

Tyndall Air Force Base

Installation of the Future





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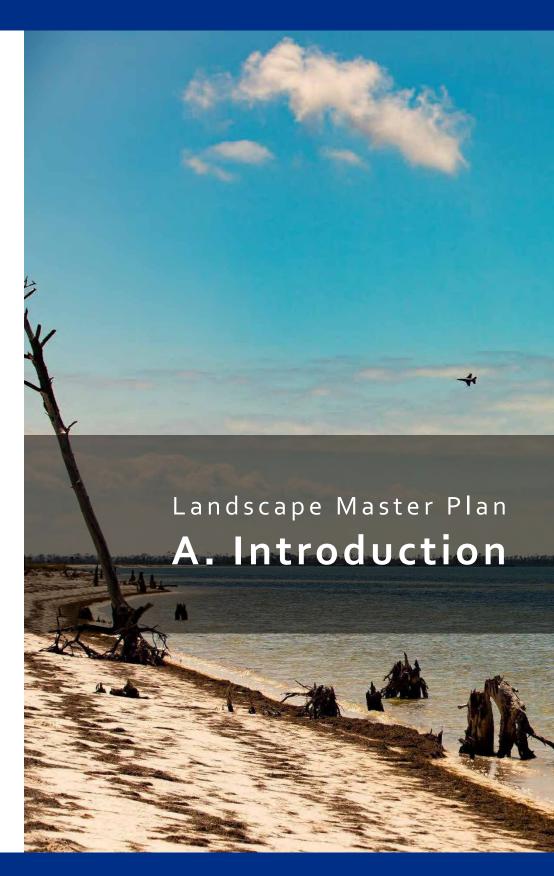




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A. Introduction

Ao1. Purpose

Welcome to the Landscape Master Plan for Tyndall Air Force Base (AFB), the **Installation of the Future**. This plan provides a road map to an innovative and reimagined Tyndall AFB. The Installation of the Future optimizes mission readiness while being sustainable, resilient, and equipped with self-monitoring analysis and reporting technology (SMART).

As demonstrated in the Landscape Master Plan Framework presented in **Section B01**, Tyndall AFB has been reimagined to be mission ready, sustainable, resilient to flooding and wind speed, and smart in terms of technology. The base workforce and families will also enjoy a more walkable and bike-friendly community.

Ao2. Background

To realize its goal of becoming the Installation of the Future, Tyndall AFB is constructing more than 100 new buildings, repairing existing buildings, and improving infrastructure throughout the base. The new buildings include replacing damaged facilities and developing new facilities to support the future F-35 mission. Totaling more than 2 million square feet, the new construction will include hangars, maintenance facilities, administrative offices, operations support, dormitories, a chapel, temporary lodging, and recreational community facilities. This Landscape Master Plan provides guidance and plans for the accompanying paths, landscapes, coordinated parking, utilities, stormwater management, site furnishings, signage, and lighting. These features underscore the base's goal to deploy sustainable, resilient, and smart solutions throughout the installation.

For planning purposes, Tyndall AFB is divided into seven planning districts based on their mission and function, as shown on Exhibit A-1. Although the guidance in this plan is applicable to the entire base, its primary focus is on the ongoing construction efforts the in Flightline and Support Districts.

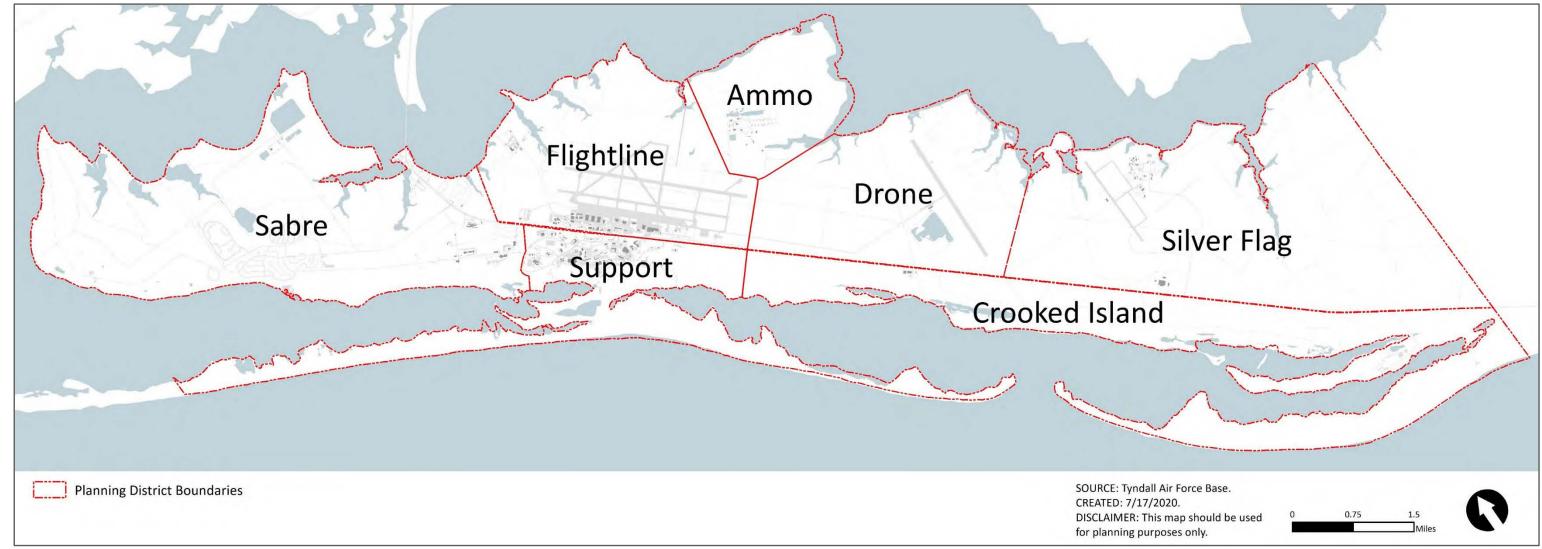
Ao₃. Vision

A vision statement guides decision-making based on an institution's mission. The vision for Tyndall AFB is to be the Air Force's Installation of the Future.

To achieve a vison, goals must be articulated to define positive progress toward that vision. The objective of the base reconstruction is to redevelop Tyndall AFB to be more resilient and sustainable, as well as to incorporate SMART systems. The rebuilding effort incorporates planning and design goals that:

- Support mission readiness
- Facilitate resilient, sustainable, and SMART solutions
- Address storm surge and high wind probability
- Consolidate development to use land efficiently
- Create an approachable, accessible, and safe campus-like base community





Ao4. Authority

The Landscape Master Plan aligns with the U.S. Department of Defense's Unified Facilities Criteria (UFC) program, which streamlines the system-wide planning, design, construction, sustainment, restoration, and modernization criteria across all military and defense agencies. The plan's guidelines also follow the Air Force Corporate Facilities Standards (AFCFS), an enterprise-wide facility program for quality and performance standards.

The Landscape Master Plan guidelines were developed during the post-Hurricane Michael update of the Tyndall AFB *Installation Facilities Standards* (IFS), the local-level facilities guide. The IFS is a comprehensive, base-specific tool that replaces, consolidates, and simplifies existing facilities standards documents, such as the Architectural Compatibility Plan, and organizes information using the same structure, or Table of Contents, as presented on the AFCFS website. The IFS is a component of the base's overall Installation Development Plan (IDP). The updated IFS addresses other important design and construction standards that directly impact Tyndall AFB, including design flood elevation and wind load requirements.

This document is intended for use by the designers/contractors working on Tyndall AFB, as well as the base staff guiding and reviewing their work. All designers/contractors have a responsibility to be familiar and compliant with the overarching UFC and AFCFS requirements while designing to the local IFS and IDP requirements for the Installation of the Future.

In addition to the design details in the Landscape Master Plan, designers/contractors must follow the "Tyndall AFB Design Wind Speeds and Building Envelope Protection" memorandum (HQ USAF/A4C, 27 Aug 2019) and the "Tyndall AFB Design Flood Elevation (DFE)" memorandum (HQ USAF/A4C, 05 June 2019).

Exhibit A-2. Air Force Facilities Guidance Hierarchy



Ao₅. How to Use This Document

Tyndall AFB has a clear vision of its future as a premier resilient, sustainable, and smart installation. This vision includes the ability to withstand disruptions and bounce back quickly to ensure mission continuity and success. It also strives toward sustainability, both in terms of lowering costs and preserving the environment. It must also be smart, deploying advanced technology.

Realizing these visionary goals requires holistic planning that weaves location and spatial analytics into the planning process so Air Force and Tyndall AFB leaders have the required information to make more informed decisions and allow these tools to live on to help consultant firms as they come on board to construct improvements.

This Landscape Master Plan supplements the IFS and should be used as a companion resource for additional detail in the implementation of the required base facilities criteria. This plan includes three additional sections, each organized to provide the appropriate level and scale of guidance, as follows.

Section B – Landscape Master Plan Framework. Based on Tyndall AFB's overarching vision and goals, Section B describes the key base-wide planning methodologies and guidance to achieve this plan's comprehensive vision for the base. Section B introduces specific elements of the framework and presents them graphically. Those elements are further detailed in Section C.

Section C – Site Development Criteria. Building on the planning framework, this section provides supplemental guidance regarding site development design criteria and coordination that is specific to the intent of this plan. The organization of this section is consistent with the IFS and provides the user with details on background for approach, context, priorities, typologies, and elements for the subject areas. The nine site development sections include user-friendly criteria worksheets to use in design development.

- 1. Site Design
- 2. Utilities
- 3. Parking Areas
- 4. Stormwater Management
- 5. Sidewalk, Pathways & Trails
- 6. Landscape
- 7. Site Furnishings
- 8. Pedestrian Signage
- 9. Lighting

Section C provides worksheets for each of the nine site development areas for designers/contractors to review and use prior to completing the **Compliance Checklist** for submittal. The worksheets describe and illustrate the various typologies to be used in the site designs and include specific applicable criteria. Designers/contractors are encouraged to use the checkbox worksheets as a communication tool among their teams and with Tyndall AFB staff. The worksheets include supplemental site development criteria and do not represent all requirements. Each designer/contractor is expected to meet the general criteria listed in **Section A06**.

Section D – Long-Term Maintenance. To provide guidance for maintaining the intent of this plan after construction is complete, this section describes the required long-term maintenance practices for the hardscape and softscape zones and elements.

Compliance Checklist. A Compliance Checklist accompanies this Landscape Mater Plan to provide the designer/contractor and Tyndall AFB with a comprehensive tool to demonstrate compliance with the required criteria. The user-friendly Excel-based checklist enables designers/contractors to indicate compliance with general and specific criteria outlined in this plan, and for base personnel to acknowledge acceptance or concurrence. The Compliance Checklist, which is provided as an appendix to the IFS, is required to be completed for each project.

Ao6. General Criteria

The general criteria listed below represent overarching guidance that much be considered for each project on Tyndall AFB. In many instances, designers/contractors must coordinate with others to determine which requirements must be met for the individual project.

Yes	No	
	GC 1.	Comply with Architectural Barriers Act (ABA) Standards, including updated provisions for outdoor developed areas.
	GC 2.	Comply with antiterrorism requirements and standoff distances, as directed in UFC 4-010-01, <i>DoD Minimum Antiterrorism Standards for Buildings</i> .
	GC 3.	Comply with the detailed design requirements for road safety and traffic control specified in the Federal Highway Administration's <i>Manual on Uniform Traffic Control Devices</i> (MUTCD) and the Surface Deployment and Distribution Command, Transportation Engineering Agency's (SDDCTEA's) Department of Defense Supplement to the National Manual on Uniform Traffic Control Devices for Streets and Highways.
	GC 4.	Comply with applicable UFC and Air Force Instructions (AFIs).
	GC 5.	Comply with AFCFS requirements.
	GC 6.	Comply with the Tyndall AFB IFS.
	GC 7.	Coordinate with Tyndall AFB 325 th Civil Engineer Squadron for specific requirements of the U.S. Fish and Wildlife Service, Bird/Wildlife Aircraft Strike Hazard (BASH) Team, environmental regulations, and maintenance guidelines.
	GC 8.	Coordinate with Tyndall AFB Security Forces.
	GC 9.	Comply with required state and local codes and ordinances.
	GC 10	. Comply with the specific requirements outlined in Sections B and C of the Tyndall AFB Landscape Master Plan.

A. Introduction

Exhibit A-3. Site Plan Rendering







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Bo1. Landscape Master Plan Framework

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Bo1. Landscape Master Plan Framework

Bo1.1 Key Planning Principles

To support the Tyndall Air Force Base's (AFB's) vision of "Delivering the Installation of the Future that is more sustainable, resilient, and smart," this Landscape Master Plan builds on several overarching planning principles that complement the design and construction activities bringing that vision into reality. The illustrative frameworks for those principles, as presented in this section, encompass a holistic strategy for delivering an Installation of the Future. This strategy centers on buildings, people, land, and utility infrastructure, as illustrated to the right.

The Air Force's increased design wind speed and design flood elevation guidance provide Tyndall AFB with a foundation for its buildings and utility infrastructure; however, accomplishing an Installation of the Future requires addressing the land infrastructure and wellness aspects of the Airmen, their families, veterans and other people who work, train, visit, and live at the base. Additionally, realizing an Installation of the Future requires the same level of investment, planning, designing, engineering, and management for the site and land infrastructure as is required for the buildings and utility infrastructure.

This section presents a detailed description of each principle, highlighting their key benefits and influence in the future design of Tyndall AFB. This is illustrated in the framework plans that provide a complete picture of the base layout and ensures the current plans for the base are designed and constructed as outlined in this document.

Planning for the base rebuild efforts is still ongoing and subject to change. The frameworks detailed in this **Landscape Master Plan**, which are founded on Tyndall AFB's vision of becoming more sustainable, resilient, and smart, will remain consistent. The frameworks in this plan expand upon the Department of Defense and Air Force planning standards and requirements.



Bo1.2 Overarching Planning Principles

The overarching principles are presented on illustrative framework plans, which provide the basis of the physical design guidance and layout recommendations described in **Section C, Site Development Criteria**. See Exhibit B01-1 for the Illustrative Landscape Master Plan for the Military Construction (MILCON) Rebuild Program.

B01.2.1 Integrated Land Management

Integrated land management includes solutions that consider the holistic environment in which the project is being executed and is part of the entire system of components in which it will impact. For the main Flightline and Support Districts, the goal is to integrate and synchronize the built environment, such as building layout, road configuration, and utility routing with the natural environment such as revegetation strategies, nature-based infrastructure for stormwater management and sensitivity to coastal resiliency measures. In the main developed areas of the Flightline and Support Districts, the integrated land management strategy overlays the requirements of the *Integrated Natural Resources Management Plan* (INRMP). This includes the use of the approved plant pallet for revegetation to encourage native plant species and eliminate invasive species. It also reduces high landscape maintenance costs and has other non-financial benefits, such as increased shade, stormwater infiltration, and air quality. See Exhibit B01-2 for the Integrated Mobility Framework.

Integrated land management also coordinates the activities upland, with the coastal areas, to ensure the water management strategy is being considered across all land areas. This is important as it relates to mitigating coastal surge and stormwater runoff in extreme weather events.

The south side of the Support District, which is below the design flood elevation of 19 feet, is a land area that had previously been developed and had a large amount of vegetation loss after Hurricane Michael. The revegetation strategy is to encourage wetland regeneration and repair the wetland band that existed pre-development. This will also assist with the water management strategy. These revegetated areas can be multipurposed for off-road pedestrian mobility, as well.

Refer to **Section B04, Integrated Land Management,** for additional planning information, and **Sections C02, Utilities, C04, Stormwater**, and **C06, Landscape**, for more information about the specific typologies and elements of integrated land management.

B01.2.2 Integrated Mobility

Integrated mobility considers all forms of mobility and centers the strategy on creating a walkable environment that is safe, comfortable, and appealing. It focuses the transformation of traditional roadway corridors into "complete streets" that are designed and operated for all users, including pedestrians, bicyclists, motorists and future transit riders. See Exhibit B01-3 for the Integrated Mobility Framework.

The installation-wide integrated mobility framework plan leverages regional investments in the movement of pedestrians and fosters connections through a range of mode typologies. These features are considered in reconstruction activity and amplified for all future planning activities. Refer to **Section B02**, **Integrated Mobility Framework** for additional planning information, and **Section C05**, **Sidewalks Pathways and Trails**, for more information about the specific typologies and elements of integrated mobility.

Most of the integrated mobility elements are planned within the Flightline and Support Districts. The key features of the system are:

- Transition of all legacy roadways and new roadways to complete streets to accommodate all modes of mobility
- Creation of a pedestrian spine through the heart of the Flightline and Support Districts that can be used for autonomous vehicles in a future phase
- A comprehensive sidewalk network that is connected and lit
- A natural trail network that connects to the more remote areas of the base

B01.2.3 Coordinated Parking

Coordinated parking encourages a holistic strategy that considers the entire parking demand for buildings that will remain as well as new construction. It considers each parking "area" as a system and does not distinguish or recognize the "Zone Boundaries" that MILCON is organized around for design and execution. It recommends solutions that avoid an overbuild of surface parking and maximizes reuse of existing parking and paved surfaces. This requires a high level of coordination and design integration.

The goal is to maximize parking efficiency and meet the UFC parking requirements without overbuilding surface parking by being building-centric in the application of parking. There are several solutions to achieve this goal that are defined by the following typologies:

- Shared Parking
- Remote Parking
- Parking Structures
- Efficient-Mode Priority Parking

Refer to Section B03, Coordinated Parking, for additional planning information, Section C03, Parking Areas, for more information about the specific typologies and elements.

B01.2.4 Coastal

Coastal resiliency is critical to achieve mission assurance at Tyndall AFB. The MILCON program is required to adhere to two major design memorandums issued by Headquarters, Department of the Air Force:

- The Design Flood Elevation Memo, which requires all new construction to be built at or above 14 feet in the Flightline District (north of U. S. Highway 98) and at or above 19 feet in the Support District (south of U. S. Highway 98)
- The Design Wind Speed Memo, which requires all new construction and modifications to be capable of withstanding future Category 5 hurricanes with winds ranging from 165-186 mph

To address the coastal resiliency aspects that are not covered by these two memorandums, a case study was executed to evaluate the opportunity to engage resources in the form of funding, in-kind support, technical support, or other measures from external stakeholders to support the implementation of nature-based coastal resilience solutions at Tyndall AFB.

Nature-based coastal resilience solutions are particularly attractive because, in the correct settings, they can be less costly, more self-maintaining, and offer a range of co-benefits associated with nature habitats. These co-benefits include the provision of habitat for threatened/endangered species and areas for recreational opportunities. Nature-based solutions can be used alone or in combination with other approaches to provide multiple lines of defense against storm surge. Another benefit of nature-based solutions is that they are attractive to a range of stakeholders, which could potentially open up new sources of funding. The large areas of varied coastal and back bay habitats surrounding Tyndall AFB provide an excellent opportunity to deploy a range of types of nature-based coastal resiliency solutions.

A recent case study developed four pilot studies to explore the viability of nature-based coastal resiliency solutions at Tyndall AFB. The pilot project descriptions were developed in two meetings in October and December 2019, with input from The U.S. Air Force, U.S. Fish and Wildlife Service, U.S. Army Corp of Engineers, and Jacobs. The four pilots that were developed are:

- 1. Reinforcing the Second Line of Defense
- 2. Alternative Techniques to Promote Dune Growth by Sand Trapping on Barrier Islands
- 3. Strategic Sediment Placement Techniques to Support Coastal Resilience
- 4. Evaluation of Nature-Based Solutions for the Back Bay Area at East Bay

The coastal resiliency projects are presented on Exhibit B01-5. Refer to **Section B05, Coastal**, for additional planning information. Coastal criteria are also included in each part of **Section C, Site Development Criteria**.

B01.2.5 Site Amenities & Furnishings

The image, character, and performance standards outlined for the site amenities and furnishings have been selected specifically for Tyndall AFB to match the architectural design intent and specific weather and climate conditions on the coast of Florida. Special considerations are given for corrosion, sea water inundation, and high sun exposure. See Exhibit B01-4 for the Site Amenities & Furnishings Framework.

The site amenities and furnishings framework is built on the mobility framework and targeting nodes of likely pedestrian gathering areas. It corresponds to the requirements for site furnishings depending on the group or type of building, sustainability measures such as encouraging bicycling through provision of bike racks and key times of reveille where the flag is raised or lowered in ceremonial areas.

There is a specialty area for playground equipment located at the Child Development Center, which is the only location where this exists in the main area of the base.

Near the Physical Fitness Center and Oasis, there will be areas where exercise equipment is placed along a circuit path for physical training requirements.

Refer to **Section C07, Site Furnishings**, for more information about the specific typologies and elements.

B01.2.6 Pedestrian Signage

Tyndall AFB has a unique opportunity to create a pedestrian-centric installation design that promotes non-vehicular travel between mission facilities and base amenities. The pedestrian signage planning objectives are centered on the UFC and expands the general requirements to the extent necessary to add clarity to the requirements for overall signage planning. The intention is to align the signage with the architecture and site furnishings to create a "family" of site amenities. The pedestrian signage is intended to increase the ease of wayfinding and navigation, clearly identify walking and biking routes, and encourage a walkable environment. See Exhibit B01-5 for the Pedestrian Signage Framework.

The pedestrian signage framework is concentrated on signage in dedicated pedestrian pathways that may vary from the traditional vehicular dominated roadway network that is not covered by the UFC. The locational strategy is focused on areas such as building entryways, intersections with high pedestrian crossings, gathering nodes and recreational trails. The image and character is influenced by the architectural design guidelines and should comply with the increased wind load standards for high wind events. The signage approach reflects Tyndall AFB's commitment to creating a multi-modal environment.

Refer to **Section C08**, **Pedestrian Signage**, for more information about the specific typologies and elements.

B01.2.7 Lighting

The lighting plan must be carefully coordinated due to the necessary balance between the base's coastal environment requirements, which has special considerations, and the high security requirements of a military installation. First and foremost, Tyndall AFB is tied to National Security, yet that must be achieved in a manner that does not negatively impact the sensitive coastal habitat. This document addresses lighting criteria in the Flightline support areas, but not the Flightline specifically, as well as in the Support District.

Three distinct lighting zones are outlined:

- Entry Control Facilities (ECFs)
- Sea Turtle-Friendly Lighting Zones
- No Lighting Zones

Highly specialized areas such as the Flightline are not addressed in this document.

The lighting typologies that are specified for both the Flightline District support areas and the Support District are related to:

- Pedestrian mobility along pathways, trails and sidewalks
- · Roadway mobility depending on the volume of pedestrian activity
- Specialty facilities such as the Child Development Center
- · Parking areas

Exhibit B01-8 presents the lighting plan overview. Refer to **Section C09, Lighting**, for more information about the specific typologies and elements.

