Department of the Air Force

Overseas Integrated Natural and Cultural Resources Management Plan

Moron INCRMP

Installation Supplement

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ABOUT THIS PLAN

This installation-specific Environmental Management Plan (EMP) is based on the Department of the Air Force's (DAF's) standardized Integrated Natural and Cultural Resources Management Plan (INCRMP) template for installations located outside the United States[1]. This INCRMP has been developed in cooperation with applicable stakeholders, including appropriate Host Nation authorities. The INCRMP documents how natural and cultural resources are managed and the roles and responsibilities of stakeholders in implementing the INCRMP. Overseas installations will comply with the Overseas Environmental Baseline Guidance Document (OEBGD) and applicable Final Governing Standards (FGS). External resources, including Department of Air Force Instructions (DAFIs), Department of Air Force Manuals (DAFMANs), DAF Playbooks, and Department of Defense (DoD) policy, are referenced where applicable.

Certain sections of this INCRMP begin with standard language that addresses DAF and DoD policy, FGS, and applicable US laws. This common text language is restricted from editing to ensure that it remains standard throughout all plans. The common text language is maintained and updated by the designated Office of Primary Responsibility (OPR) with assistance from the Office of Collateral Responsibility (OCR), as appropriate. Immediately following the DAF-wide common text sections are installation content sections that address installation-specific requirements. Installation sections are unrestricted and are maintained and updated by DAF environmental Sections and/or installation personnel.

NOTE: The terms "Natural Resources Manager," "NRM," "NRM/POC," "Cultural Resources Manager," "CRM," and "CRM/POC" are used throughout this document to refer to the installation person responsible for the natural and cultural resources program, regardless of whether this person meets the qualifications within the definition of a natural and cultural resources management professional in Department of Defense Instruction (DoDI) 4715.03, Natural Resources Conservation Program*, and DoDI 4715.16,* Cultural Resources Management*.*

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[1] *"United States" is defined in DAFI 32-7091, Environmental Management Outside the United States, as "The several States, District of Columbia, Commonwealths of Puerto Rico and Northern Mariana Islands, American Samoa, Guam, Midway and Wake Islands, United States Virgin Islands, any other territory or possession of the United States, an associated navigable waters, contiguous zones, and ocean waters of which the natural resources are under the exclusive management authority of the United States." "Overseas" is used interchangeably with "outside the United States" in this document.*

DOCUMENT CONTROL

Standardized INCRMP Template

In accordance with the Air Force Civil Engineer Center (AFCEC) Environmental Directorate (CZ) Business Rule (BR) 08, *EMP Review, Update, and Maintenance*, the standard content in this INCRMP template is reviewed periodically, updated as appropriate, and approved by the Natural Resources, Cultural Resources, and Environmental Overseas Subject Matter Experts (SME).

This version of the template is current as of 10/11/2024.

NOTE: Installations are not required to update their INCRMPs every time this template is updated. When it is time for an INCRMP update, installations should adopt the most recent version of this template available in the Plan Tool.

Installation INCRMP

Record of Review – The INCRMP is updated not less than annually, or as changes to natural and cultural resource management and conservation practices occur, including those driven by changes in applicable regulations. In accordance with DoDI 4715.16; DAFI 32-7091, *Environmental Management Outside the United States*; DAFMAN 32-7003, *Environmental Conservation* (includes Cultural and Natural Resources management), the INCRMP is required to be revised and approved for operation and effect not less than every five years or as required by an applicable FGS. Annual reviews and updates are accomplished by the installation Natural Resources Manager (NRM), the installation Cultural Resources Manager (CRM), and/or the Section Natural and Cultural Resources Media Managers. At a minimum, the installation NRM or CRM conducts an annual review of the INCRMP in coordination with internal stakeholders, where applicable, and accomplishes pertinent updates. Installations will document the findings of the annual review in an Annual INCRMP Review Summary. By signature to the Annual INCRMP Review Summary, the Civil Engineering Squadron Commander asserts concurrence with the findings. Any agreed updates are then made to the document, at a minimum updating the work plans.

ICRMP APPROVAL/SIGNATURE PAGE

Installation Supplement

The plan is to be approved by the ESOHC Chair.

Digital Signature

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EXECUTIVE SUMMARY

Installation Supplement

The Integrated Natural and Cultural Resources Management Plan (INCRMP) for Morón Air Base (AB) is a comprehensive approach to ensure the protection and conservation of both natural and cultural resources on the installation. By integrating protocols from the Natural Resources Management Plan and the Cultural Resources Management Plan, the INCRMP aims to harmonize efforts in managing these vital resources.

The INCRMP is an essential planning tool for making informed decisions with regard to future development of Morón AB and determining the potential effects the proposed actions may have on natural and cultural resources. Acting as a guiding framework, it ensures that natural and cultural resources are managed and taken into consideration into all phases of installation and mission planning.

The INCRMP aligns with the Final Governing Standards-Spain (FGS-S) and applicable Air Force directives to establish a framework for sustainable resource management. It addresses the need to maintain continuity in managing natural resources, establish habitat and species inventories, develop management guidelines for threatened and endangered species, and adhere to strategic management practices.

Furthermore, the plan emphasizes the importance of proper data management, ongoing project monitoring, and knowledge sharing among stakeholders to enhance natural and cultural resources management practices. By outlining specific actions for the 496 Air Base Squadron (ABS), the plan ensures that both natural and cultural resources are integrated into all facets of installation and mission planning processes.

The INCRMP not only provides a baseline description of natural and cultural resources but also outlines coordination procedures with host nations, identifies management concerns, and specifies training requirements. It serves as a crucial tool for informed decision-making regarding future development at Morón AB and facilitates the effective integration of potential cultural resources into planning processes in alignment with the FGS-S and USAFE mission objectives.

1 OVERVIEW AND SCOPE

This INCRMP was developed to provide for effective management and protection of natural and cultural resources. It summarizes the natural and cultural resources present on the installation and outlines strategies to adequately manage those resources. Natural and cultural resources are valuable assets of the DAF. They provide the infrastructure needed for testing weapons and technology, as well as for training military personnel for deployment. Sound management of natural and cultural resources increases the effectiveness of DAF adaptability in all environments. DAF has stewardship responsibility for the physical lands on which installations are located to ensure all natural and cultural resources are properly conserved, protected, and used in sustainable ways. The primary objective of DAF natural and cultural resources programs is to sustain, restore, and modernize natural and cultural infrastructure to ensure operational capability and no net loss in the capability of DAF lands to support the military mission of the installation. The plan outlines and assigns responsibilities for the management of natural and cultural resources, discusses related concerns, and provides program management elements that will help to maintain or improve the natural and cultural resources within the context of the installation's mission. The INCRMP is intended for use by all installation personnel. Applicable FGS, supported by DAFI 32-7091; OEBGD (where an FGS does not exist); and Title 54 United States Code (USC) § 307101(e) act as the main drivers for the INCRMP.

1.1 Purpose and Scope

Installation Supplement

The Integrated Natural and Cultural Resource Management Plan (INCRMP) for Morón Air Base (AB) is designed to provide a comprehensive framework for the conservation and management of both natural and cultural resources present on the installation.

The U.S. Air Force (USAF) recognizes its role and responsibility in safeguarding the inherent value of natural resources – defined by the FGS-S as "all living and inanimate materials supplied by nature that are of aesthetic, ecological, educational, historical, recreational, scientific, or other value" – through comprehensive planning, decision-making, and the implementation of effective natural resource management programs. Resilient and functional ecosystems form the "green infrastructure" that sustains not only the environment but also essential human activities, including the daily operations of military readiness and the long-term viability of the mission. Consequently, the primary objective of natural resource management is to preserve and restore ecosystem integrity. By maintaining these natural systems, the military base ensures a stable environment for its operational needs and contributes to global environmental stewardship.

In parallel with its commitment to natural resources, the USAF recognizes the importance of protecting and preserving cultural resources. These resources – defined by the FGS-S as the "physical remains of any prehistoric or historic district, site, building, structure, or object significant in world, national, or local history, architecture, archeology, engineering, or culture" – are invaluable to the heritage of the region and the nation. Cultural resources management involves identifying, evaluating, and safeguarding these assets in accordance with legal frameworks. Respect for cultural heritage fosters positive relationships between the military and surrounding communities and reflects the base's broader commitment to ethical and responsible stewardship. The protection of these cultural assets strengthens the base's operational legitimacy and aligns its activities with global norms for the protection of cultural heritage during both peacetime and conflict.

This plan serves as a guide to ensure the protection, integration, and sustainable management of both natural and cultural resources across all phases of the installation's mission and planning processes. The key objective is to effectively safeguard the valuable natural and cultural heritage of Morón AB while supporting the operational capability and mission of the USAF at Morón AB. It aims to do so by facilitating responsible development and decision-making that considers the potential impacts on these resources in all aspects of installation and mission planning. By combining the principles of natural resource conservation and cultural resource management, the INCRMP at Morón AB establishes a holistic approach to ecosystem and heritage preservation, contributing to the sustainable and resilient operation of the installation within the guidelines of the FGS-S and relevant USAFE mission requirements.

In summary, the objectives of the INCRMP are to:

- Ensure compliance with the FGS-S and associated USAFE regulations;
- Protect surrounding properties from potential impacts resulting from mission-essential operations through the monitoring of natural and cultural resources and rehabilitation of problem areas;
- Document the future direction of natural and cultural resources programs;
- Manage any existing natural and cultural resources to maintain current resource levels and enhance and protect these resources in a manner consistent with mission requirements;
- Maintain a "no-net-loss" natural and cultural resource management approach, if impacts to resources are unavoidable due to mission requirements; and
- Coordinate all planning efforts with appropriate on-site and off-site entities to ensure cultural resource management practices are compatible with USAF and host nation-specific requirements and are integrated into the appropriate installation plans.

The INCRMP is a living document that will be reviewed annually to ensure its alignment with environmental regulations and to address any emerging concerns or improvements in resource management practices.

1.2 Management Philosophy

Installation Supplement

The INCRMP serves as a key component of the Installation Development Plan (IDP), which provides background and rationale for the policies and programming decisions related to land use, resource conservation, facilities and infrastructure development, and operations and maintenance to ensure that they meet current requirements and provide for future growth. The INCRMP supports the mission by identifying the natural and cultural resources present on the installation, developing management goals for these resources, and integrating these management objectives into the military requirements for mission operations/support and regulatory compliance in order to minimize natural and cultural resource constraints.

Goals and objectives require monitoring on a continuous basis and management strategies are updated whenever there are changes in mission requirements, adverse effects to or from natural and cultural resources, or changes in regulations governing management of natural and cultural resources.

This INCRMP outlines the steps needed to fulfill compliance requirements related to natural and cultural resources management and fosters environmental stewardship. It is organized into the following principal sections:

- An overview of the current status and conditions of the natural and cultural resources
- Identification of potential impacts to or from natural and cultural resources
- The key natural and cultural resource management areas addressed
- Management recommendations that incorporate the installation's goals and objectives for natural and cultural resource management areas
- Specific work plans for effective implementation of the INCRMP

Management issues and concerns, as well as goals and objectives, are developed from analysis of all the gathered information, and are reviewed by ***Morón*** personnel involved with or responsible for various aspects of natural and cultural resources management. The INCRMP was developed using an interdisciplinary approach and is based on existing information of the physical and biotic environments, mission activities, and environmental management practices at ***Morón***. Information was obtained from a variety of documents, interviews with installation personnel, on-site observations, and communications with both internal and external stakeholders. Coordination and correspondence with these agencies is documented and satisfies a portion of the requirements of 32 Code of Federal Regulations (CFR) 989, *Environmental Impact Analysis Process (EIAP)*, and 32 CFR 187, *Environmental Effect Abroad for Major Federal Actions*.

1.3 Authority

Installation Supplement

The DoD Publication 4715.5-G, *Overseas Environmental Baseline Guidance Document*, requires the implementation of uniform conservation standards for natural and cultural resources and protection and management of historic and cultural resources at DoD installations and facilities in foreign countries. The OEBGD provides criteria, standards, and management practices to be used by DoD Lead Environmental Components in determining FGS IAW DoDI 4715.05, *Management of Environmental Compliance at Overseas Installations*.

FGS for each Host Nation requires preparation of integrated natural and cultural resource management plans in Chapter 13 for "Installations with significant land or water areas…" See installation and Host Nation specifics listed on the table below.

AFMAN 32-7003 applies to overseas to the extent that they are consistent with applicable international agreements, Unified Combatant Command (UCC) policy, environmental annexes to operational orders or plans, country-specific FGS, or in their absence, the OEBGD.

AFI 32-7001, *Environmental Management*, requires installations to identify processes or activities that include reducing pollution, conserving natural and cultural resources, and conserving water. USAF Policy Directive (AFPD) 32-70, *Environmental Quality*, identifies general United States Air Forces in Europe (USAFE) requirements for a natural and cultural resources management program.

Table 1: Installation-Specific Policies

Installation-Specific Policies (including Host Nation and/or Local Laws and Regulations)

Installation-Specific Policies	
FGS – Spain (2014)	The Final Governing Standards-Spain (FGS-S) are the definitive source of environmental compliance for Department of Defense (DoD) installations and U.S. Forces activities in Spain. The FGS-S outlines environmental requirements and procedures applicable to Morón AB. The Environmental Inspection Process (EIP) assesses compliance with these standards, identifying non-compliance issues and outlining corrective actions for the installation.
FGS – Spain, Chapter 12 (2014)	Focuses on Historic and Cultural Resources, providing criteria for plans and programs necessary to protect, enhance, and manage cultural resources. This includes resources listed on the World Heritage List and Spanish Heritage Lists. These criteria ensure proper stewardship of cultural assets on Morón AB.
FGS – Spain, Chapter 13 (2014)	Addresses Natural Resources and Endangered Species, establishing criteria for plans and programs to protect and manage natural resources and species deemed endangered or threatened by U.S. or Spanish authorities. Includes guidelines for inventorying habitats and species and implementing conservation measures.
AFMAN 32-7003 (2020)	The Air Force Manual 32-7003 provides comprehensive guidelines for managing environmental and cultural resources at Air Force installations. It covers compliance with regulations, creating and implementing natural resources management plans, and responsibilities of Air Force entities in conservation efforts. The manual emphasizes balancing preservation efforts with military mission requirements, ensuring sustainable practices.
Host Nation Policies (Spain)	
Natural Resources (Spain)	Governed by the Ministry of Agriculture, Food, and Environment (MAGRAMA) under Law 42/2007, which establishes biodiversity protections, the Natura 2000 network, and endangered species lists. MAGRAMA oversees the Spanish Inventory of Natural Heritage and Biodiversity, protected areas, and the implementation of conservation programs. Royal Decree 556/2011 regulates the inventory, while Royal Decree 139/2011 maintains the List of Wild Species under Special Protection and the Spanish Catalog of Endangered Species. These lists, referenced in the FGS-S, include Mediterranean species and can be accessed via MAGRAMA's website. Conservation efforts also include the State Strategic Plan for Natural Heritage and Biodiversity.
Cultural Resources (Spain)	Managed under Law 16/1985, Spanish Historical Heritage, by the Ministry of Education, Culture, and Sports (MECD). This law defines historical heritage, ensuring its protection and availability for future generations. The Ministry oversees the cultural infrastructure plan, museums, state libraries, and arts conservation. Two branches are responsible for heritage protection: the Office for the Protection of Cultural Heritage, which implements the legal framework, and the General Branch of the Institute of Cultural Heritage of Spain, which develops conservation and restoration plans. Compliance with international conventions and recommendations is ensured under this law.
Regional Policies (Andalusia)	
Nautral Resources (Junta de Andalucía)	Governed by the Junta de Andalucía via its Ministry of Environment and Spatial Planning (Consejería de Medio Ambiente y Ordenación del Territorio). Andalusia is characterized by extraordinary biodiversity and diverse landscapes. Law 2/1989 provides measures for protecting natural areas, while Law 8/2003 focuses on conserving wild flora and fauna. This legislation prioritizes biodiversity conservation, protects native species, prevents the spread of invasive species, regulates sustainable wildlife use, and promotes environmental education and public participation. The region also adheres to Law 42/2007, requiring planning and management of SPAs and SACs. The Agreement of 18 January 2011 and Agreement of 13 March 2012 outline recovery and conservation measures for threatened species and habitats.
Cultural Resources (Junta de Andalucía)	Andalusia has a rich cultural heritage with approximately 27,000 legally protected cultural properties and 124 historic areas. The protection and regulation of these resources fall under the General Secretariat of Culture (Secretaría General de Cultura) within the Ministry of Education, Culture, and Sports (Consejería de Educación, Cultura y Deporte). The Decree 128/2013 establishes the organizational structure for cultural resource management. The provincial Council of Sevilla (Diputación de Sevilla), along with its Functional Area of Citizenship, Participation, and Culture, also plays a role in protecting cultural heritage within the region.

European/International Legislation	
Habitats Directive (92/43/EEC)	Aims to conserve natural habitats and wild flora and fauna to maintain biodiversity across EU member states. It designates Special Areas of Conservation (SACs) for habitat types and species of community interest. SACs are protected from harmful development unless no viable alternatives exist, public interest is demonstrated, and compensation measures are implemented. Annexes define priority habitat types and endangered species requiring conservation. Currently, there are no SACs near Morón AB.
Birds Directive (2009/147/EC)	Focuses on conserving wild birds, protecting their eggs, nests, and habitats, and controlling hunting. Member states are required to designate Special Protection Areas (SPAs) for vulnerable and migratory bird species and maintain sufficient habitat diversity to ensure population stability. Conservation measures include creating protected areas, restoring biotopes, and prohibiting deliberate killing of birds or destruction of nests and eggs. Currently, there are no SPAs near Morón AB.
Natura 2000	An EU-wide network of protected areas, consisting of designated SPAs and SACs. Development within these areas is restricted unless overriding public interest is demonstrated, and compensation measures are implemented. Natura 2000 sites are managed by member states and aim to maintain ecological integrity.
Bonn Convention	An international framework for the conservation and sustainable use of migratory species through coordinated efforts among Range States. Appendix I lists species threatened with extinction, while Appendix II includes species requiring international cooperation.
Bern Convention	Focuses on conserving European wildlife and natural habitats, emphasizing the intrinsic value of biodiversity and its importance for future generations. It requires member states to implement conservation policies and protect vulnerable species and habitats.
World Heritage Convention	Protects sites of "outstanding universal value to humanity" under the UNESCO framework. Parties may nominate properties for the World Heritage List, which includes both cultural and natural heritage. Spain is ranked third globally with 44 World Heritage Sites, but none are located within 5 km of Morón AB.
Intangible Cultural Heritage (2003)	Adopted by UNESCO to safeguard living traditions, such as oral traditions, festivals, rituals, and craftsmanship. Spain ratified the convention in 2006 and maintains a national inventory to document intangible cultural heritage.

