed (68 kilometers per hour or 37 nautical miles per hour) and was powered by either a two-stroke or a four-stroke engine. It is unclear how the response to the slow-flying light sport aircraft used in the study would compare to overflight by military jets, operating at speeds 10 to 12 times as great as the aircraft used in the study. It is possible that response of the birds was related to the slow speed of the light sport aircraft causing it to resemble an aerial predator.

Other studies have found disturbance from energy operations, and other nearby development have adversely affected breeding behavior of greater sage-grouse (Holloran, 2005; Doherty, 2008; Walker et al., 2007; Harju et al., 2010). These studies do not specifically address overflights, do not isolate noise disturbance from other types of disturbance (e.g., visual, human presence), and do not generally provide noise levels or qualification of the noise source (e.g., continuous or intermittent, frequency, duration).

Because so few studies have been done on greater sage-grouse response to overflights or sonic booms, research on related species may be applicable. Observations on other upland game bird species include those on the behavior of four wild turkey (*Meleagris gallapavo*) hens on their nests during real and simulated sonic booms (Manci et al., 1988). Simulated sonic booms were produced by firing 5-centimeter mortar shells from a location 300 to 500 feet from the nest of each hen. Recordings of pressure for both types of booms measured 0.4 to 1.0 pounds per square foot at the observer's location.

Turkey hens exhibited only a few seconds of head alert behavior at the sound of the sonic boom. No hens were flushed off the nests, and productivity estimates revealed no effect from the booms. Twenty brood groups were also subjected to simulated sonic booms. In no instance did the hens desert any poults (young birds), and the poults did not scatter or desert the rest of the brood group. In every observation, the brood group returned to normal activity within 30 seconds after a simulated sonic boom. Similarly, researchers cited in Manci et al. (1988) observed no difference in hatching success of bobwhite quail (*Colinus virginianus*) exposed to simulated sonic booms of 100 to 250 micronewtons per square meter.

Migratory Waterfowl

Fleming et al. (1996) conducted a study of caged American black ducks (*Anas rubripes*) and found that noise had negligible energetic and physiologic effects on adult waterfowl. Measurements included body weight, behavior, heart rate, and enzymatic activity. Experiments also showed that adult ducks exposed to high noise events acclimated rapidly and showed no effects.

The study also investigated the reproductive success of captive ducks and indicated that duckling growth and survival rates at Piney Island, North Carolina, were lower than those at a background location. In contrast, observations of several other reproductive indices (i.e., pair formation, nesting, egg production, and hatching success) showed no difference between Piney Island and the background location. Potential effects on wild duck populations may vary because wild ducks at Piney Island have presumably acclimated to aircraft overflights. It was not demonstrated that noise was the cause of adverse impacts. A variety of other factors, such as weather conditions, drinking water and food availability and variability, disease, and natural variability in reproduction, could explain the observed effects. Fleming noted that drinking water conditions (particularly at Piney Island) deteriorated during the study, which could have affected the growth of young ducks. Further research would be necessary to determine the cause of any reproductive effects (Fleming et al., 1996).

Another study by Conomy et al. (1998) exposed previously unexposed ducks to 71 noise events per day that equaled or exceeded 80 dB. It was determined that the proportion of time black ducks reacted to aircraft activity and noise decreased from 38 percent to 6 percent in 17 days and remained stable at 5.8 percent thereafter. In the same study, the wood duck did not appear to habituate to aircraft disturbance. This supports the notion that animal response to aircraft noise is species-specific. Because a startle response to aircraft noise can result in flushing from nests, migrants and animals living in areas with high concentrations of predators would be the most vulnerable to experiencing effects of lowered birth rates and recruitment over time. Species that are subjected to infrequent overflights do not appear to habituate to overflight disturbance as readily.

Black brant (*Branta bernicla nigricans*) studied in the Alaska Peninsula were exposed to jets and propeller aircraft, helicopters, gunshots, people, boats, and various raptors. Jets accounted for 65 percent of all the disturbances. Humans, eagles, and boats caused a greater percentage of brant to take flight. Brant demonstrated a markedly greater reaction to Bell-206-B helicopter flights than fixed wing, single-engine aircraft flights (Ward et al., 1986).