Exhibit B01-1. Illustrative Landscape Master Plan for MILCON Rebuild Program

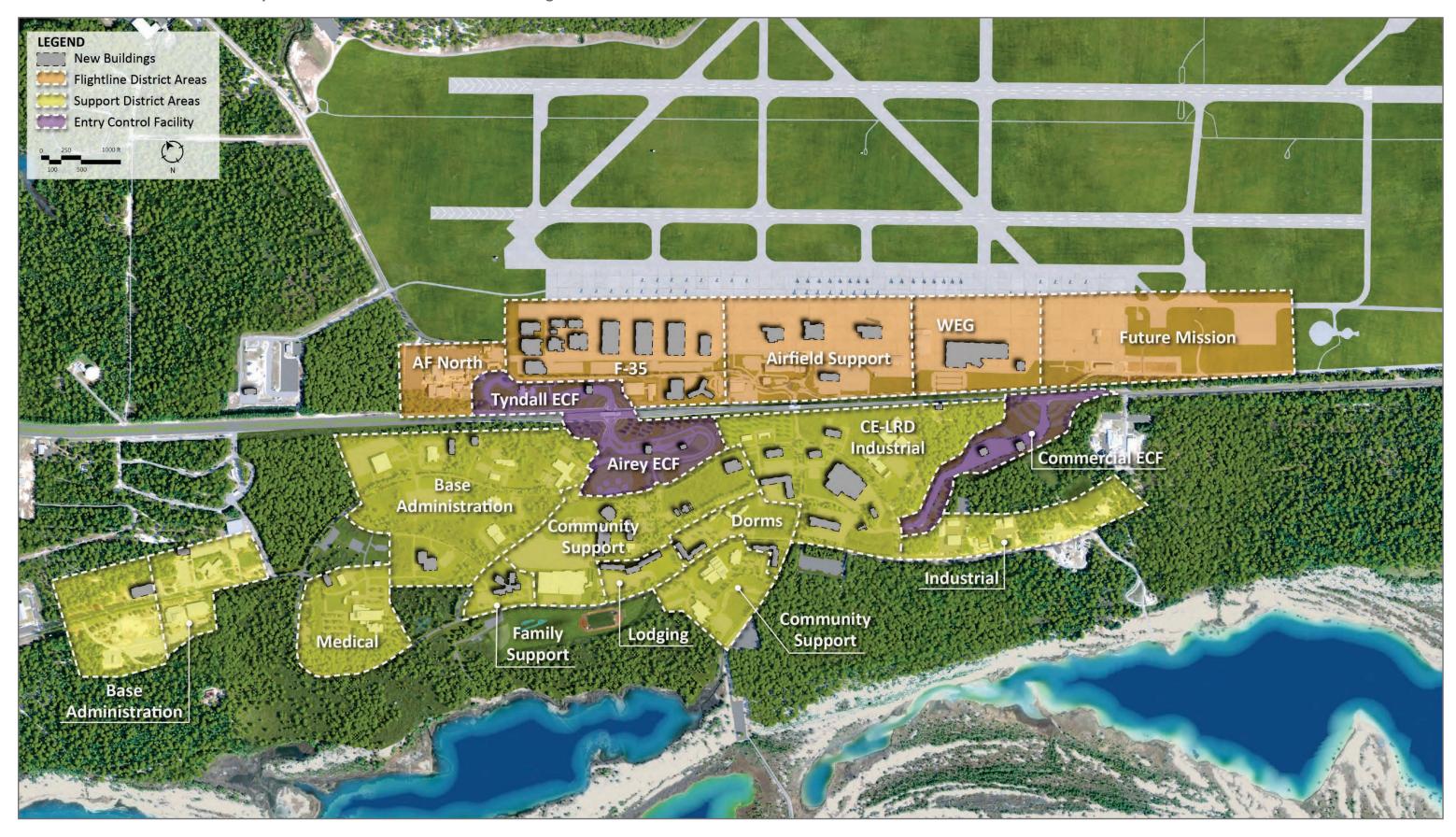


Exhibit B01-2. Integrated Land Management Framework

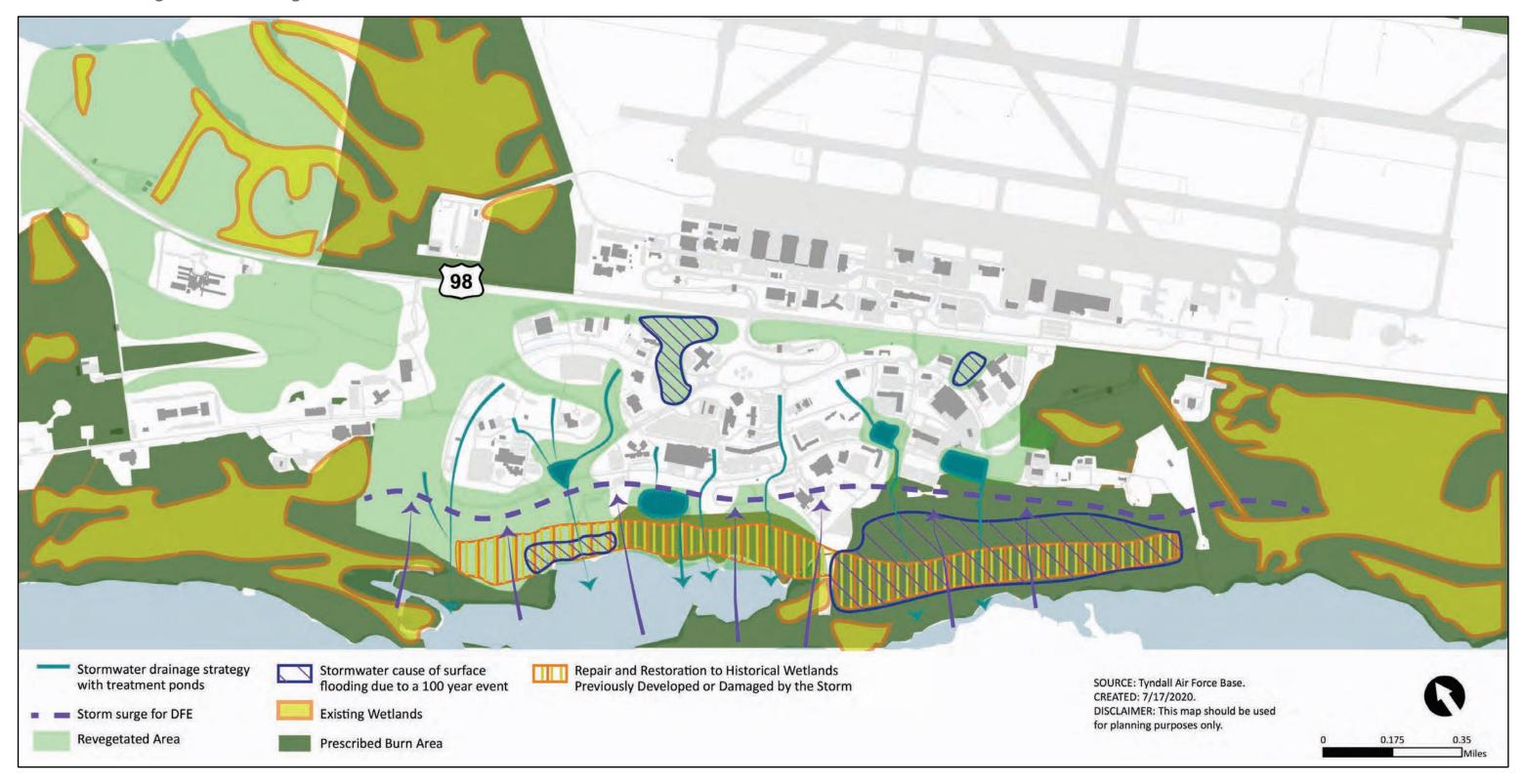


Exhibit B01-3. Integrated Mobility Framework

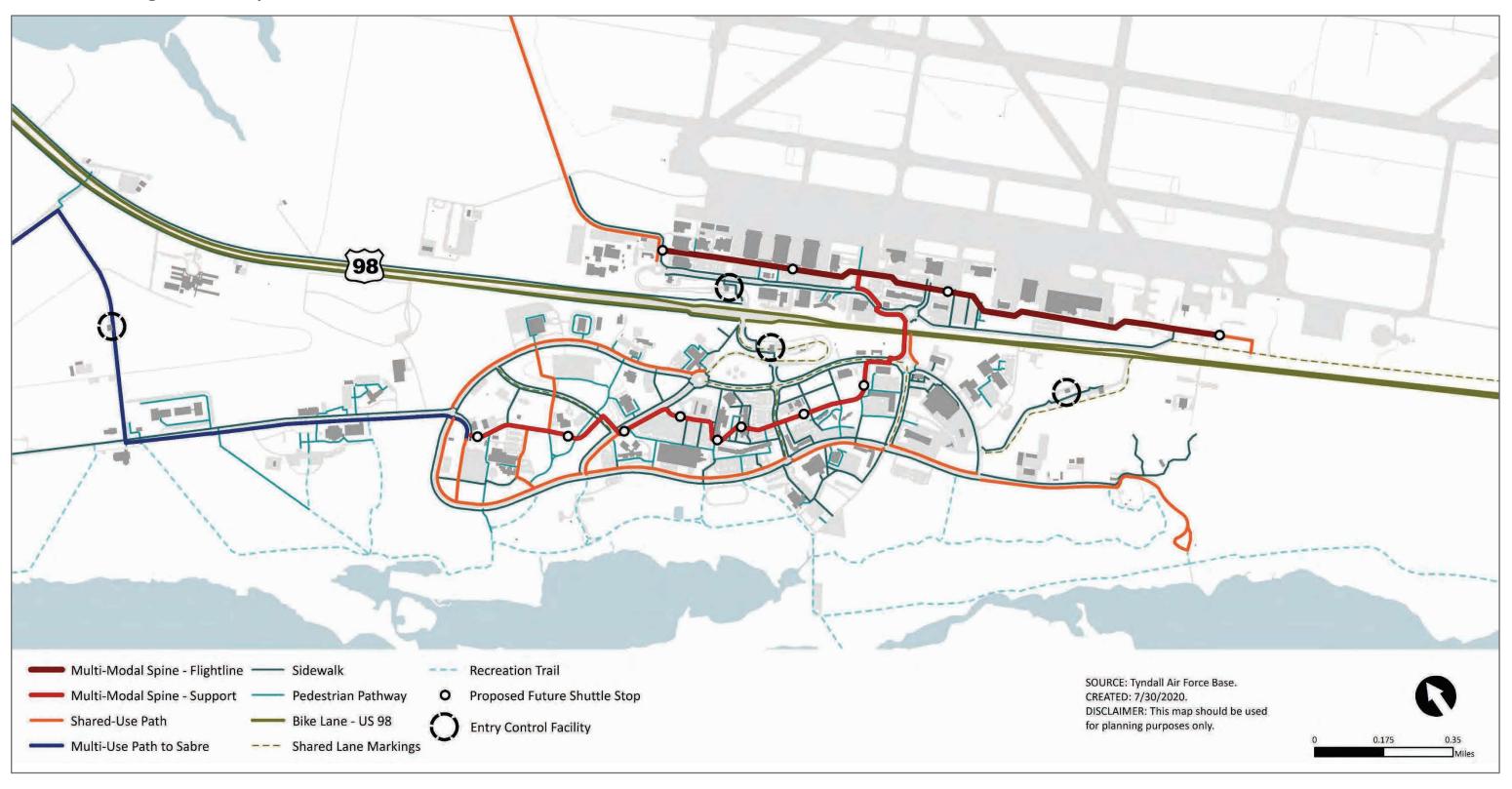


Exhibit B01-4. Coordinated Parking

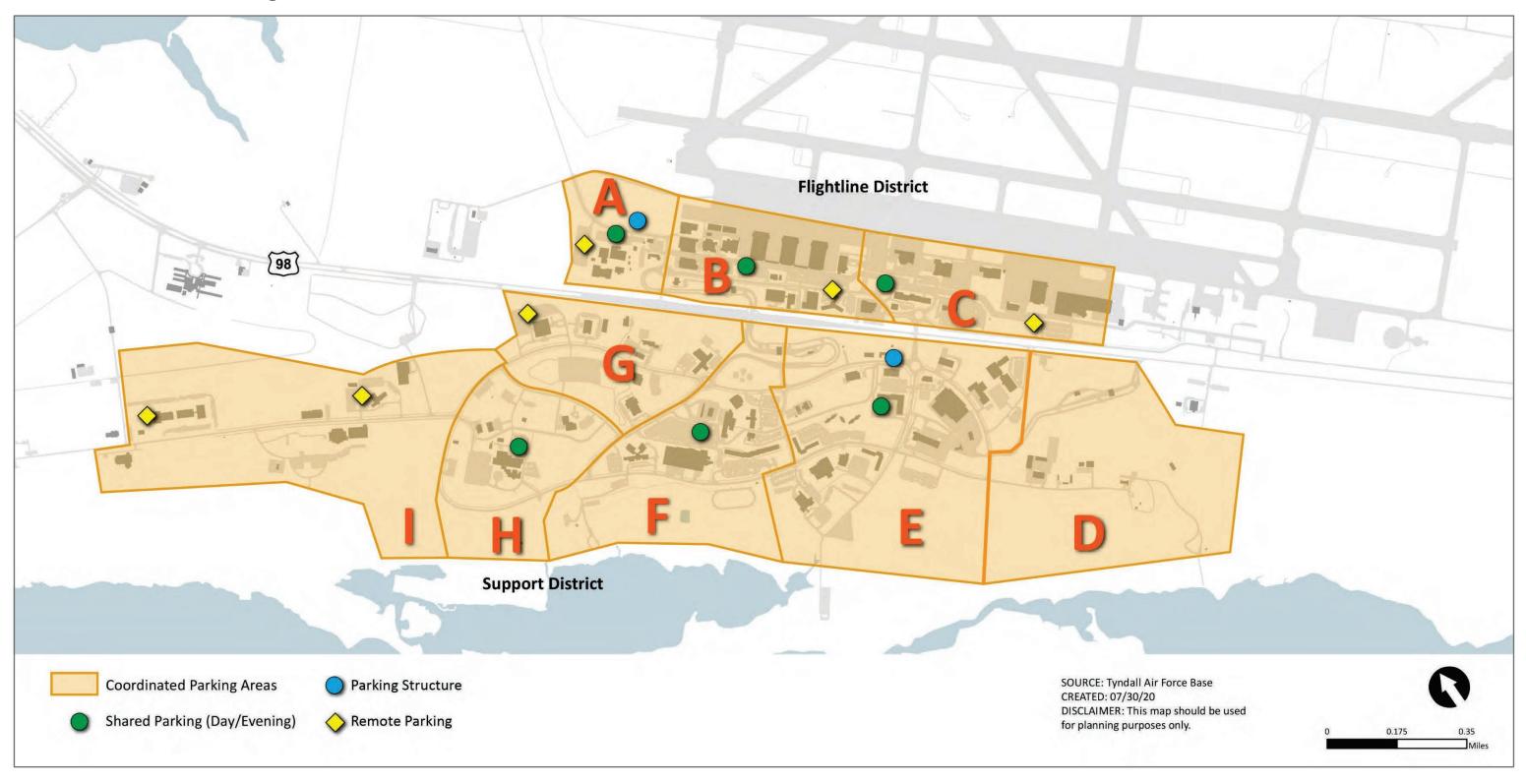


Exhibit B01-5. Coastal Resiliency Pilot Projects

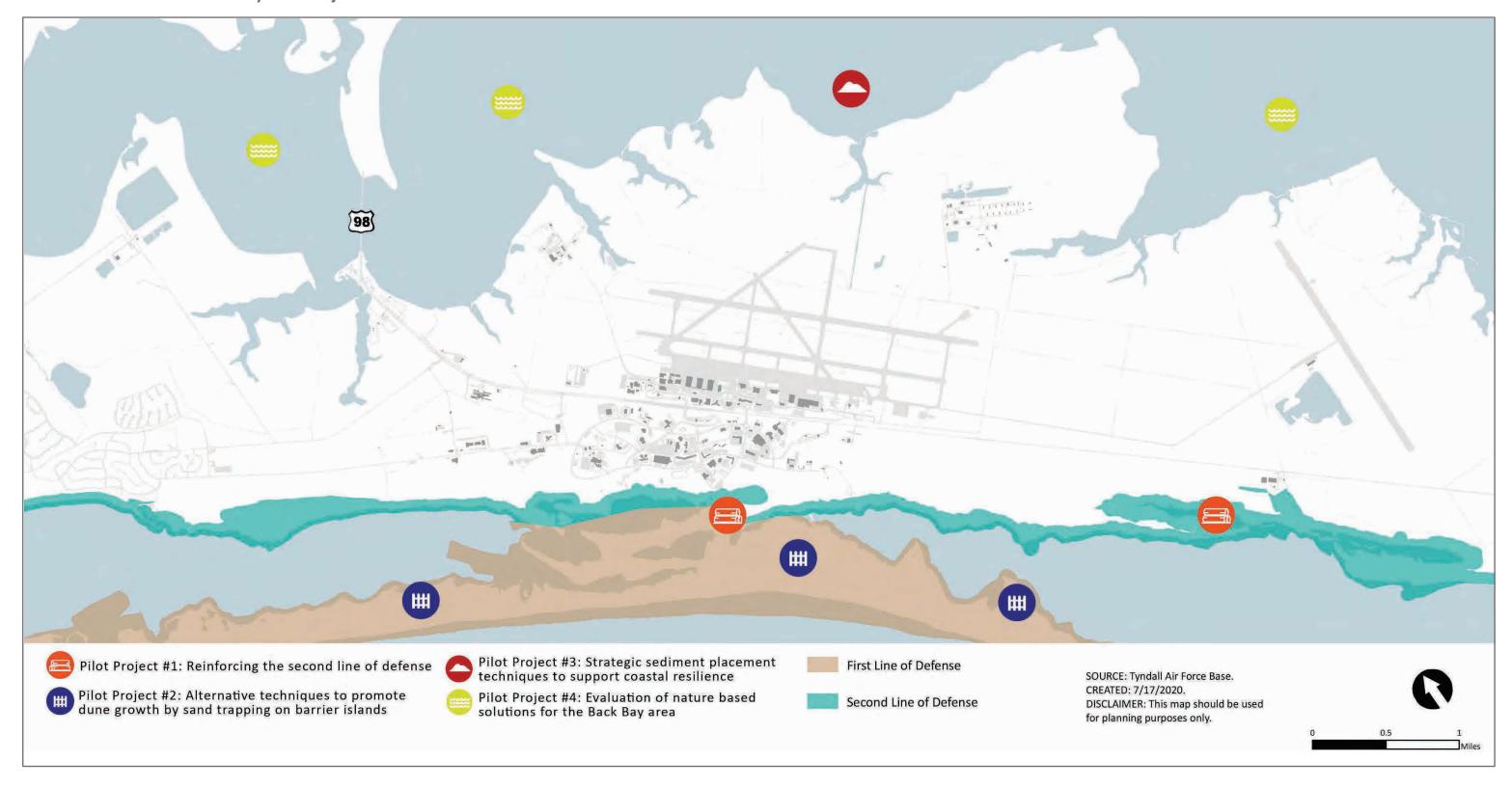


Exhibit B01-6. Site Amenities & Furnishings Framework

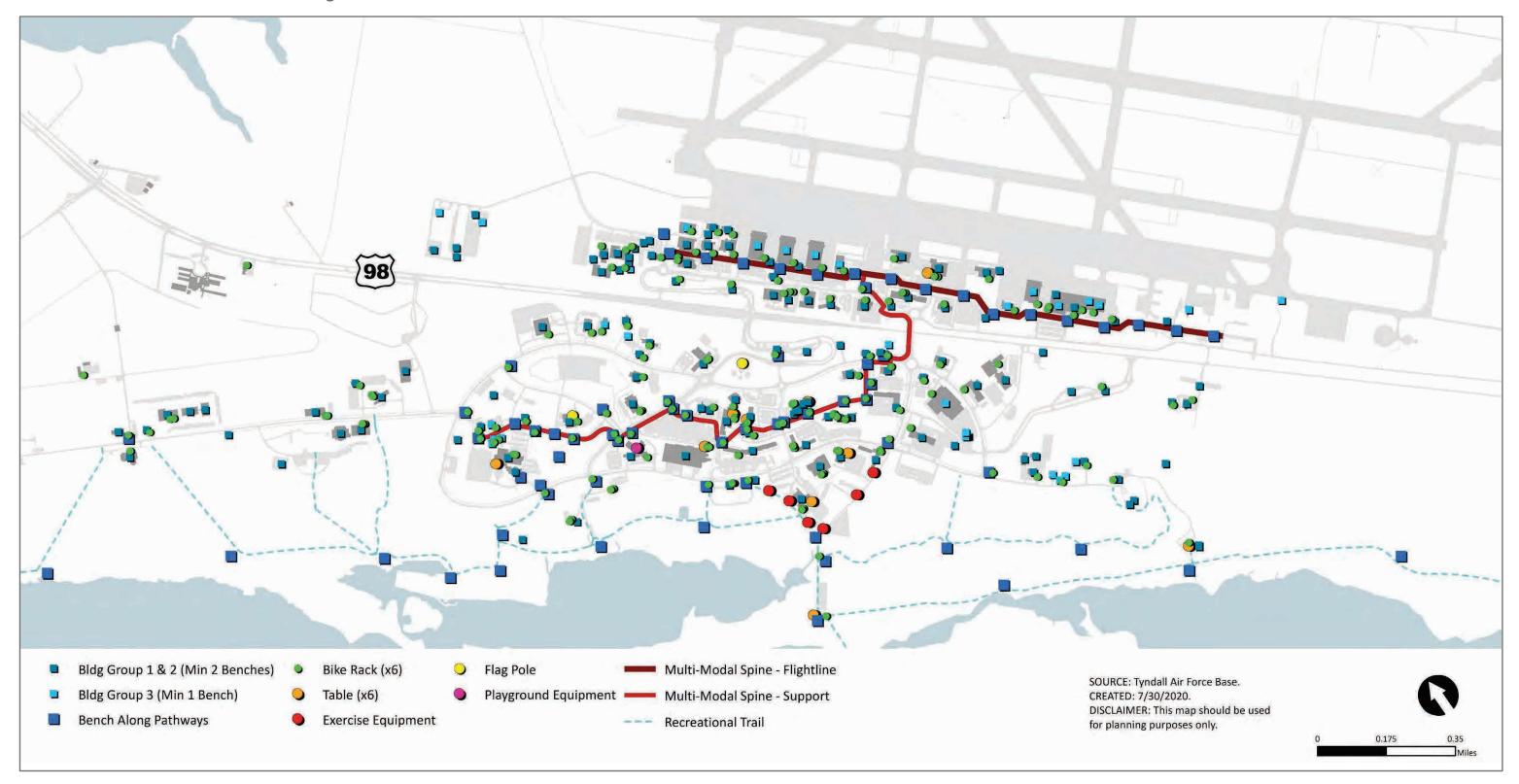


Exhibit B01-7. Pedestrian Signage Framework

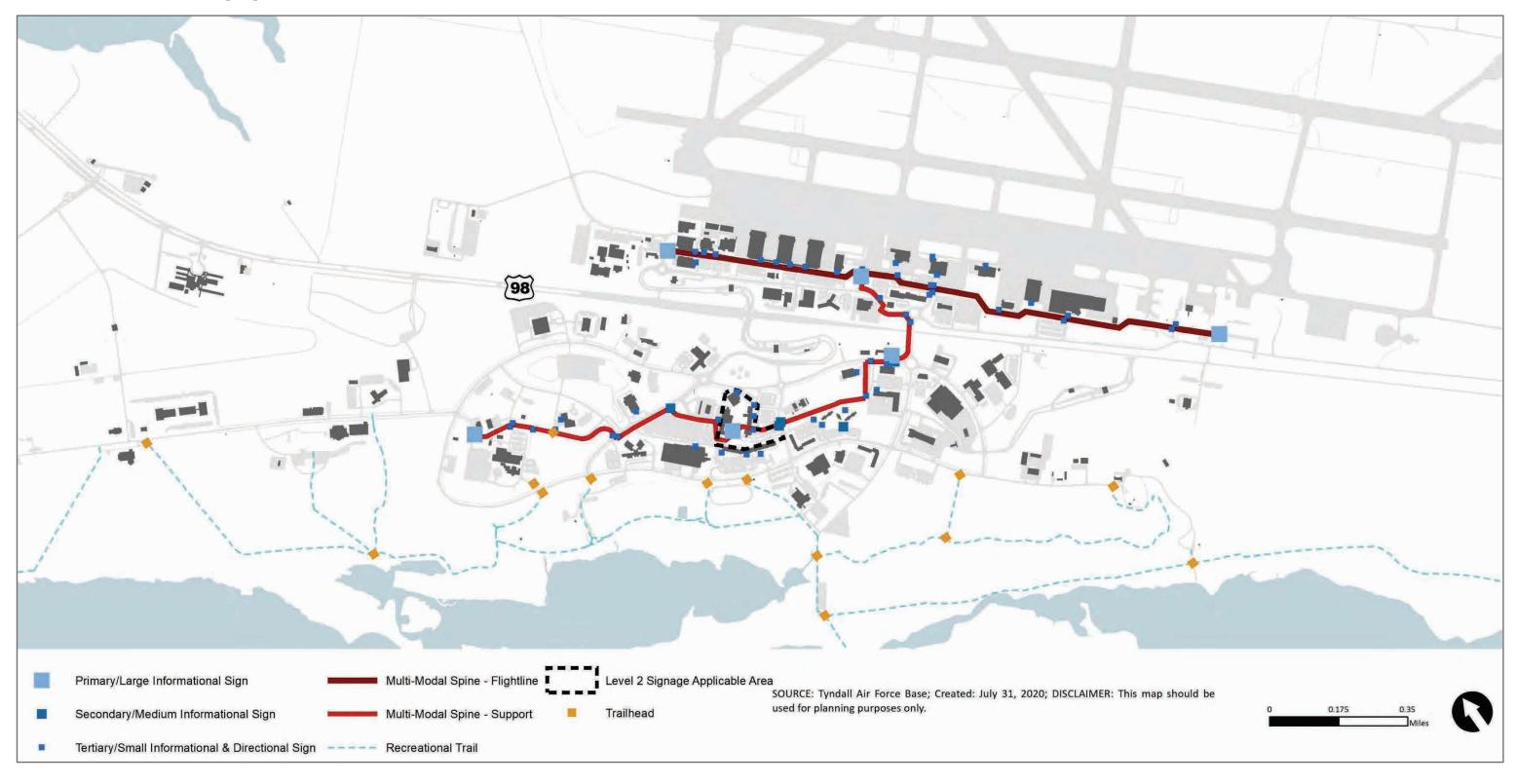


Exhibit B01-8. Lighting Overview

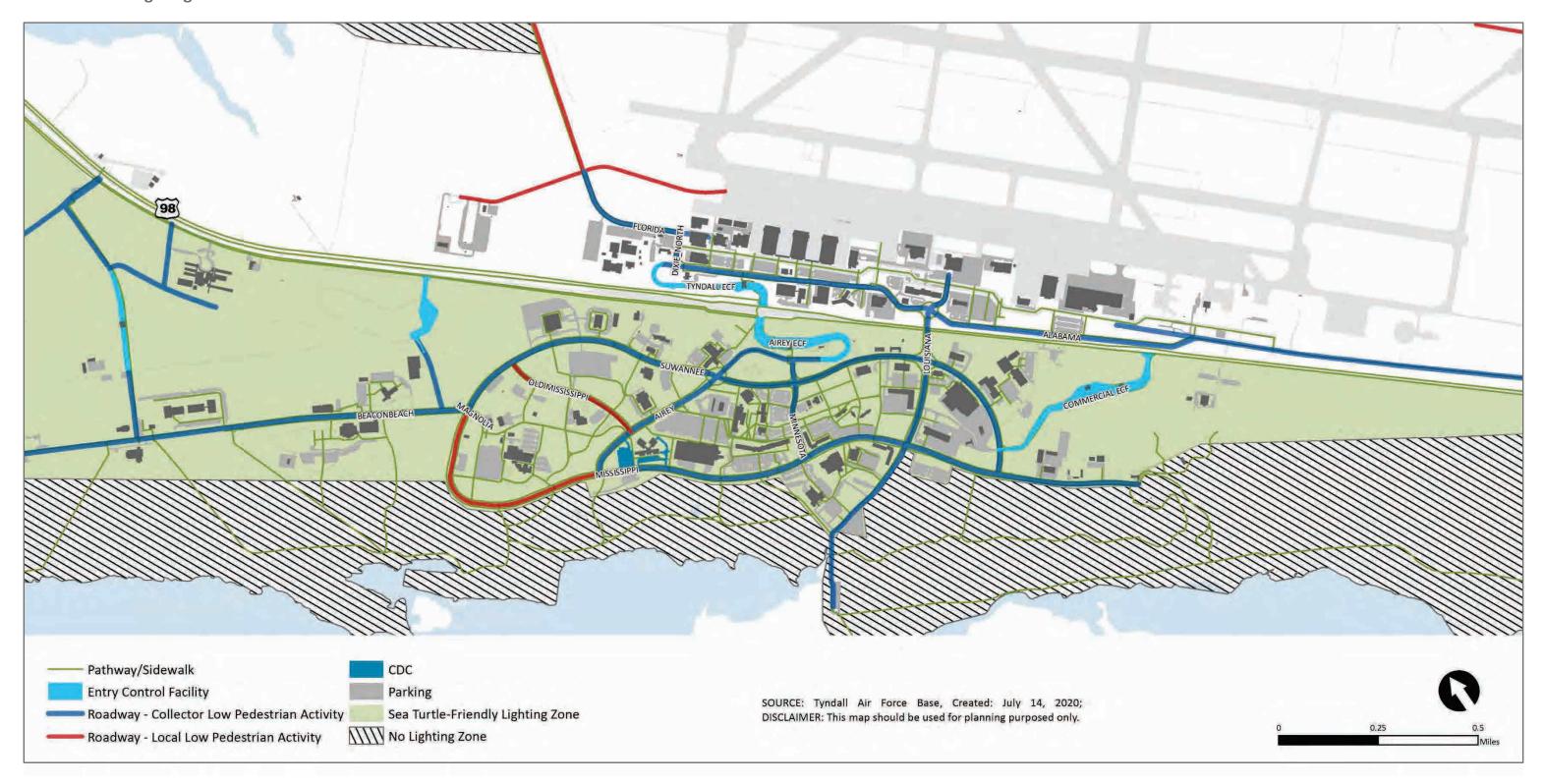




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Bo2. Integrated Mobility Framework

Bo2.1 Introduction

B02.1.1 Goals

To provide safe and reliable mobility to, from, and within Tyndall Air Force Base (AFB) all transportation elements must work together as a cohesive system. One of the guiding principles for creating the "Installation of the Future" at Tyndall AFB is to encourage alternatives to privately owned vehicle (POV) travel for short trips within the base. As with any system, its effectiveness is limited by its weakest element. A balanced mobility system must encompass all modes of transportation both within and around the base.

For Tyndall AFB, the integrated mobility system includes the following elements:

- Regional access between Tyndall AFB and the neighboring communities via U.S. Highway 98 (US 98)
- US 98 interchanges and intersections that facilitate access to Tyndall AFB
- Entry Control Facilities that provide base security and access for personnel, commercial deliveries, and visitors
- Hierarchy of Complete Streets for efficient and safe travel for all modes, and direct access to base parking areas and buildings
- Hierarchy of intersections to allow efficient and safe movement for all modes
- Multi-Modal Spine to encourage alternative transportation, largely separated from POV traffic, and providing convenient access and mobility for all modes (bicycle, pedestrian, and driver-operated or autonomous vehicle [AV] shuttles) between residential and mission areas on base
- Driveways that are strategically spaced based on good access management principles to balance convenience and safety
- Shared parking areas located and connected to maximize the use of parking, while minimizing unused impermeable cover

When well-planned and designed, the above elements provide safe and reliable mobility for the entire Tyndall Community.

B02.1.2 Objectives

A primary outcome of the integrated mobility plan is to contribute to a walkable, healthy Tyndall Community with less reliance on automobiles. This vision of a walkable and healthy installation is justified through the current rebuild master plan and the Defense Department Form 1391 packages that govern the reconstruction efforts. A main organizing element for the pedestrian circulation plan is a central Multi-Modal Spine, stretching across the majority of the Support and Flightline Districts. This tree-lined spine, in combination with a coherent, connected bikeway and pedestrian network, provides safe efficient routes for the base population to travel between the dormitories, Community Common, recreational amenities, base mission areas, and medical facilities. The result reduces the reliance on using POVs for common errands.

Exhibit B02-1. Integrated Mobility Framework

Foundational for its transformation into the Installation of the Future, Tyndall AFB will be reconstructed as an integrated multi-modal base rooted in principles of walkability, bikeability, and harnessing non-POV mobility options.

Goal 1 - Provide for safe, convenient, and enjoyable travel by pedestrians and bicyclists throughout the installation.

Objective 1.1 - Provide safe and convenient bicycle and pedestrian access in all new or improvement transportation projects, unless exceptional circumstances exist.

Objective 1.2 - Provide protected and convenient bicycle parking at destinations.

Objective 1.3 - Provide maintenance of bicycle and pedestrian facilities as part of a regular maintenance program.

Objective 1.4 - Educate bicyclists, pedestrians, and motorists to safely coexist.

Goal 2 - Integrate parking with mobility strategies to encourage a more walkable and bikeable installation.

Objective 2.1 - Reduce unnecessary parking construction and maintenance costs by using improved demand modeling strategies to right-size parking assets.

Objective 2.2 - Locate parking strategically to maximize utility and improve safe, pleasant, and meaningful connections between buildings.

Objective 2.3 – Encourage a mix of campus building uses and types to increase benefits of a shared parking approach.

Objective 2.4 - Promote a "Park Once" strategy and encourage the community to use alternative transportation options on base.

Goal 3 - Encourage transit, bicycle, and pedestrian travel as viable transportation modes.

Objective 3.1 - Create a the Bicycle/Pedestrian Advisory Committee to review installation development plans.

Objective 3.2 - Maintain a Bicycle and Pedestrian Plan.

Objective 3.3 - Make information on local bicycling and walking facilities available to the base personnel.

Objective 3.4 - Develop an onbase bike-share program to promote alternative mobility on installation.

Goal 4 - Provide integrated mobility, connectivity, and access across the installation, especially to the residential, support and school facilities.

Objective 4.1 - Connect the places where personnel and visitors live, work, and recreate by improving and expanding the base's bicycle and pedestrian network.

Objective 4.2 - Adopt a Complete Streets approach for all future street improvements on base.

Objective 4.3 - Support and encourage regional redevelopment using mixed land uses and traditional street patterns maximizing the number of trips made by alternative modes such as walking and bicycling.

Bo2.2 Principle Guidance

B02.2.1 Federal Installation Guidance

Federal facilities and military installations such as Tyndall AFB must conform to a variety of guidelines, sources, and jurisdictions. The following guidance and compliance criteria apply to integrated mobility planning.

United States Code Title **10**, Section **2864**. Master plans for major military installations plans require the following characteristics relevant to mobility:

- 1) Plans Required. At a time interval prescribed by the Secretary concerned (but not less frequently than once every 10 years), the commander of each major military installation under the jurisdiction of the Secretary shall ensure that an installation master plan is developed to address environmental planning, sustainable design and development, sustainable range planning, real property master planning, military installation resilience, and transportation planning.
- 2) To address the requirements under paragraph (1), each installation master plan shall include consideration of
 - a) planning for compact and infill development;
 - b) horizontal and vertical mixed-use development;

Unified Facilities Criteria (UFC) 2-100-01, *Installation Master Planning*. Tyndall AFB projects muct comply with the UFC. Chapter 2 of UFC 2-100-01 provides further definition and guidance relevant to integrated mobility. Pertinent sections to integrated mobility planning are paraphased below:

2-2.6 Connected Transportation Networks. Planners will ensure (through programming projects as appropriate) that uses within each district as well as the districts themselves are thoroughly connected by roads, sidewalks, and bikeways sized to support mission requirements. A connected network of streets is based on a modified grid pattern that affords multiple route options for vehicles, bicyclists, and pedestrians.

Air Force Instruction (AFI) 32-1015, Integrated Installation Planning. All plans for Air Force installations must comply with the criteria set forth in the AFI. Pertinent sections to integrated mobility planning are paraphased below:

6.4.5. Installation Development Plans must include Component Plans.
Component plans are topic specific installation-wide plans, which identify lifecycle management plans for the program or asset group. The Component Plans support the Installation Development Plan by identifying areas or assets requiring investment, preservation, or special management considerations. Individual program managers must maintain Component Plans in accordance with program guidance to support the Integrated Installation Planning process. Component Plans include:

6.4.5.1. Transportation Network Plan

B02.2.2 Planning Principles

The federal installation guidance and instructions affecting transportation and mobility planning require a set of unifying planning principles that optimize the coordination of the supportive planning components of an integrated mobility approach.

To realize the vision and achieve the goals and objectives of integrated mobility on Tyndall AFB, all ongoing reconstruction and future projects will adhere to the following planning principles:

- 1. Build Safe, Universally Accessible Complete Streets. Throughout the base, implement "Complete Streets," as defined by the National Complete Streets Coalition. Streets, sidewalks, and pathways will provide safe, accessible mobility options for all users, including pedestrians, bicyclists, motorists, and transit riders of every age and every ability.
- 2. Orient Buildings to Streets and the Multi-Modal Spine. The organization and relationship of installation buildings to streets and a robust pedestrian/bicycle network and to each other requires careful planning and design. This focus on supporting a truly multi-modal community reflects the base's commitment to integrated mobility.
- **3.** Arrange Community Uses to Support Civic Activities. Mixing support, mission, and residential uses encourages community interactions and fosters an increased sense of belonging for personnel and residents.
- **4. Create a Coherent Fine-grained Pedestrian and Bike Network.** Pedestrian and bicycle access is considered at all scales of the reconstruction and is networked to maximize clear, coherent connections and instill resilience in the mobility system.
- **5. Screen and Place Parking Behind Buildings.** Priority in site organization is given to the streets and pedestrian facilities. Parking areas are placed behind buildings or screened from view.
- **6.** Manage Local Climate Factors through Passive, Place-Based Design. Passive design features such as landscape or tensile structures are used to provide shelter and shade.
- 7. Address the Human Scale with Architecture and Landscape Details. Special detail and design emphasis are applied at the ground level where people interact with and experience the built environment.

Numerous cost-saving and campus-forming synergies may be uncovered by integrating design efforts and balancing these principles with programmatic requirements at the installation scale. For example, the benefits of a holistic planning approach are outlined **Section B02**, **Coordinated Parking**.