1.4 Integration with Other Plans

Installation Supplement

INCRMP revisions and concurrence with the final plan must be coordinated through the installation chain of command and the and the 496 ABS/CEIE . The NRM and CRM must ensure that the INCRMP and any other plans that may affect natural and cultural resources are mutually supportive and not in conflict.

2 INSTALLATION PROFILE

Installation Supplement

Table 2: Installation Profile

OPR	496 ABS/CEIE has overall responsibility for implementing the Natural and Cultural Resources Management Plan and is the lead organization for monitoring compliance with applicable regulations.
Natural and Cultural Resources Managers/POCs	Name: Andy Perfecto, CTR Phone: 722-8047 Email: andy.perfecto.ctr@us.af.mil
Host Nation POC/local authorities	NA
Total acreage managed by installation	3433
Total acreage of wetlands	NA
Total acreage of forested land	NA

Natural and Cultural Resources Program applicability **(Place a checkmark next to each program that must be implemented at the installation. Document applicability and current management practices in Section 7.0)**	x Fish and Wildlife Management x Outdoor Recreation and Access to Natural Resources x Conservation and Protection Standards Enforcement x Management of Threatened, Endangered, and Host Nation-Protected Species x Water Resource Protection x Wetland Protection x Grounds Maintenance x Forest Management x Wildland Fire Management x Agricultural Outleasing x Integrated Pest Management Program x Bird/Wildlife Aircraft Strike Hazard (BASH) ☐ Coastal Zone and Marine Resources Management x Communication, Planning, and EIAP ☐ Cultural Property Review Process x Resources Contracting x Cultural Discoveries ☐ Public Access to Host Nation Sites of Cultural or Traditional Importance ☐ Accidents and Emergencies Affecting Historic Properties ☐ Suspected Vandalism ☐ Curation of Collections and Records x Management and Coordination x Public Outreach x Geographic Information Systems (GIS)
Office of the Secretary of Defense most current "Base Structure Report" notion of the total acres managed by the Installation	
Installation's own notion of total acres managed by Installation	
Installation surveyable acres (i.e., undisturbed, accessible acres)	Cultural Resources: 3,433
Total acres ever surveyed [NR] **Total acres every surveyed [CR]**	Cultural Resources: 2,395
ICRMPs consulted with appropriate Host Nation/local authorities	NA
Cultural Resources outreach program (e.g., website, welcome package, or brochures)?	NA
Cumulative number of archaeology sites ever recorded	3
Number of known cultural resources to be managed	3
Have historic status codes been updated in the Accountable Property System of Record in FY ##.?	None
Number of archeology sites mapped into GIS	3
Number of surveyed acres mapped into GIS	
Are culturally significant real property assets (buildings/structures) mapped into GIS?	Yes, MAB-C-1

2.1 Installation Overview

2.1.1 Location and Area

Installation Supplement

The Morón AB is located in southern Spain, at approximately 35 miles southeast of the city of Seville and 75 miles northeast of Rota Naval Station. The base gets its name from the nearby town Morón de la Frontera and is located within the territory of the municipality of Arahal. It is situated in a plain relief area surrounded by crops. The distance between the base and the nearest towns (Moron de la Frontera, Arahal, Utrera and Montellano) is about 6.2 miles. Its perimeter extends just over 12,4 miles, and it covers an area of approximately 1,390 ha.

Table 3: Installation/GSU Location and Area Descriptions

Installation/ Geographically Separated Unit (GSU)	**Main Use/ Mission**	**Acreage**	**Addressed in INCRMP?**	**Describe Natural and Cultural Resource Implications**
Morón AB **496 ABS**	Contingency. The 496 ABS maintains a high state of readiness to receive forces in support of the United Nations (UN), the North Atlantic Treaty Organization (NATO), and the U.S. contingency and exercise operations. The installation is a Spanish Air Force (SpAF) facility that is occupied and operated under treaty arrangements by both the SpAF 11th Tactical Wing and 496 ABS.	3433	Yes	The presence of potential natural and historic/cultural resources requires adequate protection, conservation, and management during the development of future base plans and mission activities. Implications for natural and cultural resources are discussed in the following paragraphs/sections of this plan.

2.1.2 Installation History

Installation Supplement

Morón Air Base (AB) originated from a 10-year bilateral agreement between the United States and Spanish governments, aimed at establishing Spanish-American air bases to support joint strategic objectives. Construction of Morón AB began in 1954 and was completed in 1957, when the 3973rd Air Base Group was activated under the Strategic Air Command (SAC) as part of the Sixteenth Air Force. Early operations included B-47 Reflex missions starting in 1958, which required extensive infrastructure development, including runways, fuel storage facilities, and operational support buildings. These missions continued until 1963, when Morón transitioned to KC-135 refueling operations as part of the Chrome Dome mission. On 3 April 1963, the last B-47 aircraft departed Morón, and by 26 September 1963, the U.S.-Spanish bilateral agreement was extended for another five years.

In 1966, management of Morón AB shifted from SAC to U.S. Air Forces in Europe (USAFE), resulting in a change in mission to communications support, reconnaissance operations involving RF-4 and RF-101 aircraft, and air rescue operations by the 67th Aerospace Rescue and Recovery Squadron (ARRS). By 1969, Morón AB was designated as a Standby Dispersal Base, significantly reducing active flight operations and personnel. The 7473rd Combat Support Group transitioned into the 7473rd Combat Support Squadron, and many base functions, including civil engineering, supply, and transportation, were contracted under the Spain Base Maintenance Contract, which came into effect in July 1972. The 7473rd CSS was deactivated on 31 May 1976.

The Treaty of Friendship and Cooperation between Spain and the United States came into effect in September 1976, reconfirming Morón AB's standby status. During this time, the base saw limited activity but continued to serve as a strategic location for occasional exercises. In 1984, Morón AB was designated as a NASA Space Shuttle Transoceanic Abort Landing Site, further emphasizing its importance as a contingency base.

Morón AB played a critical role during Operation DESERT SHIELD (1990) and DESERT STORM (1991), hosting 22 KC-135 and KC-10 tankers to support refueling operations. By January 1991, Morón transitioned to bomber operations, and the 801st Bomb Wing (Provisional) deployed 24 B-52s, 3 KC-135s, and over 2,800 personnel, marking the largest bomber wing deployment of the war. In 1994, the 7120th Air Base Flight was re-designated as the 496th Air Base Squadron (ABS) under the newly formed 616th Regional Support Group stationed at Aviano AB, Italy.

Throughout the late 1990s and early 2000s, Morón AB evolved into a critical staging base for Aerospace Expeditionary Forces (AEF) rotations in the European Command (EUCOM) and Central Command (CENTCOM) Areas of Responsibility. Tanker task forces (KC-135, KC-10), fighter units, and airlifters (C-141, C-17, C-5) regularly utilized Morón for deployments. The base also hosted rotating U.S. Army personnel, with staffing levels increasing during these operations. Temporary duty personnel augmented the installation's workforce under Expeditionary Combat Support, with the majority of positions now filled by Air Reserve Component (ARC) personnel. This shift made Morón AB one of Europe's largest users of ARC personnel.

The NASA mission ended in 2012, followed by the termination of the USAF Space Surveillance mission in 2013, marking a decline in certain operational demands. During this period, the U.S. Marine Corps temporarily stationed 550 Marines at Morón to support U.S. Africa Command (AFRICOM), introducing new land use requirements and repurposing existing facilities to accommodate Marine operations.

Most recently, in 2023, the 23rd Expeditionary Bomb Squadron (EBS) began Bomber Task Force (BTF) operations, conducting missions alongside NATO allies and partners. These operations underscore Morón AB's enduring strategic relevance, its role in regional security, and its contribution to interoperability with allied forces.

For more comprehensive information on Morón AB's history, refer to the 2024 Cultural Resources Inventory.

2.1.3 Military Missions

Installation Supplement

The 496 ABS is the current USAFE host unit stationed at Morón AB, a pivotal power projection base. The 496 ABS maintains a high state of readiness to receive forces in support of the United Nations (UN), the North Atlantic Treaty Organization (NATO), and the U.S. contingency and exercise operations.

The installation is a Spanish Air Force (SpAF) facility that is occupied and operated under treaty arrangements by both the SpAF 11th Tactical Wing and 496 ABS. Although the SpAF occupies, operates, and maintains its own separate containment area at an older section of the base, the SpAF and USAF facilities are intermingled across the majority of the remaining area. The SpAF performs regular maintenance and support activities and hosts a security police-training unit on the base. The USAF provides airfield maintenance, utilities, and certain supply support functions to the SpAF. Each Air Force independently operates and maintains their specific facilities.

Regarding Natural and Cultural Resources Responsibility, at the Morón AB, the Squadron Commander holds the ultimate responsibility for the proper management of historical and cultural resources. This entails coordinating with the SpAF Base Commander to develop, implement, and fully support the INCRMP, which includes assigning funds for planning requirements.

Table 4: Listing of Tenants and Natural and Cultural Resource Responsibility

Tenant Organization	Natural and Cultural Resource Responsibility
Spanish Air Force (SpAF) – 11th Tactical Wing	Owner of the installation. Has authority to interact with the local environmental authorities.

2.1.4 Natural and Historic and Cultural Resources Needed to Support the Military Mission

Installation Supplement

Morón AB relies on its natural and cultural resources to effectively support its military operations.

Key natural resources include stable soils, open spaces, vegetation, and water resources. Stable soils are essential for maintaining the integrity of runways, taxiways, and other infrastructure, ensuring operational readiness. Open areas provide flexibility for staging, refueling, training exercises, and hosting temporary deployments. Vegetation aids in erosion control, protecting infrastructure and minimizing maintenance needs, while sustainable water resources support operational activities such as fire suppression, aircraft maintenance, and personnel needs.

Adherence to host nation cultural resource regulations is essential for maintaining strong relationships with Spain. Respecting these regulations fosters cooperation and ensures the continued operational presence of U.S. forces at the installation.

By effectively managing its natural and cultural resources, Morón AB ensures mission success while balancing operational demands with the sustainable use of resources.

2.1.5 Surrounding Communities

Installation Supplement

The Morón AB is located in southern Spain, at approximately 35 miles southeast of the city of Seville and 75 miles northeast of Rota Naval Station. The base derives its name from the nearby town Morón de la Frontera and lies within the municipality of Arahal. The surrounding area is predominantly agricultural area, with crops and livestock farming representing the primary land uses. The nearest urbanized area, belonging to the municipality of Arahal, is located 1.2 miles northwest of the base. Other nearby towns include Morón de la Frontera, Arahal, Utrera, El Coronil, and Los Morales, all situated more than 5 miles from the base's boundaries.

The table below provides a demographic overview of the communities in the vicinity of the Morón AB:

Municipality	Population Size	Age Distribution	Heritage
Morón de la Frontera	Total population (2023): 27,211 Men Population (2023): 13,370 Women Population (2023): 13,841 Relative change in the population over ten years (2012-2022): -3.6%	Average age (2022): 43.9 Percentage of population under 20 years (2023): 19.1% Percentage of population over 65 years (2023): 20.0%	Real estate assets (2021): 128 Movable assets (2021): 278 Intangible assets (2021): 7
Arahal	Total population (2023): 19,510 Population. Men (2023): 9,672 Population. Women (2023): 9,838 Relative change in the population over ten years (2012-2022): -0.2%	Average age (2022): 41.6 Percentage of population under 20 years (2023): 22.1% Percentage of population over 65 years (2023): 17.2%	Real estate assets (2021): 65 Movable assets (2021): 0 Intangible assets (2021): 2
Utrera	Total population (2023): 51,857 Population. Men (2023): 25,592 Population. Women (2023): 26,265 Relative change in the population over ten years (2012-2022): 3.9%	Average age (2022): 41.7 Percentage of population under 20 years (2023): 21.3% Percentage of population over 65 years (2023): 16.8%	Real estate assets (2021): 514 Movable assets (2021): 4 Intangible assets (2021): 10
El Coronil	Total population (2023): 4,684 Population. Men (2023): 2,358 Population. Women (2023): 2,326 Relative change in the population over ten years (2012-2022): -6.0%	Average age (2022): 45.1 Percentage of population under 20 years (2023): 18.0% Percentage of population over 65 years (2023): 21.0%	Real estate assets (2021): 51 Movable assets (2021): 24 Intangible assets (2021): 4

Los Morales	Total population (2023): 3,573 Population. Men (2023): 1,816 Population. Women (2023): 1,757 Relative change in the population over ten years (2012-2022): 2.9%	Average age (2022): 40.4 Percentage of population under 20 years (2023): 22.6% Percentage of population over 65 years (2023): 15.0%	Real estate assets (2021): 26 Movable assets (2021): 6 Intangible assets (2021): 2

Source: Andalucía pueblo a pueblo - Fichas Municipales. Sevilla | Instituto de Estadística y Cartografía de Andalucía (juntadeandalucia.es)

2.1.6 Local and Regional Natural and Cultural Areas

Installation Supplement

Natural Areas

Morón Air Base (AB) is situated within the Guadalquivir River Basin, one of Spain's most important hydrological regions. The Guadalquivir River, located approximately 40 km (25 miles) west of the installation, flows into the Atlantic Ocean near Cádiz. The basin is bordered by the Sierra Morena Mountain Chain to the north and the Sistemas Béticos Mountain Chain to the southeast, contributing to the region's diverse topography and ecosystems. Groundwater flow at the installation is influenced by the Guadaíra River, which borders Morón AB to the east. In 2003, the general groundwater flow was observed to move south-southwest to north-northeast, with flow patterns controlled by the Guadaíra River.

At the European level, the Birds Directive (Directive 2009/147/EC) and the Habitats Directive (Directive 92/43/EEC) provide protection to certain habitats, plants, and animals throughout the European Union under the Natura 2000 network. Spain's Law 42/2007 on Natural Heritage and Biodiversity and Andalusia's Law 2/1989 integrate these directives into national and regional conservation efforts.

The following natural areas are located within or near Morón AB:

- **Natura 2000 Sites:**
  - Guadaira River (Río Guadaira ES6180013): Borders Morón AB to the east and is designated as a Natura 2000 site for its ecological significance.
  - Arroyo de Santiago, Salado de Morón, and Matabueyes/Garrapata (ES6180007): Located approximately 10 km (6.2 miles) south of the installation.
  - Complejo Endorreico de Utrera (ES6180001): A notable wetland area approximately 20 km (12 miles) southwest of the installation.
- **Public Utility Forest:**
  - A public utility forest is located approximately 16 km (9.94 miles) southeast of Morón AB. These forests are designated for conservation and sustainable use, contributing to the protection of local biodiversity and providing ecological value to the region.
- **Cattle Trails (Vías Pecuarias):** The base is surrounded by several traditional cattle trails, including Cañada Real de Villamartín (0.5 km away), Vereda de Utrera a Morón de la Frontera (1.5 km south), Cañada de Piedra-Hincada (2.5 km northwest), and Cordel de Morón (1 km north). These trails are part of Spain's historical agricultural network and remain protected for their ecological and cultural significance.

Although there are no national parks within five miles of Morón AB, the installation is in proximity to two notable parks:

- **Parque Nacional de Doñana**: Located approximately 56 km (35 miles) west of Morón AB, across the Guadalquivir River, Doñana National / Nature Park is a UNESCO-designated Biosphere Reserve (1980) and was inscribed on the World Heritage List in 1994. The park is characterized by its wetlands, forests, and diverse wildlife, including migratory bird species, and holds significant ecological importance both regionally and globally.

Parque Nacional de la Sierra de las Nieves: located approximately 65 km (40.39 miles) southeast of the base, this national park is part of the mountainous Sistemas Béticos region and is known for its unique biodiversity, including endemic plant species and Mediterranean forests. It is a critical area for conservation in southern Spain.

Natura 2000 sites.png

Figure 1: Natura 2000 sites in the surroundings of the Morón AB.

Cultural Areas

Andalusia is renowned for its rich cultural heritage, encompassing a vast range of legally protected cultural sites and assets. The Digital Guide to the Cultural Heritage of Andalusia (Guía Digital del Patrimonio Cultural de Andalucía) identifies:

- 26,805 legally protected cultural sites,
- 86,805 movable resources records,
- 1,762 intangible resources,
- 116 cultural landscapes, and
- 26 cultural routes.

The protection and regulation of these areas, as well as other tangible and intangible resources, falls under the Council of Tourism, Culture and Sports, via the General Secretariat of cultural assets (*Secretaría General de Bienes Culturales*). Morón AB is situated within the province of Seville and falls under the jurisdiction of the Territorial Delegation of Seville, which oversees all matters related to Andalusian cultural heritage in the area.

In September 2023, a mapping and documentary research of the Junta de Andalucía Cultural database revealed that there are at least 23 registered sites of cultural interest listed in the General Catalog of Andalusian Historical Heritage within the Arahal municipality. Among these sites, Palomo I site (described as Roman remains), is located in the southwestern area of the base.

Additionally, the Digital Guide to the Cultural Heritage of Andalusia identifies eight cultural assets within an 8.5 km (5.3 miles) radius of Morón AB, which are depicted in the image below:

- Point 1: Molino de Francisco Valencia Cortijo (immovable);
- Point 2: Torre del Bao (immovable);
- Point 3: Torre del Cortijo Palomo (immovable);
- Point 4: Casula (immovable);
- Point 5: Hacienda Pataslargas (immovable);
- Point 6: Cortijo la Victoria (immovable);
- Point 7: Hacienda la Banda (immovable);
- Point 8: Hacienda la Mata (immovable).

cultural goods.png

Figure 2: Cultural Goods in Morón AB. Source: Guia Digital IAPH

2.2 Physical Environment

2.2.1 Climate

Installation Supplement

The installation is located within the Guadalquivir River basin and falls within what is known as a Mediterranean continental climate sphere. The region's climate is characterized by a seasonal contrast, with a hot, dry summer lasting four to five months, and a mild, humid autumn-winter period. The average annual temperature is around 18°C (64°F). Summers are particularly extreme, with temperatures often exceeding 40°C (104°F). Despite the summer heat, the Guadalquivir River Depression is open to Atlantic airflows, resulting in a wide temperature range. Frosts are rare but can occur during cold waves originating from northern Europe.