The presence of humans and low-flying helicopters in the Mackenzie Valley North Slope area did not appear to affect the population density of Lapland longspurs (*Calcarius lapponicus*), but the experimental group was shown to have reduced hatching and fledging success and higher nest abandonment. Human presence appeared to have a greater impact than fixed-wing aircraft on the incubating behavior of the black brant, common eider (*Somateria mollissima*), and Arctic tern (*Sterna paradisaea*) (Gunn and Livingston, 1974).

Gunn and Livingston (1974) found that waterfowl and seabirds in the Mackenzie Valley and North Slope of Alaska and Canada became acclimated to float plane disturbance over the course of three days. Additionally, it was observed that potential predators (e.g., the bald eagle) caused a number of birds to leave their nests. Non-breeding birds were observed to be more reactive than breeding birds. Waterfowl were affected by helicopter flights, while snow geese (*Chen caerulescens*) were disturbed by Cessna 185 flights. The geese flushed when the planes were less than 1,000 feet AGL compared to higher flight elevations. An overall reduction in flock sizes was observed. It was recommended that aircraft flights be reduced in the vicinity of premigratory staging areas.

Manci et al. (1988) reported that waterfowl were particularly disturbed by aircraft noise. The most sensitive appeared to be snow geese. Canada geese (*Branta Canadensis*) and snow geese were thought to be more sensitive to aircraft noise than other animals such as turkey vultures (*Cathartes aura*), coyotes (*Canis latrans*), and raptors (Edwards et al., 1979).

Wading and Shorebirds

Black et al. (1984) studied the effects of low-altitude (less than 500 feet AGL) military training flights with sound levels from 55 to 100 dB on wading bird colonies (i.e., the great egret [*Ardea alba*], snowy egret [*Egretta thula*] tricolored heron [*Egretta tricolor*], and little blue heron [*Egretta caerulea*]). The training flights involved three or four aircraft and occurred once or twice per day. This study concluded that the reproductive activity--including nest success, nestling survival, and nestling chronology--was independent of F-16 overflights. Dependent variables were more strongly related to ecological factors, including location and physical characteristics of the colony and climatology.

Another study on the effects of circling fixed-wing aircraft and helicopter overflights on wading bird colonies found that at altitudes of 195 to 390 feet, there was no reaction in nearly 75 percent of the 220 observations. Approximately 90 percent displayed no reaction or merely looked toward the direction of the noise source. Another 6 percent stood up, 3 percent walked from the nest, and 2 percent flushed (but were without active nests) and returned within 5 minutes (Kushlan, 1978). Apparently, non-nesting wading birds had a slightly higher incidence of reacting to overflights than nesting birds. Seagulls observed roosting near a colony of wading birds in another study remained at their roosts when subsonic aircraft flew overhead (Burger, 1981). Colony distribution appeared to be most directly correlated to available wetland community types and was found to be distributed randomly with respect to military training routes. These results suggest that wading bird species' presence was most closely linked to habitat availability and that they were not affected by low-level military overflights (U.S. Air Force, 2000).

Burger (1986) studied the response of migrating shorebirds to human disturbance and found that shorebirds did not fly in response to aircraft overflights but did flush in response to more localized intrusions (i.e., humans and dogs on the beach). Burger (1981) studied the effects of noise from JFK Airport in New York on herring gulls (*Larus argentatus*) that nested less than 1 kilometer from the airport. Noise levels over the nesting colony were 85 to 100 dB on approach and 94 to 105 dB on takeoff. Generally, there did not appear to be any prominent adverse effects of subsonic aircraft on nesting, although some birds flushed when the Concorde flew overhead and, when they returned, engaged in aggressive behavior. Groups of gulls tended to loaf in the area of the nesting colony, and these birds remained at the roost when the Concorde flew overhead. Up to 208 of the loafing gulls flew when supersonic aircraft flew overhead. These birds would circle around and immediately land in the loafing flock (U.S. Air Force, 2000).