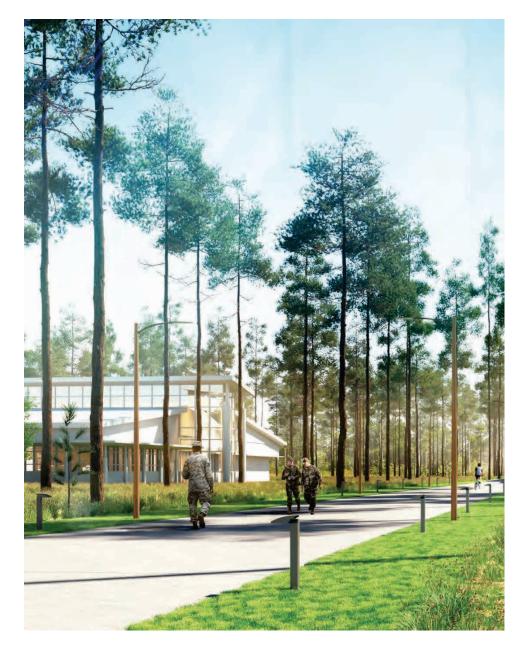


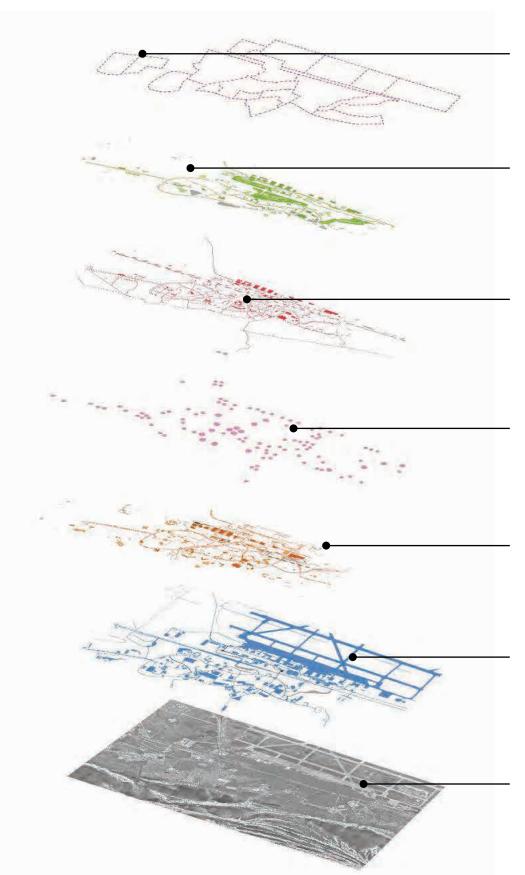
Bo2.3 Planning Approach

B02.3.1 Integrated Mobility Requires Systems Thinking

More than any other element of the Tyndall AFB rebuild, the mobility network will foster connections and opportunities within the different rebuild packages to find cost saving synergies. In addition to fostering connections, the integrated mobility framework must unite the various master plan components and generate relationships for the vertical development.

The components of this plan must be designed and coordinated using a "systems thinking" approach. This holistic approach will yield improved plan organization and function without necessarily adding cost to short-term reconstruction efforts.





Base Policies

Base policy will drive integrated mobility vision and goals as Tyndall AFB moves from today's reconstruction toward future mission growth.

Landscape and Integrated Land Management

Integrated, environmentally attuned landscape and coastal design creates sustainable appealing spaces for motorists, cyclists, and pedestrians, and encourages alternative modes of transportation for trips across the peninsula.

Bicycle and Pedestrian Network

Designated facilities will safely accommodate personnel by bike or foot and encourage the community to use these transportation options as a healthy alternative.

Signage and Wayfinding

Uniform signage and wayfinding will provide user-friendly guidance throughout the installations and enhance the community's experience.

_ighting

Well thought-out lighting will provide both safety and security along routes, bike parking, parking areas, and building entrances.

Motorized Transportation

An improved transportation network with future shuttle/transit and integrated bicycle and pedestrian improvements will calm motor traffic, and minimize junctions among the modes, contributing to safer installation circulation.

A System of Systems

Optimizing, not maximizing, each component will contribute to the success of the mobility framework across the entire development.

B02.3.2 Opportunities & Constraints – Installation-Wide

Proper integrated mobility planning, design, and implementation requires a holistic look at all modes of transportation both on base and regionally. To achieve the vision set forth by the rebuild program, mobility across the entire peninsula must be considered. Any plans or investments in mobility must be developed in alignment with the guiding principles.

When evaluating concept feasibility for mobility plans and designs special consideration will be given to the site constraints. Numerous environmental, cultural, and flooding constraints can impact everything from large-scale alignments to small-scale design solutions. Considering these constraints early and often will contribute to smart, sustainable, and cost- effective implementation solutions. The large number of county-wide rebuild activities offer major opportunities to bolster regional connections by integrating base redevelopment using coordinated mobility strategies. Some of these major redevelopment opportunities include the following projects.

Sabre Housing and Enhanced Use Lease (EUL) Integration

There is a plan to rebuild housing within the Sabre District and a potential EUL development that would both require integrated mobility solutions to connect back to the installation.

City of Parker East Gateway Redevelopment Project

North of the Dupont Bridge, several regional developments are being planned or considered. Tyndall AFB will be an active stakeholder and participant in these discussions to foster improved connections that will yield better mobility choices and activities for personnel and visitors to the base.

In addition to redevelopment activities nearby, there are opportunities for Tyndall AFB to become an active partner in improving regional mobility connections.

New Dupont Bridge

A replacement for the Dupont Bridge is being planned and designed. The anticipated start of construction is 2024. The new bridge will include pedestrian and bicycle facilities not currently provided for in the existing bridge.

Regional Bike-Ped Plans

SUN Trails and Bay County have plans governing regional bicycle connections to support Tyndall AFB in growing its connectivity for recreation and commuting on the peninsula.

Bike Connections on Existing Streets

Ammo, Drone, and Silver Flag are three of the more remote districts for non-POV mobility. There are opportunities to safely and cost-effectively encourage bicycle connections to these and all districts using existing streets with shared-lane markings and a bike share program.

Morale, Wellness, and Recreation (MWR)

Along with the mission and commuting connectivity there are opportunities to establish an expansive MWR program providing access to the pristine natural resources of the Tyndall peninsula, such as Shell Island and Buck Beach.

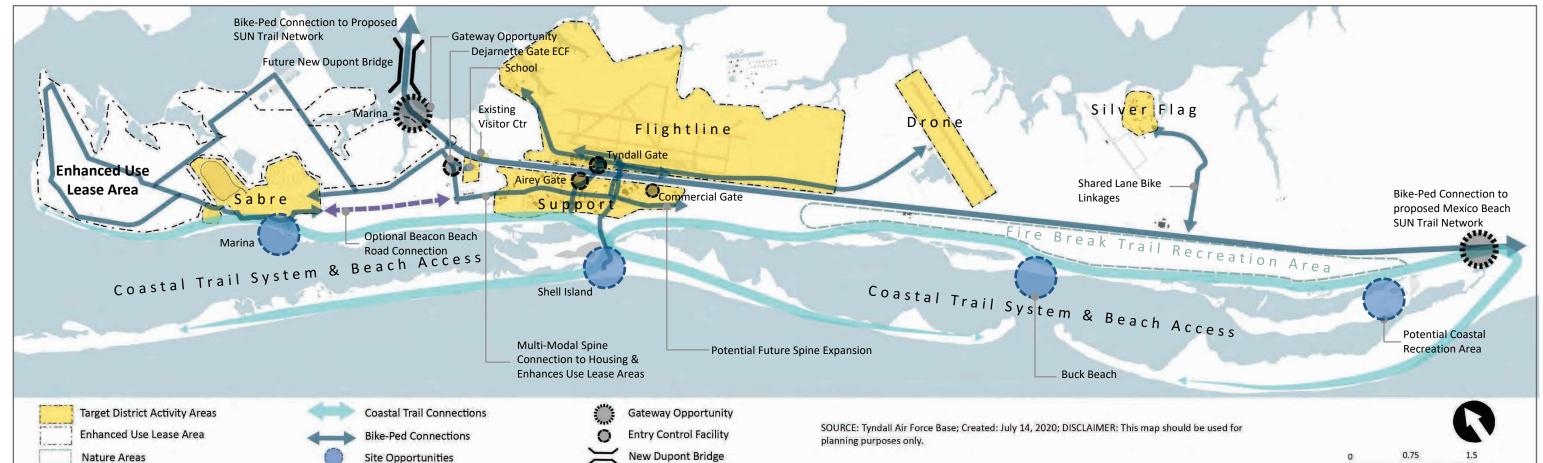


Exhibit B02-2. Opportunities & Constraints – Installation-Wide

B02.3.3 Opportunities & Constraints – Support & Flightline Districts

Most of the trips within the installation start and end in two districts – Support and Flightline. Relatively speaking, the greatest opportunities to make an immediate and lasting impact to integrated mobility for the Tyndall Community will be in this central area of the base. Furthermore, within these two districts, plans and designs will refer to the National Association of Transportation Officials (NACTO) *Urban Street Design Guide* and *Urban Bikeway Design Guide* for best practices relative to the alternative mobility features of the integrated mobility framework. The primary integrated mobility connection opportunities in these districts include the key features and considerations listed below.

The Multi-Modal Spine

The Multi-Modal Spine links these two districts from the intersection of Beacon Beach Road and Suwannee Avenue in the west of the Support District to both ends of the Flightline District. In addition to pedestrians, the Multi-Modal Spine accommodates bicycles, PRT/maintenance vehicles, as well as a future AV system, that could quickly and efficiently allow Airmen to traverse the Support District and connect to the Flightline District. As future growth opportunities are identified, parcels along the spine will be the first choice for dense, urban campus development to occur.

Existing Mobility Facilities

Whether it's the existing streets or certain sidewalks, it is important to consider maintaining and/or repurpose existing, quality pavement where possible to minimize costs while increasing overall connectivity.

Streets

Tyndall AFB's streets must be planned and designed in accordance with the guiding principles and follow the code guidelines established within the *Tyndall AFB Installation Facilities Standards* (IFS). In neighborhood or mixed-use areas, streets will be designed to Complete Streets standards.

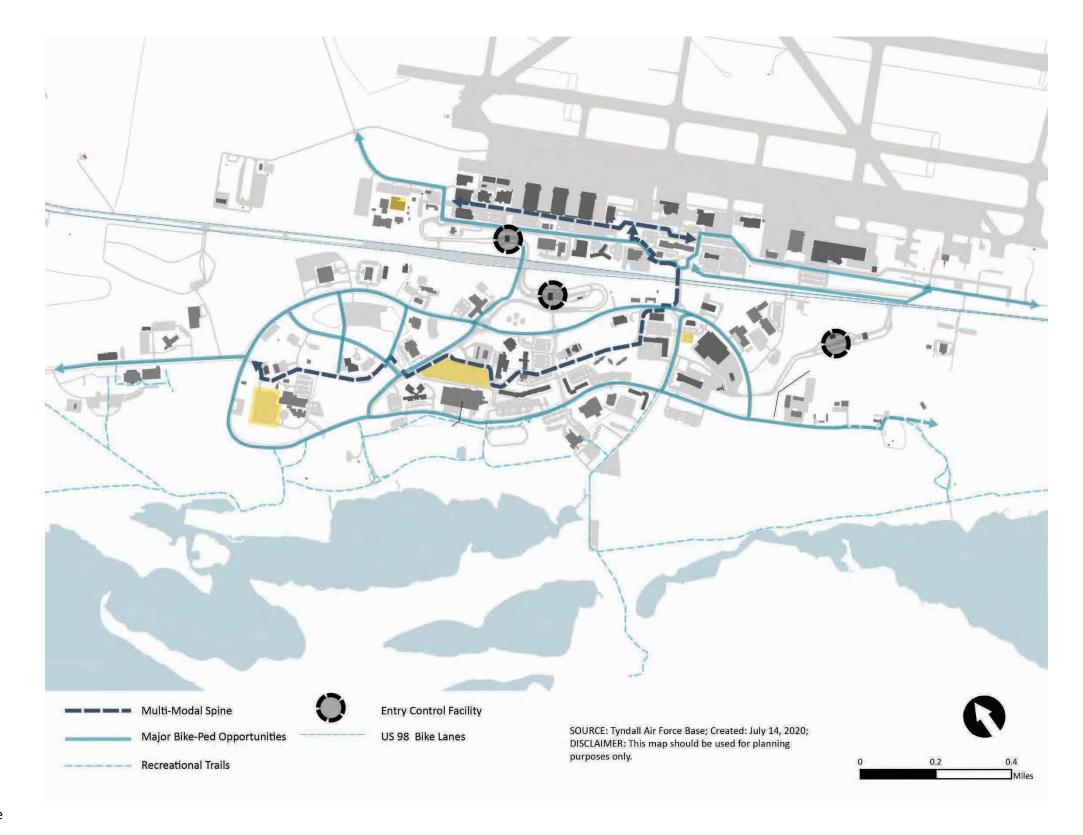
Coordinated Parking Strategy

Parking areas can significantly diminish walkability on base if they are oversupplied or are not coordinated to enhance (and not dilute) the Bike-Ped network. Parking is to be shared between buildings and directly connected to surrounding sidewalks and paths.

Bike Share Programs

The ability for base personnel to access a bike-share program will support non-POV mobility and contribute to the vision of an urban campus environment. Bike share hubs will be considered for the primary trip generators and destinations.

More information on recommended mobility elements and typologies are provided in **Section C, Site Development Criteria**.



Bo2.4 Framework Plan

B02.4.1 Installation-Wide Plan

The installation-wide integrated mobility framework plan leverages regional investments in holistic mobility and fosters connections through a range of mode typologies. These features are considered in reconstruction activity and amplified for all future planning activities. Refer to **Section C, Site Development Criteria,** for more information about the specific typologies and elements of the integrated mobility plan.

Regional Bicycle and Pedestrian Connections

On-base development will leverage state and local investments and adhere to the intent and reflect the goals and objectives of regional mobility plan initiatives.

Installation Streets

Streets within Tyndall AFB have been planned and designed based on the known mission elements within the base, and the resulting demand on those roads. All streets are to be designed to accommodate all modes of transportation, with sidewalks and/or shared-use paths separated from the motorized vehicle lanes by a landscape buffer and/or drainage swale. With US 98 serving as the principle arterial through the base, the remainder of the streets function as local or collector streets, with design elements congruent with their use, speeds, and anticipated volumes.

Sidewalks and shared-use paths are designed in accordance with guidelines from the American Association of State Highway Transportation Officials (AASHTO). All streets and intersections are designed to provide Level of Service D or better. For Tyndall AFB to have a higher level of resiliency the next time a significant storm hits, traffic signals and other high-profile traffic control devices have been eliminated in favor of more resilient choices (such as roundabouts and inpavement lighting).

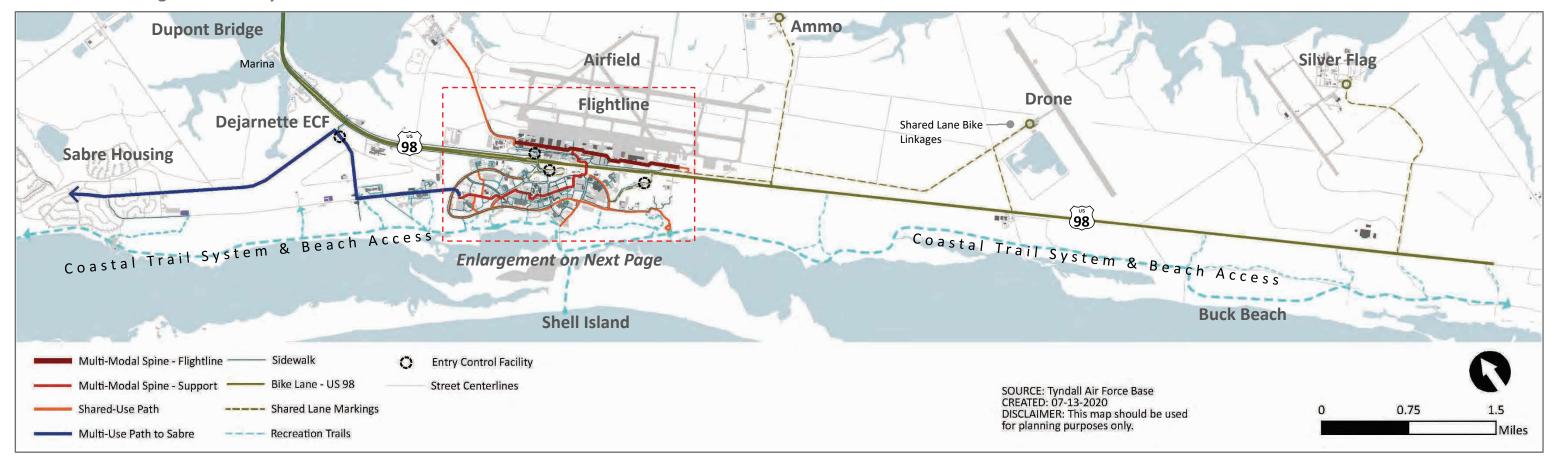
US 98 Bike Lanes and Sidewalks

Bicycles travelling along US 98 currently use a striped shoulder. In some areas, the shoulder includes pavement markings indicating its dedication to bicycle travel. Florida Department of Transportation is implementing a program to provide for bicycle travel along US 98, using shared-use paths separated from the US 98 vehicular lanes.

MWR –Coastal and Recreation Trails

MWR will take advantage of Tyndall AFB's beautiful beaches, unique coastal features, and fire break trails to build a robust and varied trail network. Directional signage and distance markers will be placed at trail heads and at regular intervals.

Exhibit B02-4. Integrated Mobility Framework - Overall



B02.4.2 District-Level Plan - Support & Flightline

Most of the integrated mobility elements exist and/or are planned within the Flightline and Support Districts. In addition to the installation-wide framework plan elements on the previous page, key features of the system are listed below.

Multi-Modal Spine

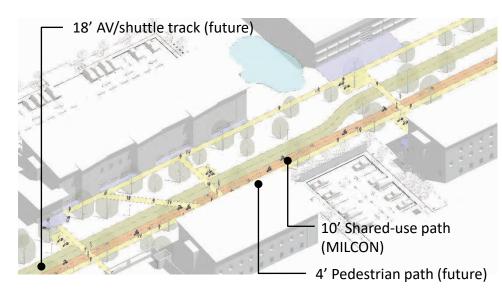
In order to provide a true alternative to POV travel within Tyndall AFB, a Multi-Modal Spine is planned and designed. This Multi-Modal Spine provides an independent mobility alternative to the street system, and includes:

- An east-west spine connecting the majority of uses on the Support side of Tyndall AFB
- A north-south spine connecting the Support and Flightline sides of Tyndall AFB, using the Louisiana Avenue underpass at US 98
- An east-west spine, aligned with the Utility Spine, serving multiple purposes including emergency access, improved drainage and connecting the mission elements on the Flightline side of Tyndall AFB
- 10 shuttle stops serving the major origins and destinations at Tyndall AFB

The Multi-Modal Spine will initially be built with a 10-foot shared-use path for bicycles and pedestrians, with an additional 22 feet of reserved width for future elements including a shuttle (with drivers or using AVs) and additional pavement for increased pedestrian or bicycle capacity.

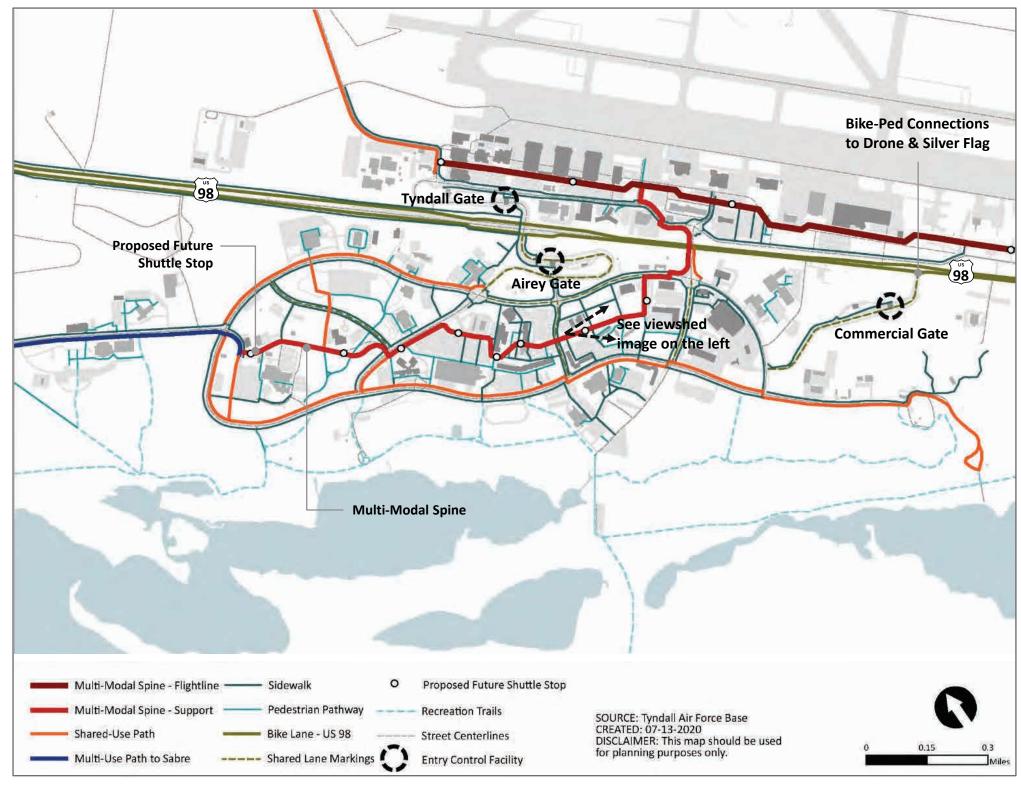
Fine-grained Path Network

The fine-grained bike and pedestrian network is important to connect the spine to all corners of the rebuild program and beyond. This network includes multiuse pathways, shared-use pathways, primary walkways, sidewalks, and trails. Refer to **Section C, Site Development Criteria** for the description of these facilities and supporting components.



Typical Multi-Modal spine condition within the support district showing integration of planning principles

Exhibit B02-5. Integrated Mobility Framework – Support & Flightline Districts



B02.4.3 Recommended Bicycle & Pedestrian Elements

Exhibit B02-6 lists recommended interventions to ensure the sidewalks, pathways, and trail components support a walkable and bikeable installation – a critical aspect of the vision set forth for the Tyndall AFB rebuild program. These interventions include policy, program, and project recommendations. Considering the rebuild is step one of the long-term transformation of Tyndall AFB, it is important for the rebuild designs and plans to coordinate with future policy, program, and project opportunities.

In **Section C, Site Development Criteria,** detailed typologies and element guidelines are provided for the various components of the pedestrian and bicycle mobility network. This system is one part of the larger integrated mobility framework. Each aspect of the master plan needs to be carefully considered and orchestrated to support the mobility goals set forth by the current master plan, the IFS, and the rebuild program.

Exhibit B02-6. Recommended Bicycle & Pedestrian Elements

	Pedestrian Elements	Bicycle Elements	Combined		
Policies	 Reduced dependence on automobiles Maintenance policies related to sidewalks and crosswalks Installation land-use planning and development regulations/incentives that promote walkability Crosswalk enforcement policies 	 Roadway maintenance policies related to bikeways (striping and re-striping bike lanes, clearing debris, filling potholes) Bicycle/transit integration policies Updates to roadway performance evaluation methodology Bikeway encroachment enforcement policies 	 Complete Streets ordinances for Support District and JBLU/ neighborhoods Street connectivity standards Traffic calming, road diet, and speed reduction programs Travel demand management programs 		
Programs	 "Walk the Installation" programs Fitness challenges Pedestrian safety education programs 	 Bike-to-work programs Bicycle safety education programs Bicycle mechanics and maintenance classes Bike sharing 	 Safe Routes to Work (including US 98) Regional alternative transportation system incentive programs 		
Projects	 Sidewalks and pedestrian pathways Crosswalks and median refuge islands Way-finding for pedestrians Outdoor fitness stations 	 Bikeways Shared-use roadway markings Bicycle traffic signals Bicycle boxes and painted bike lanes Bicycle parking and end-of-trip facilities Way-finding for bicycles Bike repair stations with air pumps 	 Multi-use paths/trails Installation transit/shuttle service Grade-separated crossings Streetscape improvements Transit stop facilities for walkers and bicyclists 		





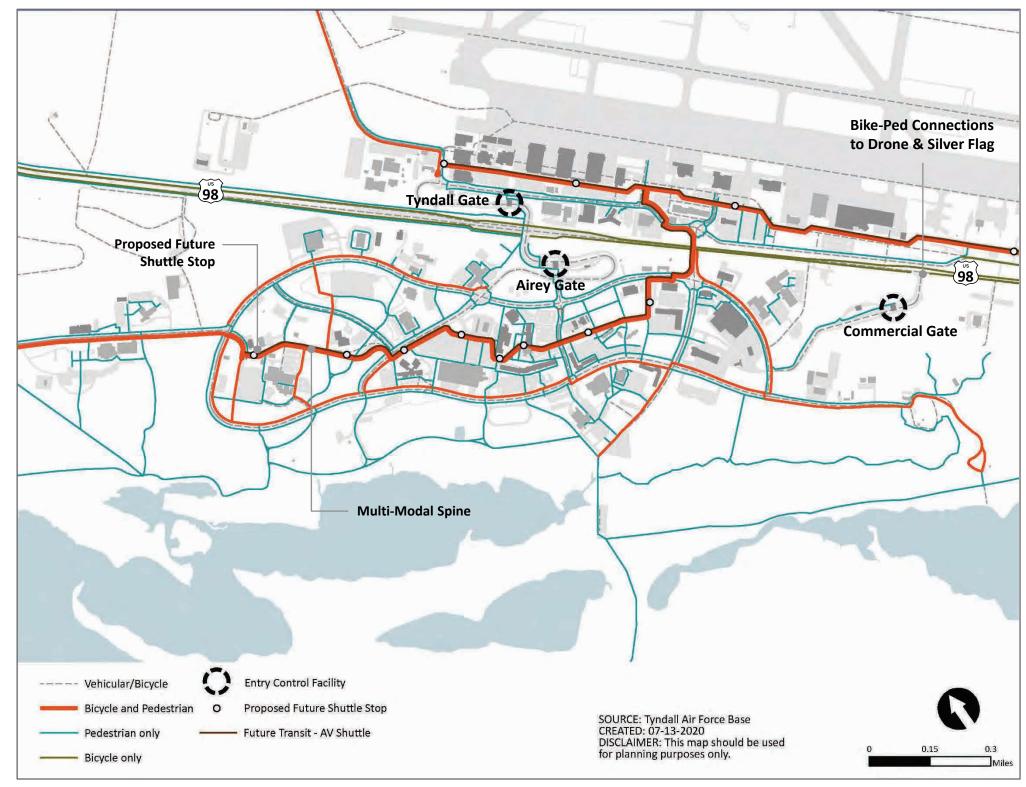


B02.4.4 Non-POV Mobility Mode Diagram

All primary roadways will feature sidewalks and trails, and shared lanes for bicycles. In its entirety, this well-organized and safe pedestrian circulation network will place most primary Support District facilities within a 10- to 15-minute walk for most of the District's population, as reflected in the Multi-Modal Connectivity Analysis.

Exhibit B02-7 shows the various mode types for the mobility features.

Exhibit B02-7. Integrated Mobility Modes



Bo2.5 Framework Prioritization & Implementation

Exhibit B02-8 illustrates the mobility system considered part of the MILCON reconstruction, as well as long range mobility investments to position Tyndall AFB as the Installation of the Future. A matrix of stakeholders and funding opportunities for future phase elements is included in **Section C05**, **Sidewalks**, **Pathways**, and **Trails**.

The renderings below show how the initial investment from MILCON can be enhanced in concert with mission growth and increased investment in alternative mobility options.



Multi-Modal Spine, initial MILCON phase



Multi-Modal Spine, future project TBD – full build-out

Exhibit B02-8. MILCON Mobility System

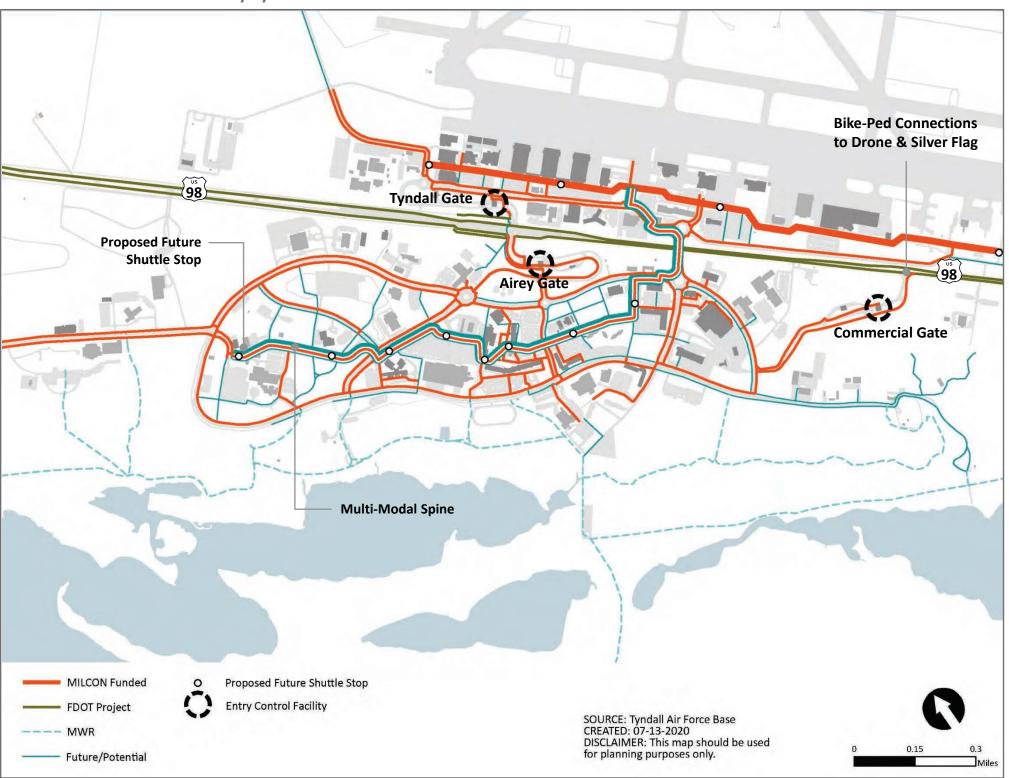




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Bo3. Coordinated Parking

Bo3.1 Introduction

B03.1.1 Framework

Coordinated parking is a broad framework that includes multiple strategies aimed to right-size parking assets on Tyndall Air Force Base (AFB) to reduce unnecessary costs and bolster base mobility in a campus-like environment.

Coordinated parking should be assessed as a key component of Integrated Mobility presented in **Section B02**, **Integrated Mobility Framework**. This section provides data and the methodology to achieve coordinated parking goals and objective described below.

Detailed criteria for Coordinated Parking is described in **Section C03**, **Parking Areas**.