Average annual rainfall in this part of the Guadalquivir Valley is 535 millimeters (21.1 inches), with the majority occurring between October and March. The driest months are July and August, while the drought period extends for nearly five months, coinciding with the region's extreme summer heat.

According to the Köppen and Geiger classification, this climate is categorized as Csa. The following figures provide typical climate data for the Morón de la Frontera area.

climate diagram 2.png

Figure 4: Morón de La Frontera climate diagram. Monthly average temperature and precipitation. Source: climate-data.org

climate diagram 3.png

Figure 5: Morón de La Frontera climate diagram. Monthly mean, mean maximum and mean minimum temperatures. Source: climate-data.org.

The Andalusian government, in collaboration with the Foundation for Research on Climate and Meteogrid, has developed the Climate Change Scenarios in Andalusia 2021 project. This initiative corresponds to local climate change projections adapted to the 6th Report of the Intergovernmental Panel on Climate Change (IPCC).

Future climate scenarios indicate a notable rise in average maximum temperatures, particularly in the *campiña* areas, where the Morón AB is located. By mid-century (2041-2070), even the most sustainable scenarios foresee a temperature increase of 2 to 4.5°C (35.6 to 40.1ºF). By the end of the century (2071-2100), optimistic scenarios show an increase of 2 to 5.5ºC, while the most pessimistic ones foresee rises between 4 and 9.5ºC (39.2 and 49.1ºF). This would result in maximum average temperatures exceeding 30°C (86ºF) in the Guadalquivir lowlands, resembling early 21st-century temperatures in Baghdad, Iraq. Additionally, an increase in extreme heat waves and tropical nights (with minimum temperatures above 20°C (68ºF) is expected.

By mid-century (2040-2070), average precipitation is projected to decline across the region, with reductions ranging from -1% to -15%, depending on the scenario. Toward the end of the century (2070-2100), precipitation decreases become more pronounced in pessimistic scenarios, with drops of up to -20% to -25% along much of the Andalusian coast and some inland areas.

This data is available at https://www.juntadeandalucia.es/medioambiente/portal/areas-tematicas/cambio-climatico-y-clima/escenarios-locales-de-cambio-climatico/escenarios-locales-de-cambio-climatico-actualizados-6-informe-ipcc. Cartographic information is available at https://andalucia.sicma.red/clima/ and https://www.mapaclima.es/?variable=temperature_avg&year=2015-2040.

Specifically, for the Morón AB, climate projections suggest minimum and maximum temperatures will increase over time under two emission scenarios – a moderate carbon emission scenario (Representative Concentration Pathway [RCP] 4.5) and a high emission scenario (RCP 8.5). The potential impact of these two climate change scenarios on the site's natural resources was analyzed using extracted climate data from 2026 to 2035 to represent the decadal average for 2030 and extracted data from 2046 to 2055 for the decadal average for 2050. For the decade centered around 2030, both scenarios project a similar degree of increase in average annual temperature (TAVE) of between 1.4 ℃ (2.6 ℉) and 2.0 ℃ (3.6 ℉) over historic average. The two emission scenario projections show higher warming by 2050, with RCP 4.5 expressing a warming of 2.3 ℃ (4.1 ℉). RCP 8.5 expresses a slightly greater warming of 3.2 ℃ (5.7 ℉) for this period.

Average annual precipitation (PRECIP) varies between emission scenarios and time due to larger interconnected ocean-atmosphere dynamics associated with the NCAR CCSM model. For 2030, the RCP 4.5 scenario projects a small increase in PRECIP of 1% while RCP 8.5 shows an increase of 8%. For 2050, RCP 4.5 projects a PRECIP decrease of 22% while RCP 8.5 shows a decrease of 28%.

Table 5: Summary climate data

Variable	Historical	RCP 4.5		RCP 8.5	
		2030	2050	2030	2050
PRECIP (mm)	618	623	480	667	446
TMIN (ºC)	11.9	13.1	13.7	13.6	14.4
TMAX (ºC)	24.7	26.4	27.5	27.1	28.6
TAVE (ºC)	18.3	19.8	20.6	20.3	21.5
GDD (ºC)	3139	3511	3718	3633	3979
HOTDAY	83.1	112.6	126.2	119.2	134.3
WETDAYS	0.5	0.3	0.2	0.4	0.3

Notes: TAVE ℃ = annual average temperature; TMAX ℃ = annual average maximum temperature; TMIN°C = annual average minimum temperatures; PRECIP (mm) = average annual precipitation; GDD ℃ = Average annual accumulated growing degree days with a base temperature of 10 ℃; HOTDAYS (average # of days per year) = average number of hot days exceeding 32 ℃; WETDAYS (average # of days per year) = annual number of days with precipitation exceeding 51 mm in a day.

Understanding changes in daily intensity and total precipitation for multi-day precipitation events is helpful to evaluate precipitation patterns in addition to assessment of annual averages. Three-day storm events (design storms) were generated from projected precipitation data based on RCP 4.5 and 8.5 emission scenarios for the 2030 and 2050 timeframes (Table 6). Historical precipitation data were used to calculate a baseline storm event for the year 2000 for comparison.

2000	2030	2050	2030	2050		
Precipitation (mm)	Day 1	97	104	84	105	155
	Day 2	117	109	104	135	97
	Day 3	104	109	76	64	64
	Total	318	323	264	302	315
Percent change from baseline			2%	-17%	-5%	-1%

2.2.2 Landforms

Installation Supplement

Morón AB is situated in the Guadalquivir River basin, in the northern part of the Subbetic zone. Physiographically, Morón AB lies at an elevation of 500 m (1,640.4ft) above mean sea level (amsl), with a maximum height of 587 m (1,925.8 ft) a.m.s.l. at the Vértice del Espartero. The area is primarily a flat plain, situated on the northern side of the Sierra Nevada Mountains.

2.2.3 Geology and Soils

Installation Supplement

Based on structural geology, Morón AB is part of the external orogenic belt of the Betic System, known as the Subbetica. The principal geological formations include sediments ranging from the Mesozoic through the Tertiary to the Quaternary age. Orogenic processes have resulted in tectonic deformation, where older sediments were thrust over younger sediments during detrition. The detrital deposits consist of highly heterogeneous sediments, characterized by large clasts that are older than the enclosing matrix. The olistostrome is subdivided into an autochthonous unit of the Triassic age and an overlying allochthonous unit of late Miocene age. These units transition into marine deposits, followed by post-orogenic sediments comprising Miocene and Plio-Quaternary deposits (Tetra Tech, 2015).

The geological profile beneath Morón AB comprises:

- Quaternary alluvial sediments formed by the Guadaira River consist of clays, silts, sands, and some gravels, with thicknesses between 5 and 15 m (16 and 49 ft).
- Upper Miocene sediments comprising a sandier unit (limestones, calcarenites, sands, sandstones, and marls) and a less permeable unit (marls, sandstones, silts, and clays), with a total thickness of approximately 50 m (164 ft).
- 'Allochthonous' unit of the late Miocene Olistostrome deposits that are relatively undeformed. Recent documents class this unit into the middle Miocene (Tetra Tech, 2015).

2.2.4 Hydrology

Installation Supplement

Morón AB is located in the Guadalquivir River Basin. The Guadalquivir River runs approximately 40 km (25 miles) to the west of the installation, flowing into the Atlantic Ocean near Cadiz. The basin is bordered by the Sierra Morena Mountain range immediately to the north and the Sistemos Beticos Mountain range to the southeast. In 2003, the general groundwater flow at the installation was from the south-southwest to north-northeast with flow patterns controlled by the Guadaira River.

The Guadairilla Stream is a seasonal water course tributary of the Guadaira River, which borders the eastern flank of the Morón AB. During the site visit in July 2023, the Guadairilla Stream was dry because of the summer's lack of rain. However, according to interviews with the installation's staff, the western limit of the Morón AB, discharging into to this stream, is a floodplain susceptible to flooding during heavy storms.

Regional hydrogeology is characterized by two main aquifer units (Versar, 2003):

- Aquifer 1: The shallow aquifer is approximately 2 m (6.6 ft) below ground surface (bgs) with the water-bearing sand and gravel lenses of the Quaternary alluvium; and
- Aquifer 2: The deeper limestone and sandstone aquifers of the Upper Miocene Yellow Formation named Arahal-Coronil-Morena-Puebla de Cazalla; these are detrital deposits.

The local hydrogeologic situation is described in the Final Hydrogeological Study, with the lithology detailed further in recent documents.

The general groundwater conditions at Morón AB can be summarized as follows:

- Aquifer 1 at depths below 10 m (32.8 ft) bgs. The first water bearing layer (Mio-Quaternary) encountered beneath Morón AB is found under the brown silts and cohesive marks (sandy-silt to silty-clay with carbonate nodules) at depths less than 10 m bgs. The aquifer is formed of poorly consolidated sand and gravel layers, generally with a combined thickness of less than 1 m. This first aquifer is likely connected to the Guadaira River and underlain by a several meter thick low permeability Miocene layer that may be considered an aquitard. The aquifer may be considered, in general, as a water table (or unconfined) aquifer.
- Aquifer 2 at depths between 15 to 20 m (49.2 to 65.6 ft) bgs. A second aquifer is encountered in the Miocene sand and gravels at depths between 15 and 20 m (49.2 and 65.6 ft) bgs, with an average thickness of 3.4 m (11.2 ft). Information on this aquifer has been derived from the borehole logs of 21 monitoring wells drilled at depths ranging from 15.2 to 96 m (49.9 to 315.0 ft) bgs as part of the Final Hydrogeological Study. Based on well data analysis, several of the 21 monitoring wells are screened only in this deeper Miocene sand and gravel layer (Tetra Tech, 2015).

Based on November 2012 groundwater elevation measurements, the general groundwater flow at Morón AB was found to be from the southeast to north-northwest. Flow patterns were still controlled by the Guadaira River and, contrary to previous assumptions, obviously not significantly impacted by the base's drinking water extraction. Filter sections of the production wells 1-A and 1-C start at 10.3 m (33.8 ft) bgs exploiting Aquifer 2 and may catch some Aquifer 1 waters.

In the past, several hydrogeological tests were conducted to investigate the aquifer properties:

- 2003: Simultaneous 72-hour pump tests at wells W-2, W-3 and W-5 with flow rates of 6.7, 8.4, and 15.8 liter per second (L/s), respectively, and drawdown monitoring at up to nine piezometers.
- 2002: The URS 2002 report contains information derived from a pump test performed on supply well 1B, with an estimated permeability of 7 meters per day (m/d) (8.1x10-5 meters per second [m/s]).
- 1999: Pump test at Well R1 with an estimated permeability of 16 m/d and slug tests at MW6 and MW8, with permeabilities ranging from 0.11 to 0.82 m/d (1.3-9.5x10-6 m/s). Likely based on the well depths, the pump test results were assigned to the deeper aquifer within the sand and gravel layer and the slug test results to the shallow aquifer within the silty upper layers.

An analysis of available well data suggests that most wells found on Morón AB intersect the shallow aquifer above the confining clay (Tetra Tech, 2015)

Stream Channel Modeling of stream channel overflow (or flood modeling) was conducted at Morón AB to examine the extent of flooding along Guadairilla Stream and Guadaira River associated with climate projections. The spatial extent of projected flooding is depicted in a series of maps included in Appendix C. Flood modeling did not consider flooding of independent surface bodies, stormwater systems, or surface ponding. Flood modeling was conducted using local watershed characteristics and the design storms generated from climate projection data (Table 2). The projected design storms do not represent extreme weather events (e.g., hurricanes, extraordinary storm fronts). Inundation projections were influenced by two variable inputs: (1) variation in total precipitation between design storms, and (2) variation between the daily distributions of precipitation over the three-day period. Projected inundation associated with each climate scenario and the relative change from baseline conditions are summarized in Table 3. Projected changes in stream channel overflow can be used to assess potential vulnerabilities to species, habitat, mission, and built and natural infrastructure. The baseline storm event for the year 2000 is 318 mm (12.52 inches) over three days, with the precipitation falling on evenly across all days (Table 3). Stream channel overflow associated with the baseline design storm was estimated to inundate approximately 567.5 ha of installation area along Guadairilla Stream and Guadaria River (Table 3). Inundation is projected to increase by 7% in 2030 under the RCP 4.5 scenario associated with a 2% increase in total design storm precipitation. Inundation is projected to decrease by 4% in 2050 under the RCP 4.5 scenario associated with a 17% decrease in total design storm precipitation.

Under the RCP 8.5 scenarios, total design storm precipitation is projected to decrease slightly, but inundation is projected to increase up to 41% in 2050. Although total design storm precipitation does not increase, the daily distribution is shifted with a higher percentage of precipitation in the first two days. Higher precipitation in a single day increases runoff rates within the model, therefore affecting projected inundation.

Table 7: Area inundated by stream channel overflow.

	Baseline	RCP 4.5		RCP 8.5	
	2000	2030	2050	2030	2050
Projected innundation (ha)	567.5	609.4	542.8	712.0	801.4
Change in innudation area from baseline (ha)		41.8	-24.8	144.4	233.8
Percent change from baseline		7%	-4%	25%	41%

The Hydrogeological survey can be found here:

2.3 Ecosystems and the Biotic Environment

2.3.1 Ecosystem Classification

Installation Supplement

The Classification of Ecosystem is based on the EUNIS (European Nature Information System) classification, adapted to the specific case of the Morón AB in order to simplify and facilitate their understanding. The reference documents used were the EUNIS habitat classification and the Interpretation Manual of European Union Habitats EUR 28 (European Commission, DG Environment), 2013 edition, and the 2019 4th draft version. Special attention was paid to the possible existence of natural habitat types of community interest, particularly priority habitat types, according to Directive 92/43 of 21st Council relative to the Conservation of Natural Habitats and Wild Flora and Fauna, as adapted by Directive 97/62 of the Council, 27/10/1997 (Annex I).

Habitats at the Morón AB

The Habitat Directive (92/43/EEC) was accepted to preserve, protect, and improve the quality of the environment, including the conservation of natural habitats and ofwild fauna and flora, which are an essential objective of general interest by the European Community.

The Habitat Directive defines natural habitats as terrestrial or aquatic areas distinguished by geographic, abiotic and biotic features, whether entirely natural or semi-natural (92/42/EEC). Thedirective developed five categories of protection for habitats and species of mammals, reptiles, amphibians, fish, arthropods, mollusks, and plants.

The principal natural communities on Morón AB can be described as improved agricultural and landscaped areas, grasslands associated with the Morón AB flightline, and seasonal wetlandssurrounding drainage channels. Most of the installation consists of anthropogenic habitats, mainly improved agricultural lands and landscaped zones. During the latest field survey, performed between May 2023 and May 2024, three main categories were used to identify habitats at Morón AB:

- Anthropogenic habitats. Habitats with no relation to the vegetation that would naturally grow in those spaces. These include crop fields, gardens, and linear plantations of trees and shrubs. Their origin is artificial, and they are intensively managed. Built-up areas (buildings and constructed hard-surfaced areas) are also included in this category as artificial spaces.
- Semi-natural habitats. Habitats where vegetation develops spontaneously but is subject to continuous management. This includes areas of grassland and herbaceous vegetation inside the base, on the periphery, and around the runway, most of which are periodically mowed to maintain a certain height, except in areas with soil deposits or difficult access.
- Natural habitats. Habitats where vegetation develops spontaneously, without any management, growing freely. This includes vegetation growing on the edges of ponds and streams and in the last stretch of the drainage network.

According to the methodology, the list and description of AB habitats are as follows, including EUNIS and Habitats Directive codes. The list is summarized in table 4 below. The distribution of these habitat categories within the Morón AB can be consulted in figure 4.

A. ANTHROPOGENIC HABITATS

Habitats with no relation to the vegetation that would naturally grow in those spaces. These include crop fields, gardens, and linear plantations of trees and shrubs. Their origin is artificial, and they are intensively managed. Built-up areas (buildings and constructed hard-surfaced areas) are also included in this category as artificial spaces.

A1. Intensive unmixed crops **EUNIS: I1.1**

Croplands planted for annually harvested crops. They include fields of cereals, of sunflowers, of legumes and other plants. They occupy a vast surface of the Base, near 600 ha, and they are divided into parcels of different size and shape. The bigger plots are located in the peripheral areas though there are some of them in the inner positions. Main crops are sunflower (Helianthus annus) grain (Triticum aestivum), legumes and safflower (Carthamus tinctorius). All crops rotate among the different allotments. Lands are treated with phytosanitary and phytocide treatments before seeding in January and February and with fertilizing products in the end of autumn, in November, December.

A1a: runways area

A1b: Guadaira river area

A1c: E and SE area

A1d: Interior base crops

A2. Planted forest and groves **EUNIS: G2.8**

They comprise three different units:

A2.1. Pinus Plantations. Young pinus mass (planted in 1995) of Pinus halepensis and Pinus pinea with some clearing areas where cereal crops are grown for green harvesting. They take about 100 ha of old farming lands in the eastern part of the base. In the last years many species of autochthonous trees and shrubs have been planted such as mastic (Pistacia lentiscus) myrtle (Myrtus communis), carob tree (Ceratonia siliqua), fig tree (Ficus carica), holm oak (Quercus ilex subsp. ballota), cork oak (Quercus suber), etc.

A2.2. Eucalyptus plantations (Eucalyptus camaldulensis). Dense and old reduced mass of trees surrounding a small pond of non-permanent water (C2) where Typha domingensis grows. Enclosing them there is a small reedbed of Phragmites australis and other species of humid grounds (Rubus ulmifolius).

A3. Planted tree lines **EUNIS: G5.1**

Monospecific plantations outlining some of the roads in the base.

A3.1. Line Platanus plantations (Platanus x hispanica)

A3.2. Line Eucalyptus plantations (Eucalyptus camaldulensis)

A3.3. Line Ulmus plantations (Ulmus minor)

A3.4. Line Morus plantations (Morus alba)

A3.5. Line Celtis plantations (Celtis australis)

A4. Planted oleander hedges (Neurium oleander) **EUNIS: FA.2**

Linear oleander plantation as hedge that flanking the main road in the oldest part of the Base.

A5. Garden Spaces **EUNIS: I2.2**

Leisure zones or peripheral to buildings areas with small grasslands and exotic and native group of trees and shrubs. Lawn areas are made of the species that spontaneously grow there, mainly annual weed and ruderal herbaceous plants (floristic composition similar to B1). These lawns need of an intense maintenance in their growing phase, cutting them many times to keep a high of 2-4 inches (5-10 cm). In the hot season, they are watered just in some buildings so that most of them get dried up in the summer. They are rarely fertilized.