In 1970, sonic booms were potentially linked to a mass hatch failure of sooty terns (*Onychoprion fuscatus*) on the Dry Tortugas (Austin et al., 1970). The cause of the failure was not certain, but it was conjectured that sonic booms from military aircraft or an overgrowth of vegetation were factors. In the previous season, sooty terns were observed to have reacted to sonic booms by rising in a "panic flight," circling over the island, then usually settling down on their eggs again. Hatching that year was normal. Following the 1969 hatch failure, excess vegetation was cleared, and measures were taken to reduce supersonic activity. The 1970 hatch appeared to proceed normally. A colony of noddies (*Anous* spp.) on the same island hatched successfully in 1969, the year of the sooty tern hatch failure.

Subsequent laboratory tests of exposure of eggs to sonic booms and other impulsive noises (Cottereau, 1972; Cogger and Zegarra, 1980; Bowles et al., 1991, 1994) failed to show adverse effects on hatching of eggs. A structural analysis by Ting et al. (2002) showed that, even under extraordinary circumstances, sonic booms would not damage an avian egg.

Burger (1981) observed no effects of subsonic aircraft on herring gulls in the vicinity of JFK International Airport. The Concorde aircraft did cause more nesting gulls to leave their nests (especially in areas of higher density of nests), causing the breakage of eggs and the scavenging of eggs by intruder prey. Clutch sizes were observed to be smaller in areas of higher-density nesting (presumably due to the greater tendency for panic flight) than in areas where there were fewer nests.

Raptors

In a literature review of raptor responses to aircraft noise, Manci et al. (1988) found that most raptors did not show a negative response to overflights. When negative responses were observed, they were predominantly associated with rotor-winged aircraft or jet aircraft that were repeatedly passing within 0.5 mile of a nest.

Ellis et al. (1991) performed a study to estimate the effects of low-level military jet aircraft and mid- to high-altitude sonic booms (both actual and simulated) on nesting peregrine falcons (*Falco peregrinus*) and seven other raptors (common black-hawk [*Buteogallus anthracinus*], Harris' hawk [*Parabuteo unicinctus*], zone-tailed hawk [*Buteo albonotatus*], red-tailed hawk, golden eagle, prairie falcon [*Falco mexicanus*], and bald eagle). They observed responses to test stimuli, determined nest success for the year of the testing, and evaluated site occupancy the following year. Both long- and short-term effects were noted in the study. The results reported the successful fledging of young in 34 of 38 nest sites (including all eight species) subjected to low-level flight and/or simulated sonic booms. Twenty-two of the test sites were revisited in the following year, and observations of pairs or lone birds were made at all but one nest. Nesting attempts were underway at 19 of 20 sites that were observed long enough to be certain of breeding activity. Reoccupancy and productivity rates were within or above expected values for self-sustaining populations.

Short-term behavior responses were also noted. Overflights at a distance of 150 meters or less produced few significant responses and no severe responses. Typical responses consisted of crouching or, very rarely, flushing from the perch site. Significant responses were most evident before egg laying and after young were "well grown." Incubating or brooding adults never burst from the nest, thus preventing egg breaking or knocking chicks out of the nest. Jet passes and sonic booms often caused noticeable alarm; however, significant negative responses were rare and did not appear to limit productivity or re-occupancy. Due to the locations of some of the nests, some birds may have been habituated to aircraft noise. There were some test sites located at distances far from zones of frequent military aircraft usage, and the test stimuli were often closer, louder, and more frequent than would be likely for a normal training situation (Ellis et al., 1991).

Manci et al. (1988) noted that a female northern harrier (*Circus hudsonius*) was observed hunting on a bombing range in Mississippi during bombing exercises. The harrier was apparently unfazed by the exercises, even when a bomb exploded within 200 feet. In a similar case of habituation/non-disturbance, a study on the Florida snail-kite (*Rostrhamus sociabilis*) stated that the greatest reaction by that species to overflights (approximately 98 dB) was “watching the aircraft fly by.” No detrimental impacts to distribution, breeding success, or behavior were noted.

Fish and Amphibians

The effects of overflight noise on fish and amphibians have not been well studied, but conclusions regarding their expected responses have involved speculation based upon known physiologies and behavioral traits of these taxa (Gladwin et al., 1988). Although fish do startle in response to noise from low-flying aircraft, and probably to the shadows of aircraft, they have been found to habituate to the sound and overflights. Amphibians that respond to low frequencies and those that respond to ground vibration, such as spadefoot toads, may be affected by noise.

Summary

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 because 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 number and frequency 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 the aircraft. 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.

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