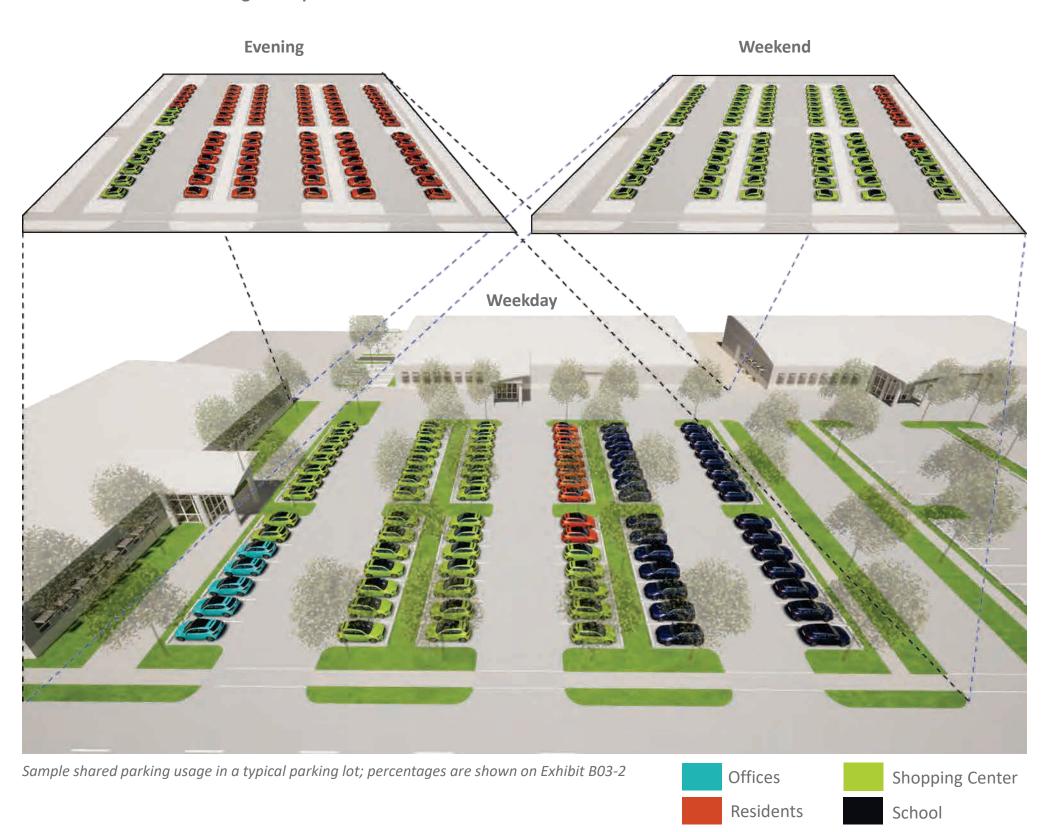
B03.1.2 Goals

- Reduce unnecessary parking construction and maintenance costs by using improved demand modeling strategies to right-size parking assets
- Strategically locate parking on base to maximize utility and improve safe, pleasant, and meaningful connections between buildings
- Integrate parking and mobility strategies to encourage a more walkable and bikeable campus-like base design

B03.1.3 Objectives

- Coordinate site development activities with Tyndall AFB planning staff
- Develop and locate parking assets so they can be shared by surrounding uses when possible
- Use Urban Land Institute's Shared Parking demand methodology to supplement the parking ratios in Table B-2 of Unified Facilities Criteria (UFC) 3-201-01, Civil Engineering, to right-size parking areas and consider nearby facilities and uses
- Allow excess existing pavement to revert to natural permeable state

Exhibit B03-1. Shared Parking Concept



B03.1.4 Key Planning Principles of Coordinated Parking

When individual facilities provide required parking for their anticipated peak demand—as is typical in many vehicle-centric mixed-use environments and reflected in UFC parking ratios—users are encouraged to drive from place to place, parking their vehicles at each location. If adequate parking were provided individually by all (or even most) of the installation's collective facilities, most people would exhibit this behavior and have little incentive to use alternative mobility options such as walking, biking, or potential shuttle services.

Not only would this general status quo in base mobility fail to meet the base's walkability goals, but it would prevent Tyndall AFB from achieving is goal to become the Installation of the Future. A 2014 study by the Institute for Transportation & Development Policy (ITDP) found that shared parking can reduce parking requirements by 20 to 40%.1

The following planning concepts guide the coordinated parking strategy discussion and must be considered in development opportunity evaluation.

View Parking as an Installation Asset

Traditional parking demand is based on individual facilities and their primary functions, whereas mixed-use developments, such as Tyndall AFB, are purposely designed for multiple uses operating in proximity to each other. When the facilities in a mixed-use development all build their own parking areas, there is a disconnect between the purposeful clustering of facilities and the use of land for parking purposes. This disconnect means providing parking based on individual facility use will inevitably oversupply parking and increase the spacing between facilities, both of which significantly diminish the base's walkability.

In a coordinated parking strategy, parking assets are viewed as an installationwide amenity serving all nearby facilities. Not only does this promote the coordination and sharing of spaces, reducing construction and maintenance costs, but also encourages future development to orient facilities in higher densities and increase the viability of connections between buildings.

Use Demand Modeling Best Practices

As is explained in **Section B03.2**, the parking development process supplements UFC 3-201-01 parking ratios with Urban Land Institute's Shared Parking Model parking rates from the ITE Parking Generation Manual, 5th ed. This model is designed for mixed-use developments and assists in identifying potential shared uses and avoid unnecessary cost.

The Sample Shared Parking Usage chart to the right is based on a study of similar mixed-use developments. Whereas each housing or school use has its own needed parking spaces, they do not need them at the same time; school parking is needed primarily during the day and when residential parking is needed in the evenings and on weekends. Employing a modeling process to identify similar opportunities helps right-size base parking assets as well as improve mobility and quality of life.

Benefits of Coordinated Parking:

- Optimize location and size of parking areas
- Reduce parking construction costs
- Minimize runoff from parking areas
- Reduce heat island effect from excess parking



Optimize

Use



Cost



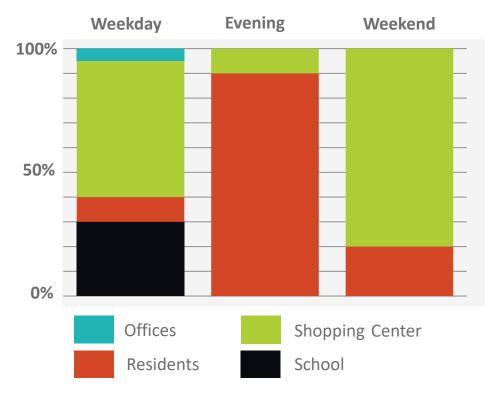


Runoff Reduction

Temperature



Exhibit B03-2. Sample Shared Parking Usage¹



Achieve Installation Goals through Integrated Design

The Tyndall Air Force Base Master Plan states the installation design should "promote campus like environment, live in dorms and walk to fitness... walk to community support, walk to workplace; Monday to Friday without getting into vehicles." Not only will reducing space between buildings devoted to storing vehicles increase the likelihood of achieving this vision but having a coordinated process in each district as described in Section CO3, Parking Areas, that can engage across zone boundaries and between uses will ensure the installation works as a cohesive unit as opposed to a collection of parts in proximity.

Evaluate Parking Development Impacts to Access, Network, and Experience

Detailed more fully on the following page, parking assets must be considered in relation to how they are located on the site and how they connect to surrounding facilities and the installation. Making the primary external connection point (the parking lot) an integral component to the overarching mobility framework will attract users and motivate them to walk or bike for their internal trips rather than moving the car and parking in another lot on base for each successive trip throughout the day.

¹ Kondransky, Michael. 2014. "What is Shared Parking?" *Transport Matters*. Institute for Transportation & Development Policy. December.

Bo3.2 Planning Approach

B03.2.1 Integrated Mobility & Parking Development

Evaluate Impacts

The success around parking and overall base mobility can be focused into three integrated characteristics: Access, Network, and Experience. In initial installation construction and in future programs, improvements in parking planning, design, and development are considered as they apply to these three characteristics. By doing so, a more comprehensive strategy will guide the connections within the installation and a more walkable base can be achieved.

Provide Access

The base's intent for parking areas is to provide access to the surrounding facilities for the predominant mode of travel at the base, which is by personal vehicle. Critical to Tyndall AFB becoming the Installation of the Future, however, is what resources are accessible from the lot once the vehicle is parked. Is the lot discreet to an individual facility with inconvenient or no connections to the wider mobility framework? If so, any trips to other base destinations will require the continued use of a vehicle and will perpetuate increased circulating vehicle traffic within the installation.

The preferred access will include locating parking areas in proximity to multiple buildings and developing connections to not only the immediate facilities but also the proposed bicycle and pedestrian network on base.

Connect to the Network

Strategically locating parking areas with optimized access in mind not only provides more opportunity for shared, or coordinated, parking assets but also improves mobility throughout the base and offers alternatives for internal trips. Parking areas must be viewed as part of the network and have direct connections to network links around the lot even when not tied directly to the immediate facility.

Provide a Choice Experience

Integrated network and base design must provide a user experience that is viewed as beneficiary; a feeling where given the choice, one would choose to walk 5-10 minutes over using a vehicle to travel a quarter-mile away. The majority of daily base functions operate within an accessible area in the Flightline and Support Districts, so making the connections between destinations an attractive alternative has a significant impact on what choice is made.

Critical components in providing a positive experience within the parking areas and the proposed mobility framework, along with their relevant sections in this document for further detail, include shaded walkways (C06, Landscape), available seating (C07, Site Furnishings), informative signage (C08, Pedestrian Signage) and security lighting (C09, Lighting).

Exhibit B03-3. Coordinated Parking Strategy – Access, Network & Experience

Coordinated Parking Strategy – Access, Network & Experience

ACCESS

- Future parking development design evaluated with an intent to:
- » Locate parking in proximity to multiple facilities when applicable
- » Make direct connections to overall network around the lot and the immediate facility

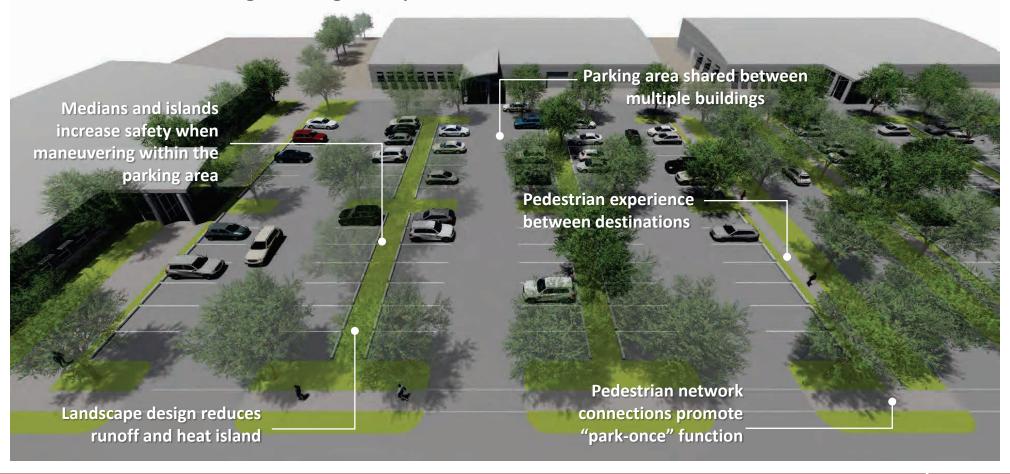
NETWORK

 Enable the ability to "park once" and establish connections around the lot to nearby facilities when available

EXPERIENCE

- Encourage safe walking within parking areas with buffered lanes and appropriate landscaping
- Maintain parking areas and connections along with components that encourage walking by including shade, lighting, available seating, and signage

Exhibit B03-4. Preferred Parking Area Design Concept



Coordinated Parking Methodology

The coordinated parking methodology for Tyndall AFB has been adapted by the widely accepted standards described in the Urban Land Institute publication *Shared Parking (Third Edition)*. This methodology, shown in Exhibit B03-5, compares the parking demand by time of day and type of use, which shows how the same parking spaces associated with a daytime use (for work or school) also can be used by an evening or overnight use (residential).

The coordinated parking concept is also supported by the Institute of Transportation Engineers (ITE) and communities around the world.

The Tyndall AFB coordinated parking analysis used parking ratios from the UFC 3-201-01 related to each of the new facilities on the base.

To develop coordinated parking recommendations for Tyndall AFB, each district or subarea requires specific analysis to determine the appropriate strategies that will meet the distinct goals of each district and the overall base.

A coordinated parking boundary is defined for the MILCON area, shown on Exhibit B03-6, and is identified as a candidate for a coordinated parking strategy:

- Facilities with compatible uses (such as dormitories and retail) that can share parking assets because of the differences in their hourly demand distribution
- Good connectivity between buildings and parking lots
- Proximity (5-10-minute walk) between parking and buildings

The following information describes the coordinated parking area in the MILCON area, summarizes the analyses performed for each coordinated parking area, and presents an example for implementing a shared parking strategy at Tyndall AFB.

Coordinated Parking Areas and Parking Savings

Analysis results displayed below show considerable potential space and cost savings that can be realized through a coordinated design. Each coordinated parking area (labeled A through I) shows the savings in either reduction of new parking to be built or existing spaces that can be returned to their natural state. These results are broken down in the summary tables in **Section B03.4**.

Primary opportunities involve the base's core functions in both the Flightline and Support Districts due to the increased density and diversity of land uses that are more conducive for a coordinated parking strategy.

The coordinated parking area boundaries were determined by logical breaks in development and surrounding land uses. Further coordination could result in shared parking potential across these analytical boundary lines.

For example, although there are significant opportunities to reduce parking in Coordinated Parking Areas E and F, further synergies can be realized between the two as well. This is particularly critical regarding the viability of the comprehensive mobility framework and pedestrian, bicycle, and a proposed shuttle service transecting these areas along the Multi-Modal Spine.

Exhibit B03-6. Coordinated Parking Areas

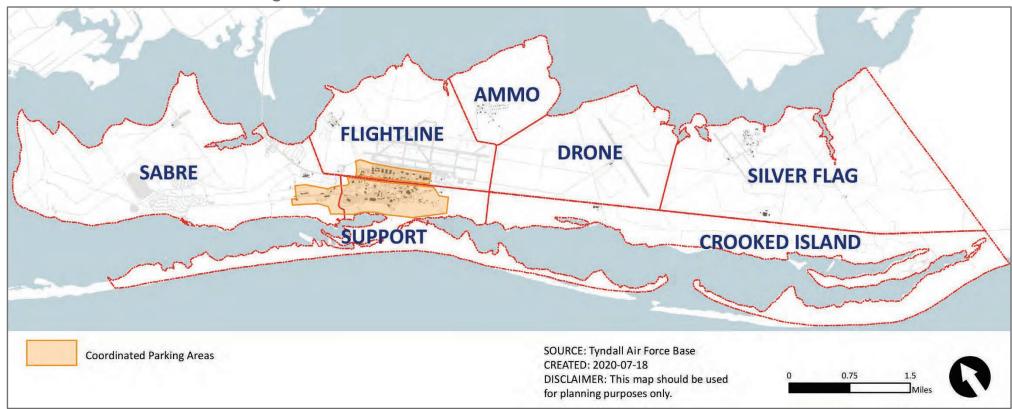


Exhibit B03-5. Coordinated Parking Methodology Flow Chart

Gather / Review Project Data

- Building locations, types, and magnitudes
- Local mode split

Develop Shared Parking Areas

- Walkable
- Compatible uses
- Agreements and direction

Select Parking Ratios

- UFC
- Urban Land Institute/ITE
- Personnel, resident, visitor

Select Factors

- Use type
- Time of day

Calculate Shared Parking Demand

- In coordinated parking areas
- In Flightline and Support Districts
- On Tyndall AFB

Bo3.3 Key Planning Strategies

B03.3.1 Coordinated Parking Typologies

The coordinated parking strategy considers four parking typologies: shared parking, remote parking, efficient-mode priority parking, and parking structures.

Shared Parking

Parking areas are oriented to be accessible between multiple buildings that are close to each other and have compatible uses (that is, differing parking demands based on time of day or day of the week). Using the shared parking demand methodology discussed in **Section B03.2**, these synergy opportunities can be identified and used to direct site design in the following primary ways:

- Location, orientation, and design of the building in relation to existing or future uses
- Parking area location and design provide optimal access to existing and proposed proximate uses
- Connections to sidewalks and trail network are established both toward and away from the proposed building to improve site and overall installation access and mobility

Exhibit B03-7. Shared Parking Concept



Remote Parking

Strategically locate remote parking where special event or occasional overflow parking is needed. Design remote parking areas without raised interior curbs and to be flexible and pervious for multiple uses. Beyond typical parking use, this area could be event parking for remote installation sites and connected via shuttle or a temporary staging space during a response event. To meet installation mobility goals, remote parking should be adequately connected to the bike and pedestrian network.

Exhibit B03-8. Remote Parking Concept



Efficient-Mode Priority Parking

Reserve and designate non-accessible parking spots near building entrances to encourage higher efficiency vehicular options such as carpooling, vanpooling, and electric vehicles. Designate efficient-mode priority spaces with signage and/or pavement markings.

Exhibit B03-9. Efficient-Mode Priority Parking Concept



Parking Structure

A parking structure can be considered where a lack of developable space is available to provide adequate parking assets. The IFS dictates design elements of parking structures. The benefits of a structure in this situation could justify the additional cost in constructing a parking structure if the potential area meets one or more of the following considerations:

- Parking demand for surrounding mission uses exceeds available space and remote parking connected via shuttle and bicycle/pedestrian network is unavailable
- Opportunity to combine adjacent parking lots into a shared parking structure and increase the potential for use of the structure and surrounding areas (thus repurposing the parking asset for a more critical use)
- Parking structure will be located close to available connections such as sidewalks, shared-use paths, and the Multi-Modal Spine
- The parking structure is designed with multi-purpose functionality such as staging area, extreme-weather shelter, or installation utility storage

Exhibit B03-10. Parking Structure Concept



Bo3.4 Benefits of Coordinated Parking

B03.4.1 Life-Cycle Cost Comparison

To compare the potential cost impacts of using a coordinated parking strategy on base, a life-cycle cost comparison analysis was conducted using ECONPAK software and included the estimated capital and operating expenditure for parking facilities on base. These assumptions were based on similar facilities in the region and historical base expenses. The following provides an example as a type of study that should be completed for each district or subarea.

Non-financial benefits of runoff reduction and impact to heat island effect on base that can be expected with a reduction in parking was also considered.

Coordinated Parking Reductions

Under this coordinated parking strategy, 968 spaces that were planned to be built under UFC code and the current rebuild design can be reduced from the program. Assuming a general cost of \$5,000 per space, this would reduce construction costs by more than \$4.8 million. A detailed breakdown of the comparison between the traditional and shared parking demand strategies as it relates to the nine coordinated parking areas is included in Exhibit B03-11.

Exhibit B03-11. Parking Demand Results by Coordinated Parking Area

	Weekday					
Coordinated Parking Area	UFC Strategy	Shared Parking Strategy	Spaces Saved			
А	115	102	13			
В	681	681	0			
С	559	10				
D	90	89	1			
E	2,594 1,952		642			
F	1,222	942	280			
G	675	656	19			
Н	532 529		3			
1	487	487	0			
TOTAL	6,955	5,987	968			

The majority of these space savings come from the core of the Support District where a planned density and mix of land uses make the area conducive for coordinated parking and ensure this critical common area is not diluted by an oversupply of empty parking spaces.

Oversupplied Existing Spaces with Reduced Maintenance

In addition to spaces that can be removed from the program and reduce the build cost for the base, additional "existing to remain" spaces can impact the bottom line by being removed from the maintenance schedule and allowed to return to a natural permeable state over time. This strategy would apply to oversupplied existing parking that can be used for overflow parking as needed.

More than 2,600 existing parking spaces were determined to be "oversupply" using the shared parking model. Counts per coordinated parking area are shown in Exhibit B03-12. Using an estimated \$191 annual operating cost per space, it can be expected that more than \$500,000 in annual base operating expenses can be saved.

Exhibit B03-12. Parking Conversion Recommendations by Coordinated Parking Area

	Weekday					
Coordinated Parking Area	Existing or Planned Spaces	Shared Parking Strategy	Convert to Permeable			
А	623	102	521			
В	844	681	163			
С	1,113	549	772			
D	<89	89	0			
E	<1,952	1,952				
F	1,292	942	350			
G	1,031	656	375			
Н	713	529	184			
I	774	487	287			
TOTAL	8,323	5,987	2,652			

Non-Financial Benefits to Right-Sized Parking Assets

Coordinating parking across the most active portions of the base will accomplish more than reducing base costs. Less impervious surface leads to less stormwater infrastructure needing to be built and maintained. This greater amount of natural surface cover can absorb runoff rather than adding it to the cumulative stormwater system.

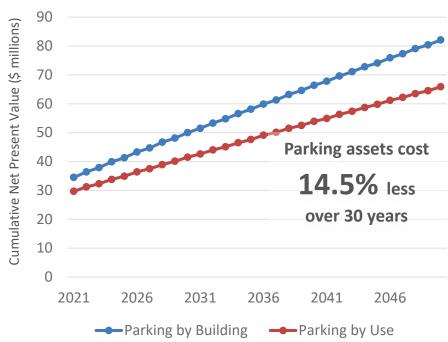
By reducing the number of planned parking spaces to be built and allowing 2,600 spaces to become permeable and eliminating the need to maintain these spaces each year, the amount of runoff that requires stormwater infrastructure would be reduced by an estimated 15.7 million gallons every year. Whereas this comes with significant cost savings on its own, the stormwater impacts to having more than 7 acres of land converted from an impervious state to a permeable one is an added benefit to the base overall.

A reduction in the base's overall heat island effect is an additional direct (and positive) impact of having less parking surface. A heat island effect is created when asphalt reflects solar radiation back into the atmosphere; natural ground cover, on the other hand, absorbs the solar radiation and heat. The average temperature difference between asphalt and grass-covered area with no shade is 29 degrees Fahrenheit, with an increased average of 42 degrees with shade. This significant temperature difference will positively impact mission training and quality of life on base.

Life-Cycle Benefits

The 30-year life-cycle costs considering capital and operational comparisons between the two parking scenarios as modeled by ECONPAK is detailed in Exhibit B03-13.

Exhibit B03-13. 30-Year Life-Cycle Costs



Tyndall Air Force Base Installation of the Future



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Bo4. Integrated Land Management

Bo4.1 Introduction

B04.1.1 Restorative & Resilient Base Restoration

Tyndall Air Force Base (AFB) is dedicated to achieving mission readiness, improved base resilience, and enhanced quality of life through optimized land management practices. These integrated land management design guidelines advance the creation of a base landscape that reflects the restorative partnership between the U.S. Air Force (USAF) and the U.S. Fish and Wildlife Service (USFWS) to advance best management practices employed within Tyndall AFB's *Integrated Natural Resources Management Plan* (INRMP).

These guidelines provide a framework of best practices and performance goals to create sustainable outcomes rather than prescribe site-specific solutions. The designer/contractor will use these guidelines as applicable to their specific project. This effort requires collaboration with Tyndall AFB Natural Resources staff for plant species selection and collaboration with base plan reviewers in incorporating landscapes that perform measurable outcomes in environmental, social, and economic goals. Performance landscapes can provide benefits such as flood protection, maintenance reductions, and mental wellbeing.

B04.1.2 Goals

Integrated land management practices will be employed to:

- Restore and maintain natural base hydrology
- · Align with current efforts in native Longleaf Pine forest restoration
- Improve walkability
- Enhance base character and quality of life
- Minimize environmental impacts to Tyndall AFB's vital coastal ecosystem
- Attract and retain base personnel and staff by making a positive first impression of a sustainable, coastal installation
- Improve mental and physical health and wellbeing
- Design for greater connection to nature which has been proven in reduce stress levels and a decrease in suicide rates
- Reduce infrastructure costs by using grey stormwater infrastructure.
- Implement Low-Impact Development (LID) principles

B04.1.3 Objectives

If adhered to properly, an integrated land management approach to overall base construction and maintenance operations will help Tyndall AFB meet numerous key objectives:

- Improve stormwater management and soil health for reduced maintenance and capital costs
- Reduce heat island effect for walkability and energy conservation by increased shade from tree canopy
- Increase biodiversity and biomass through use of native plants to align with Tyndall AFB Natural Resources Section efforts

- Develop a plant palette that maximizes greater wind resistance and natural stormwater absorption
- Reduce the use of harmful chemicals, pesticides, and herbicides
- Reduce landscape maintenance costs
- Improve air quality
- Minimize tree failures by placing trees in masses, designed as a system with native groundcover vegetation, rather than singular tree installations
- Maximize the use of native groundcover vegetation rather than turf
- Maximize tree rooting strategies to minimize occurrence of uprooting during high winds



Promoting a native landscape contributes to the base's resiliency

Bo4.2 Planning Approach

B04.2.1 Installation-Wide Integrated Land Management

In applying an integrated land management approach one must consider the following as parts of an overall functioning system:

- Soils
- Water and stormwater management
- Vegetation
- Materials and hardscape
- · Human health and wellbeing

These elements must be balanced across the planning, design, construction, procurement, and operations/maintenance phases of implementation. As shown on Exhibit BO4-1, these parts influence and impact the installation-wide ecosystems, the planning and maintenance for the different Landscape Zones, and the design and implementation of projects on individual construction sites throughout Tyndall AFB. Most importantly through proper application of this approach, integrated land management will offer Tyndall AFB multiple lines of nature-based storm defense through creation of a Stormwater Treatment Train.

B04.2.2 Installation-Wide Ecosystem Categories

At a installation-wide scale, Tyndall AFB is categorized into four broad-based ecosystem categories (see Exhibit B04-1) including dry forest, wet forest, wetlands, and coastal. The restoration of historical ecosystems or natural landscapes provides multiple lines of defense against the effects of storm surge and high winds brought by hurricanes, increasing base resilience and mission readiness. Altogether these lines of defense create a Stormwater Treatment Train, that will help mitigate the impacts of future storm events.

B04.2.3 Landscape Zones

Employed from the building scale to the base scale, the base is divided into five landscape zones (see Exhibit B04-1). Each zone is defined by a number of factors including land use, maintenance intensity, funding sources, and their general visual characteristics. When integrated within building sites, open space, and roadways, these community zones can reduce maintenance while providing synchronized co-benefits for the base and mission readiness.

B04.2.4 Additional Resources

In implementing integrated land management on Tyndall AFB, refer to the following sections for further guidance:

- **C01, Site Design**, for guidelines on layout and circulation integration
- **C04, Stormwater**, for guidelines on design and siting criteria of stormwater management elements
- C06, Landscape, for guidelines on plant selection and design
- Tyndall AFB Coastal Resiliency Program
- Tyndall AFB INRMP

Exhibit B04-1. Integrated Land Management Approach



B04. Integrated Land Management

Bo4.3 Components of an Integrated Land Management Approach



B04.3.1 General Soils Planning Criteria

Soils are the foundation to a healthy, functioning integrated land management approach. Properly managed, they support healthy plants, biological communities, and water quality. They are also critical to stormwater management practices by supporting proper water storage, filtration, and infiltration. Restoring damaged soils, protecting healthy soils, and limiting soil disturbance during construction also provides a number of benefits including reduced design complexities, decreased construction costs, and ease of maintenance. The following are best soil management practices recommended for Tyndall AFB.

- Do not compact planting soils more than 85%
- Stabilize soils against soil erosion during and after construction
- Use planting soils that contain 1% to 5% of organic matter content
- Use organic soil amendments such as mature stable compost from local and renewable sources
- Use compost that has a carbon-to-nitrogen ratio lower than 25:1, pollutant concentrations below U.S. Environmental Protection Agency (EPA) regulations, and no viable weed seeds or invasive plant propagules
- Balance quantities of cut-and-fill used in site grading and reuse existing soils instead of importing soils
- Protect stockpiled soil by seeding or covering
- Restore compacted soil to a minimum depth of 12 inches by amending it with organic matter, tilling or ripping to reduce compaction, and restoring nutrient profile of the soil



B04.3.2 General Water & Stormwater Management Planning Criteria

Restoring natural hydrology patterns, implementing water reuse irrigation systems, and protecting and preserving natural water features is critical for advancing stormwater management strategies within an integrated land management approach. Strategies to manage onsite stormwater are critical. These strategies will, promote onsite infiltration, increase evapotranspiration, lower grey infrastructure capital costs, reduce precipitation runoff volumes, and capture pollutant discharges. The following are best stormwater management practices recommended for Tyndall AFB:

- Reduce impervious surfaces and implement previous pavements in parking spots, pedestrian circulation routes, or in low traffic areas
- Where pervious pavements cannot be used, drain impervious surfaces to vegetated areas that use native species
- Minimize turf areas to reduce irrigation demand
- Do not use turf in Maintained and Managed zones where nature-based infrastructure is employed
- Reduce pesticide and herbicide use in land clearing and maintenance activities to protect natural waterways and water bodies, while protecting pollinator habitats vital to Florida's agricultural industry
- Use onsite infiltration strategies, increase evapotranspiration, and reduce precipitation runoff volumes and pollutant discharges by incorporating nature-based infrastructure



B04.3.3 General Vegetation Planning Criteria

An integrated land management approach considers trees, shrubs, and herbaceous perennials as an ecological system that works together. The use of native plants provides ecosystem benefits, such as pollutant interception and removal, better water management, and the provision of habitat for vital regional pollinator species. Preserving and protecting existing natural vegetated systems with thoughtful building siting and site design will also decrease construction and maintenance costs. The following are best vegetative practices recommended for Tyndall AFB:

- Plan and design using common native plant assemblages incorporating trees, shrubs, groundcovers, and other plantings listed in Section C05, Landscape
- Minimize turf use in the Manicured Zone and use low groundcovers or native grasses over turf
- Coordinate tree plantings with light pole planning and siting to minimize tree canopy interference with street and pedestrian lighting for maximum shade and walkability
- Coordinate tree plantings with utility planning and siting to maximize tree canopy on the base, while protecting utility infrastructure against root interference and hurricane damage from downed trees
- Eliminate turf from streambanks and wetland edges



B04.3.4 General Materials & Hardscape Planning Criteria

An integrated land management approach uses material resources that are regionally sourced. Local materials reflect the northern Florida context, while their use supports the local economy. In addition, to reduce energy costs and promote walkability materials must promote stormwater permeability and exhibit a low percentage of solar reflectance for maintaining cooler surfaces. Landscape design around hardscape and along corridors should also incorporate the tree canopy to maximize shade and reduce the heat island effect. The following are material and hardscape planning best practices recommended for Tyndall AFB:

- Maximize hardscape materials with a minimum Solar Reflective Index of 29 to reduce energy demand and increase walkability
- Use materials and products that have recycled content or seek opportunities to reuse or repurpose materials slated for disposal



B04.3.5 General Health & Wellbeing Planning Criteria

The retention of personnel and attraction of recruits to Tyndall AFB is vital to the sustainability of mission and resilience in executing mission. Planning and designing the base using an integrated land management approach fosters a greater connection to nature and its natural processes which has been linked to stress reduction, healthier lifestyles, and reduced anxiety, depression, and suicide rates. To help accomplish this, the following health and wellbeing planning practices are recommended for Tyndall AFB:

- Plan and design outdoor spaces to promote social interaction with favorable views of nature, shaded, and conducive to relaxing activity
- Locate public spaces away from mechanical systems, traffic noise, and unsightly views when possible
- Use plant species that provide varying textures, fragrance, and color in public spaces

Bo4.4 Categorization of Ecosystems

B04.4.1 Alignment to the Tyndall AFB Integrated Natural Resources Management Plan

Tyndall AFB is in a unique position to align best management practices in the INRMP and apply them across USAF building sites, corridors, and open space. These best practices mirror the implementation goals in the design and maintenance of performance landscapes, which rely on natural assemblages of native plants that must be applied within built environments.