A5a: small spaces at the north and south

A5b: central area

A5c: old Spanish base area

A5d: Spanish Military Emergency Unit

A.6. Built-up areas **EUNIS: J2 and J4**

Buildings, roads and other impermeable surfaces. This category includes all constructions and buildings, excluding garden spaces (A5).

A6.1: Buildings (J2)

A6.2: Constructed hard-surfaced areas (streets, roads, runaways) (J4)

B. SEMI-NATURAL HABITATS

Habitats where vegetation develops spontaneously but is subject to continuous management. This includes areas of grassland and herbaceous vegetation inside the base, on the periphery, and around the runway, most of which are periodically mowed to maintain a certain height, except in areas with soil deposits or difficult access. These plant communities include autochthonous herbaceous species forms that spontaneously grow in the Base lands. Their development, floristic composition and appearance depend on the management of the area where they grow.

B1. Subnitrophilous annual grasslands EUNIS: E1.6

Open spaces covered by grasslands of annual ruderal plants and weeds such as the surroundings of the flying area, the ammunition and explosives store, fuel deposits, allotments between buildings, border of roads and drainage channels, crops edges and so on. They have similar characteristics to the grasslands of landscaped areas. In both cases, their sub-nitrophilic character derives from their origin (the base soils are former croplands) and their maintenance, with periodic cuttings that at the same time avoids plant succession and provides a periodic supply of organic matter.

B1a: runways area

B1b: large areas at the east air base

B1c: grassland between buildings

B1d: bands next to roads

B2. Anthropogenic herb stands EUNIS: E5.1

Spaces of disturbed and disturbed soils used as waste deposits, or recent soil stockpiles without maintenance, covered by nitrophilous and ruderal species, many shared with B1. A lower density of plants and the presence of some large thistles such as milk thistle (Sybilum marianum) is characteristic. Due to the characteristics of the soil in which they grow, irregularly shaped soil deposits that cannot be accessed by mowers, they are not cut periodically.

B3. Drainage channels with humid grasslands EUNIS: E3.1, C3.2 and C3.3

B3.1: Occasional water flow (EUNIS: E3.1 and C3.3). Drainage channels with low water flow but edaphic humidity. They are colonized by various species of sedges and bulrushes such as roundhead bulrush (Scirpoides holoschoenus). They are connected to B1, so they are periodically cut.

B3.2: Temporary water flow (EUNIS: E3.1, C3.2 and C3.3). Drainage channels with temporary presence of water after rainy periods that can be maintained water for months. Some small ponds can originate, especially in the final stretch, before leaving the Base. They are colonized by plant communities typical of wetlands that follow a moisture gradient. In the part away from the water there are species similar to those mentioned in B3, while in the banks grow helophytic species as reeds (Phragmites australis). In those areas where some stream appears, it also finds small hydropytic communities of buttercups (Ranunculus sp.) and watercress (Nasturtium officinale) and the grass (Glyceria declinata).

B4. Temporal water flow drainage channels with humid grounds vegetation EUNIS: E3.1, C3.2 and C3.3

Drainage channels with temporary presence of water after rainy periods that can be maintained water for months. Some small ponds can originate, especially in the final stretch, before leaving the Base. They are colonized by plant communities typical of wetlands that follow a moisture gradient. In the part away from the water there are species similar to those mentioned in B3, while in the banks grow helophytic species as reeds (Phragmites australis). In those areas where some stream appears, it also finds small hidrophytic communities of buttercups (Ranunculus sp.) and watercress (Nasturtium officinale) and the grass (Glyceria declinata).

C. NATURAL HABITATS

Habitats where vegetation is developed spontaneously, without any management, growing freely. This includes vegetation growing on the edges of ponds and streams and in the last stretch of the drainage network. There are plant communities typical of humid soils, wetlands and streams. They include the temporary ponds in the northwestern part of the base and the small pond among the eucalyptus, as well as the Guadairilla River. In these places, the vegetation is the result of a natural colonization process, without (or with little) human intervention, which has led to consider these communities as natural habitats.

C1. Wetland vegetation of mediterranean seasonal ponds C1.66

There are different vegetation communities along the moisture gradient.

C1.1. Riparian woody vegetation (EUNIS: F9.3; HD: 92D0). Small/medium trees communities with Populus alba, Ulmus minor, Tamarix (Tamarix africana, Tamarix gallica) and some subspontaneus species (Gledistsia triacanthos). They are located in Guadairila River and the northern pools; in the latter locations, only Tamarix occurs.

C1.2. Beds of Arundo (EUNIS C3.3). Reed formations (Arundo donax). They can grow far from the banks, but they need some moisture in the soil. Arundo donax is not a native species but has been naturalized in the Mediterranean area for centuries. It is considered a highly invasive species.

C1.3. Reedbeds of Phragmites and Typha (EUNIS C3.2). Helophyte formations that grow on the shore or very close to the water. Typha domingensis is more demanding in humidity than the reed (Phragmites australis) and it is normally rooted below the water surface.

C1.4. Humid grounds herbaceous vegetation (EUNIS E3.1; DH 6420). Plant communities similar to those described in B3 and B4.

C2. Temporary ponds EUNIS: C1.6 HD: 3170

Ponds whose level of water depends on rainfall and periodically dry up, with their aquatic animal and vegetal communities associated.

C3. Temporary streams EUNIS: C2.5 HD: 3290

Strems depend on rainfall and stop to flowing for part of the year (dry season), leaving a dry bed or pools, with their aquatic animal and vegetal communities associated (Guadairilla River).

Table 8: hábitats codes

A. ANTHROPOGENIC HABITATS	A1. Intensive unmixed corps	A1a: runways area A1b: Guadaira river area A1c: E and SE area A1d: Interior base crops
	A2. Planted forest and groves	A2.1 Pinus plantations A2.2 Eucalyptus plantations
	A3. Planted tree lines	A3.1. Line Platanus plantations A3.2. Line Eucalyptus plantations A3.3. Line Ulmus plantations A3.4. Line Morus plantations A3.5. Line Celtis plantations
	A4. Planted oleander hedges	
	A5. Garden spaces	A5a: small spaces at the north and south A5b: central area A5c: old Spanish base area A5d: Spanish Military Emergency Unit
	A6. Built-up areas	A6.1: Buildings A6.2: Constructed hard-surfaced areas (streets, roads, runaways)
B. SEMI-NATURAL HABITATS	B1. Subnitrophilous annual grasslands	B1a: runways area B1b: large areas at the east air base B1c: grassland between buildings B1d: bands next to roads
	B2. Anthropogenic herb stands	
	B3. Drainage channels with humid grasslands	B3.1: occasional water flow B3.2: temporary water flow
C. NATURAL HABITATS	C1. Wetland vegetation of temporary streams and ponds	C1.1. Riparian woody vegetation (Ulmus, Populus, Tamarix, Gleditsisa) C1.2. Beds of Arundo C1.3. Reedbeds of Phragmites and/or Typha C1.4. Humid grounds and margin stream herbaceous vegetation
	C2. Temporary ponds	
	C3. Temporary streams	

Nearly half of the base's area is occupied by crop fields, about one-fifth by buildings and asphalt surfaces, and another one-fifth by subnitrophic annual grasslands. Forested areas (pines and eucalyptus) make up barely 5%, only slightly more than the total garden spaces. Habitats considered natural represent less than 3% of the area.

habitats 1.png

Figure 6: Distribution of Major Habitat Categories. Orange: Anthopogenic Habitats; blue: Seminatural Habitats; green: Natural Habitats.

2.3.2 Vegetation

Installation Supplement

Morón AB hosts two primary natural ecosystems, identified through Copernicus Land Monitoring Service data: grasslands and wetlands/riparian areas. Beyond these natural ecosystems, the installation also includes developed, agricultural, landscaped, and barren land areas.

The Mediterranean region, where Morón AB is located, is a transitional climatic zone where vegetation is highly sensitive to climatic changes. Mediterranean ecosystems are characterized by relatively dry conditions and strong seasonality, with hot, dry summers and mild, wet winters. Climate change impacts to grassland bioregions include increased seasonal, annual, minimum, and maximum temperatures, as well as shifting precipitation patterns. Because these ecosystems are adapted to specific environmental conditions, they are vulnerable to changes in climatic regimes, which may significantly impact vegetation community structure, composition, and distribution patterns over time (Seufert, Kotzias, Sparta, & Versino, 1995; Sahney, Benton, & Falcon-Lang, 2010).

Projected climate scenarios indicate that increased drought frequency, changing precipitation patterns, and rising temperatures could cause major changes in vegetation cover. Loss of vegetative cover, coupled with increases in precipitation intensity and climate-induced reductions in soil aggregate stability, may lead to significantly higher erosion rates. Rising temperatures are also likely to accelerate soil decomposition, reducing soil fertility and plant productivity across large areas.

Mediterranean plant species are adapted to optimal temperature ranges for photosynthesis, but an increase in temperature combined with low water availability is expected to reduce photosynthetic efficiency, CO2 assimilation, and stomatal conductance. These processes may result in cell dehydration, necrosis, and a decline in the ability of vegetation to regenerate consistently year to year. Grasslands and riparian areas at Morón AB, which rely on seasonal moisture and stable hydrological conditions, are particularly vulnerable to these changes.

In summary, shifts in long-term environmental conditions, including rising temperatures, reduced rainfall, and increased drought frequency, could potentially alter the vegetation associations at Morón AB. The extent of these changes will depend on the severity of climatic shifts and the occurrence of secondary impacts, such as fire frequency and intensity.

2.3.2.1 Historic Vegetation Cover
Installation Supplement

The area surrounding Morón Air Base (AB) historically falls within a pluvial-oceanic Mediterranean bioclimate (Mpo), characterized by an upper Thermo-Mediterranean thermotype, upper dry ombrotype, and warm-temperate thermal type. Biogeographically, it is situated within the Mediterranean Region, specifically in the Mediterranean-Ibero-Atlantic Superprovince, Betic Province, Hispalense Sector, and Hispalense District.

biogeographic sectors 2.png

Figure 7: Biogeographic sectors of Andalusia. Environmental Information Network of Andalusia (Andalusia government). Black triangle: Morón AB.

bioclimatic zones 2.png

Figure 8: Bioclimatic Zones of Andalusia. Source: Environmental Information Network of Andalusia (Andalusia government). Black triangle: Morón AB.

Under natural conditions and without human intervention, the historic vegetation in this area would have been dominated by dense holm oak forests (Quercus rotundifolia). These forests are typical of the thermo-Mediterranean, dry-subhumid, basophilic series, and would have been rich in diverse woody species such as palmetto (Chamaerops humilis), carob (Ceratonia siliqua), blackthorn (Rhamnus lycioides subsp. oleoides), mastic (Pistacia lentiscus), and wild olive (Olea europea var. sylvestris). The forest would have also contained abundant lianas, such as Smilax aspera, Aristolochia baetica, and Rubia peregrina, along with other species including Daphne gnidium, Asparagus acutifolius, Rhamnus alaternus, and kermes oak (Quercus coccifera).

Riparian forests were historically present along rivers and streams. In areas with permanent water flow, distinct vegetation bands would have existed: willow groves (Salix purpurea subsp. lambertiana), white poplar groves (Populus alba), and elm groves (Ulmus minor), depending on proximity to the riverbed. These riparian forests were diverse and included species such as Nerium oleander and Tamarix gallica.

However, over time, human activity drastically altered these ecosystems. Agricultural practices, including cereal and sunflower farming, and more recently, intensive olive groves, replaced much of the original holm oak forests. Abandoned cultivated areas were colonized by grasses or thickets dominated by Pistacia lentiscus and Quercus coccifera. Riparian forests have also been degraded due to deforestation, livestock pressure, fires, reforestation with eucalyptus, and eutrophication, which favors nitrophilous plant communities along riverbanks.

These human-driven changes have resulted in a predominantly agricultural landscape, with few remnants of natural vegetation near rivers and streams. This altered landscape represents the historic vegetation cover of the Morón AB vicinity prior to the base's construction.

2.3.2.2 Current Vegetation Cover
Installation Supplement

Vegetation Communities

The vegetation at Morón AB includes a mix of natural, semi-natural, and human-altered habitats. Most of the installation is dedicated to rainfed agriculture, with crops such as cereal and sunflower rotated across plots annually. Some plots are planted with safflower (Carthamus tinctoreus), an herbaceous plant of the composite family grown primarily for its seeds, from which edible oil is extracted.

Grasslands are present around the runways, between buildings, and in restricted access areas such as the powder magazines. These grasslands are regularly trimmed, preserving a Mediterranean grassland ecosystem that appears dry and parched during summer months. Grasslands surrounding the runway feature extensive drainage networks to evacuate rainwater. During rainy periods, the accumulation of water and higher humidity of the terrain allows the development of wet grasslands. Small water stagnations occasionally occur, enabling the presence of species typical of such environments.

In the eastern part of the base, a large pine forest of pine reforestation exists, primarily composed of Pinus halepensis and Pinus pinea. This forest includes small plantations of other native species such as mastic, wild olive, holm oak, cork oak, myrtle, and tamarisk. Non-native species, such as casuarina and date palm, are also present within this forested zone.

A smaller area at the southwestern end of the base along the Guadairilla Stream bed hosts a dense riparian forest dominated by elms and white poplars. The riparian forest also includes three-thorned acacia (Gleditsia triacanthos), a non-native species that has naturalized and competes with native vegetation. Two areas in the northern part of the base, near the track and perimeter fence, are associated with terrain depressions that seasonally flood during rainy periods. These formations are dominated by tamarisk (Tamarix gallica and Tamarix africana). However, prolonged droughts have caused these areas to remain dry for extended periods.

The eastern side of the base is bordered by the Guadaira River, which supports a tall and dense riparian forest outside the perimeter fence. Dominant species include poplars (Populus alba), ash trees (Fraxinus angustifolia), elms (Ulmus minor), and eucalyptus (Eucalyptus globulus). While native species dominate some areas, eucalyptus, a non-native species, has naturalized and is prevalent in parts of the riparian zone. Scattered eucalyptus trees within the base are among the tallest vegetation in the area.

Flora

Andalusian is home to approximately 4,000 vascular plant taxa, representing over 50% of all Iberian Peninsula flora within just 15% of the territory. Of these taxa, more than 11% are endemic to Andalucía, with a similar proportion being exclusive to Spain.

At Morón AB, most land is occupied by crops and transformed habitats. Natural habitats are limited in extent and have a relatively recent origin, meaning they are still undergoing colonization by appropriate species. Current flora consists of widespread and hearty species that are common to the region. It is anticipated that, over time, more species will be introduced by birds and natural seeding.

Vegetation at Morón AB has been classified using a methodology that categorizes species based on their origin and growth patterns:

- **Native/spontaneous:** Autochthonous species of Andalusian flora that grow spontaneously on the base.
- **Native/planted:** Native species of Andalusian flora that have been deliberately planted.
- **Native/planted and spontaneous:** Native species that appear both spontaneously and as a result of planting.
- **Non-native/planted:** Introduced species planted for landscaping purposes (e.g., garden plants).
- **Non-native/naturalized:** Non-native species that have naturalized and grow spontaneously.

A vegetation survey conducted at Morón AB in 2023-2024 identified 292 vascular plant species, a notable increase from the 250 species identified in 2013. Of the species recorded: 91% are herbaceous, and most grow spontaneously. However, 30% are cultivated, primarily in flower gardens and plantations within the pine forest zone. None of the recorded species are listed as threatened or endangered in regional, national, or international catalogs or red lists. However, some species are classified as exotic or interesting and are included in the final inventory (see Flora Table in the Appendix).

flora demographics.png

Figure 9: Morón Flora Demographics

flora demographics 2.png

Figure 10: Morón AB Flora Demographics

2.3.2.3 Future Vegetation Cover
Installation Supplement

Climate scenarios for the Morón Air Base (AB) region project a generalized increase in temperatures (average and maximum) across all seasons and a decrease in precipitation. Given the scarcity of natural vegetation within the base and its surroundings, except for areas near permanent and seasonal watercourses, no major changes are anticipated.

Most native species present are widely distributed and exhibit high ecological amplitude, allowing them to adapt to a broad range of environmental conditions. However, species associated with wetland environments, which have higher humidity requirements, may decline or disappear if water availability drops below their ecological limits.

2.3.2.4 Turf and Landscaped Areas
Installation Supplement

The landscaped areas at Morón AB feature a mix of native species (wild olive, mastic, carob tree) and non-native and ornamental species, commonly found in gardens with temperate climates. There are notable plant alignments along some roads, including the London planetree (Platanus x hispanica) on the main access road from the outside, oleander (Nerium oleander) on the perpendicular road (Vázquez Sagastizábal), and elm (Ulmus minor) between D Avenue and Camp B Road.

In total, 137 different species have been identified in the landscaped areas, 108 non-native plants, and 29 native plants. The complete list can be consulted in the 2024 Natural Resources Inventory.

2.3.3 Fish and Wildlife
Installation Supplement

Invertebrates

Morón AB supports a variety of invertebrate species, particularly generalist insects thriving in grasslands with minimal insecticide use. These insects provide food for insectivorous birds like the House Martin, Barn Swallow, Common Swift, and Pallid Swift. Butterfly diversity is low, with predominant species being the Great White (Pieris brassicae) and Red Admiral (Vanessa atalanta). Terrestrial mollusks include slugs (Arion vulgaris) and snails (Otala lactea, Rumina decollata, Theba pisana, and Xerosecta sp.).

Amphibians

Two amphibian species were detected during the 2023–2024 survey: Pérez's Frog (Pelophylax perezi) and the Natterjack Toad (Epidalea calamita). Previous inventories recorded additional species, including the Sharp-ribbed Salamander (Pleurodeles waltl), Spanish Painted Frog (Discoglossus galganoi), Iberian Parsley Frog (Pelodytes ibericus), and possibly the Common Toad (Bufo spinosus).

Recent drought conditions in southern Spain—particularly the prolonged drying of water points within the installation—have created unfavorable habitats for amphibians. Although heavy rainfall in autumn 2023 was insufficient to replenish the northwestern pond, abundant precipitation in spring 2024 improved conditions, enabling reproduction of the Natterjack Toad and sightings of Pérez's Frog at several water bodies, including the Guadairilla River, the northwest pond, and the evacuation channel, likely indicating migration from the nearby Guadaira River.