Native plant communities are assemblages of plant species whose composition are typical of indigenous plant communities in an Ecoregion. A plant palette has been developed in close coordination with Tyndall Natural Resources personnel to align with mission and safety specific requirements which are adapted to Tyndall AFB Florida Natural Area Inventory (FNAI) Plant Communities assemblages.

The 13 major natural resources identified by FNAI are categorized into Dry Forest, Wet Forest, Wetlands, and Coastal. This will guide all future development at Tyndall AFB when identifying native plant assemblages to align with the INRMP. The full Tyndall AFB Master Plant List palettes draw from the following ecosystem categories are appropriate for use on the base.

Dry Forest

Corridors and open space with soils and hydrology conditions allowing infiltration of overland water flows within 72 hours or less. Roadway corridors and parking areas must balance elements of aesthetics, safety, site disturbances, and ecology that use desirable native vegetation within regularly maintained areas of the base. These areas are considered the Urban Forest. Areas of the Urban Forest that have an herbaceous groundcover but do not include tree canopy are Groundcover Dominant.

Dry forests use native plant assemblages found in FNAI Plant Communities, such as Sandhill-Longleaf Pine Forest, Mixed Hardwood-Coniferous, Upland Hardwood Forest, and Scrubby Flatwoods.

Wet Forest

Wet forest is a diverse category that includes wet and mesic flatwoods and wet prairies and can include a diverse herbaceous understory with little or no midstory shrub component. Wet forests also include open space with soils and hydrology that exhibit standing water within the subsurface or at the surface with a maximum depth of 2 feet, and do not infiltrate overland water flows within 72 hours. Wet forests are also found in open space with high groundwater conditions.

These areas maximize base-scale amenity strategies in stormwater design by incorporating a balance of moisture tolerant trees, shrubs, and groundcover species.

Wetlands

Open space with soils and hydrology influenced by high groundwater depths and/or standing water within the subsurface or at the surface greater than 2 feet deep, and do not infiltrate overland water flows within 72 hours.

Wetland areas incorporated within Maintained zones must include base-scale amenity strategies within open areas for managing stormwater with vegetated littoral zones where water depths or other conditions limits tree canopy installations to water edges. Wetlands use native plant assemblages found FNAI Plant Communities such as Mixed Scrub-Shrub Wetland, Depression Marsh, and Natural Lakes and Ponds.

Coastal

Coastal areas are open space within the Managed Zone that comprise tidally influenced lands near the Gulf of Mexico and the East Bay.

These areas contain native plant assemblages conducive only to the coastal environment at Tyndall AFB and contain FNAI Plant Communities such as Salt Marsh, Sand Dunes, Coastal Dune Lakes, and Tidal Flats.



Tyndall AFB's coastal areas contain native plant assemblages conducive only to the coastal environment at the base

Exhibit B04-2. Land Cover

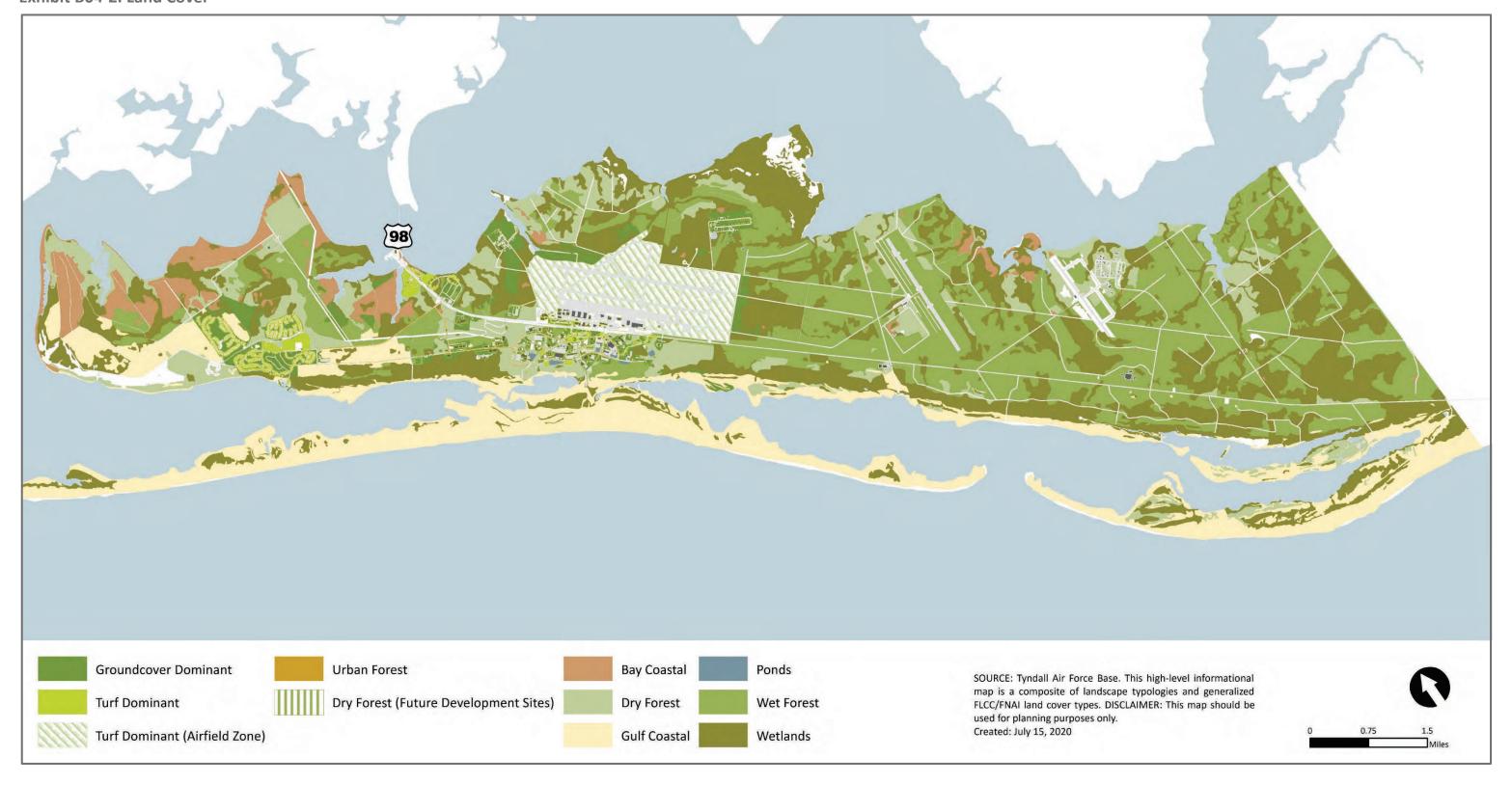
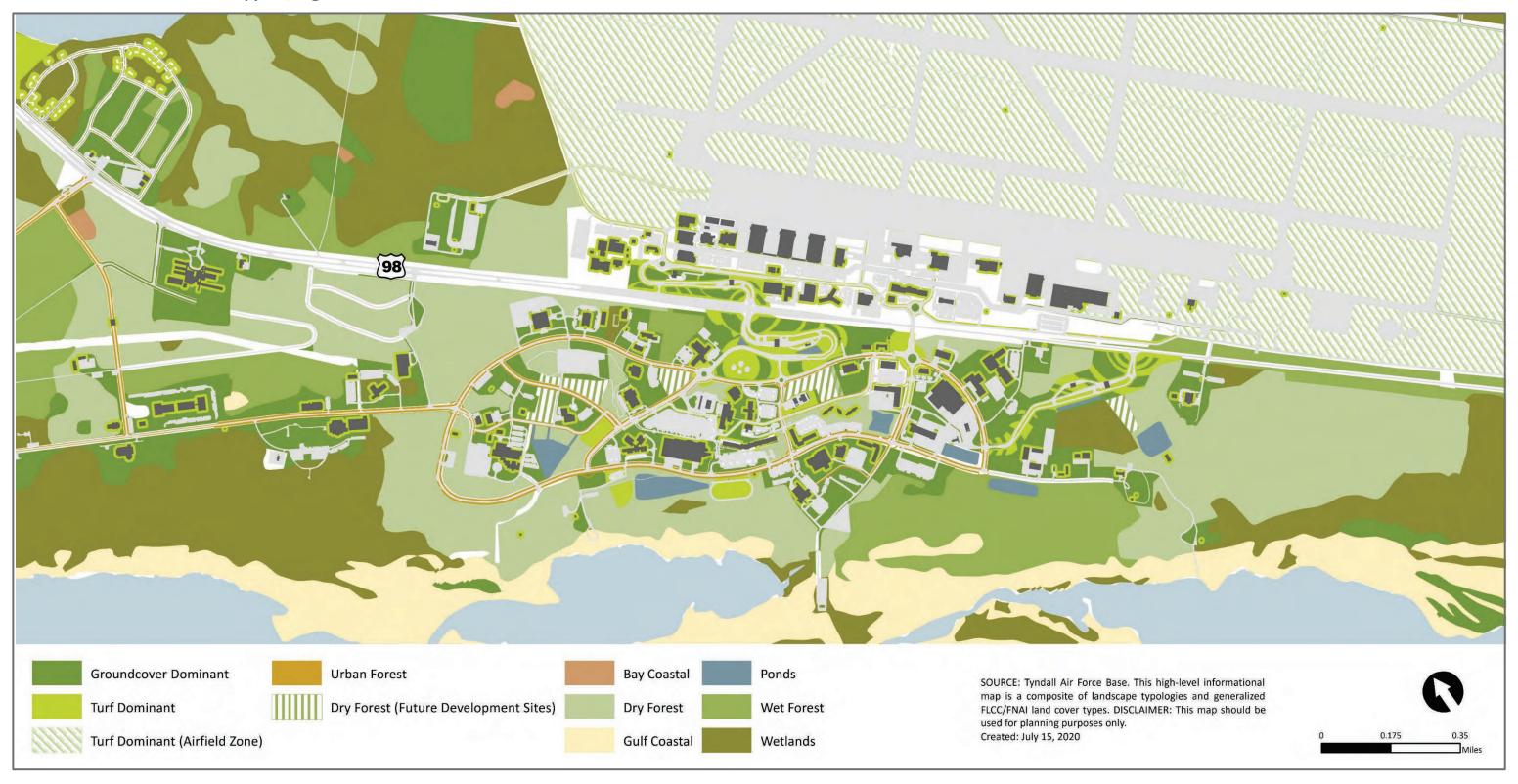


Exhibit B04-3. Land Cover – Support/Flightline



Bo4.5 Landscape Community Zones

B04.5.1 Landscape Zones with USAF Building Sites

Tyndall AFB is divided into five landscape zones that have specific characteristics and aesthetics based on land use, maintenance intensity, funding sources, and their general visual characteristics. This translates into different and specific landscape requirements across the base.

Manicured Zone

The Manicured Zone is the most highly maintained landscape on Base and is located within building perimeters and within entrance points around the base. This zone must balance mission safety and clearance antiterrorism (AT) standards with landscape performance and aesthetics. The AT zone is a subzone of the Manicured Zone and is located adjacent to buildings (a minimum of 20 feet wide). Landscape in this zone will have vegetation that meets the AT regulations. Vegetation in the other areas of the Manicured Zone must be drought-resistant and contain native trees for shade and ornamental grasses and native shrubs for color and variety. The different characteristics for this zone will need to be implemented in the Flightline and Support Districts because of their different mission requirements.

Maintained Zone

The Maintained Zone comprises low native herbaceous groundcover plant material, along with trees and shrubs, occurring near buildings such as parking, common public open space, and corridors. Turf area must be minimized or eliminated within the Maintained Zones to reduce maintenance costs, labor, and complexities and to exhibit a Florida panhandle appearance. Nature-based infrastructure such as vegetated stormwater basin and vegetated swales are included in this zone.

Managed Zone

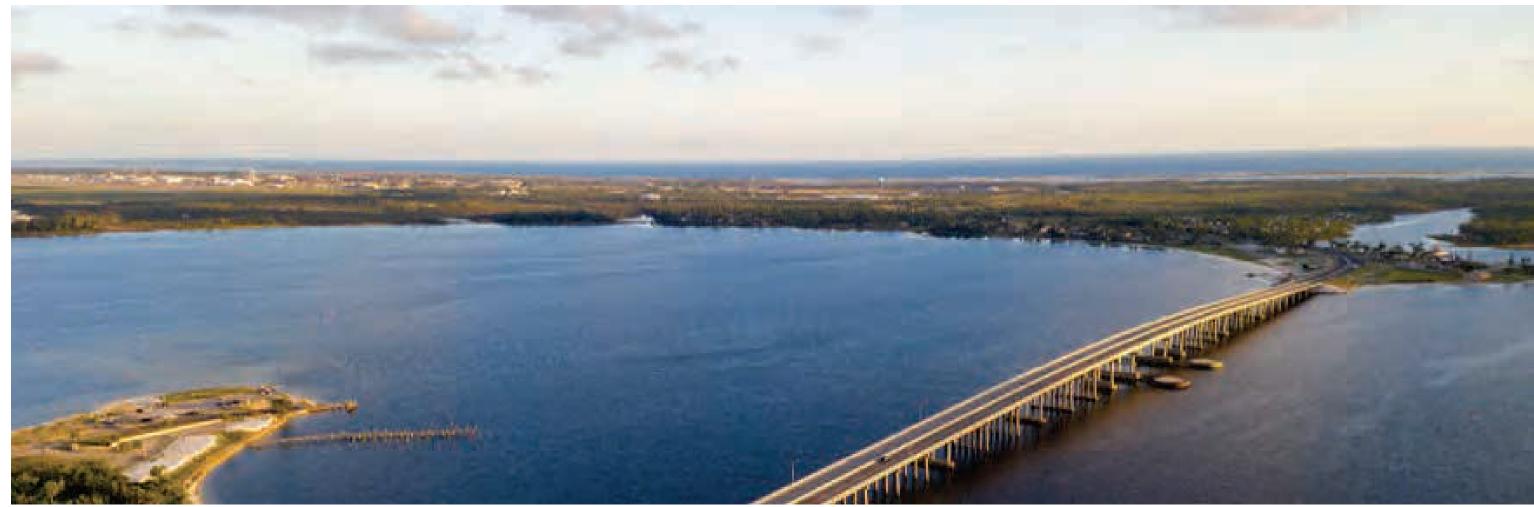
The Managed Zone encompasses all perimeter areas upland of the peninsula coastline, as well as large open areas in between facilities on the base. This zone includes areas of mesic/wet flatwoods, wet prairie, freshwater wetlands, and inland ponds and lakes. According to the INRMP, areas of this zone include work to transform Slash Pine areas into native Longleaf Pine plantations. This effort has expanded in size and scope due to the damage from Hurricane Michael. Installation-wide landscape will first and foremost aim to restore itself to a condition in which it can sustain the demands of nature and society.

Airfield Zone

This zone includes the runways on the Flightline District and the natural areas between the runways and areas surrounding the perimeter extending to the Pine Forest. The work in this area includes repair to the surface that is disturbed by installation of utilities or for stormwater areas. This area also includes the Flightline. Refer to **Section C06**, **Landscape**, for design guidance within the Airfield Zone to meet mission safety and clearance standards for vegetation.

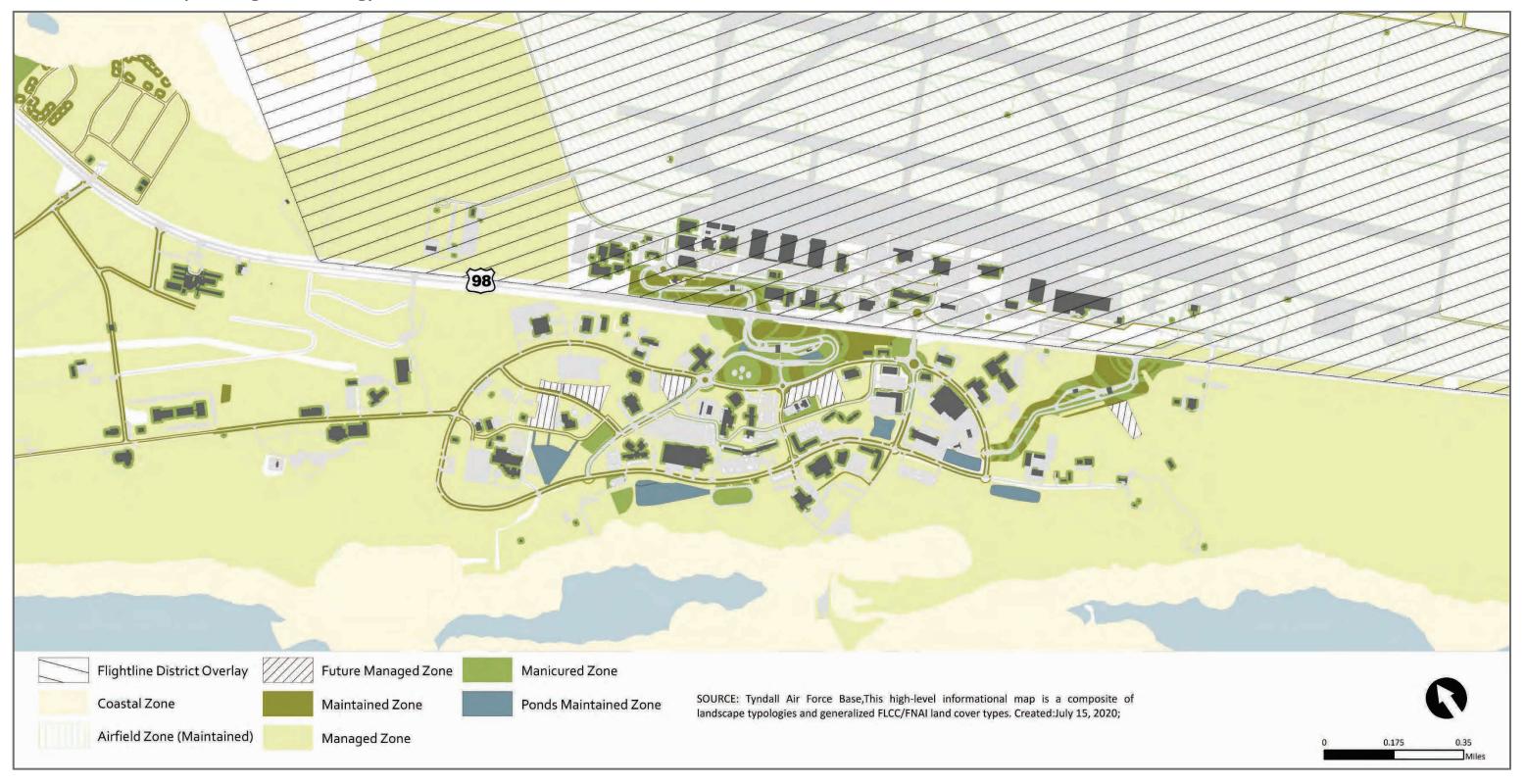
Coastal Zone

This zone encompasses all areas from the ocean shoreline back to the second line of defense, including beaches, coastal dunes, coastal wetlands, salt marshes, estuaries, coastal dune lakes, and coastal upland. Any work or maintenance proposed in this zone is part of the INRMP or Coastal and Marine Construction Guidelines contained in the IFS *Design Intent: Coastal Resiliency* appendix.



Aerial view of Tyndall AFB as seen above U.S. Highway 98

Exhibit B04-4. Landscape Management Strategy



Bo4.6 Integrated Land Management Framework

B04.6.1 Integrated Land Management Application from the Building Site to the Coast

An integrated land management approach requires a balance of healthy soils, natural stormwater management, use of native vegetation, incorporation of locally sourced materials and hardscape, and site design that fosters health and wellbeing.

The "treatment train" (as shown on Exhibit B04-5) uses a systems-based design approach that plans for stormwater management in the selection and placement of vegetation, a thorough understanding of existing conditions such as soil and existing vegetation, site design which limits pervious surfaces and incorporates human comfort and scale, plans and designs for the human senses, and building siting that maximizes natural hydrology patterns. Soil contamination must be understood early in the planning process to plan and design for a treatment train approach as groundwater resources, and adjacent water bodies and waterways can be significantly impacted. For example, nature-based infrastructure must be considered in mitigation of contaminated soils through the use of constructed wetlands.

When incorporated, this approach reduces:

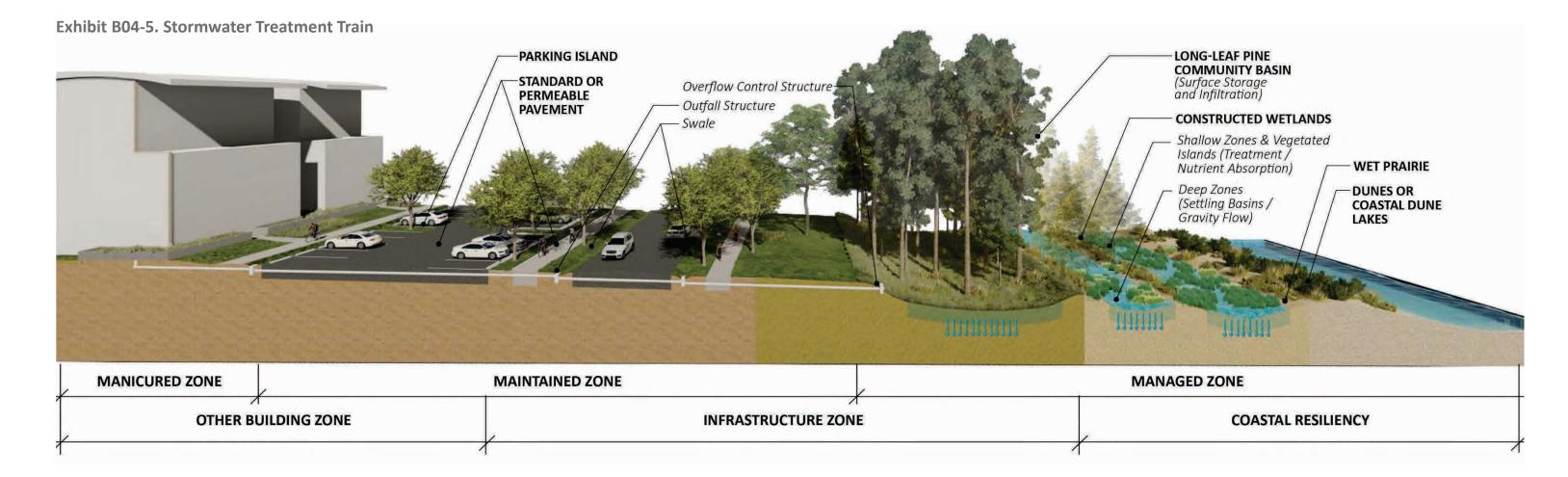
- Traditional stormwater capital and system maintenance costs
- Flooding and building damage resulting from high winds
- Establishes a more self-sustaining landscape for lower maintenance costs

Planning and design must replicate natural hydrologic conditions and manage precipitation onsite by meeting or exceeding the requirements for low-impact development as outlined in EPA's *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects* (under Section 438), as well as Northwest Florida Water Management District's *St. Andrew Bay Watershed Surface Water Improvement and Management Plan*.

Sites must be restored and/or designed to retain a site's predevelopment hydrology by employing techniques that filter, infiltrate, store, and evaporate stormwater at or near its source in a natural way vs. conventional "pipes and pond" infrastructure utilizing pipes, storm drains, curbs, and gutters which distribute stormwater to one centralized point elsewhere or within adjacent water bodies and waterways.

Promote onsite infiltration, increase evapotranspiration, and reduce precipitation runoff volumes and pollutant discharges with the following strategies:

- Use bioswales, constructed wetlands, riparian buffers, or simple shallow depressions to intercept runoff
- Improve water retention of soils through by adding 1% to 5% organic matter
- Incorporate pervious pavement in parking areas, plazas, and large expanses of pavement with low traffic loads
- Drain impervious surfaces into onsite landscape areas
- Rehabilitate lost or degraded stream channels, wetlands, and associated native plant communities
- Protect riparian and shoreline buffers where required by law and/or where feasible exceed requirements



B04.6.2 Bridging the INRMP's Best Management Practices within the Support District for Greater Resilience along the Gulf of Mexico

Employing a nature-based infrastructure strategy across the base produces multiple lines of natural defense against high winds and tidal surge typically experienced during hurricanes.

First Line of Defense: Dunes

Within the Coastal Zones, dunes are act as wave attenuators, slowing the initial force of tidal surge as it reaches land.

Second Line of Defense: Wetlands

Coastal dune lakes and wet prairies act as sponges to absorb waters brought by surge and provide further wave attenuation as tidal surge moves inland.

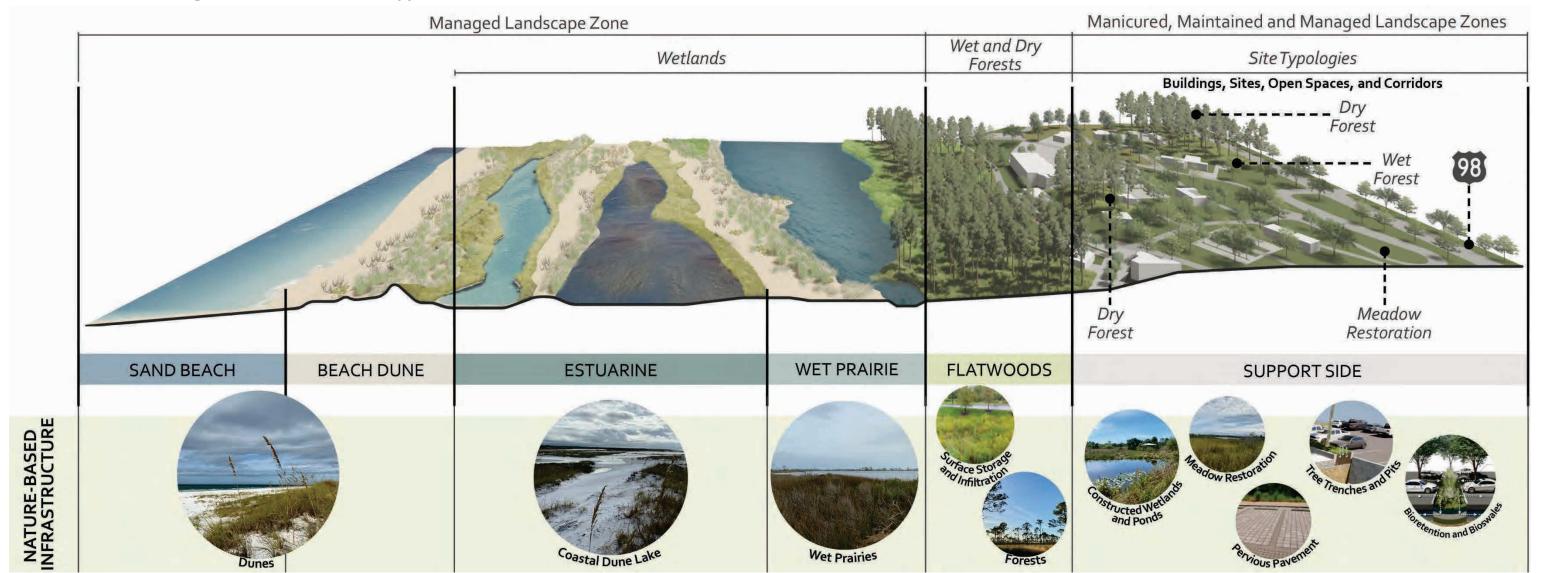
Third Line of Defense: Longleaf Pine Forests

Forests provide not only further wave attenuation during strong hurricanes but provide a continuous canopy of wind protection which slows and obstructs projectiles carried from high winds.

Inland Defenses: Urban Forests

Within the Support District areas of dry and wet forest and wet (retention) ponds (refer to **Section C04**, **Stormwater** for wet ponds description,) provide further protection for installation buildings and structures against wind damage and overland flooding resulting from increased storm events. Maximizing nature-based infrastructure elements within buildings, sites, corridors, and open space within the Support District provides greater absorption and filtration of stormwater for smaller storm events, freeing capacities within the stormwater system for larger storm events.

Exhibit B04-6. Best Management Practices in the Support District



B04.6.3 Bridging INRMP's Best Management Practices within the Flightline District for Greater Resilience along the Back Bay

Continuing the strategy of implementing multiple lines of defense within the Back Bay includes a greater focus on rising waters from surge and higher winds.

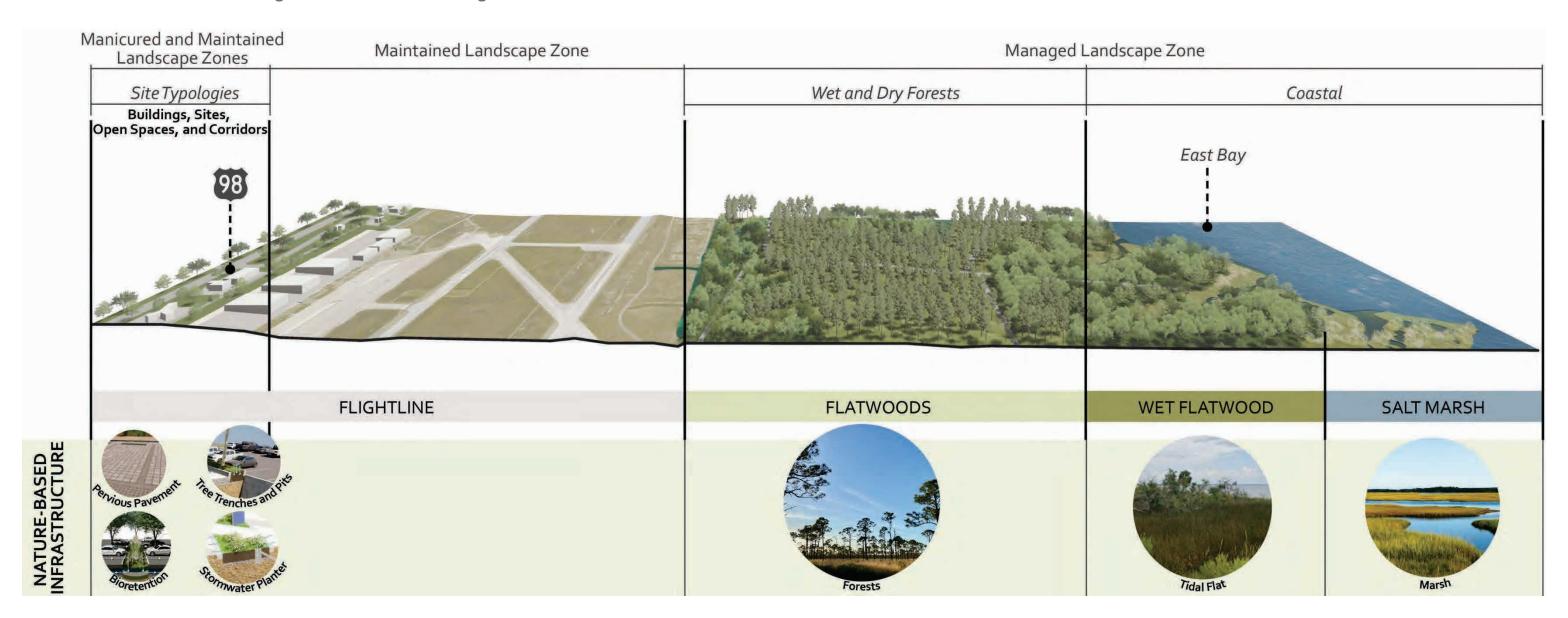
First Line of Defense: Marshes and Wet Forests

As waters swell within the Back Bay, salt marshes and the wet forest absorb tidal surges and act as a natural water filter as tides subside.

Inland Defenses: Urban Forests

Much like the maximizing nature-based infrastructure elements within buildings, sites, corridors, and open space within the Support District, urban forests provide greater absorption and filtration of stormwater for smaller storm events, freeing capacities within the Flightline District's stormwater system for larger storm events.

Exhibit B04-7. INRMP Best Management Practices in the Flightline District



Bo4.7 Benefits & Advantages

B04.7.1 Native Landscape Approach Benefits

Using an integrated land management approach to revegetate Tyndall AFB achieve the following benefits:

Approved Native Plant Palette Vegetation

- Maximizes wind resistance and natural stormwater absorption
- Reduces use of harmful chemicals, pesticides, and herbicides

Native Longleaf Pine Forest Canopy

- Minimizes tree failures when trees are placed in masses with natural groundcover vegetation
- Increases shade, resulting in reduced temperature and lower energy costs at base assets and facilities
- Improves wind and coastal surge resilience during hurricanes

Native Longleaf Pine Forest Understory

- Reduces maintenance costs, labor, and complexities
- Improves soil quality and biomass supports Tyndall AFB Natural Resources Section forest ecosystem restoration efforts
- Reduces grey infrastructure costs and maintenance from natural stormwater filtration and absorption
- Supports local pollinator habitats vital to Florida's agriculture industry

Exhibit B04-8. Integrated Land Management Sunny Day Benefits



Stormwater & Groundwater Benefits

- Restored native herbaceous groundcover provides large expanses of stormwater detention and infiltration
- Designed to infiltrate within 48-72 hours
- Stormwater infiltration replenishes fresh groundwater resources, critical to the survival of the forest on Tyndall AFB
- Stormwater detention and infiltration minimizes the intrusion of brackish saltwater in restored native forest areas, which—in turn—minimizes tree loss

Exhibit B04-9. Integrated Land Management Rainy Day Benefits



Tyndall Air Force Base Installation of the Future



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Bo5. Coastal Zone

Bo5.1 Introduction

The Coastal Zone of Tyndall Air Force Base (AFB) provides critical natural infrastructure to support mission readiness, enhance the overall resilience of the built infrastructure, and conserve a wealth of natural resources. This unique coastal area provides numerous year-round recreational opportunities that are vital to the health and wellbeing of Airmen and their families. The preservation and enhancement of these critical waterfront ecosystems positively supports the many aspects of Tyndall AFB's current and future missions through a more resilient natural infrastructure.

B05.1.1 Goals

- Provide clear guidance for landscape improvements in the Coastal Zone to support sustainability and resilience while achieving regulatory compliance
- Establish and delineate the Coastal Zone planning area to streamline the coordination and alignment with non-Coastal Zone development projects
- Identify and maximize the important inter-relationship between ongoing coastal zone landscape management and coastal resiliency's long-term planning requirements, strategies, and initiatives

B05.1.2 Objectives

- Minimize disturbance to the natural environment and while enhancing existing natural resources
- Align with Tyndall AFB's Integrated Natural Resources Management Plan (INRMP) and support installation-wide ecosystem initiatives as a part of a broader integrated resilient environmental infrastructure system
- Coordinate with Tyndall AFB Civil Engineer Squadron Environmental Element for any planned improvements in the Coastal Zone



Tyndall AFB's Coastal Zone provides critical natural infrastructure

Bo5.2 Planning Approach

B05.2.1 Policy & Compliance

All work within the Coastal Zone should be consistent with applicable regulations and guidance documents, highlighted below:

Air Force-Specific Guidance – Tyndall AFB's INRMP guides natural resource management at the base and is developed in conjunction with the installation's many stakeholders. INRMPs assist installation commanders with natural resource conservation and rehabilitation, consistent with base use that ensures Armed Forces readiness. INRMP actions include invasive and nuisance species management, outdoor recreation, forest ecosystem management, wildland fire management, wetland restoration, longleaf pine forest restoration, and specific action related to managing federal- and state-listed species and their habitats. This may limit the type, location, and timing of activities that are allowed in certain locations.

Florida Coastal Management Program (FCMP). The FCMP (2017 Guide), implements the Coastal Zone Management Act (CZMA 1972) to protect Florida's coastal resources. The FCMP restricts development activities to minimize vulnerability to coastal erosion and sea level rise, and to protect coastal ecosystems, recreation, and public access, along with other coastal zone resources.

National Environmental Policy Act (NEPA) (1969). A NEPA analysis was implemented consistent with Title 40 of the *Code of Federal Regulations* (CFR) Parts 1500-1508 and the Air Force Environmental Impact Analysis Process Regulations (32 CFR Part 989). NEPA is used to evaluate the potential effects of projects and programs and prevent or eliminate damage to the environment. A NEPA analysis includes consideration of biological resources (such as state and federally listed species, Migratory Bird Treaty Act species, and wetlands), water quality, geology, cultural resources, environmental justice, and land-use, amongst other resources.

Endangered Species Act (ESA) (1973). ESA provides guidance to protect and recover imperiled species and their habitats.



The Coastal Zone provides nesting habitat for protected sea turtles

Wetlands and Waters

- Section 404 of the Clean Water Act (<u>1972</u>) regulates pollution discharges into waters of the U.S. and quality standards for surface waters
- Section 10 of Rivers and Harbors Act (1899) prohibits obstructions to navigable waters of the U.S.

Cultural Resources

- Section 106 of the National Historic Preservation Act (<u>1966</u>) requires federal agencies to identify and assess the effects its actions may have on historic buildings
- Executive Order (EO) 13175, Consultation and Coordination with Indian Tribal Governments (2000) establishes regular and meaningful consultation and collaboration with tribal officials regarding federal policies that have tribal implications, strengthen relationships with Indian tribes, and reduce unfunded mandates upon Indian tribes



Multiple endangered shore birds, beach mice, and sea turtles call the Coastal Zone home



The base's beaches are designated Critical Wildlife Area

Bo5.3 Boundary Definition Approach

B05.3.1 Coastal Zone Boundary

The Coastal Zone represents a composite of marine influenced habitats (tidal waters, wetlands, beaches, dunes, and coastal grasslands) and a 200-foot boundary from the shoreline. The shoreline boundary is intended to cover coastal areas that are not characteristic coastal habitats but that occur along the waterfront and should be managed through the regulatory lens of the Coastal Zone.

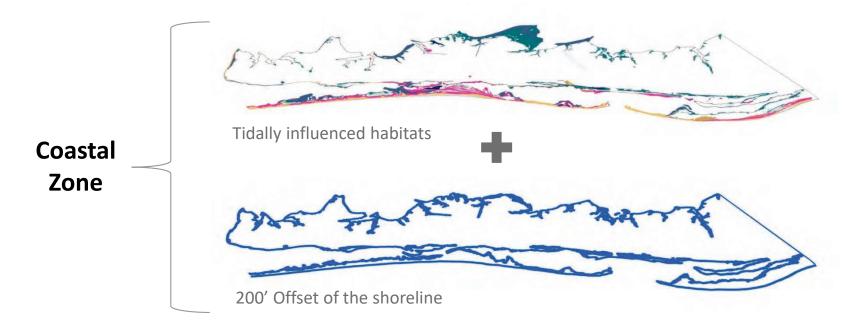
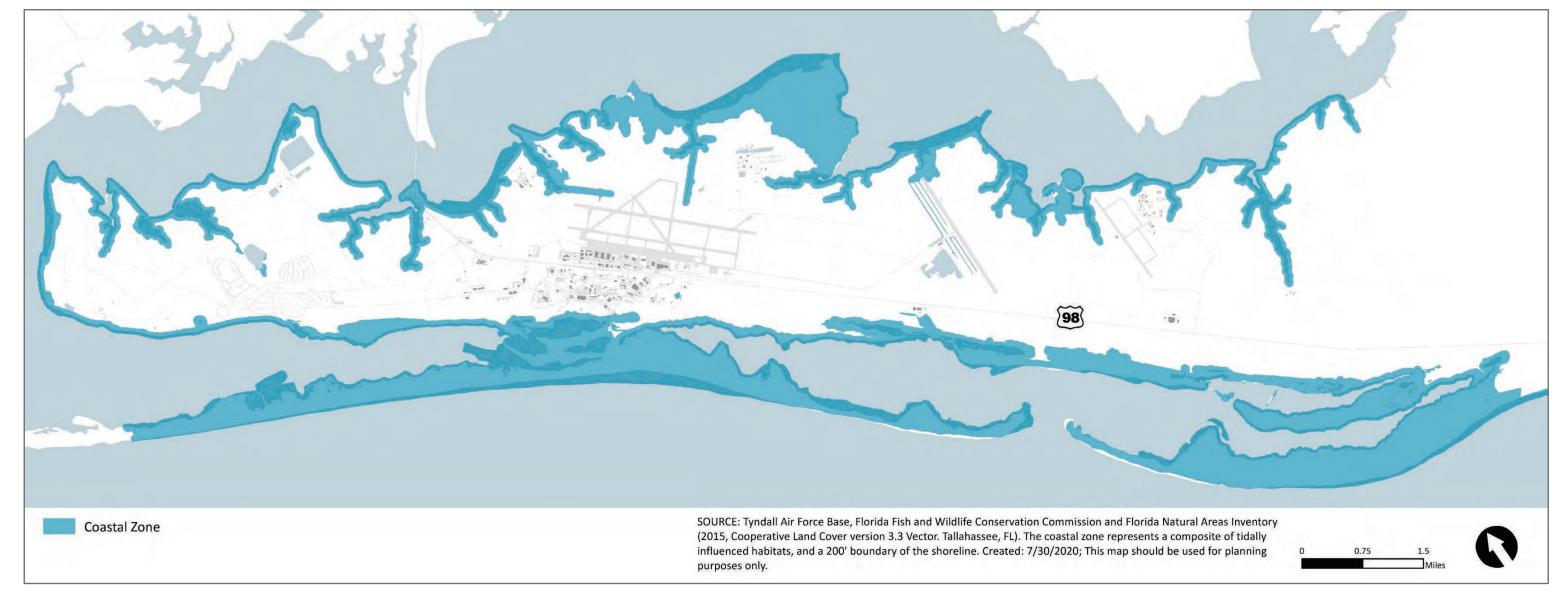


Exhibit B05-1. Coastal Zone



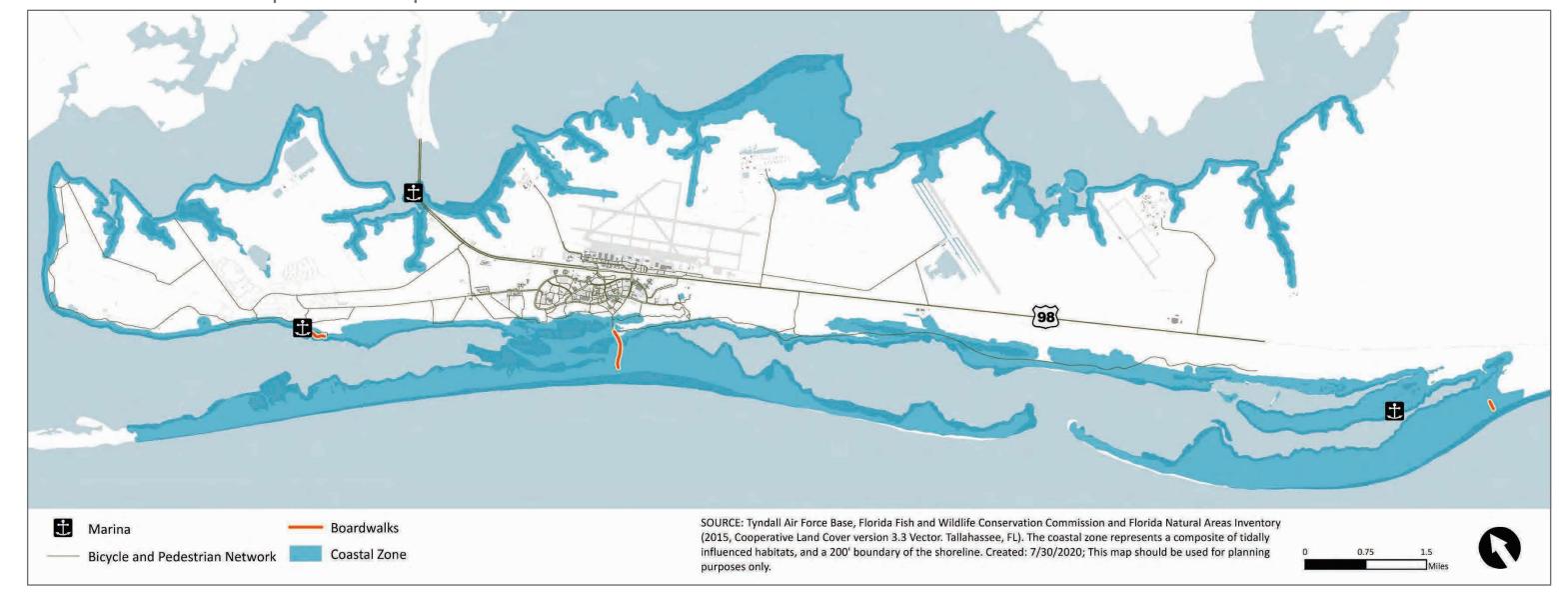
Bo5.4 Extent of Landscape Master Plan Improvements

A range of built infrastructure currently exists within the Coastal Zone, including Morale, Welfare, and Recreation (MWR) facilities, streets, and other support structures. MWR facilities will be the primary new improvements within the Coastal Zone, to include:

- Restoration/repair of existing marinas (Beacon Beach Marina, Benita Bay Marina)
- Restoration/repair of existing boardwalks
- Implementation of proposed bike and trail network

Refer to relevant sections in this Tyndall AFB **Landscape Master Plan** for the specific Coastal Zone guidelines and requirements of various landscape-related facilities that may be planned for installation within the Coastal Zone.

Exhibit B05-2. Extent of Landscape Master Plan Improvement

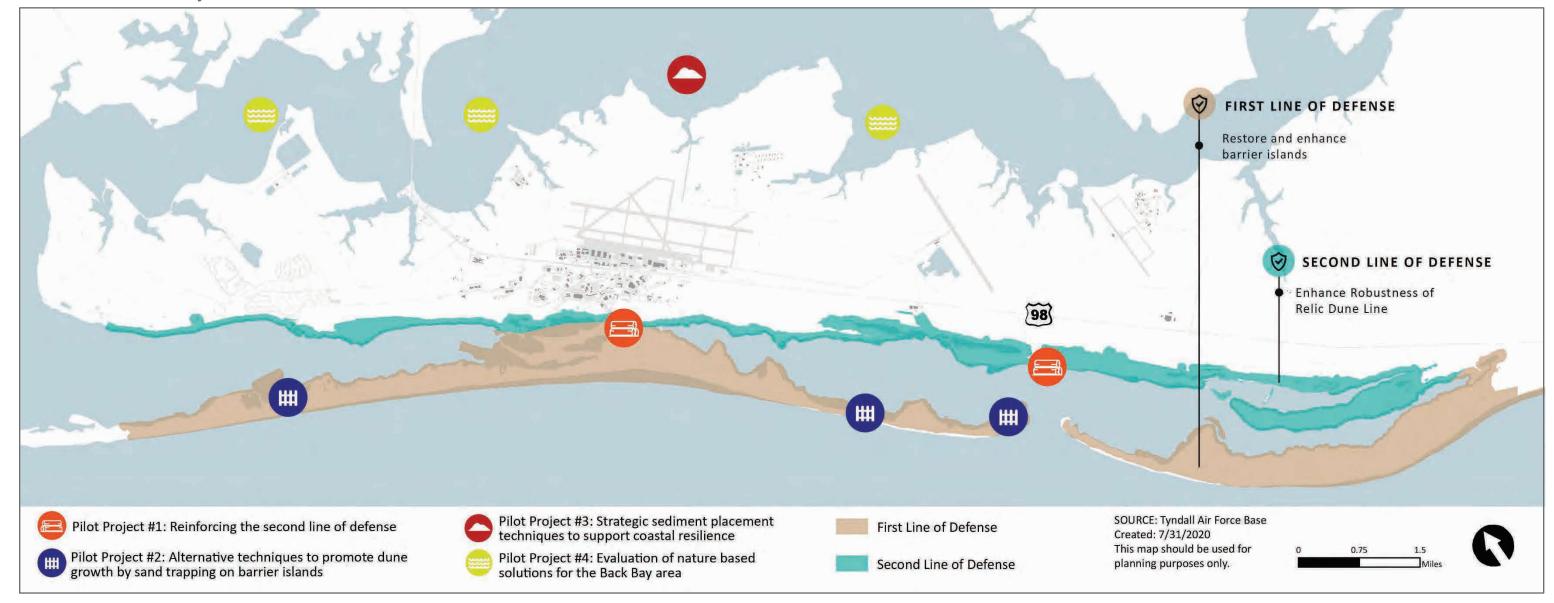


Bo5.5 Future Coastal Projects Integration

Tyndall AFB is working with an array of stakeholders on four proposed pilot projects to evaluate a range of nature-based solutions to help protect mission readiness by reducing coastal flood risks and erosion while also enhancing the natural environment.

The four proposed pilot projects listed below are described in detail in the *Alternative Delivery and Finance Report: Coastal Restoration and Resilience.* The design criteria for coastal elements are provided in **Section C, Site Development Plan**.

Exhibit B05-3. Pilot Projects



Tyndall Air Force Base Installation of the Future



Tyndall Air Force Base Installation of the Future



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Co1. Site Design

Co_{1.1} Introduction

C01.1.1 Context

Effective and proper site design is critically important for all existing and new facilities on Tyndall Air Force Base (AFB). Site design incorporates strategies for safety, security, efficiency, resiliency, well-being, and connectivity. These focus areas promote a more cohesive base appearance and contribute to consistency and unity throughout the site design, thus establishing a connected, resilient installation.

This section presents important site design principles, strategies, and elements to be considered when planning, designing, and implementing new facilities.

The site design and development guidance provided in this section is intended to complement current design standards outlined in Unified Facility Criteria (UFC) issued by U.S. Department of Defense (DoD). Where applicable, it is intended to fill gaps not addressed either in the UFC or the updated *Tyndall AFB Installation Facilities Standards* (IFS). In that regard, this document mainly applies to proposed sites and their facilities. The prototypical site design concepts shown in this section are intended for use as references for functional and aesthetic consideration.

C01.1.2 Authority

All site development criteria must comply with Air Force Corporate Facilities Standards for Site Development: http://afcfs.wbdg.org/site-development/index.html

Additional references include the Uniform Facilities Criteria (UFC), the Whole Building Design Guide (WBDG), and Crime Prevention Through Environmental Design (CPTED):

- UFC 3-201-02, Landscape Architecture
- UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings
- UFC 4-022-01, Entry Control Facilities Access Control Points
- UFC 4-022-02, Selection and Application of Vehicle Barriers
- UFC 4-022-03, Security Fences and Gates
- UFC 3-600-01, Fire Protection Engineering for Facilities
- National Fire Protection Association (NFPA) Standards
- www.wbdg.org
- www.cpted.net

C01.1.3 Warranty

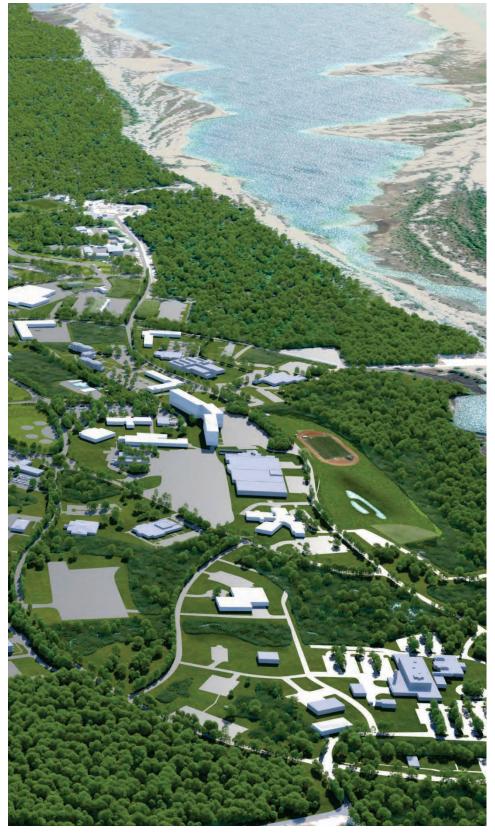
Coordination of design and construction with Tyndall AFB staff, agencies, service providers and third-party contractors is critical to the successful implementation of planned improvements. All work is required to be warrantied regarding location and installation of materials in a manner consistent with the intent of the Landscape Master Plan and IFS, and to not create a conflict for installation of adjacent improvements by others. All potential conflicts will be identified by designers/contractors in respective sections of the Compliance Checklist and reviewed by Tyndall AFB Staff.

Co_{1.2} Design Objectives

Tyndall AFB was established and constructed in the early 1940s as an airfield. Over the decades, new facilities were added to the installation's property. As missions evolved throughout the years, buildings, streets, entrances, and supporting facilities have been demolished, constructed, and renovated. Given the growth that has occurred across Tyndall AFB over the past 80 years, the installation's appearance has an inconsistent overall appearance, building placement, orientation, access, parking, and pedestrian mobility.

During Hurricane Michael in October 2018, the base's support, Flightline, and housing areas incurred substantial damage. Although this storm caused major disruption to the base mission and operations, it has provided significant opportunity for transformation. As Tyndall AFB rebuilds into the Installation of the Future, the goal is to create a more resilient and efficient base that is better equipped to respond to future missions as well as to future environmental hazards.

Expanding on the current UFC and IFS guidance, this site design section provides additional guidance related to buildings, their siting, and supporting facilities and how these elements connect to one another. This guidance underscores the base's vision of creating a more efficient, compact, and safe installation through a planned system of interconnected, adjacent sites, rather than a more traditional approach to constructing independent facilities.



The future of Tyndall AFB

Co1.3 Design Approach

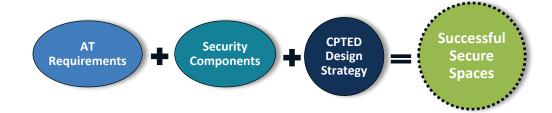
The three layers of integrating security with the design of the natural environment at Tyndall AFB is the application of antiterrorism (AT) requirements, inclusion of security-specific components, and use of CPTED principles in siting and layout. This section details how each should be incorporated to create successful and secure spaces.

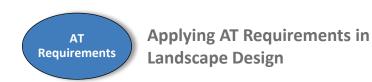
C01.3.1 Antiterrorism Requirements

The DoD outlines its standards for technical criteria (UFC) and specifications (Unified Facilities Guide Specifications, or UFGS) pertaining to planning, design, construction, and operation and maintenance of Real Property facilities. The program is administered by the U.S. Army Corps of Engineers (USACE) and the Air Force Civil Engineer Center (AFCEC) to provide the current standards of development for ongoing and future projects. The UFC and UFGS are available at the WBDG website (www.wbdg.org). The DoD uses WBDG not only distribute up-to-date guidance, but also to inform the planning, programming, and design of built projects.

AT requirements are a key component of DoD installations, and a special consideration for design. As described in UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings* (2018), the requirements establish the minimum standards for incorporating AT mitigating measures that are not associated with an identified threat or level of protection. Compliance with the UFC reduces collateral damage and the scope and severity of mass casualties in the event of a terrorist. The process for incorporating AT components into planning and design projects is illustrated on Exhibit C01-1.

Force protection, a related component of AT, describes the measures needed to protect a property or facility from an attack using force. Design elements that can contribute to force protection are guided by multiple UFC in Section 4-022.





Building Foundations

- The landscape at building foundations must be low in height
- Enhance the aesthetic of the building
- Assist with positive stormwater drainage
- Plant material must be selected from the Tyndall AFB Master Plant List

Building Entrances

- The landscape at building entrances must be clean and simple
- · Highly trafficked buildings must have pedestrian amenities
- Entrances must be well lit at night for safety and the lighting must act as a beacon to the front door
- Bollards can be used for AT purposes as well as light elements

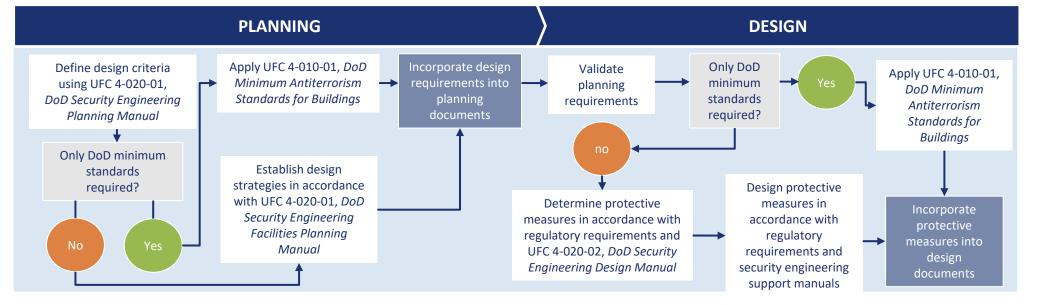
Viewsheds and Corridors

- Eliminate any opportunity objects to be concealed in the AT zone around buildings
- Groundcovers should be no taller than 6 inches
- Single-stem deciduous trees installed with a minimum 3-inch caliper must be limbed up to the top two-thirds of the specimen, as shown on Exhibit C01-2
- At maturity, the landscape of the AT zone should create an open viewshed of 6 inches to approximately 7 feet
- Landscape along circulation routes create view corridors through uniform application of overstory and understory materials that provide uninterrupted lines of sight
- View corridors from building entrances to circulation routes preserved

Exhibit C01-2. Landscape Maintenance to Support AT Viewshed Requirements



Exhibit C01-1. Security Engineering UFC Applicability Decision Matrix



C01.3.2 Physical & Digital Security Systems

The installation's security, comprising both physical and digital components, is of the utmost importance at Tyndall AFB. Therefore, integrating security components must be included in all planning and design phases of work, and guided by the resources listed below.

The natural landscape and site furnishings are designed and used to perform security functions as necessary and provide cohesion to the base's security system in its entirety.



Applying Security Components in Landscape Design

Because security will never be the only requirement associated with a project, it is imperative for security considerations to be coordinated with all the requirements from the time planning begins throughout all phases of design. Surveillance, access control, and emergency assistance components are planned within the landscape.

Surveillance

Unobstructed Space. Provide clear lines of sight and prevent visual impairment to physical threats. Unobstructed space is referred to as setback, standoff distance, and clear zone.

Lighting. Provide visibility to its surroundings.

Closed-circuit television (CCTV). Provide visibility and record everything in the camera's viewshed.

Manned Stations. Provide a space with reasonable comfort from the elements for personnel who are present for periods of time. These stations require high levels of visibility and can include outpost shacks, shade structures, and other components.

Access Control

Vehicle Barriers. Control access and circulation of vehicles and include bollards, immoveable objects, gate arms, and other preventative items.

Fencing. Control access and circulation of pedestrians and vehicles.

Obstructed space. Control visual access and deter pedestrian and vehicular access. Within the natural environment this can include heavily wooded landscape, boulders, waterways, and rock formations.

Controlled Elevation Change. Changes in elevation are meant to control visual and vehicular access and provide an extra layer of security without sacrificing visual design aesthetics. These can include trenches and waterways. Although landscaped berms are applicable in some cases, they are not recommended for Tyndall AFB due to the base's stormwater drainage patterns.

Emergency Assistance

Blue Light Phones. Blue light phones with emergency buttons may be used when a person is in need of medical assistance or in the event of a crime. They can be placed around the installation as an additional safety measure.

Landscape Design as Threat Deterrents

Well-executed design of the natural environment has proven to be an effective means of threat deterrent when applied using the principles listed below, an approach that has been successfully in use for decades. The pillars of CPTED facilitate the integration of AT requirements and security components into effective site layouts and landscape designs. When planned successfully, it both motivates positive behavior and discourages negative behavior. This strategy is appropriate for inhabited areas as a complement to AT and other security requirements.

To be most effective, the CPTED strategy must be implemented as early as possible in the planning stage. To do so, security personnel must be engaged in planning activities that involve siting, signage, lighting, and circulation. These discussions should identify the following:

- Who the legitimate users, visitors, and vendors of a space are, what their purpose is, where they should and should not be going, and when they should be there
- What risks are presented from surrounding areas

An effective, multifunctional planning and design strategy relies on the coordination of the site layout and the security features. Like with all multifunctional components, successful implementation can result in streamlined, cost-efficient site operations.



Gate arm and security camera at entrance



Blue light phone for emergency assistance

C01.3.3 Landscape Design as Threat Deterrents



Applying CPTED Strategy in Landscape Design

Natural Surveillance

"See and be seen" is the overall goal when it comes to CPTED and natural surveillance. Landscape and lighting are key to effective natural surveillance by providing uninterrupted sight lines at all times. This is best achieved when viewsheds are considered from circulation corridors, exterior destination points such as plazas and parking areas, and building entrances and windows.

Natural Access Control

The goal of natural access control is to direct the flow of people while decreasing the opportunity for criminal threat. This can be accomplished with coordinated site and building layouts, proposed circulation patterns, and effective wayfinding and screening components that guide users with visual cues. These components can include signage, designated treatments of landscape and pavement materials, fences, and other barriers. These components should be overlaid with the site layout and security features and operations to create short travel distances between destinations and predictable circulation routes for users, visitors, and vendors.

Territorial Reinforcement

Clear delineation of space creates a sense or ownership or territorial reinforcement of each area. Public areas are clearly distinguished from private ones using landscape, site furnishings and pavement materials. Potential trespassers perceive this control and are thereby discouraged.

Maintenance

The "Broken Window Theory" suggests that one "broken window" or nuisance, if allowed to exist, will lead to others and ultimately to the decline of an entire installation. Neglected and poorly maintained properties can inadvertently encourage opportunity for criminal threat as they are perceived to be unsupervised.