Despite targeted search efforts, the Spanish Painted Frog and Iberian Parsley Frog—last recorded in 2013—were not confirmed during the 2023–2024 survey, likely due to their greater reliance on stable aquatic habitats and the adverse effects of prolonged drought.

Reptiles

Seven reptile species were identified during the 2023–2024 survey, including the Iberian False Smooth Snake (Macroprotodon brevis), which had not been recorded in previous inventories. However, three species documented in earlier surveys were not observed during this assessment: the Iberian Southwestern Worm Lizard (Blanus mariae), the Horseshoe Whip Snake (Hemorrhois hippocrepis), and the Western Three-toed Skink (Chalcides striatus). In addition, the Andalusian Lizard (Podarcis vaucheri) and the Ocellated Lizard (Timon lepidus) were absent. According to the Spanish Inventory of Natural Heritage and Biodiversity, the Turkish Gecko (Hemidactylus turcicus) may also occur within the installation.

Overall, habitat conditions across the site are generally unfavorable for reptiles. Key limiting factors include the lack of sheltering features such as rocks and boulders, frequent land disturbances, the use of herbicides and pesticides in surrounding agricultural areas, and regular mowing of grasslands. Additionally, a substantial population of domestic cats poses a significant threat, as they are opportunistic predators that frequently hunt reptiles and other small wildlife, negatively affecting local biodiversity.

Reptile sightings during the survey were scarce, with only 15 individuals recorded over 60 field days, alongside four additional observations reported by external sources. Most records involved the Moorish Gecko (Tarentola mauritanica), which accounted for nine sightings. Other species included two Ladder Snakes (Zamenis scalaris), one Large Psammodromus (Psammodromus algyrus), and three aquatic reptiles—the Viperine Snake (Natrix maura) and Spanish Terrapin (Mauremys leprosa)—likely originating from the Guadaira River following spring rainfall.

Although the continued presence of some previously recorded species cannot be completely ruled out, their populations are likely very small, with limited evidence of active reproduction.

Mammals

Fifteen mammal species were identified during the 2023–2024 study: seven through direct observation, three via photo-trapping cameras, four through acoustic detection (bats), and one through indirect signs (vole burrows). Ten of these species were also recorded in previous surveys conducted in 2007 and 2013.

Rabbits are the most abundant mammal species on the installation. They occur throughout the site and breed in various habitats, including grasslands, gardens, and areas near buildings.

Two small mammals—the Long-tailed Field Mouse and the White-toothed Shrew—and two carnivores—the European Polecat and the Eurasian Badger—previously recorded, were not detected during this survey.

The Polecat typically inhabits areas near watercourses, suggesting it may still be present given the proximity of the Guadaira River and its connection to the installation via drainage channels. Notably, an Otter was observed just outside the base along this river. During periods of heavy rainfall, when significant volumes of water flow through the channels, Otters may potentially enter the base by moving upstream.

Badgers were also not detected. The Guadairilla River area is the most suitable location for their presence. Although they were not captured on photo-trapping cameras deployed in this area, their presence cannot be ruled out. As with other species, it is likely that badgers use the riverbed as a movement corridor. This assumption is supported by confirmed camera records of Wild Boar, Genet, Fox, and Mongoose using the same routes.

The photo-trapping data highlight the importance of the Guadairilla River as a natural corridor and the drainage channels as entry points for predators searching for prey, particularly rabbits. Wildlife activity in these areas was recorded almost daily under favorable conditions. A fox was observed using the lagoon in the northwestern section of the base as a refuge over a period of at least three months.

Bat presence was confirmed through ultrasonic recordings, which identified four species: three from the genus Pipistrellus and the European Free-tailed Bat (Tadarida teniotis). The three Pipistrellus species are difficult to distinguish visually or sonographically, requiring capture for accurate identification. All three are documented in scientific literature for this region of Andalusia.

Both Pipistrellus and Tadarida teniotis are commonly associated with human structures, where they seek refuge and establish breeding colonies. Given the typical roosting range of Pipistrellus species (1–2 km), along with the operating times of the acoustic recorders, it is likely that roosts and breeding colonies are located within the base. Two visual observations of Pipistrellus were made on the Spanish side of the installation.

One of the most notable findings was the Southern Water Vole (Arvicola sapidus), classified as Vulnerable on the IUCN Red List, although not currently protected under European, Spanish, or Andalusian legislation.

As a final note, a Red Fox established itself in the lagoon area for at least two months in 2024, attracted by the presence of water, dense vegetation for cover, and abundant rabbits. The fox was seen multiple times entering and exiting its den, and on one occasion ventured onto the runway before returning to its shelter.

Birds

During the 2023–2024 survey, a total of 112 bird species were recorded, including 49 not previously observed in earlier surveys. Across the three monitoring periods—2007, 2013, and 2023–2024—a cumulative total of 125 bird species has been documented on the base. Of the species observed in 2023–2024, 42 were confirmed as nesting, 7 were probably nesting, and 13 were possibly nesting within the installation.

Comparisons between survey periods are complicated by varying environmental conditions. A severe spring drought in 2023 reduced nesting success, while improved conditions in spring 2024 supported higher breeding activity. However, the survey concluded before the end of the breeding season, limiting final assessments.

Some species showed notable population changes. House Martin (Delichon urbicum) nest counts declined significantly, from 401 in 2013 to 240 in 2023–2024, largely due to control measures in key breeding zones. Barn Swallow (Hirundo rustica) nests decreased from 8 to 3, while Daurian Swallow (Cecropis daurica) nests slightly increased from 3 to 5. These trends are consistent with regional declines over the past decade but contrast with the overall increase in House Martin populations observed across southern Spain.

Numerous insectivorous species, such as swallows and swifts, regularly forage at the base, attracted by the abundance of insects in untreated grassland areas, which are free of herbicides and insecticides. Common Swifts (Apus apus) are frequently seen in large numbers during spring and summer, likely originating from nearby towns. Birds foraging near the runway occasionally interfere with flight operations, as reported by the base's falconry team.

Birds of prey are also commonly observed, drawn by the high density of rabbits. This presents potential risks to air operations. Waterfowl species are regularly recorded around local water bodies, including the Guadairilla Stream, the northwestern lagoon, and the Guadaira River.

Morón Air Base lies along a major migratory route for European birds traveling to winter wetlands or continuing to Africa via the Strait of Gibraltar. Large flocks of migratory species—such as storks, black kites, geese, and booted eagles—are often seen resting or feeding near the quieter runway areas, particularly at night during migration seasons.

Soaring birds like the Griffon Vulture (Gyps fulvus) are frequently observed flying over the base, originating from nesting colonies in surrounding mountain ranges. The nearby Zaframagón Rock hosts the largest Griffon Vulture colony in Andalusia. These vultures often use the warm air rising from the runway's asphalt to gain altitude during flight.

For detailed species lists, distribution, and conservation statuses, refer to Appendix, which also includes climate data sources, methods, and models relevant to habitat conditions.

2.3.4 Threatened, Endangered, and Host Nation-Protected Species

Installation Supplement

The conservation and protection status of species identified during the survey is outlined below, based on regional, national, and international classifications. Conservation statuses follow the International Union for Conservation of Nature (IUCN) criteria, as well as international agreements ratified by Spain (Bonn and Bern Conventions), European nature conservation directives (Habitats and Birds Directives), and Spanish and Andalusian legislation.

The following lists include all species detected during the 2007, 2013, and 2023/24 surveys, as well as additional species with potential presence according to the Spanish Inventory of Natural Heritage and Biodiversity.

IUCN classification

The IUCN Red List provides a global assessment of species, subspecies, and subpopulations, assigning conservation statuses to highlight those at risk of extinction and promote their protection. Categories used by the IUCN are:

Table 9: IUCN categories

Applicable Legal Frameworks:

1. **International Conventions:**
    - Bonn Convention (CMS): Focused on the conservation of migratory species and their habitats.
        - Appendix I: Endangered migratory species.
        - Appendix II: Migratory species requiring international cooperation.
    - Bern Convention: Protects European wildlife and habitats.
        - Appendices I-II: Strictly protected flora and fauna.
        - Appendix III: Protected fauna species with regulated exploitation.
        - Appendix IV: Banned means and methods of capture and killing.

- **European Legislation:**
    - Birds Directive (2009/147/EC): Protects all wild bird species in the EU.
        - Annex I: Species requiring special conservation measures.
        - Annex II: Species that may be hunted under regulation.
        - Annexes III–V: Related to prohibited practices and exceptions.
    - Habitats Directive (92/43/EEC): Protects threatened habitats and species.
        - Annex I: Natural habitat types needing conservation.
        - Annex II: Species requiring designation of Special Areas of Conservation.
        - Annexes III–VI: Selection criteria, protection methods, and species management provisions.
- **National Legislation:**
    - Law 42/2007 on Natural Heritage and Biodiversity: Establishes the List of Wild Species under Special Protection Regime (LESRPE) and the Spanish Catalogue of Threatened Species.
        - Critically Endangered: At imminent risk of extinction without conservation action.
        - Vulnerable: At risk of becoming endangered if current conditions persist.
- **Regional Legislation:**
    - Decree 23/2012 (Andalusia): Mirrors national law, establishing the Andalusian List and Catalogue of Threatened Species.

HABITATS

Some of the habitats identified during the study correspond to those listed under Annex I of the Habitats Directive, although none qualify as priority habitats. Correspondence is summarized as follows:

Morón AB Habitat Type	**Habitats Directive Annex I Code & Description**
C1.1. Riparian woody vegetation	92D0 Southern riparian galleries and thickets
C1.4. Humid grounds and margin stream herbaceous vegetation	6420 Mediterranean tall humid grassland
C2. Temporary ponds	3170 Mediterranean temporary ponds
C3. Temporary streams	3290 Intermittently flowing Mediterranean rivers of the Paspalo-Agrostidion

FLORA

No plant species recorded during the survey are listed as protected under European, Spanish, or Andalusian legislation. However, the regional government regulates the economic exploitation of several native species, including:

- Chamaerops humilis
- Myrtus communis
- Pistacia lentiscus

None of the plant species identified appear on the Red Lists at European, national, or regional levels.

FAUNA

Among the vertebrate species recorded at the base, the following are included in various conservation and protection frameworks:

- International Conventions:
  - 6 amphibians, 13 reptiles, 11 mammals, and 131 birds.
- European Legislation:
  - 3 amphibians, 2 reptiles, 4 mammals, and 57 birds (66 species in total).
- National Legislation (Spain):
  - 4 amphibians, 12 reptiles, 3 mammals, and 106 birds protected, with 7 species listed in the Spanish Catalogue of Threatened Species (total: 125 species).
- Regional Legislation (Andalusia):
  - 4 amphibians, 12 reptiles, 3 mammals, and 107 birds protected, with 9 species included in the Andalusian Catalogue of Threatened Species (total: 126 species).

2.3.5 Wetlands and Floodplains

Installation Supplement

At the regional level, wetlands in Andalusia are cataloged in the Inventory of Wetlands of Andalusia (IHA), established by Decree 98/2004 (March 9). This inventory includes all wetlands designated as protected areas due to their significant natural value. Wetlands in the IHA are part of the Network of Protected Natural Spaces of Andalusia (RENPA), regulated by Decree 95/2003 (April 8). The network establishes conservation and usage criteria for 226 wetlands covering 142,245.73 hectares. Additionally, these wetlands are included in the Spanish Inventory of Wetlands, which forms part of the Spanish Inventory of Natural Heritage and Biodiversity, regulated by Royal Decree 435/2004 (March 12).

There are no listed wetlands in the immediate vicinity of Morón AB. The closest designated wetland is the Ventosilla Lagoon, located more than 15 kilometers southwest of the installation.

As noted in Section 2.3.2, there are two depressions northeast of the base that were formed by historic soil excavations. During periods of heavy rainfall, the southernmost depression forms a small temporary lagoon, which can retain water for several months. This lagoon supports vegetation and fauna typical of temporarily flooded environments. Under optimal conditions, the lagoon can reach a surface area of approximately half a hectare, but during dry periods or years with low rainfall, it may remain dry for multiple seasons.

2.3.6 Other Natural and Historic and Cultural Resource Information

Installation Supplement

Cultural resources inventories are key tools in the identification and protection of existing cultural resources. The following resources inventories are maintained, as necessary, by the installation:

- Archaeological sites
- Buildings and structures
- Traditional cultural resources and sacred sites

The Cultural Resources Inventory Tables are maintained in Microsoft Excel format and are available as an Appendix to this Plan.

2.4 Mission Impacts on Natural and Historic and Cultural Resources

2.4.1 Natural and Historic and Cultural Resource Constraints to Mission and Mission Planning

Installation Supplement

Natural Resources

Currently, there are no significant natural resource constraints that directly affect Morón Air Base (AB) missions or mission planning, either inside or outside the installation. Surveys have not identified critical habitats, protected wetlands, or protected botanical species within the installation boundaries. While some protected fauna have been observed, they do not pose operational constraints beyond standard precautions to reduce the risk of aerial accidents involving wildlife.

The installation borders the Guadaira River Special Protection Area (SPA) on its eastern flank. While base operations do not interfere with the conservation objectives of this protected area, potential risks include the discharge of contaminated water into the river, as drainage channels and wastewater flow into its riverbed. However, the base has implemented control and purification systems to mitigate these risks, making the likelihood of adverse impacts very low. Additionally, the connection between the river and the base facilitates the movement of some species, which find favorable habitats within the base.

Below is a map showing the location of this natural area and its position in relation to the AB.

natural resources map 2.jpg

Figure 11: Natural areas in the vicinity of Morón AB

Future mission impacts linked to climate change may include:

- Increased temperatures and wind velocities, creating unsafe conditions for equipment launches and requiring increased maintenance or new infrastructure (DoD, 2014).
- Increased dust generation, affecting visibility and equipment functionality (DoD, 2014).
- Higher wind velocities, potentially damaging mission-critical infrastructure (Sydeman et al., 2014).
- Increased drought potential, reducing water availability (Glick, Stein, & Edelson, 2011).
- Potential loss of training areas, which may be required due to geopolitical shifts or base realignment.
- Climate change may also disrupt the acquisition and transportation of materials necessary for maintenance, construction, and equipment storage (DoD, 2014). These challenges highlight the need for long-term planning to ensure mission resilience.

For details, see the installation map of habitats at the following link:

https://usaf.dps.mil/teams/10626/Moron/Shared+Documents/Integraged+Natural+Resources+Management/INRMP+Resources/Appendixk

-

Cultural Resources

Three archaeological sites have been identified at Morón AB in accordance with international, U.S., and Andalusian cultural heritage policies. Although none meet the criteria for designation as Bienes de Interés Cultural (BIC) with special protection status, they are recommended for inclusion in the General Catalog of Andalusian Historical Heritage (CGPHA) or the Inventory of Recognized Assets of Andalusian Historical Heritage, due to their well-preserved condition.

archaeological remains.png

Figure 12: Three locations at Morón AB which exhibit surface evidence of archaeological remains

Table 10: evaluated Archaeological Resources at Morón AB

Id.	Zone	Period	Description
MAB-F-1	F	Prehistoric No diagnostic pieces were found	Low concentration eroded prehistoric ceramics
MAB-F-2	F	Roman 1st century BC to the 3rd AD	Low concentration eroded roman ceramics (terra sigilata)
MAB-C-1	C	Roman 1 st century BC to the 3rd AD	Abundant construction material and ceramics (terra sigilata)

Any activity carried out at the MAB-C-1 site, a culturally significant real property asset, must be preceded by an archaeological intervention project and approved by the competent local authority. It is recommended to cease agricultural activities in the area to prevent further degradation or complete destruction of the site.

The MAB-F-1 and MAB-F-2 sites exhibit a low density of archaeological materials. According to the LPHA, it is recommended to control land movements and follow archaeological procedures during any construction activities. Since site MAB-F-2 is already registered in the CGPHA, its information must be updated, and any construction activity must be communicated to the Council of Tourism, Culture and Sports.

If any archaeological material is discovered during construction works, excavation must be stopped immediately, and the Cultural Resources Manager should be informed with detailed site information. The Cultural Resources Manager will contact the Base Civil Engineer, who will inform the U.S. Installation Commander and the Spanish Base Commander via official channels. The resource in question is to be protected and not removed or disturbed until the authorities have determined the best course of action, which must be communicated to the Council of Tourism, Culture and Sports or the City Hall of Arahal. No excavation or construction works are permitted on or near archeological sites without the prior approval from the competent local authority. The location of archeological sites must be communicated to the Council of Tourism, Culture and Sports.

In the event of accidental discoveries of objects or material remains with historical value under Andalusian Historical Heritage, the discovery must be promptly reported to the Council responsible for historical heritage or the corresponding City Council, which is required to notify the Council within twenty-four hours. Under no circumstances may the remains or artifacts be removed without prior authorization and supervision from the Department responsible for historical heritage. The discovered items must remain undisturbed at the site of discovery to ensure their proper evaluation and availability to the Administration.

2.4.2 Land Use

Installation Supplement

The installation encompasses a total of 3,433 acres. The land is distributed across industrial areas, farmland under SpAF control, and residential areas. See the Natural Resources Inventory for further information.

distribution of habitats.jpg

Figure 13: Distribution of habitats within the Morón AB

Legend: A1. Intensive unmixed crops. A2. Planted forest and groves. A3. Planted tree lines. A4. Planted oleander hedges. A5. Garden spaces. A6. Built-up areas. B1. Subnitrophilous annual grasslands. B2. Anthropogenic herb stands. B3. Drainage channels with humid grasslands. C1. Wetland vegetation of temporary streams and ponds. C2. Temporary ponds. C3. Temporary streams (values in hectares).

2.4.3 Current Major Impacts

Installation Supplement

Air and Water Pollution

The primary source of air pollution at Morón Air Base (AB) is daily aircraft and vehicle operations, including private travel within and around the installation. Water pollution risks stem from the discharge of treated water into the Guadaira River, as well as potential spills of fuels, oils, coolants, and other substances that could enter the drainage network. These pollutants may affect nearby watercourses, such as the Guadaira River to the north and the Guadairilla Stream to the south. Environmental controls, including water treatment systems and spill prevention protocols, are in place to mitigate these risks and ensure compliance with regulatory standards.

Vegetation Management

Vegetation management within the installation primarily involves periodic mowing of herbaceous vegetation to maintain airfield operations and ranges. This practice mimics the effects of herbivorous grazing and generally has minimal impact on plant species. However, mowing can disturb ground-nesting birds during incubation or chick hatching, though no affected species are classified as endangered or threatened. To mitigate this impact, mowing schedules should avoid critical breeding periods. Additionally, mowing near rabbit burrows may result in rabbit mortality, and carcasses can attract birds that pose risks to aerial operations. Coordinating mowing activities with the bird control service can minimize bird presence and reduce potential hazards to flight safety.

Groundwater Contamination and Restoration Activities

Groundwater contamination risks at the installation primarily arise from accidental spills of fuels, oils, and coolants used in aircraft and vehicle operations. Fertilizer use in agricultural areas also poses a secondary risk of contamination. Morón AB has established protocols to manage and limit these risks, including spill containment measures.

Erosion and Erosion-Sensitive Soils

Due to the flat topography and extensive vegetation cover, Morón AB does not currently have erosion-prone soils that could impact mission operations. Vegetation plays a key role in stabilizing soils and reducing erosion risks across the installation.

Archaeological Sites

Construction and agricultural activities involving excavation at Morón AB have the potential to uncover or damage cultural artifacts, particularly at identified archaeological sites such as MAB-C-1, MAB-F-1, and MAB-F-2. Any activity in these areas must follow established archaeological procedures and preservation protocols. For example, activities at MAB-C-1, a culturally significant site, must be preceded by an archaeological intervention project approved by the competent authority. Similarly, construction at MAB-F-1 and MAB-F-2 requires monitoring and compliance with historical heritage regulations. Accidental discoveries of artifacts must be reported immediately, and excavation halted until the appropriate authorities determine the best course of action.

2.4.4 Potential Future Impacts

Installation Supplement

Future mission impacts at Morón AB will depend on changes such as mission expansion, Base Realignment and Closure (BRAC), or infrastructure development. Expanded operations may affect sensitive areas within the installation, including riparian zones, temporary wetlands, and archaeological sites (MAB-C-1, MAB-F-1, MAB-F-2). No foreseeable impacts on nearby natural or cultural areas, priority habitats, or Host Nation-designated critical habitats are expected unless the AB expands, legislation changes, or new archaeological sites or sensitive species are discovered. Future development activities are outlined in the Installation Development Plan (IDP).

3 ENVIRONMENTAL MANAGEMENT SYSTEM

The DAF environmental program adheres to the Environmental Management System (EMS) framework and its "Plan, Do, Check, Act" cycle for ensuring mission success. Executive Order (EO) 14057, *Catalyzing Clean Energy Industries and Jobs Through Federal Sustainability*; DoDI 4715.17, *Environmental Management Systems*; DAFI 32-7001, *Environmental Management*; and International Organization for Standardization (ISO) 14001 standard, *Environmental Management Systems – Requirements with guidance for use*, provide guidance on how environmental programs should be established, implemented, and maintained to operate under the EMS framework.

The Natural and Cultural Resources program employs EMS-based processes to achieve compliance with all legal obligations and current policy drivers, effectively manage associated risks, and instill a culture of continual improvement. The INCRMP serves as an administrative operational control that defines compliance-related activities and processes.

4 GENERAL ROLES AND RESPONSIBILITIES

General roles and responsibilities that are necessary to implement and support the natural and cultural resources program are listed in the table below. Specific natural and cultural resources management-related roles and responsibilities are described in appropriate sections of this plan.

Installation Supplement

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Table 11: installation roles and responsabilities

5 TRAINING

DAF installation NRMs/CRMs/POCs and other natural and cultural resources support personnel require specific education, training, and work experience to adequately perform their jobs. Chapter 13 of the FGS requires that trained personnel perform the tasks necessary to update and carry out certain actions required within this INCRMP. Specific training and certification may be necessary to maintain a level of competence in relevant areas as installation needs change, or to fulfill a permitting requirement.

Installation Supplement

USAF installation NRMs/CRMs/POCs and other natural and cultural resources support personnel require specific education, training, and work experience to adequately perform their jobs. Chapter 13 of the FGS requires that trained personnel perform the tasks necessary to update and carry out certain actions required within this INCRMP. Specific training and certification may be necessary to maintain a level of competence in relevant areas as installation needs change, or to fulfill a permitting requirement.

- NRMs at installations should take the course DoD Natural Resources Compliance, endorsed by the DoD Interservice Environmental Education Review Board and offered for all DoD Components by the Naval Civil Engineer Corps Officers School (CECOS). See http://www.netc.navy.mil/centers/csfe/cecos/ for CECOS course schedules and registration information. Other applicable environmental management courses are offered by the Air Force Institute of Technology (http://www.afit.edu), the National Conservation Training Center managed by the United States Fish and Wildlife Service (USFWS) (http://www.training.fws.gov), and the Bureau of Land Management Training Center (http://training.fws.gov)ç
- Natural and cultural resource management personnel shall be encouraged to attain professional registration, certification, or licensing for their related fields, and may be allowed to attend appropriate national, regional, and Host Nation/local conferences and training courses.
- Individuals participating in the capture and handling of sick, injured, or nuisance wildlife should receive appropriate training, including training that is mandatory to attain any required permits.
- Personnel supporting the BASH program should receive flight line drivers training, training in identification of bird species occurring on airfields, and specialized training in the use of firearms and pyrotechnics as appropriate for their expected level of involvement.
- The DoD supported publication Conserving Biodiversity on Military Lands -- A Handbook for Natural Resources Managers (http://dodbiodiversity.org) provides guidance, case studies, and other information regarding the management of natural resources on DoD installations.

Cultural resources awareness training is crucial to ensure that installation personnel, contractors, and visitors are aware of their role in the program and the importance of their participation in its success. The eDASH Training Matrix, available from the eDASH Cultural Resources Home Page, identifies cultural resources-related training topics, target audiences, training frequency, etc. Appropriate personnel must complete the required education, training, and certification necessary to perform their jobs. Training records are maintained IAW the Recordkeeping and Reporting section of this plan.

Below are key cultural resources management-related training requirements and programs:

- The FGS-S requires that cultural resources managers are adequately trained in cultural resources management and possess expertise in global, national, and local history and culture.
- Appropriate personnel must complete the required education, training, and certification to effectively carry out their responsibilities. An important resource is the Defense Environmental Network Information Exchange (DENIX). This site provides links to many available resources offering information, guidance, and training sources.
- Another general website for training courses, both classroom and online, in many areas of environmental management, including cultural resources, is available through FedCenter.
- Short courses in historic preservation are offered overseas, most of which are geared to building conservation practice or the architecture of a specific country. These courses are offered by the International Council on Monuments and Sites (ICOMOS) in Paris, the International Center for the Study of the Preservation and Restoration of Cultural Property in Rome, and UNESCO worldwide. Courses cover many topics including architectural and archaeological conservation; industrial archaeology and heritage management; and principles of building conservation.
- Accreditation to carry out activities related to cultural heritage will be obtained upon completion of such courses. The actions must always be carried out by an accredited professional, with the administrative permits established in the LPHA.

6 RECORDKEEPING AND REPORTING

6.1 Recordkeeping

The installation maintains required records in accordance with applicable FGS, DAFI 32-7091, DAFMAN 33-363, *Management of Records*. It disposes of records in accordance with applicable FGS, DAFI 32-7091, and the Air Force Records Information Management System (AFRIMS) records disposition schedule (RDS). Numerous types of records must be maintained to support implementation of the natural and cultural resources programs. Specific records are identified in applicable sections of this plan, in the Natural Resources Management Playbook, Cultural Resources Management Playbook, and in referenced documents.

Installation Supplement

6.2 Reporting

The installation NRM and CRM are responsible for responding to natural and cultural resources-related data calls and reporting requirements. The NRM, CRM, and supporting Air Force Installation and Mission Support Center Detachment or AFCEC Media Manager and SMSs should refer to the Environmental Reporting Playbook for guidance on execution of data gathering, quality control/quality assurance, and report development.

Installation Supplement

7 NATURAL AND CULTURAL RESOURCES PROGRAM MANAGEMENT

This section describes the current status of the installation's natural and cultural resources management program and program areas of interest. Current management practices, including common day-to-day management practices and ongoing special initiatives, are described for each applicable program area used to manage existing resources. Program elements in this outline that do not exist on the installation are identified as not applicable and include a justification, as necessary.

Installation Supplement

The installation will review and follow the corresponding playbook as it applies overseas. Most management actions involve work that may involve the river that borders the Northern perimeter of the installation. Other actions include removal or nests or nesting areas such as trees.

7.1 Fish and Wildlife Management

Installation Supplement

Applicability Statement

This section is applicable to all overseas installations.

Program Overview/Current Management Practices

Wildlife management at Morón AB is primarily overseen by the SpAF. The SpAF is responsible for controlling rabbit and bird populations, including Bird/Wildlife Aircraft Strike Hazard (BASH) management, which is carried out through the SpAF Falconer. Annual rabbit population control is conducted via authorized hunts exclusively for SpAF personnel, while bird nesting is managed under a permit renewed yearly with local authorities. These efforts are crucial for maintaining operational safety and reducing wildlife hazards. The 496 ABS CE Operations Flight Entomology Shop has been coordinating local hunters to augment the SpAF efforts to reduce the rabbit population. As we innovate and find more effective measures to control the rabbit population on the installation while respecting HN laws we will update this plan with that information.

Under the Spanish Constitution, the Autonomous Regions have exclusive jurisdiction over hunting and fishing in rivers and lakes, including planning, regulation, and management of these activities. In Andalusia, wildlife management is governed by regional laws such as Law 8/2003 of October 28 on Wild Flora and Fauna and Decree 126/2017 of July 25, which approves the Regulation on the Management of Hunting in Andalusia. These regional laws align with broader European and Spanish legislative frameworks, including Council Directive 79/409/EEC on the conservation of wild birds, Council Directive 92/43/EEC on the conservation of natural habitats and wild flora and fauna, and Spanish Law 4/1989 of March 27 on the conservation of natural areas, wild flora, and fauna. The Regional Ministry of Sustainability, Environment, and Blue Economy is the primary entity responsible for overseeing fish and wildlife management in Andalusia, ensuring compliance with European and national regulations.

Current fish and wildlife management issues at Morón AB include the presence of invasive and pest species, as well as ongoing BASH concerns. These challenges are expected to persist, with changing climatic conditions increasing their complexity. Rising temperatures and varying precipitation patterns may create conditions favorable for invasive species, potentially allowing them to outcompete native species. Effective monitoring and adaptive management plans will remain critical to addressing these issues as environmental conditions evolve. Warmer water temperatures in ponds and other lentic systems are likely to reduce dissolved oxygen levels, diminishing habitat quality for larval amphibians, aquatic macroinvertebrates, and fish. Algal blooms may further deplete oxygen, exacerbating habitat degradation. Mitigation strategies should include removing invasive aquatic plants and algae, as well as planting shade trees around water sources to limit excessive heating and maintain water quality.

Climate change is also likely to favor disease vectors such as mosquitoes and ticks. Minimizing stagnant water in and around the cantonment area will help reduce mosquito populations. Similarly, controlling tick populations requires keeping lawns mowed and managing overabundant hosts such as deer and rodents in urban areas. These measures are crucial to minimizing the spread of mosquito- and tick-related infections, which could impact personnel and operations at Morón AB.

7.2 Outdoor Recreation and Access to Natural Resources
Installation Supplement

Applicability Statement

This section is applicable to all overseas installations.

Program Overview/Current Management Practices

Outdoor recreation activities near Morón AB are managed by the Regional Ministry of Tourism, Culture, and Sports, under the framework of Decree 10/2002 of January 29, which regulates tourism in rural environments and active tourism. However, activities taking place in natural environments are subject to the rules and limitations established by the Regional Ministry of Sustainability, Environment, and Blue Economy. The regulations aim to ensure that recreational and sporting activities do not pose risks to wild species or their habitats. These regulations are outlined in Decree 23/2012 of February 14, which governs the conservation and sustainable use of wild flora and fauna and their habitats and are further supported by Law 8/2003 of October 28 on Wild Flora and Fauna.

At Morón AB, the USAF controls only the Fitness Center area, which includes a running track, basketball courts, and tennis courts. No natural trails or other outdoor recreation areas are under USAF jurisdiction.

7.3 Conservation and Protection Standards Enforcement
Installation Supplement

Applicability Statement

This section is applicable to all overseas installations.

Program Overview/Current Management Practice

The Morón AB, located in Spanish territory, is subject to the same environmental regulations applicable throughout Andalusia. The Regional Ministry of Sustainability, Environment and Blue Economy is the competent authority responsible for ensuring compliance with these regulations.

Several environmental protection practices are currently implemented at Morón AB. Bird nest protection measures are enforced annually from February to August, during which vegetation cutting along the river is also prohibited. Additionally, the removal of trees is not permitted without prior approval from the SpAF Environmental Office. Any work that could potentially impact the river must be coordinated with the Spanish River Authorities to ensure compliance with water protection regulations.

7.4 Management of Threatened, Endangered, and Host Nation-Protected Species
Installation Supplement

Applicability Statement

This section applies to USAF installations on which are located threatened, endangered, or Host Nation-protected species. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

Careful management of the habitats at the Morón AB is necessary to promote biodiversity and to preserve and enhance the number of species on site. Management of natural resources needs to be compliant with respect to legislation and, wherever possible, best practice, in order to be able to sustain the species currently supported and enhance biodiversity. Several management issues and recommended actions have been prescribed to manage the impacts upon the natural resources present throughout the installation.

USAFE instructions require that the base's daily routine and maintenance comply with FGS-S in order to preserve the natural resources.

Management actions taken to protect threatened and endangered species will be influenced by the speed at which the climate changes, the nature of the climatic changes and the ability of the species to respond to those changes. Our understanding of species' response to changing climate is not yet sufficient to be able to predict how an individual species will respond. In addition, the response of sub-populations of a single species may vary. Species can exhibit behavioral, plastic and genetic response to environmental conditions. Genetic variation within a species has been associated with exposure to environmental conditions, however, populations may not be able to undergo selection for preferred traits if environmental conditions change rapidly (Hoffmann & Sgrò, 2011). Behavioral changes, such as hostplant or food source switching, and plastic responses, such as changes in body size associated with longer growing seasons, have already been observed (Iwamura et al., 2013; Ozgul et al., 2010). Many current T&E management activities are appropriate for increasing resilience or facilitating adaptation to climate change. An ecosystem approach that prioritizes functional diversity, maintenance of habitat, habitat variability and connectivity can help support genetic diversity that may be important for adaptation, and can help species migrate to more favorable habitats. However, when approaching the uncertainty that is inherent with managing species under changing environmental conditions, additional analysis and planning is required. Research into actionable science used for biodiversity conservation in changing conditions has developed several key principles. Historic patterns used for management decisions are likely to be insufficient for future management challenges (Bierbaum et al., 2013). Proactive approaches that anticipate change can help extend the period over which species can adapt to changing climate and avoid catastrophic declines associated with stochastic events that act on an already stressed ecosystem.

7.5 Water Resource Protection

Installation Supplement

Applicability Statement

This section applies to USAF installations that have water resources. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

Water quality

Aquifer recharge at Morón AB occurs primarily through rainwater infiltration, rivers, and excessive irrigation water, with discharge occurring via springs, rivers, evapotranspiration, and pumping. Aquifer recharge is most significant during rainy months (autumn to early spring). According to Versar (2003), the apparent small differences in the groundwater levels between summer and winter is due to the relatively high storage capacity of the aquifer, associated with its porosity.

According to interviews with technical staff of the Morón AB, GW monitoring was performed annually until 2018, after which no water sampling campaigns have been undertaken. It is noteworthy that the installation has an appropriate piezometer network established in those areas where historical affections related to TCE and LNAPL have been identified.

The Source Water Protection/Wellhead Protection (SWP/WHP) Plan is required by FGS-S Chapter 3 for DoD installations that withdraw and distribute water. FGS-S Section C3.3.2.3. requires protecting groundwater supply wells and surface water from contamination through proper placement and construction of the wells, proper intake placement to all water treatment facilities, siting and maintaining septic system and onsite treatment units, and land use management. Arcadis updated the base's SWP in July 2023.

The water supply system includes eight active wells, four located centrally within the installation near industrial facilities and four positioned at the southern edge where industrial activity is minimal. Well clusters W1 and W3 in the central area experienced contamination by TCE, nitrates (from nearby agriculture), and coliform bacteria, designating them non-potable. A Water Treatment Plant (WTP) was installed in 2007 to address TCE contamination, and new wells (W2, W4, W5, W6) were drilled in the south to supply potable water. Wells W3B and W3C remain restricted to irrigation use due to persistent coliform contamination, likely from wastewater seepage near Zone I of W3.

Non-point source pollution issues

Non-point source pollution at Morón AB primarily stems from agricultural runoff (nitrates) and historical contamination from industrial activities (TCE and LNAPL). Coliform contamination in well cluster W3 highlights ongoing wastewater management challenges, with seepage from nearby pipes suspected as a source.

Wastewater and Stormwater Management Issues

Wastewater at Morón AB is treated at the Wastewater Treatment Plant (WWTP) in Building 1215 before being discharged into the Guadaira River. The WWTP includes biological treatment, aeration basins, and sludge drying beds, with treated water released through an outfall. Sludge is removed and disposed of off-base by contractors. Stormwater is managed through the Storm Water Pollution Prevention Plan (SWPPP), which identifies potential sources of pollution and implements best management practices (BMPs). The SWPPP was updated in 2023 to align with FGS-S requirements and address changes in base facilities.

The stormwater drainage system, consisting of lines, culverts, and open ditches, is generally well-maintained but shows signs of erosion and sediment accumulation in certain areas, such as drainage areas near the runway (DA-7) and the eastern crops (DA-3 and DA-4). Sediment accumulation is also observed near outfalls due to ongoing construction. Industrial activities, such as fueling, maintenance, and hazardous material storage, present risks of stormwater pollution. Spill prevention and response measures, as required by the Spill Prevention Response Plan (SPRP), are crucial to mitigate these risks. The SPRP, last updated in 2023, outlines responsibilities and procedures for spill containment and remediation.

Regional Programs

Water resource management at Morón AB is aligned with the Hydrological Plan of Guadalquivir (HPG) 2022–2027, which addresses regional aquifer and river quality standards. The Guadaira River, located near the base, is classified as deficient in water quality due to excessive fertilizer runoff.

Climate Change impacts existing and future management activities

No significant changes to the SWPPP are anticipated in the near term, as the region is not projected to experience increased intense rainfall. Long-term planning should consider potential impacts on aquifer recharge rates, stormwater infrastructure, and wastewater treatment to ensure resilience under changing climatic conditions.

7.6 Wetland Protection
Installation Supplement

Applicability Statement

This section is applicable to all overseas installations.