Exhibit C01-3. Successful Secure Space



AT Requirements



Unobstructed space created by low/no groundcover and limbed up trees

Security Components

- Lighting
- CCTV surveillance
- Vehicle barriers created with bollards and planters

CPTED Design Strategy

- Wide viewsheds created at building entrances and clear sightlines from windows and destinations provide opportunities for natural surveillance (Natural Surveillance, Natural Access Control)
- 2 Wayfinding signage positioned in a highly visible circulation intersection with clear visible cues (Natural Access Control)
- Designated landscape and hardscape materials and forms and site furnishings clearly delineate circulation routes from gather spaces (Natural Access Control, Territorial Reinforcement)
- Well-maintained low-growing landscape treatment allows for uninterrupted sightlines (Natural Surveillance, Maintenance)
- 5 Short, linear travel distance between entrances eliminates blind corners and provides predictable routes (Natural Access Control)

C01.3.4 Typical Site Layout: Green Infrastructure Treatments

Exhibit C01-4 illustrates how stormwater facilities can be integrated into the overall site design while incorporating parking, plantings, and walkway elements into a cohesive site plan.

Refer to Section B04, Integrated Land Management, and Section C04, Stormwater, for further information regarding green infrastructure treatments, applications, components, and materials.

LEGEND



Building Perimeter

- Biofiltration
- Bioswale (edge)
- Tree trench



Open Space

- Longleaf Pine Restoration
- Biofiltration (edge)
- Bioswale (edge)
- Constructed natural wetland



Overflow Parking Areas

Turf or pervious paving



Site Parking Area Landscaping

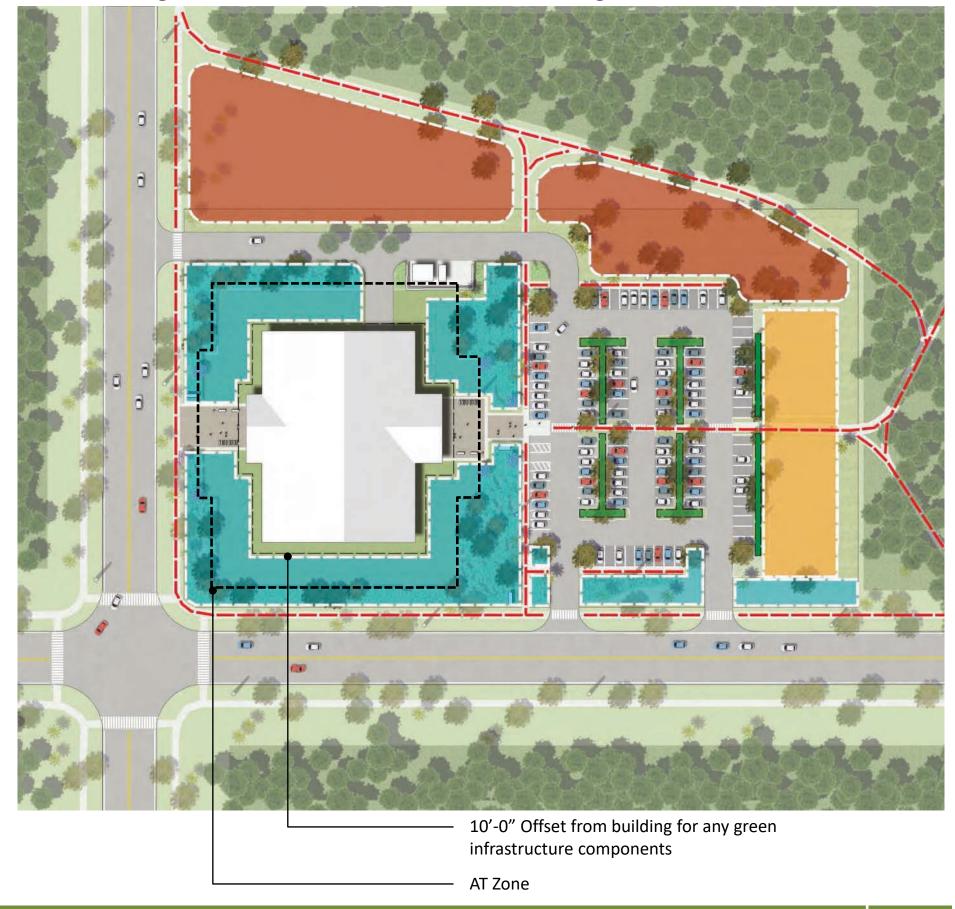
Tree trench and biofiltration



Site Sidewalks

- Standard concrete pavement design
- Specialty paving can be pervious paving
- Pedestrian walkways should not conflict with stormwater requirements

Exhibit C01-4. Integration of Stormwater Facilities into the Overall Site Design



Co1.4 Design Typologies & Criteria

C01.4.1 Site Design Criteria (SDC)

The criteria in this section relate to specific design requirements, including IFS requirements, and guidelines for designer/contractors to follow and Tyndall AFB personnel to review. Additional criteria are provided in the other sections of this Landscape Master Plan and are not repeated in this section; however, the requirements for site design must be coordinated with other site elements. The sections that follow serve as worksheets, with supporting guidance and illustrations, for designers/contractors to use among their teams and in coordination with Tyndall AFB. These worksheets should be used to complete the **Compliance Checklist** submittal for each project. Each requirement includes a selection of check boxes to indicate the applicability of that requirement to a specific context, and to demonstrate compliance with the requirements.

Yes No N/A The designer/contractor either selects "Yes" if compliance has been met, "No" if it has not, or "N/A" if the requirement is not applicable to the project.

C01.4.2 Typical Site Layout Typology

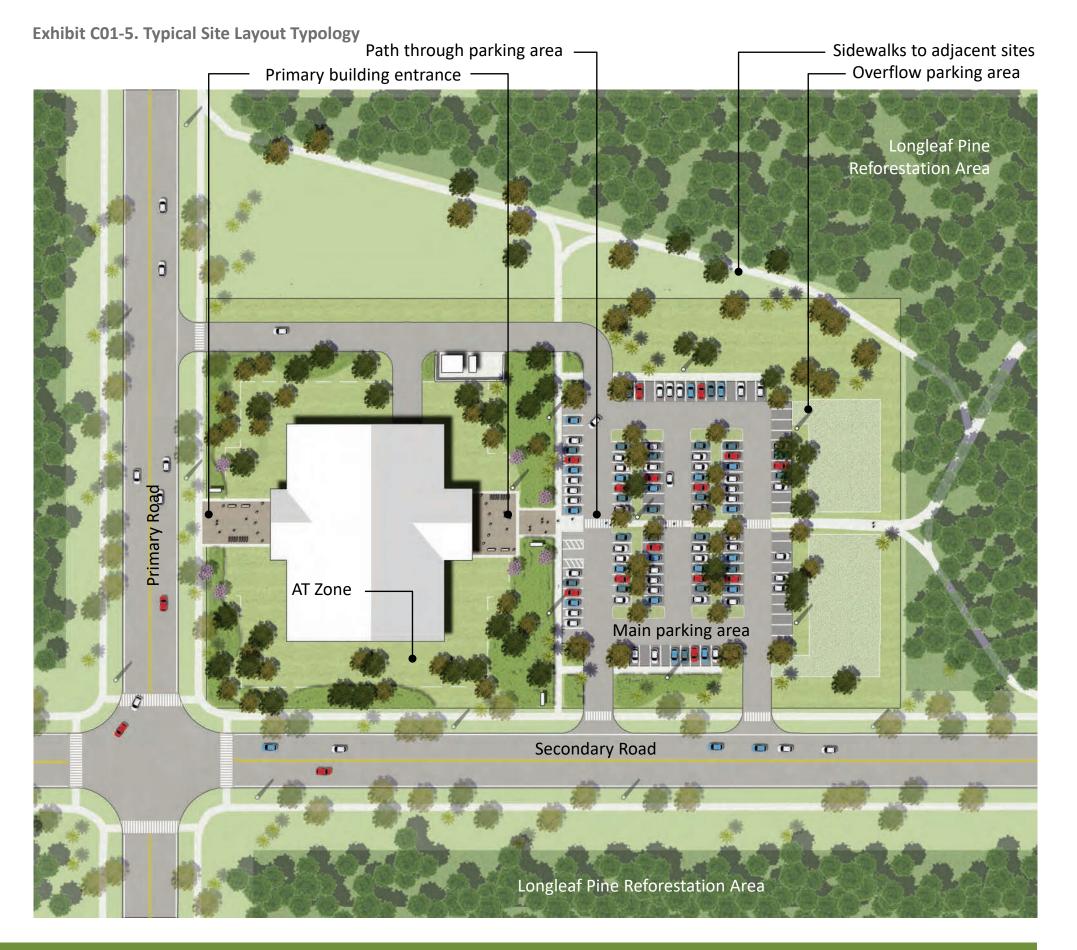
The site design and layout of the facility must comply with the following criteria: Yes No N/A SDC 1. Locate service areas and utility infrastructure to the side or rear of building, relative to streets and the primary building entrance. SDC 2. For sites along a shared-use path, orient the building so the primary façade addresses the path and secondary façade faces the most primary street. SDC 3. For sites not along a shared-use path, orient the building so the primary façade addresses the most primary street and secondary façade faces a parking area to rear of site. SDC 4. Provide building entrances with access to both street side and parking side of structure. SDC 5. Provide site sidewalks and shared-use paths that connect to surrounding pedestrian/bike systems. SDC 6. Configure parking so areas are navigable by local emergency response apparatus. Ensure fire department

access complies with UFC 3-600-01/NFPA.

directly in front of any outlet (UFC 3-600-01).

obstructions so they are located a minimum of 24-inches from the vertical centerline of fire hydrants and not

SDC 7. Design landscaping, fencing, bollard placement, and similar



C01.4.3 Antiterrorism Strategies

The AT and force protection measures suggested in Exhibit C01-6 illustrate how these may be integrated within the overall site design. Force protection measures must follow all required regulations in the planning and design relative to the unique requirements of each site and facility. Additionally, AT applications must adhere to the following criteria:

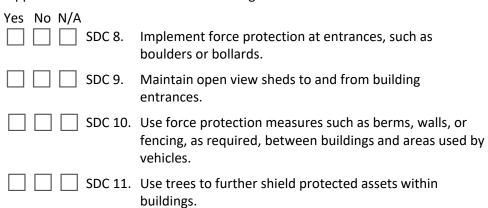
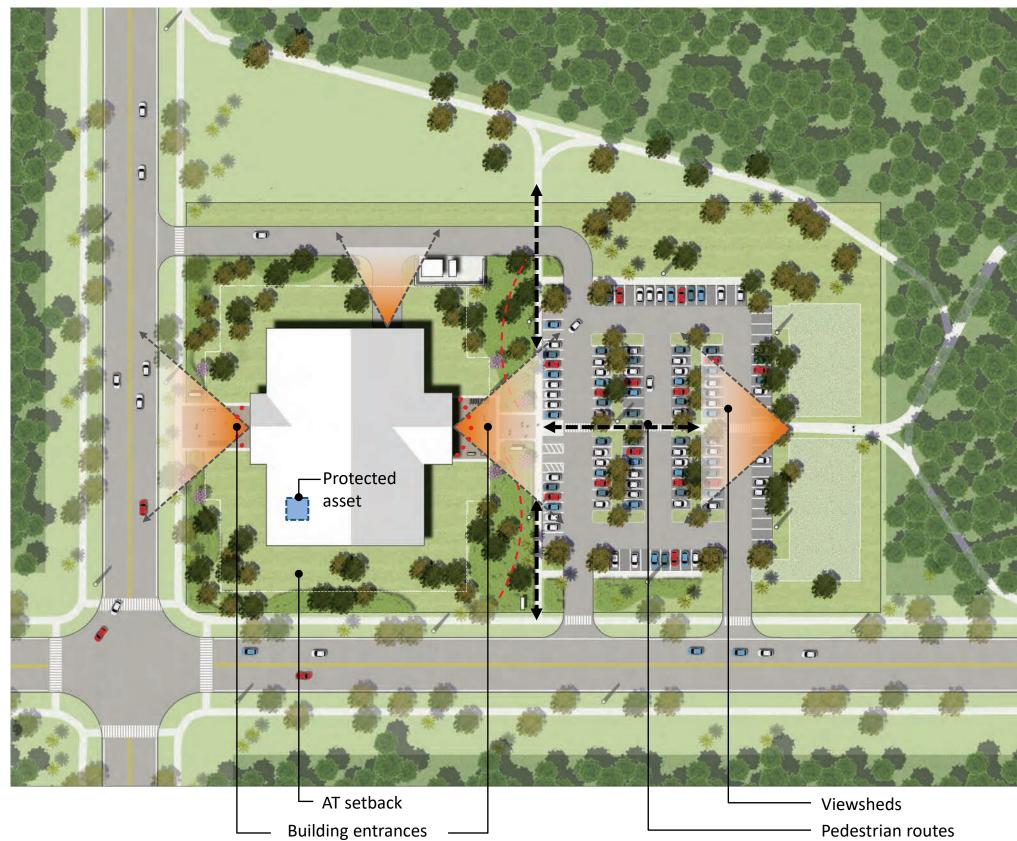


Exhibit C01-6. Antiterrorism and Force Protection Measures



C01.4.4 Building Perimeter

The site design relating to the building perimeter, shown on Exhibit CO1-7, must comply with the following criteria:

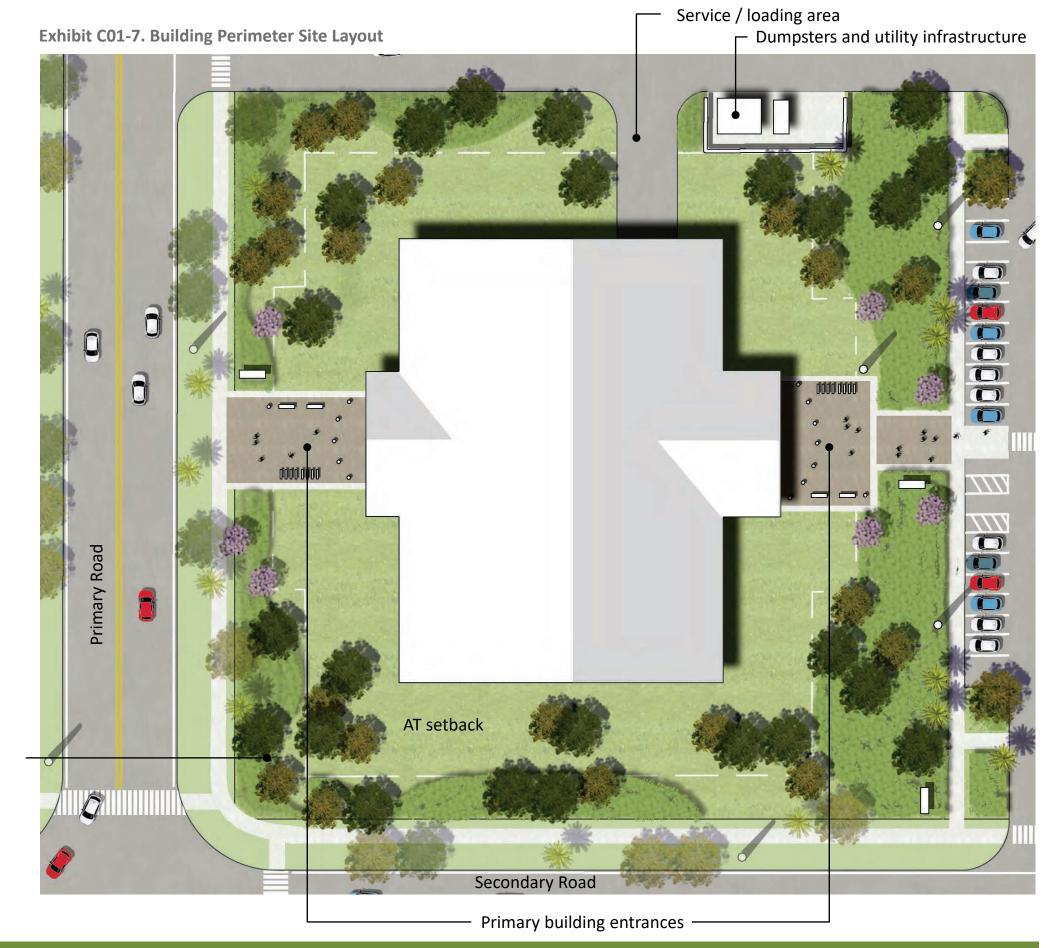
Yes No N/A

SDC 12. Locate service areas and utility infrastructure to the side or rear of building, relative to streets and the primary building entrance.

SDC 13. Orient service areas and loading bays to side or rear areas. Avoid orientation to primary streets, parking areas, and

building entrances

SDC 14. Avoid obstructing fire hydrants, fire department inlet connections, or fire protection system control valves in a manner that would prevent such equipment or fire hydrants from being immediately visible and accessible (NFPA 1).



C01.4.5 Parking Area Perimeter

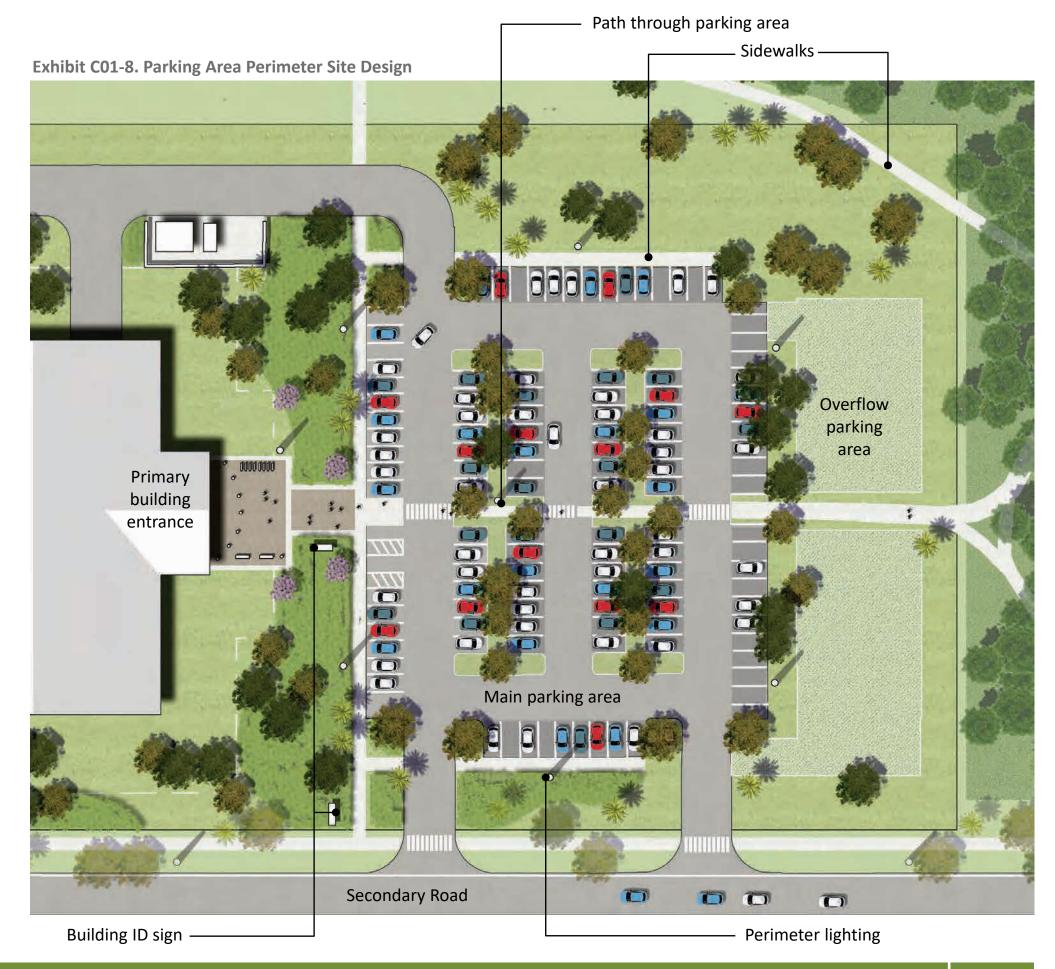
The site design relating to the parking area perimeter, as shown on Exhibit C01-8, adhere to the following criteria:

Yes No N/A

SDC 15. Provide walkways through parking areas that lead to primary building entrances.

SDC 16. Contain sidewalks and shared-use paths that connect building entrances to base-wide network of sidewalks, pathways, and trails.

SDC 17. Use tall shade trees and low shrubs to create clear lines of sight at eye-level across parking areas and to building entrances.



Co1.5 Treatments for Specific Areas

C01.5.1 Main Entry Control Facilities

The Entry Control Facility (ECF) typically begins at the installation perimeter. The

design and layout of the facility must adhere to the following criteria: Yes No N/A SDC 18. Provide entry walls and vertical sculptural elements on each side of the entrance. SDC 19. Provide tree planting at the Tyndall Gate in the Flightline District in accordance with the landscape requirements for the Flightline District. SDC 20. Arrange trees and ground-level plantings as indicated in graphic. Ground-level species should remain low to allow eye-level visibility within the ECF areas. Place accent or flowering trees at highly visible areas. SDC 21. Provide turf only in the Maintained Zone at the back of the curb for increased visibility in the ECF areas. SDC 22. Reconfigure existing landscape elements in the ECF areas to accommodate new gate and intersection alignments. SDC 23. Select plant materials from the Manicured Zone Plant List. Refer to the Flightline Plant List for specific plant requirements in the Flightline District. SDC 24. Use low maintenance landscape treatment to include xeriscape practices that feature plant species which require low to moderate water consumption. SDC 25. Integrate traditional and/or natured-based stormwater management solutions into the overall facility layout and planting design.

SDC 26. Refer to the IFS Design Intent: Architecture Image &

architectural elements.

Character appendix for design guidelines for any

Exhibit C01-9. Entry Control Facility Layout

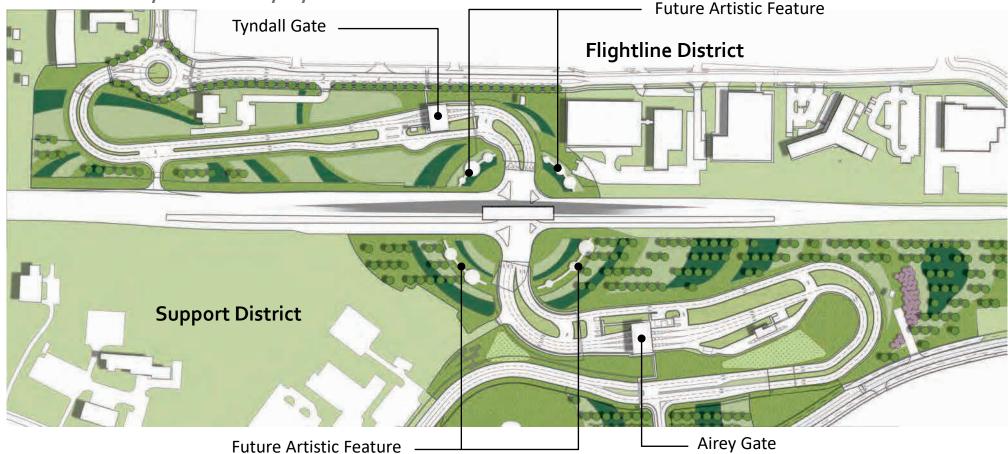
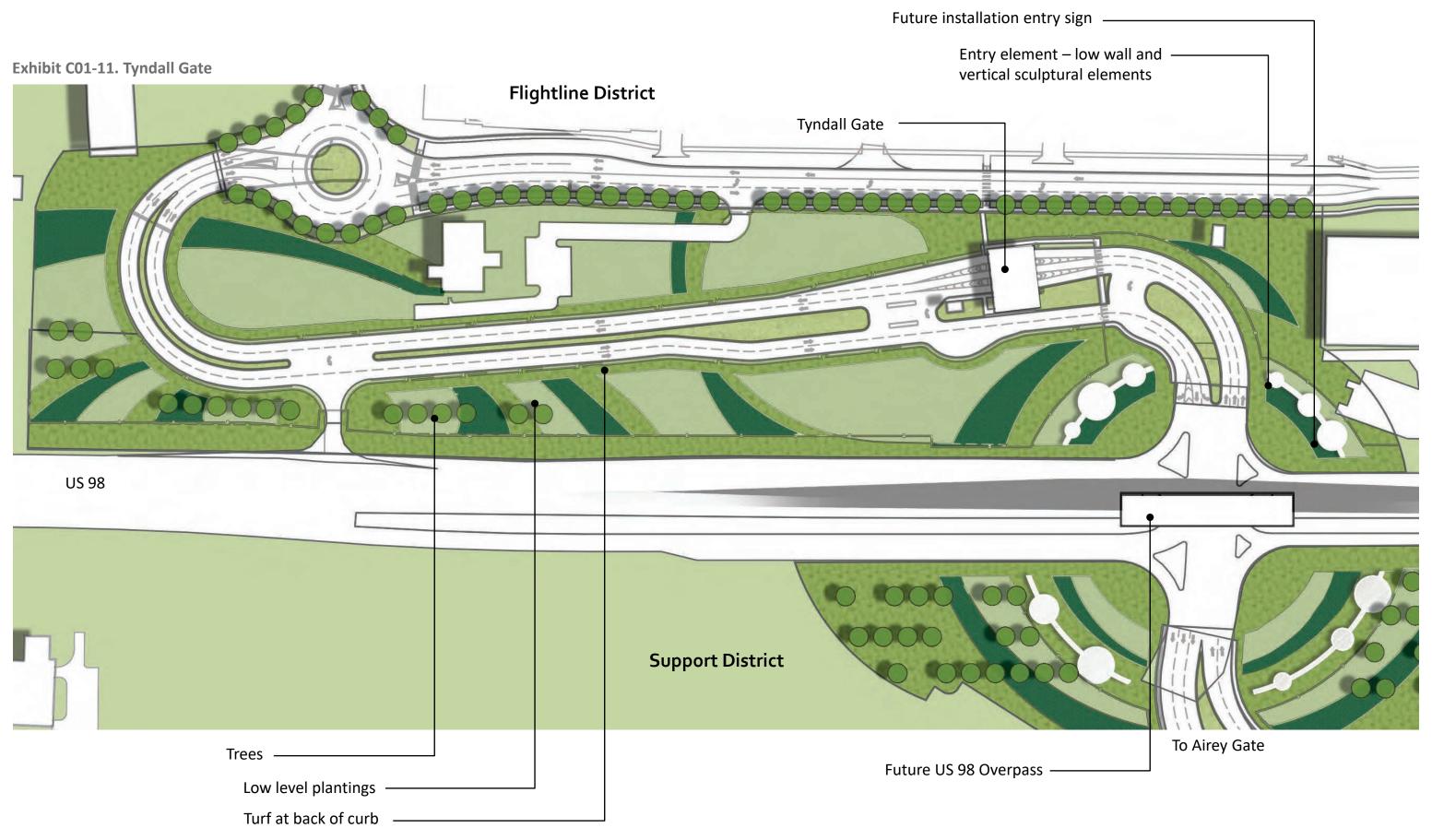


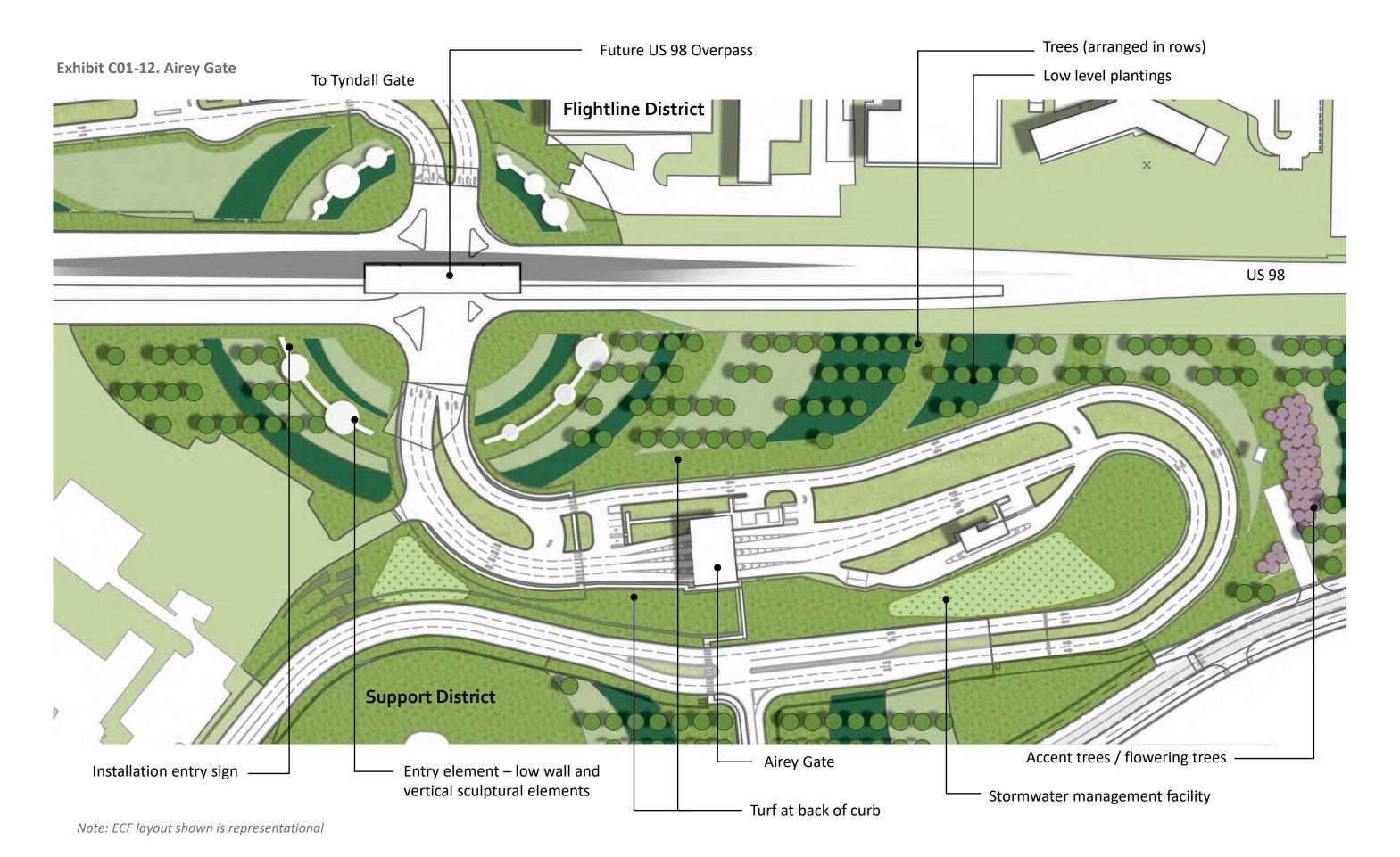
Exhibit C01-10. Entry Control Facility Airey Gate Rendering



(Design TBD)



Note: ECF layout shown is representational



C01.5.2 Community Common Typology

Yes No N/A SDC 27. Install a manicured central lawn to provide space for various activities. Design the lawn to be resilient under heavy public use. SDC 28. Install non-turf landscaped areas around the perimeter of the Community Common. Include a mix of evergreen ground cover, evergreen shrubs, flowering shrubs, and perennials. SDC 29. Provide canopy trees along both sides of the walking path for a minimum of 60% of shade for along the entire length. SDC 30. Maintain a clear line-of-sight line from building entrances to the Community Common. Trees should be spaced at maximum 40 feet on center. SDC 31. Facilitate maintenance and pedestrian movement by preserving access from the buildings to open space. SDC 32. Install a minimum 10-foot-wide pedestrian walking path around the Community Common. Use concrete pavers or stamped concrete. See Section CO5, Sidewalks, Pathways and Trails, for allowed types of enhanced pavements. SDC 33. Include four benches at each building entrance near the edge of pavement and away from direct flow of pedestrian movement. SDC 34. Locate and position outdoor seating and pedestrian areas in spaces shaded by buildings, tree canopies, or shade structures. Introduce shade structures to provide shelter space when needed. SDC 35. Confirm individual program requirements and the need for items such as electric outlets needed for power during events.