Program Overview/Current Management Practices

At the regional level, the Inventory of Andalusia's Wetlands (IHA) was established by the Decree 98/2004, of March 9, which includes all the wetlands declared protected areas for their special natural value, whether edaphological, geomorphological, hydrochemical, ecological, biological, or cultural. All the wetlands of the IHA are part of the Network of Protected Natural Spaces of Andalusia, for which Decree 95/2003, of April 8, establishes the criteria for their conservation and use. The IHA consists of 226 wetlands and 142,245.73 ha. They are also included in the Spanish Inventory of Wetlands as part of the Spanish Inventory of Natural Heritage and Biodiversity, regulated by Royal Decree 435/2004, of March 12. The management entity is the Regional Ministry of Sustainability, Environment and Blue Economy and the frame of reference to guide their conservation, study, restoration, and dissemination plans is the Andalusian Wetlands Plan, approved by Resolution of November 4, 2002.

To the northeast of Morón Air Base (AB), there is a small pond formed by historic ground excavations. During heavy rains, the pond retains water for several months, allowing the development of vegetation and fauna typical of temporary wetland environments. However, due to its limited scope, this pond is not included in the Inventory of Andalusia's Wetlands (IHA). The base presently lacks any management, monitoring, or restoration plans for this site. Climate change is expected to increase periods without water retention in this pond, leading to the disappearance of species reliant on higher water availability.

Wetland and riparian ecosystems are particularly vulnerable to climate change impacts, including rising air and surface water temperatures, changes in precipitation patterns, and altered runoff seasonality. These changes can disrupt reproductive phenology and the distribution of plants and animals (Parmesan & Yohe, 2003). Riparian ecosystems, despite being naturally resilient, provide critical linear habitat connectivity and refugia for wildlife, linking aquatic and terrestrial ecosystems. These characteristics can support ecological adaptation to climate change. However, wetland systems are highly variable geographically, and there is an urgent need to develop localized, place-based strategies to address climate change threats to these ecosystems.

7.7 Grounds Maintenance
Installation Supplement

Applicability Statement

This section is applicable to all overseas installations.

Program Overview/Current Management Practices

Grounds maintenance is managed by contract and determined by the PWS. Work includes standard USAF practices for grounds maintenance. Solid waste from grounds maintenance is handled by the contract refuse service.

7.8 Forest Management
Installation Supplement

Applicability Statement

This section applies to USAF installations that maintain forested land on USAF property. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

The management of Andalusian forests falls under the responsibility of the Regional Ministry of Sustainability, Environment, and Blue Economy, through the Directorate General for Forestry Policy and Biodiversity.

To the east of the AB lies a pine forest covering about 100 ha, planted at the end of the 20th century. It is not a continuous mass, as there are large areas where the trees have been removed and are now occupied by crops. In addition to the pine trees, there are small plantations of other native species like mastic, wild olive, holm oak, cork oak, myrtle, and tamarisk, as well as some allochthonous species like casuarina and date palm.

Within the forest, there is only a 250 meters long road for vehicles, which allows access to the military installations located there. There is no tree management plan or any type of forest harvesting.

The following map shows the perimeter of the forested area, highlighted in green.

forest mass in AB.png

Figure 14: Forest mass within the Morón AB

7.9 Wildland Fire Management
Installation Supplement

Applicability Statement

This section applies to USAF installations with unimproved lands that present a wildfire hazard and/or installations that utilize prescribed burns as a land management tool. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

Wildfire frequencies and intensities, as well as the length of the fire season, are likely to increase at Morón AB due to projected precipitation deficits and temperature increases. Precipitation projections indicate a drier March, a summer that is very dry, similar to current day, and very substantial precipitation deficits from September through December, in both the RCP 4.5 and RCP 8.5 2050 scenarios. Very large temperature increases are expected by 2050 as well. However, these changes in fire potential may be of little consequence given the highly managed vegetation at the Base and on surrounding properties, which are largely agricultural. The only exception of any size is the plantation area containing the golf course.

7.10 Agricultural Outleasing
Installation Supplement

Applicability Statement

This section applies to USAF installations that lease eligible USAF land for agricultural purposes. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

There is no livestock farming conducted within Morón AB, but nearly half of its area, about 690 ha, is arable land, distributed across the installation. Arable crops are grown on dry land, with cereals being the most common crop, followed by sunflowers and legumes, and small areas devoted to safflowers. A map of their location is shown below.

arable areas.jpg

Figure 15: arable areas within the Morón AB.

The intensive farming practices at Morón AB include the use of fertilizers and biocides, with all plots cultivated every season, leaving no areas fallow. The use of fertilizers and biocides has been known to contribute to significant contamination of surface water and aquifers, along with a notable decrease in biodiversity. Non-fallow lands exacerbate these environmental concerns. Proposed improvements include promoting organic farming practices or reducing the use of agrochemicals wherever possible. Additionally, biodiversity within the installation could be enhanced by eliminating or reducing cultivated areas inside the pine forest, where agrochemical use should be prohibited or limited. Leaving at least a 100-meter buffer zone around the small lagoon without cultivation would further improve water quality and protect its fragile ecosystem.

Crops depend significantly on rainfall, especially in late winter and early spring. Otherwise, yields are low, and profitability is affected. Future scenarios of reduced rainfall due to climate change are anticipated to increase the frequency of poor harvests, potentially impacting the sustainability and profitability of agricultural practices.

7.11 Integrated Pest Management Program
Installation Supplement

Applicability Statement

This section is applicable to all overseas installations.

Program Overview/Current Management Practices

The Pest Management Program (PMP) at Morón Air Base (MAB) is an integral part of the Morón Base Maintenance Contract, which is currently held by KBR. The PMP utilizes the concept of Integrated Pest Management (IPM), incorporating cultural, mechanical, and chemical control methods. Cultural and mechanical control measures include rodent and insect traps, proper sanitation practices, correction of structural defects, and the elimination of breeding areas. Chemical control measures involve the use of insecticides, herbicides, and rodenticides to manage insects, weeds, and rodents. Regular surveys for pest issues are conducted at base facilities under the Recurring Work Program (RWP), with housing inspected and treated for infestations upon change of occupancy. All pest control activities are performed through service calls or job orders.

The PMP is reviewed annually by the 496 ABS Pest Management Shop Supervisor, in coordination with the USAFE Command Entomologist/MAJCOM Pest Management Consultant at Ramstein Air Base (A7NE). The plan undergoes revision and formal staffing every five years, involving key personnel such as the natural resources manager, pest management coordinator, environmental coordinator, public health officer, bioenvironmental engineer officer, installation civil engineer, mission support group commander, wing commander, and command entomologist.

Regarding exotic and invasive species, two invasive plant species listed in the Spanish Catalog of Invasive Alien Species (Royal Decree 630/2013), created under the State Law 42/2007, have been identified at Morón AB: Ailanthus altissima and Arundo donax.

Ailanthus altissima is an ornamental tree species widely used in public gardens accross southern Europe, but originally native to China. This fast-growing tree is highly resistant to pollution and environmental stress, producing large quantities of fruit annually and regenerating rapidly. It thrives in diverse environments, forming dense groves along roadsides and posing a significant threat to native vegetation. At Morón AB, only one specimen has been detected near the area of the Military Emergency Unit.

Arundo donax, a bamboo-like herbaceous plant, grows along wetlands and moist soils, spreading through underground rhizomes to form colonies that can span several kilometers. While originally native to Asia, it was introduced long ago and is now considered one of the 100 most harmful invasive alien species by the International Union for Conservation of Nature (IUCN). At Morón AB, colonies of this species have been detected along drainage channels and near the small pond.

7.12 Bird/Wildlife Aircraft Strike Hazard (BASH)
Installation Supplement

Applicability Statement

This section applies to USAF installations that maintain a BASH program to prevent and reduce wildlife-related hazards to aircraft operations. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

The Bird/Wildlife Aircraft Strike Hazard (BASH) program at Morón AB aims to provide a safe operating environment for pilots during both peacetime and wartime operations by reducing the risk of wildlife strikes. Due to its location in a migratory corridor between Europe and Africa, as well as its proximity to agricultural fields and water sources, Morón AB experiences significant wildlife activity that poses hazards to aircraft operations. Resident bird species, migratory birds, and birds of prey attracted by the abundance of rabbits within the installation are of particular concern.

Existing Hazards to Aircraft Operations

Morón AB lies directly in the path of seasonal migratory routes and is surrounded by agricultural land that attracts large concentrations of birds during seeding and harvest seasons. Birds such as storks, hawks, and waterfowl pose a high risk to aircraft operations. The nearby Doñana Wildlife Refuge, located 20 nautical miles west of the installation, supports migratory and non-migratory bird populations, further increasing the likelihood of wildlife strikes. Flights below 6,000 feet in this area are prohibited to minimize risks. Additionally, water sources within and around the installation, including the swamp along the east side of the runway and the Guadalquivir River, create favorable conditions for migratory and resident bird species, particularly during summer and winter migration peaks.

Natural Resources Management and BASH Program

The BASH program is actively supported by natural resource management efforts, including daily wildlife control conducted by the Spanish Air Force Bird Control Team. This team uses falconry birds as well as vehicles to deter birds from settling near the runway and removes animal remains to prevent attracting predators. Periodic rabbit relocation efforts are also conducted in collaboration with the Hunting Control Service to reduce the area's appeal as a hunting ground for birds of prey. These measures help control the presence of hazardous wildlife and mitigate risks to flight operations.

Climate Change Impacts

Climate change may alter the risk dynamics of bird strikes at Morón AB. Migratory birds may shift their migration periods, with spring and fall peaks occurring earlier, while resident species may experience changes in abundance due to their adaptability to wide ecological ranges. Wintering species, such as the red kite (Milvus milvus), may reduce their presence in southern latitudes, including the Iberian Peninsula, as their wintering range shifts northward. This trend is also being observed in other raptor species and certain waterfowls.

7.13 Coastal Zone and Marine Resources Management
Installation Supplement

Applicability Statement

This section applies to USAF installations that are located along coasts and/or within coastal management zones (as defined by the Host Nation). This section **IS NOT** applicable to this installation.

7.14 Natural Hazards

Installation Supplement

Applicability Statement

This section applies to USAF installations that have identified climate change risks, vulnerabilities, and adaptation strategies using authoritative region-specific climate science, climate projections, and existing tools. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

The projected climate change scenario for the geographical area where the AB is located indicates a decrease in average precipitation and an increase in average and maximum absolute temperatures. These changes pose several risks and vulnerabilities that could impact USAF missions and operations at the installation:

- A decrease in the availability of water resources; an assessment of this decrease and the future needs of the AB would be advisable to anticipate a water shortage scenario.
- An increase in the fire risk season to practically all year round; it would be necessary to assess whether sufficient material and human resources are available to intervene in case of fire at any time of the year.
- An increase in the number of days with extreme maximum temperatures; protocols should be developed for the civilian and military population to avoid risky behavior, generally for the operation of the AB and particularly for the health of people, during the hottest times of the day.

7.15 Communication, Planning, and EIAP

Installation Supplement

Applicability Statement:

This section **IS** applicable to this installation.

Background/Overview:

The EIAP is the USAF procedure for performing environmental project review, in compliance with the requirements of 32 CFR Part 187, *Environmental Effects Abroad of Major Department of Defense Actions*. The proponent of an action is responsible for initiating the EIAP early in the planning stages of a proposed action. The EIAP process is documented on Air Force (AF) Form 813, *Request for Environmental Impact Analysis*. The NRM and CRM must be familiar with the EIAP process for overseas actions, which is specified in AFI 32-7091. Additional information and guidance regarding overseas EIAP is available on the eDASH Overseas EIAP website.

Procedure:

The NRM/CRM should:

- Work in close coordination with EIAP manager during all environmental reviews
- Identify and consult with local governments/other parties, when appropriate
- Plan for public participation, as necessary

7.16 Historic and Cultural Resources Review Process

Installation Supplement

Applicability Statement:

This section **IS NOT** applicable to this installation.

Background/Overview:

As required by each country-specific FGS, installation Commanders shall take into account the effect of any action on any property listed on the World Heritage List or on the applicable country's equivalent of the National Register of Historic Places (NRHP) for purposes of avoiding or mitigating any adverse effects. Activities, programs, or projects that have the potential to involve or affect Host Nation historic properties may include, but are not limited to:

- Ground disturbance for new construction, utility installation, road widening, etc.
- Rehabilitation, renovation or addition to buildings, structures, and/or utilities
- Replacement or maintenance of infrastructure
- Demolition of buildings and structures
- Proposed beddowns
- Environmental investigations and remediation
- Real property actions such as land transfers, out-leasing, etc.

The environmental review process should be initiated early in the planning stages of a project.

Procedure:

Project Proponents should:

- During initial project planning (e.g., completion of AF Form 813; AF Form 332, *Base Civil Engineer Work Request*; DD Form 1391, *Military Construction Project Data*, AF Form 103, *Base Civil Engineering Work Clearance Request*/Dig Permit), provide adequate information necessary to determine whether Host Nation historic properties are present and to assess impact of the proposed project on historic properties
- Implement mitigation or management conditions stipulated by the CRM resulting from the 54 USC § 307101(e) consultation/coordination process and required by the applicable FGS
- The CRM should:
- During review of the proposed action, determine whether historic properties are present and assess the impact of the proposed project on Host Nation historic properties. Results of this review could include:
    - ***No Adverse Effect to Historic Properties***: This determination is made by the CRM (with AFCEC reach back coordination if needed) when the project will have no foreseeable effects on Host Nation historic properties. Document determination and proceed with the action
    - ***Adverse Effect***: This determination is made by the CRM (with AFCEC reach back coordination if needed) when the potential effect could diminish the integrity of the characteristics that qualify the property for the World Heritage List or the Host Nation equivalent of the NRHP. Upon a finding of "adverse effect," the installation will consult with AFCEC and, if appropriate, the Host Nation about trying to avoid or mitigate the adverse effect
- Coordinate environmental review process to support desired project schedules

7.17 Resources Contracting
Installation Supplement

Applicability Statement:

This section **IS** applicable to this installation.

Background/Overview:

USAF Planning, Programming, Budgeting, and Execution (PPBE) is the process of acquiring funding for activities. Contracting of natural and cultural resources-related work follows standard USAF PPBE processes. The Environmental Quality PPBE Playbook and Activity Management Plan Playbooks contain detailed information on funding and contracting.

Procedure:

- The NRM/CRM proposes future projects and includes them in the INCRMP and in the Accountable Property System of Record (APSR).
- If the project is determined to be eligible and funds are available for the project, the NRM/CRM/Section specialist develops a detailed statement of work and moves forward with contracting options.

7.18 Historic and Cultural Discoveries
Installation Supplement

Applicability Statement:

This section **IS** applicable to this installation.

Background/Overview:

Discoveries of human remains and archaeological resources may occur on lands made available for USAF use overseas. When discoveries are made, the proper actions must be taken to minimize damage to resources. The CRM should refer to the applicable FGS for instructions on how to proceed.

Procedure:

USAF or Contractor personnel that make a potential cultural discovery should:

Immediately notify the CRM or Installation Commander of the nature and location of the discovery

Immediately cease potentially damaging activities and take efforts to ensure protection of resources until arrival of the CRM or designee

The CRM should:

Ensure that all cultural items are left in place and that no further disturbance is permitted to occur

Sufficiently identify the location of the discovery to provide efficient relocation, yet take efforts to minimize the types of signs that could attract personnel and place the discovery in danger

Notify Security Forces of the discovery

Provide guidance to installation personnel and contractors on FGS requirements. If the FGS is silent about a matter, go through AFCEC to seek guidance from the appropriate LEC or, if there is no LEC, the appropriate geographic combatant command

Direct installation personnel and contractors to take efforts to resume mission-associated activities in a reasonable and timely manner

Security Forces should:

Notify the Wing Commander regarding the location, nature, and circumstances of the discovery

Provide security/protection for the site to prevent unauthorized disturbance, looting, or vandalism

If human remains are discovered or if there is sufficient reason to suspect that human remains are present (such as the observation of an oval-shaped rock or earthen mound), the CRM should follow the FGS, request assistance from the LEC, or consult with the Host Nation authorities.

7.19 Public Access to Host Nation Sites of Historic, Cultural, or Traditional Importance
Installation Supplement

Applicability Statement:

This section applies to USAF installations that have sites of cultural or historical importance and allow public access. This section **IS NOT** applicable to this installation.

7.20 Accidents and Emergencies Affecting Historic and Cultural Resources
Installation Supplement

Applicability Statement:

This section **IS NOT** applicable to this installation.

7.21 Suspected Vandalism
Installation Supplement

Applicability Statement:

This section **IS** applicable to this installation.

Background/Overview:

The installation has established procedures to deter vandalism and to investigate suspected acts of vandalism when a Host Nation cultural resource is damaged as a result of unauthorized activity.

Procedure:

In the event of a discovery of damaged archaeological site or other historic property, the following actions should be performed:

- Discoverer of potential looting or vandalism should:
    - Immediately notify the CRM (at 722-8047) and Security Forces (at ***[PHONE NUMBER]***)
    - Take all necessary precautions to protect the resource from further damage, loss, or destruction
    - Wait for further instructions from the CRM or other authority
- Security Forces should:

    - Notify the Installation Commander immediately regarding the location, nature, and circumstances of the looting or vandalism
    - Provide security/protection to prevent further unauthorized disturbance, looting, or vandalism
- The CRM should:
    - Inspect the site to assess damage
    - Notify the Installation Commander of damage within 48 hours of discovery. Include the following information in the damage report: Circumstances of site damage, assessment of the nature and extent of damage, recommendations for treatment procedures (coordinate with Host Nation local authority as appropriate), and suggestions for future protection measures
    - Comply with relevant provisions in applicable FGS
- Legal Department personnel will:
    - Assess whether or not accused violators can be prosecuted
    - Advise Installation Commander and appropriate commanders on disciplinary options and processes for vandalism suspects.

7.22 Curation of Collections and Records

Installation Supplement

Applicability Statement:

This installation **DOES NOT** maintain such a collection and **IS NOT** required to implement this SOP.

The installation Base Commander is committed to upholding and enforcing federal laws, Air Force regulations, and the Historical Heritage Andalusian regulations that strictly prohibit the unauthorized collection of artifacts.

7.23 Management and Coordination

Installation Supplement

Applicability Statement:

This section **IS** applicable to this installation.

Background/Overview:

The following Procedure outlines and describes natural and cultural resources-related communication, review, and coordination processes and workflows.

Procedure:

Internal Reviews

Internal review procedures will be initiated as early in project planning as possible, so that personnel are allowed sufficient time to implement appropriate natural and cultural resource activities, as required. Specific documents and processes that typically require internal review include:

- Completion of AF Form 332 for proposed work to Civil Engineering (CE) to determine whether the proposed work will affect any natural or cultural resources
- Completion of AF Form 103, generally for work involving digging to CE to determine whether the proposed work will affect any natural or cultural resources
- Environmental project review, including the EIAP and completion of the AF Form 81

Notification and Consultation

- Consultation can occur at any time with Host Nation officials at the discretion of the NRM and CRM

Agreement Documents

- Agreement documents pertaining to the treatment of natural and cultural resources will be drafted and coordinated by the NRM and CRM and approved by the Installation Commander
- Agreement documents are referenced in the Appendix section of this INCRMP

GIS Management

- The installation maintains maps showing locations of certain significant cultural resources.
- Information divulging the location and character of archaeological sites should be limited to parties involved in management and/or planning and shall not be divulged to the general public. Such confidentiality prevents damage to sites

7.24 Public Outreach

Installation Supplement

Applicability Statement

This section applies to USAF installations that perform community outreach activities in support of natural and cultural resources programs. This section **IS** applicable to this installation.

Program Overview/Current Management Practices

Program overview/current management practices: Earth Day activities include natural resources information for elementary school. In addition, a quarterly bulletin will be emailed to USAF/Contractor personnel with natural resources information.

7.25 Geographic Information Systems (GIS)

Installation Supplement

Applicability Statement

This section applies to all USAF installations that maintain geospatial information within a GeoBase system. The section **IS** applicable to this installation.

Program Overview/Current Management Practices

GIS information is available on Geoviewer and with the installation GIS office. Colorado State University, Center for Environmental Management of Military Lands gathered GIS information for the installation under contract with AFCEC.

- This information was processed and added to Geoviewer for users to locate items of interest within the NR program.The installation maintains maps showing locations of certain significant natural and cultural resources.
- Information divulging the location and character of archaeological sites should be limited to parties involved in management and not divulged to the general public. Such confidentiality is important in preventing damage to sites.

8 MANAGEMENT GOALS AND OBJECTIVES

The installation establishes long term, expansive goals and supporting objectives to manage and protect natural and cultural resources while supporting the military mission. Goals express a vision for a desired condition for the installation's natural and cultural resources and are the primary focal points for INCRMP implementation. Objectives indicate a management initiative or strategy for specific long or medium range outcomes and are supported by projects. Projects are specific actions that can be accomplished within a single year. Also, in cases where off-installation land uses may jeopardize DAF missions, this section may list specific goals and objectives aimed at eliminating, reducing or mitigating the effects of encroachment on military missions. These natural and cultural resources management goals for the future have been formulated by the preparers of the INCRMP from an assessment of the natural and cultural resources, current condition of those resources, mission requirements, and management issues previously identified. Below are the integrated goals for the natural and cultural resources programs.

The installation goals and objectives are displayed in the "Installation Supplement" section below in a format that facilitates an integrated approach to natural and cultural resource management. By using this approach, measurable objectives can be used to assess the attainment of goals. Individual work tasks support INCRMP objectives. The projects are key elements of the annual work plans and are programmed into the conservation budget, as applicable.

Installation Supplement

GOAL 1: Ensure environmental safety around the runway by protecting biodiversity and endangered species.

- OBJECTIVE 1.1: Reduce the rabbit population in the vicinity of the runway's headwaters to diminish the presence of predators and scavengers, thus creating a safer environment for the birds to hunt and forage without being threatened by an abundance of rabbits.
    - PROJECT 1.1.1: Increase rabbit control in these areas to reduce predators and scavengers' presence.
    - PROJECT 1.1.2: Coordinate and plan mowing activities in areas with rabbit burrows in conjunction with the bird control service to ensure operational presence in the designated area, aiming to prevent or minimize the presence of birds that

pose risks during aerial operations.

- OBJECTIVE 1.2: Manage and monitor water points to mitigate risks to aerial operations and promote the safety of birds by providing alternative habitats.
    - PROJECT 1.2.1: Utilize the pond as a refuge to deter birds from settling near drainage channels, potentially reducing risks to flight operations.
    - PROJECT 1.2.2: Combine daily monitoring of water points with proactive cleaning and clearing actions to prevent water accumulation issues caused by erosion or sedimentation.
    - PROJECT 1.2.3: Continuously monitor medium and large bird behavior, primarily handled by the falconer service.
- OBECTIVE 1.3: Enhance biodiversity and ecological diversity within the reforested pine forest in the eastern part of the base through strategic forest management practices and habitat improvements.
    - PROJECT 1.3.1: Reduce tree density in selected areas to alleviate competition for nutrients and water, enabling better tree growth and soil conditions to support a more diverse flora and fauna population.
    - PROJECT 1.3.2: Remove thick layers of pine needles under the canopy to facilitate the establishment of understory species and promote ecosystem diversity.
    - PROJECT 1.3.3: Introduce large trees and shelters, such as hollows, to provide habitat for various wildlife species and enhance the overall biodiversity within the forest.
    - PROJECT 1.3.4: Increase the diversity of fauna and flora by promoting more species through selectively clearing some areas, allowing better tree development and improved soil conditions.
    - PROJECT 1.3.5: Plant shrubs to introduce a greater variety of food, as the Hunting Control Section of the Spanish Air Force is already doing in some areas.
    - PROJECT 1.3.6: Install nesting boxes for birds, bats, insect "hotels," and other wildlife shelters to further increase species richness.
- OBJECTIVE 1.4: Ensure and enhance the presence of threatened and endangered species without great effort or risk to the mission.
    - PROJECT 1.4.1: Reduce the number of domestic cats present. The Pest Control Service should be complemented by an awareness campaign at the level of the workers and residents of the AB, so that they do not encourage the presence of these animals by providing them with care and food, even if it is minimal.
    - PROJECT 1.4.2: Leave the surroundings of the northwestern ponds uncultivated, or at least leave a band of about 10 m wide around them, allowing the grassland to grow to enhance its role as a refuge for small vertebrates and invertebrates.
    - PROJECT 1.4.3: leave some cultivated areas of the pine forest as pasture and mow them after the breeding season.
    - PROJECT 1.4.4: Encourage crops to receive the lowest possible dose of herbicides and pesticides.

GOAL 2: Address surface and groundwater contamination sites through effective environmental restoration activities.

- OBJECTIVE 2.1: Implement practices within the AB that significantly reduce the use of fertilizers in agricultural areas to mitigate groundwater contamination risks.
- OBJECTIVE 2.2: Promote organic farming or at least reduce the use of agrochemicals as much as possible.
- OBJECTIVE 2.3: Reduce the cultivated area inside the pine forest, where the use of agrochemicals should be prohibited or limited.
- OBJECTIVE 2.4: Leave at least 100 meters around the small lagoon without cultivation to improve better quality of its waters.

GOAL 3: Address climate changes risks and vulnerabilities.

- OBJECTIVE 3.1: Asses of the decrease on water resources availability and the future needs of the AB in order to anticipate a water shortage scenario.
- OBJECTIVE 3.2: Assess whether sufficient material and human resources are available to intervene in case of fire at any time of the year.
- OBJECTIVE 3.3: Develop protocols for the civilian and military population to avoid risky behavior, in general for the operation of the AB and in particular for the health of people, during the hottest times of the day.

GOAL 4: Ensure comprehensive compliance with regulations and laws related to cultural resource preservation while effectively balancing these preservation efforts with the military mission and tenant activities.

- OBJECTIVE 4.1: Ensure compliance with the FGS-S and associated USAFE regulations.
- OBJECTIVE 4.2: Establish specific procedures for compliance with all federal and Spanish laws and regulations governing the protection and preservation of cultural resources while ensuring compatibility with the military mission and ongoing and future tenant activities.

- OBJECTIVE 4.3: Locate and evaluate the significance of cultural resources located on the installation and to identify all those that meet the eligibility criteria for inclusion in the General Catalogue of Andalusian Historical Heritage (Catálogo General del Patrimonio Histórico Andaluz, CGPHA).
- OBJECTIVE 4.4: Protect surrounding properties from potential impacts resulting from mission-essential operations through the monitoring of cultural resources and rehabilitation of problem areas.
- OBJECTIVE 4.5: Document the future direction of cultural resources programs.
- OBJECTIVE 4.6: Manage any existing cultural resources to maintain current resource levels and enhance and protect these resources in a manner consistent with mission requirements.
- OBJECTIVE 4.7: Maintain a "no-net-loss" cultural resource management approach, if impacts to resources are unavoidable due to mission requirements.

OBJECTIVE 4.8: Coordinate all planning efforts with appropriate on-site and off-site entities to ensure cultural resource management practices are compatible with USAF and host nation-specific requirements and are integrated into the appropriate installation plans.

9 INCRMP IMPLEMENTATION, UPDATE, AND REVISION PROCESS

9.1 Natural and Cultural Resources Management Staffing and Implementation

Installation Supplement

AF Forms 103 (Base Civil Engineering Work Clearance Request) and 332 (Base Civil Engineer Work Request) are distributed to the relevant units within the Civil Engineering Squadron for review and coordination. This process ensures that construction projects, whether contracted, non-contracted, or part of Multiple Award Construction Contracts (MACC), undergo thorough internal assessment for environmental impact, including their impact on cultural resources.

The INCRMP is implemented by the CE Installation Management Environmental Section. Currently, it is a two-person team, neither of whom has received formal NR training. The Environmental Chief's background includes a course in watershed management while attending graduate school. More training is required for both team members to improve this program.

9.2 Monitoring INCRMP Implementation

Installation Supplement

The INCRMP is implemented by various organizations on the installation. They are identified in earlier sections of this plan. The annual review of the INCRMP will be conducted by the CEIE with coordination with installation leadership. Implementation of INCRMP is part of the EIAP which includes development of 813s and CoCs for project execution. Also, 332s are reviewed to ensure NRs and CRs are protected and considered for work requests.

9.3 Annual INCRMP Review and Update Requirements

Installation Supplement

The INCRMP requires annual review, IAW AFMAN 32-7003, to ensure the achievement of mission goals, verify the implementation of projects, and establish any necessary new management requirements. This process involves the NRM and CRM reviewing the INCRMP to assess status of meeting INCRMP goals/objectives; updating the work plans; ensuring that projects are programmed, budgeted, and executed IAW established PPBE processes; and determining internal USAF or tenant units that may be affected and coordinating reviews of any updates to the INCRMP. An Annual INCRMP Review Report will be produced and signed by the Civil Engineering Squadron Commander and posted to the installation eDASH Natural Resources page, Cultural Resources page, and EMP Repository.

10 ANNUAL WORK PLANS

The INCRMP Annual Work Plans are included in this section. These projects are listed by fiscal year, including the current year and four succeeding years. For each project and activity, a specific timeframe for implementation is provided (as applicable), as well as the appropriate funding source, and priority for implementation. The work plans provide all the necessary information for building a budget within the AF framework. Priorities are defined as follows:

- High: The INCRMP signatories assert that if the project is not funded the INCRMP is not being implemented and DAF is non-compliant with the Sikes Act; or that it is specifically tied to an INCRMP goal and objective and is part of a “Benefit of the Species” determination necessary for ESA Sec 4(a)(3)(B)(i) critical habitat exemption
- Medium: Project supports a specific INCRMP goal and objective and is deemed by INCRMP signatories to be important for preventing non-compliance with a specific requirement within a natural or cultural resources law or by EO 13112, *Invasive*

Species. However, the INCRMP signatories would not contend that the INCRMP is not be implemented if not accomplished within programmed year due to other priorities

- Low: Project supports a specific INCRMP goal and objective, enhances conservation resources or the integrity of the installation mission, and/or support long-term compliance with specific requirements within natural and cultural resources law, but is not directly tied to specific compliance within the proposed year of execution

Installation Supplement

Annual Work Plans

Work Plans should extend out to current year plus 4 additional years

Resource Category	Goal	Objective	Occurrence	FY	OPR	Funding Source	Priority Level	PB28 Code*	Standard Title*	Project Number	Description

***Cultural Resources Standard Titles by PB28 Code (excluding CZT/CZC titles):**

***Natural Resources Standard Titles by PB28 Code (excluding CZT/CZC titles):**

INRP	MMA	T&E	MNRA	WTLD
P&F, CN	Mgt, Species	Mgt, Habitat	Compliance Public Notification	Mgt, Wetlands / FloodPlains
Interagency/Intraagency, Government, Sikes Act	Interagency/Intraagency, Government, Sikes Act	Mgt, Species	Plan Update, Other	Monitor Wetlands
Interagency/Intraagency, Government, Sikes Act, CLEO	Outsourced Environmental Services, CN	Mgt, Invasive Species	Recordkeeping, Other	Interagency/Intraagency, Government, Sikes Act
Outsourced Environmental Services, CN	Supplies, CN	Mgt, Nuisance Wildlife	Outreach	Outsourced Environmental Services, CN
Supplies, CN	Supplies, CN, CLEO	Interagency/Intraagency, Government, Sikes Act		
Supplies, CN, CLEO	Vehicle Leasing, CN	Interagency/Intraagency, Government, Sikes Act, CLEO		
Equipment Purchase / Maintain, CN		Outsourced Environmental Services, CN		
Vehicle Leasing, CN		Supplies, CN		
Vehicle Fuel & Maintenance, CN		Supplies, CN, CLEO		
Mgt, Wildland Fire		Equipment Purchase / Maintain, CN		
Plan Update, INRMP		Vehicle Leasing, CN		
Plan Update, Other		Vehicle Fuel & Maintenance, CN		
Mgt, Habitat		Plan Update, Other		
Mgt, Species		Environmental Services, CN		
Mgt, Invasive Species				
Mgt, Nuisance Wildlife				
Recordkeeping, Other				

11 REFERENCES

Standard References *(Applicable to all DAF installations)*

- DAFI 32-7001, *Environmental Management* (Includes UEC Role)
- AFI 32-1015, *Integrated Installation Planning*
- Cultural Resources Environmental Action Plan (EAP)
- Cultural Resources Management Playbook
- DAFI 32-7091, *Environmental Management Outside the United States*
- DAFI 32-10112, *Installation Geospatial Information and Services (IGI&S)*
- DAFMAN 32-7003, *Environmental Conservation*
- eDASH AF/JAOE Legal and Other Requirements List
- eDASH Cultural Resources Home Page
- eDASH Natural Resources Program Page
- eDASH Training Matrix
- Environmental Reporting Playbook
- Environmental Quality PPBE Playbook
- Natural Resources Management Playbook
- Air Force Activity Management Plan Playbooks

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12 ACRONYMS

Standard Acronyms *(Applicable to all DAF installations)*

- eDASH Acronym Library
- Cultural Resources Management Playbook – Acronym Section
- Natural Resources Management Playbook – Acronym Section

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13 DEFINITIONS

Standard Definitions *(Applicable to all DAF installations)*

- Cultural Resources Management Playbook – Definitions Section
- Natural Resources Management Playbook – Definitions Section

Installation Supplement

APPENDIX A ANNOTATED SUMMARY OF KEY LEGISLATION RELATED TO DESIGN AND IMPLEMENTATION OF THE INCRMP

DoD Policy, Directives, and Instructions	
32 CFR Part 187, *Environmental Effects Abroad of Major Department of Defense Actions*	Provides the exclusive and complete requirement for taking account of considerations with respect to actions that do significant harm to the environment of places outside the United States
32 CFR Part 989, *Environmental Impact Analysis Process (EIAP)*	Implements the DAF EIAP and provides procedures for environmental impact analysis both within the United States and abroad.
DoDI 4150.07, *DoD Pest Management Program*	Implements policy, assigns responsibilities, and prescribes procedures for the DoD Integrated Pest Management Program.

DoDI 4715.05, *Environmental Compliance at Installations Outside the United States*	This instruction reissues DoD Instruction (DoDI) 4715.5 (Reference (c)) to update established policy and assigned responsibilities for managing environmental compliance to protect human health and safety outside the United States on installations under DoD control.
DoDI 4715.05-G, *Overseas Environmental Baseline Guidance Document (OEBGD)*	This Guide provides criteria, standards, and management practices for environmental compliance at DoD installations overseas.
Environmental Final Governing Standards (FGS)	A comprehensive set of country-specific substantive environmental provisions; typically technical limitations on effluent, discharges, etc., or a specific management practice, developed in accordance with DoDI 4715.05.
DAF Instructions and Directives	
AFI 32-1015, *Integrated Installation Planning*	This publication establishes a comprehensive and integrated planning framework for development/redevelopment of Air Force installations.
AFPD 32-70, *Environmental Considerations in Air Force Programs and Activities*	Outlines the DAF mission to achieve and maintain environmental quality on all DAF lands by cleaning up environmental damage resulting from past activities, meeting all environmental standards applicable to present operations, planning its future activities to minimize environmental impacts, managing responsibly the irreplaceable natural and cultural resources it holds in public trust and eliminating pollution from its activities wherever possible. AFPD 32-70 also establishes policies to carry out these objectives.
DAFI 32-7001, *Environmental Management*	Establishes the framework for an Environmental Management System (EMS) at Headquarters, United States Air Force (HQ DAF), major commands (MAJCOMs), and at installations
DAFI 32-7091, *Environmental Management Outside the United States*	This Air Force Instruction (AFI) provides information, guidance, and requirements to ensure Air Force environmental programs at enduring locations outside the United States (also referred to as "overseas") achieve and maintain environmental quality as prescribed in AFPD 32-70.
DAFI 32-10112 *Installation Geospatial Information and Services (IGI&S)*	This instruction implements Department of Defense Instruction (DoDI) 8130.01, Installation Geospatial Information and Services (IGI&S) by identifying the requirements to implement and maintain an Air Force Installation Geospatial Information and Services program and Air Force Policy Directive (AFPD) 32-10 Installations and Facilities.
DAFMAN 32-7003, *Environmental Conservation*	Implements AFPD 32-70, Environmental Quality; DODI 4715.03, Natural Resources Conservation Program; and DODI 7310.5, Accounting for Sale of Forest Products. It explains how to manage natural resources on DAF property in compliance with Host Nation/local standards.
DAFMAN 32-7003, *Environmental Conservation*	This instruction implements AFPD 32-70 and DoDI 4710.1, Archaeological and Historic Resources Management. It explains how to manage cultural resources on DAF property in compliance with Federal, state, territorial, and local standards.