Exhibit C01-13.1 Community Common Site Layout

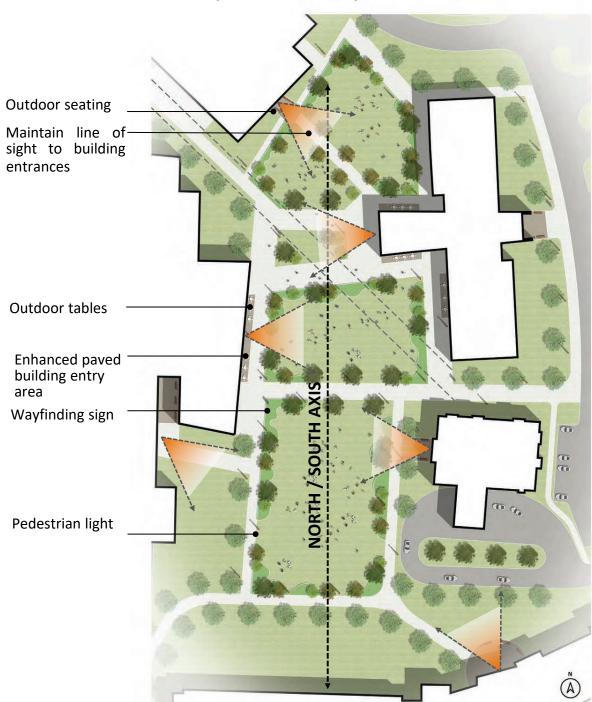
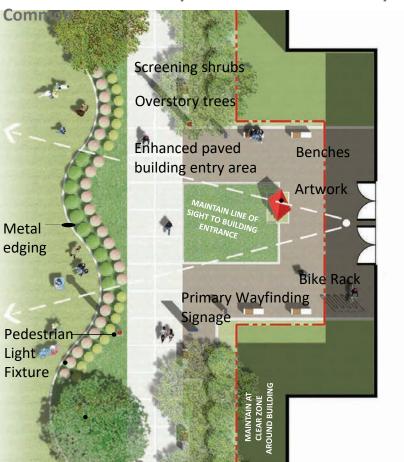


Exhibit C01-13.2 Facility Entries to the Community



C01.5.3 Community Common Typology, Facility Entry Areas

Yes No N/A

SDC 36. Install metal edging along the edges of the landscaped areas.

SDC 37. Incorporate low landscape plantings, art work, and site furnishings in the building entry area.

C01.5.4 Coastal Zone Facilities, Shorelines, & Waterfronts

Proposed Coastal Zone Marine Facilities

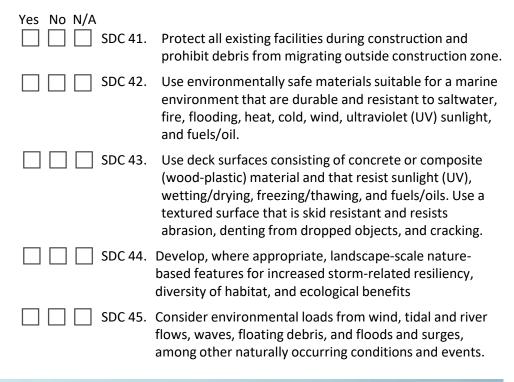
All design and construction activities related to the planning, design, and construction of marine-related features and shoreline protection must be conducted in collaboration with the 325 CES Environmental Element within the guidelines of the Tyndall AFB INRMP. Project teams must assess and develop opportunities for integrating Natural and Nature-Based Features (NNBF) in all shoreline protection designs. Examples of NNBF include beaches and dunes; vegetated environments such as maritime forests, salt marshes, freshwater wetlands, fluvial flood plains, and seagrass beds; coral and oyster reefs; and barrier islands, among others. These features may occur naturally in landscapes or be engineered, constructed, and/or restored to mimic natural conditions. For more information see USACE's Engineering With Nature website: https://ewn.el.erdc.dren.mil/nnbf.html.

C01.5.4.1 Piers, Docks, Bulkheads, & Other Marine-related Facilities (Shoreline/Off-Shore)

Facilities implemented along the shoreline or in waterways provide access to Tyndall AFB's unique and beautiful marine environment. These facilities must be designed and implemented with extreme care to protect and enhance this fragile waterfront ecosystem for generations.

Piers, floating docks and other marine-related facilities, at a minimum, must adhere to the following criteria:

adhere to the following	ng criteria:
Yes No N/A	
SDC 38.	Coordinate with 325 CES Environmental Element and the Tyndall AFB INRMP to align with coastal restoration and resilience plan objectives and to identify the site-wide ecological context and potential vulnerabilities.
SDC 39.	Follow all applicable local, state, and federal codes for planning, design, and construction activities, including but not limited to, demolition, dredging, and new construction.
SDC 40.	Protect adjacent shorelines, waterways, wetlands, and other environments during construction.





Coastal Zone rendering

Tyndall Air Force Base Installation of the Future



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Co2.3	Design Approach	C02-1
Co2.4	Utility Typologies & Criteria	C02-1
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	C02.4.2 Utilities Criteria (UC)	C02-1
	C02.4.3 Typical Underground Utility	
	Clear Zones & Easements	C02-2
	C02.4.4 Screening for Utility Infrastructure	C02-2
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Co2. Utilities

Co_{2.1} Introduction

Utilities on Tyndall Air Force Base (AFB) include vital services that support the operation of the base, including water, sewer, power, and communications. In terms of the **Landscape Master Plan**, the primary concerns for utilities are to avoid disrupting these services during construction activities, bolster system resilience in the event of emergencies and future storms, and ease maintenance activities and anticipated growth needs.

C02.1.1 Authority

All utility-related improvements are governed by utility Owners and must align with the requirements of the *Tyndall AFB Installation Facilities Standards* (IFS) as well as the recommendations of this **Landscape Master Plan**.

Co2.2 Design Objectives

To achieve Tyndall AFB's vision of becoming a sustainable, resilient Installation of the Future, the utilities design and installation will:

- Maintain the desired aesthetic character of the base
- Facilitate ease of maintenance and service, particularly after a storm event
- Accommodate anticipated technological advancements, including selfmonitoring analysis and reporting technology (SMART) systems

Co2.3 Design Approach

The overall approach to utilities design and installation can be summed up in the phase "out of sight, out of mind." *Out of sight* refers to the use of underground utility lines as well as screening for any utility equipment required to be above ground. *Out of mind* refers to lessening the level concern about how resilient the base's utilities will be during future storm events with accompanying high wind and flooding.

Consideration is also given to the increasing demand for digital communications, which has grown exponentially in recent years. Supporting the current requirements, as well as anticipating future advancements, requires laying additional digital cables. The infrastructure that is needed to support SMART systems and hard-wired lighting requires laying additional conduit.

Co2.4 Utility Typologies & Criteria

C02.4.1 Overview

Each landscape-related utility typology addresses unique circumstances found on the base. The various typologies are as follows:

- Underground utility easements
- Screening for utility infrastructure
- Low-impact development (LID)
- Flightline utility corridor

C02.4.2 Utilities Criteria (UC)

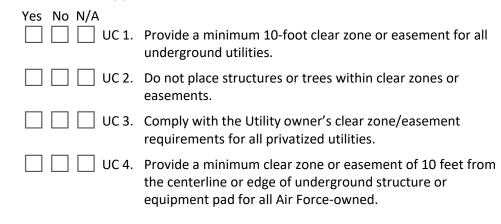
The criteria in this section relate to specific design requirements, including IFS requirements, and guidelines for designers/contractors to follow and Tyndall AFB personnel to review. Additional criteria are provided in the other sections of this Landscape Master Plan and are not repeated in this section; however, the requirements for utilities must be coordinated with other site elements. The sections that follow serve as worksheets, with supporting guidance and illustrations, for designers/contractors to use among their teams and in coordination with Tyndall AFB. These worksheets should be used to complete the Compliance Checklist submittal for each project. Each requirement includes a selection of check boxes to indicate the applicability of that requirement to a specific context, and to demonstrate compliance with the requirements.

Yes	No	N/A	
\checkmark			The designer/contractor either selects "Yes" if compliance ha
			been met, "No" if it has not, or "N/A" if the requirement is no
			applicable to the project.

C02.4.3 Typical Underground Utility Clear Zones & **Easements**

Interdisciplinary coordination is necessary to design and implement utility clear zones and easement that provide ready access for maintenance and repairs and protect the utility infrastructure from damage. Easements or clear zones must be designated to prevent locating structures, trees, and other large unmovable site improvements near underground utilities. These restricted areas will reduce the possibility of underground infrastructure being damaged by tree roots or falling/uprooted trees during storm events. In addition, clear zones and easements provide easier access for performing utility maintenance and emergency repairs and limit the need to remove trees or other landscaping elements to complete these functions.

Easements and clear zones for all base-owned utilities must conform to the direction of Tyndall AFB Civil Engineer Squadron. Privatized utilities and easements must be constructed in accordance with the standards of the individual utility provider.



C02.4.4 Screening for Utility Infrastructure

Screening all aboveground utility infrastructure aligns with the visual and

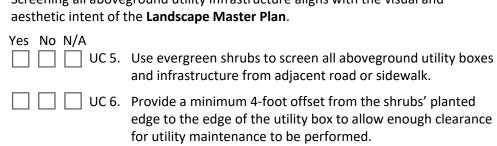


Exhibit C02-1. Typical Underground Utility Clear Zone/Easement Section

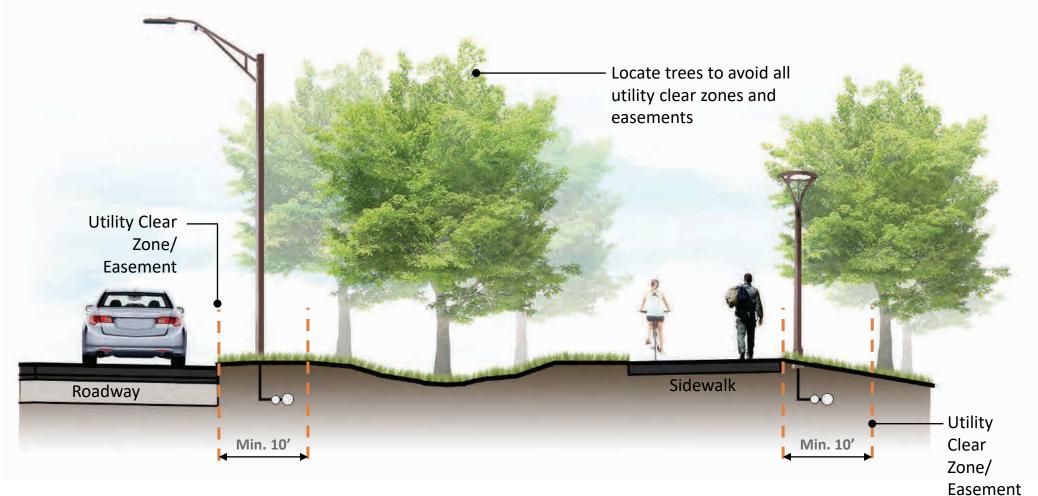
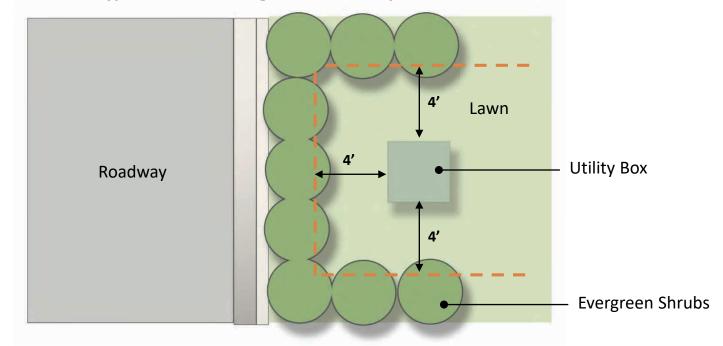


Exhibit C02-2. Typical Shrub Planting to Screen Utility Infrastructure, Plan View

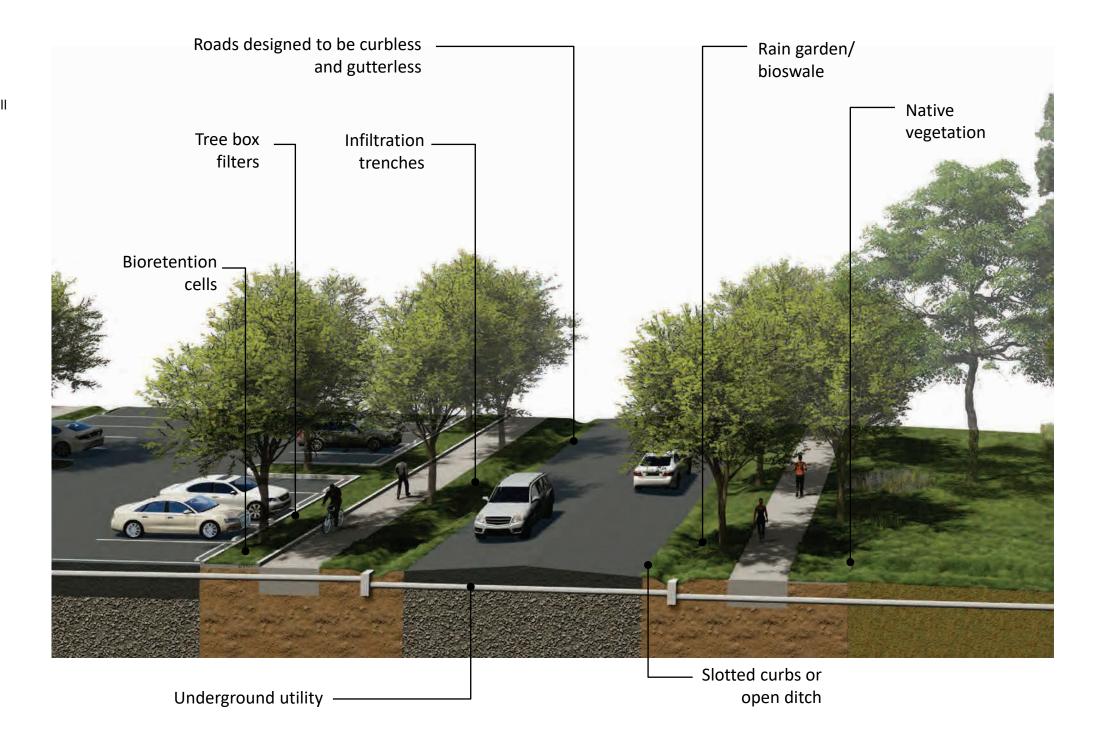


C02.4.5 Low-Impact Development

LID principles, as outlined in **Section B04, Integrated Land Management**, are used throughout major portions of Tyndall AFB. A successful LID approach requires interdisciplinary coordination to protect utility corridors.

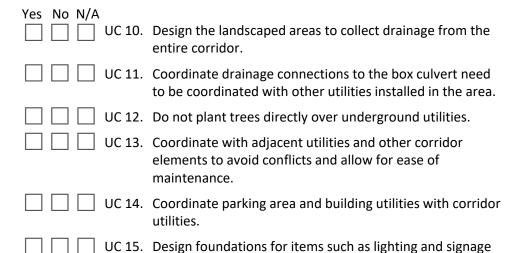
•	, ,
Yes No N/A	
U	C 7. Coordinate with engineered systems that filter stormwater from parking lots and impervious surfaces, such as bioretention cells, filter strips, and tree box filters. Ensure a plantings, pipes, and utilities are designed in concert with each other.
U	C 8. Use native vegetated areas to filter, direct, and retain stormwater, such as rain gardens and bio-swales. Ensure adequate coverage and clearance requirements are met.
U	C 9. Locate plantings and utilities so they do not interfere with water collection systems, such as subsurface collection facilities, cisterns, or rain barrels.

Exhibit C02-3. Typical LID Section



C02.4.6 Multi-Modal Spine Utility Corridor

The Multi-Modal Spine in the Flightline District is located above the underground utilities that serve the facilities in that area. This dense network of utilities provides critical services to the operation of all the Flightline missions. Design of the Multi-Modal Spine's hardscape and landscape elements, as well as the drainage systems, must be coordinated with the underground utilities so they do not impact the operation or maintenance requirements of the utilities.



to avoid conflicts with underground utilities.

Exhibit C02-4. Multi-Modal Spine Utility Corridor Section

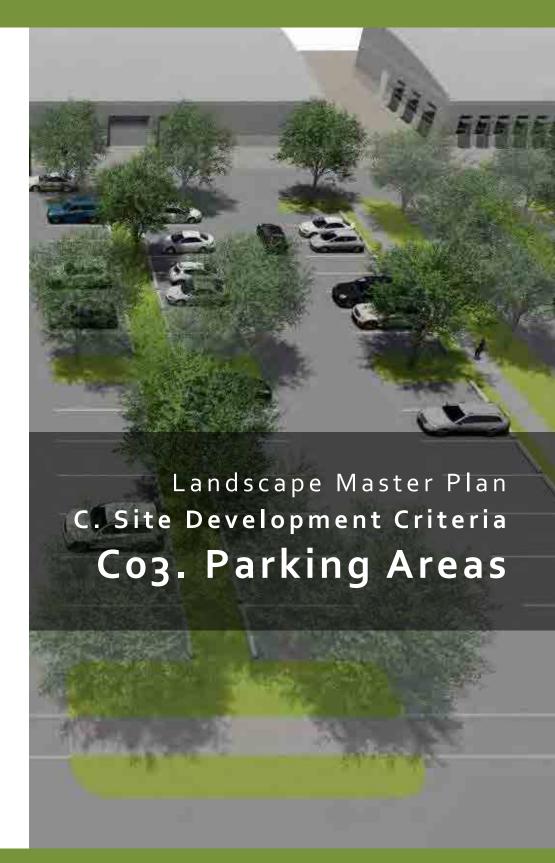


Tyndall Air Force Base Installation of the Future



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	C03.4.1 Parking Area Criteria (PAC)	C03-2
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	Parking Areas	C03-2
	C03.4.3 Specific Criteria for Districts	C03-2



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Co3. Parking Areas

Co3.1 Introduction

This parking areas plan applies strategies presented in **Section B03 Coordinated Parking** aimed to optimize the number of parking spaces at Tyndall Air Force Base (AFB). The strategies integrate best-practice planning, design, and operations to the underlying requirements of applicable Unified Facilities Criteria (UFC). This plan expands the *Tyndall AFB Installation Facilities Standards* (IFS) and provides specific criteria regarding the four typologies described in **Section B03, Coordinated Parking,** for shared parking, remote parking, parking structures, and efficient-mode priority parking.

C03.1.1 Opportunities

There are several opportunities to improve the efficiency of on-base parking areas, minimizing both construction and maintenance costs and providing additional benefits from sustainability and resilience standpoints. By implementing the strategies in the parking recommendations, the base can:

- Limit the use of impermeable materials (such as asphalt) for surface parking to only those parking spaces that are needed on a daily basis
- Reduce and optimize parking in the areas where excessive on-base parking has been provided in the past
- Relocate and/or make permeable surface parking needed only for special purpose uses (such as training)
- Improve pedestrian, bicycle, and shuttle connectivity between parking areas, allowing sharing of parking between buildings and optimizing the number of parking areas dedicated to individual buildings

C03.1.2 Authority

Planning principles related to Tyndall AFB parking requirements are governed by the UFC. Additional planning policies include *United States Code* Title 10, Section 2864, *Master Plans for Major Military Installations*; Department of Defense Instruction 4165.70, *Real Property Management*; UFC 2-100-01, *Installation Master Planning*; and Air Force Instruction 32-1015, *Integrated installation. Planning*. Parking is covered under UFC 3-201-01, *Civil Engineering*.

Provision of parking for visitors and handicapped persons is outlined in Surface and Distribution Command/Transportation Engineering Agency (SDDCTEA) pamphlets 55-15, *Traffic and Safety Engineering for Better Entry Control Facilities*, and 55-17, *Better Military Traffic Engineering*. Accessible parking is also governed by the Architectural Barriers Act (ABA).

C03.1.3 Warranty

Coordination of design and construction with Tyndall AFB staff, agencies, service providers and third-party contractors is critical to the successful implementation of planned improvements. All work is required to be warrantied regarding location and installation of materials in a manner consistent with the intent of the Landscape Master Plan and IFS, and to not create a conflict for installation of adjacent improvements by others. All potential conflicts will be identified by designers/contractors in respective sections of the Compliance Checklist and reviewed by Tyndall AFB Staff.

Co_{3.2} Design Objectives

The approach to parking areas discussed in this master plan is based on the following objectives:

- Provide adequate but not excessive parking for normal uses
- Eliminate parking that is only needed for special purposes, encouraging other
 modes of transportation to special purposes (such as shuttle, bicycle, or
 walking) and allow extra vehicles to park on remote temporary or permeable
 surfaces
- Provide direct and safe connectivity between parking areas so that nearby buildings can share parking
- Provide remote parking for overflow and special purposes
- Minimize costs associated with maintaining excess parking
- Improve environmental impacts related to surface water runoff and heat island effects

Co_{3.3} Design Approach

C03.3.1 Coordinated Parking Study and Typologies

Optimizing on-base parking requires the creation of a Coordinated Parking Study for all districts or subareas and should be prepared for the areas defined in Exhibit CO3-1. The study methodology and the parking area typologies are described in **Section B03**, **Coordinated Parking**, which identifies compatible uses and strategies to share parking assets due to differences in hourly demand distribution. Coordinated Parking Studies should integrate the following typologies and address the following considerations:

- Shared Parking: Implement the shared parking typology for all parking areas
- Remote Parking: Incorporate the remote parking typology where surge or overflow parking occurs
- **Parking Structure**: Assess the cost and benefits of a parking structure typology for areas where development of base land is in a shortage
- **Efficient-Mode Parking**: Designate non-ABA parking spaces near building entrances as efficient-mode priority typology spaces, where applicable
- Incorporate multiple typologies that allow compatible uses (such as
 dormitories and retail facilities) to share parking assets based on different
 hourly demand distributions, and facilitate safe and convenient walking
 times (5-10 minute) and connectivity between buildings and parking areas



Shared parking assets with mobility connection concept (Clay Kaserne, USAG Wiesbaden, Germany)

Co_{3.4} Design Criteria

Yes No N/A

C03.4.1 Parking Area Criteria (PAC)

The criteria in this section relate to specific design requirements, including IFS requirements, and guidelines for designers/contractors to follow and Tyndall AFB personnel to review. Additional criteria are provided in the other sections of this Landscape Master Plan and are not repeated in this section; however, the requirements for parking areas must be coordinated with other site elements. The sections that follow serve as worksheets, with supporting guidance and illustrations, for designers/contractors to use among their teams and in coordination with Tyndall AFB. These worksheets should be used to complete the Compliance Checklist submittal for each project. Each requirement includes a selection of check boxes to indicate the applicability of that requirement to a specific context, and to demonstrate compliance with the requirements.

The designer/contractor either selects "Yes" if compliance has been met, "No" if it has not, or "N/A" if the requirement is not applicable to the project.

C03.4.2 General Criteria for Installation Parking Areas

The criteria and checkboxes below apply to parking throughout Tyndall AFB, including the Sabre, Drone, and Silver Flag Districts. Additional criteria include specific recommendations based on results of the shared parking study that was completed. Any work related to parking on Tyndall AFB, including visitor and accessible parking accommodations, must comply with all parking requirements of UFC 3-201-01, *Civil Engineering* (current edition), SDDCTEA pamphlets 55-15 and 55-17, and the IFS.

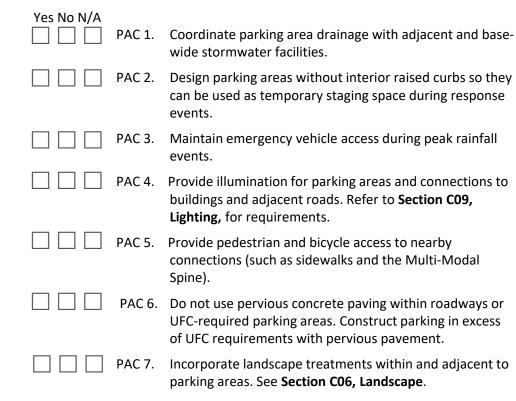
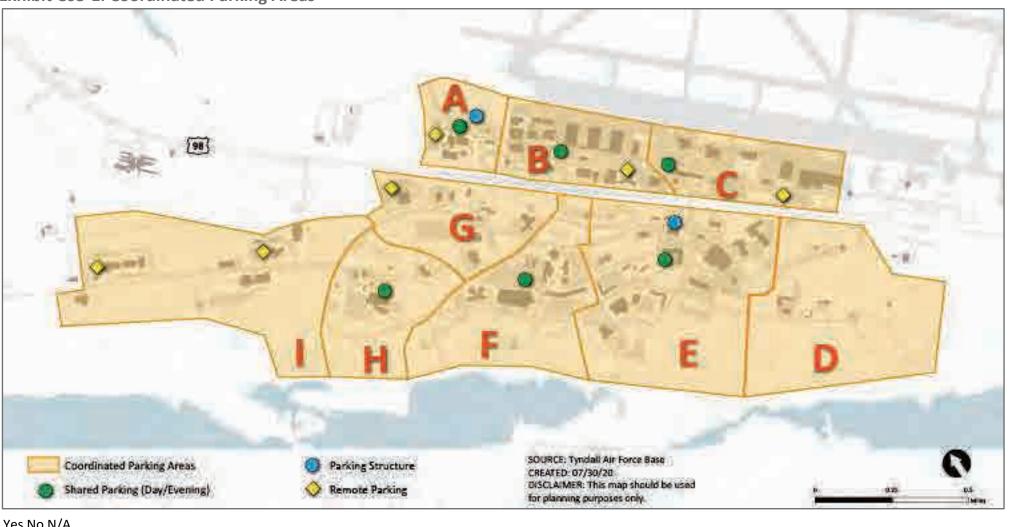


Exhibit C03-1. Coordinated Parking Areas



10314014/71		
	PAC 8.	Provide opportunities for remote parking typology for short-term, special-event parking scenarios.
	PAC 9.	Designate parking spaces for motorists who are accompanied by a child in a stroller or where parking is likely to include parents with young children.
	PAC 10.	Reserve efficient-mode priority parking typology spaces for electric vehicles, vanpools, and carpools.
	PAC 11.	Eliminate on-street parking along arterials and avoid on- street parking on collector streets.
	PAC 12.	Include temporary vehicle access and parking for special program providers to enable deliveries and event staging.
	PAC 13.	Use recycled asphalt pavement mixes for parking areas to the maximum extent allowed by Unified Facilities Guide Specification Division 32, <i>Exterior Improvements</i> .
	PAC 14.	Provide wayfinding signage per UFC requirements.
	PAC 15.	Size driveway aisles and parking spaces per IFS requirements.

C03.4.3 Specific Criteria for Districts

A coordinated parking approach is defined for the Tyndall AFB Flightline and Support Districts. The area is divided into nine coordinated parking subareas, as illustrated on Exhibit CO3-1, based on proximity, walkability, and where possible compatible uses are located. In each of these areas, the following criteria must be met:

be met:		· · · · · · · · · · · · · · · · · · ·
Yes No N/A	PAC 16.	Shared Parking: Analyze and provide data that show parking numbers are coordinated with other parking facilities within a 5-minute walk to avoid providing excess parking areas.
F	PAC 17.	Remote Parking: Encourage use of remote parking areas for special event purposes.
F	PAC 18.	Parking Structure: Study benefits and costs of a potential parking structure.
□ □ □ F	PAC 19.	Efficient-Mode Priority Parking: Designate non-accessible

vanpool, and electric vehicles.

parking spaces close to building entrances for carpool,

Tyndall Air Force Base Installation of the Future



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	C04.1.3 Warranty	C04-1		CO4.5.3 Stormwater Criteria for Building Perimeters	s C04-7
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Co4. Stormwater

Co_{4.1} Introduction

The Tyndall Air Force Base (AFB) drainage system comprises two systems, generally divided by U.S. Highway 98 (US 98) and identified as the Flightline District drainage system and the Support District drainage system. The Florida Department of Transportation (FDOT) constructed and maintains the drainage system for US 98. This system ties into the existing base drainage systems along the highway. FDOT has developed an improvements plan for US 98 that will coincide with the reconstruction of Tyndall AFB.

The Flightline system includes a piped system and a few onsite treatment ponds in the upland areas, and a combination of piped and channelized drainage systems throughout the airfield. Wet ponds are generally not used in the Flightline areas because of Bird/Wildlife Aircraft Strike Hazard (BASH) risks. The Support District's existing drainage infrastructure consists of an aging piped system that has been poorly maintained, linear surface channels, and scattered dry and wet detention ponds. Because the existing control structures were not studied in detail, the efficacy of the current ponds is unknown.

The onsite soils are highly permeable and the depth to the water table is generally shallow (approximately 2-5 feet below the ground). There are some areas that are more compacted and will require special treatments as described in this section. This creates challenges to designing and constructing dry stormwater elements (sometimes referred to as Integrated Management Practices [IMPs] or Best Management Practices [BMPs]) and will result in the base systems having large areas and shallow depths in order to provide at least 12 inches of separation to groundwater. In addition, there are known contaminant plumes in the ground that should be avoided for surface elements. Finally, there are several cultural heritage sites where grey stormwater infrastructure is not permitted.

C04.1.1 Opportunities

Tyndall AFB has an opportunity to improve the performance of the existing stormwater system. Green and natural infrastructure alternatives are integrated throughout the rebuilt installation. These strategies are aimed at improving stormwater quality, reducing capital and maintenance costs, and enhancing environmental benefits, including the management of storm surge.

C04.1.2 Authority

This stormwater plan was developed based on local and federal stormwater ordinances, and environmental regulations and protections. It expands the stormwater requirements found in the *Tyndall AFB Installation Faculties Standards* (IFS) and presents criteria for stormwater management associated with an integrated land management approach.

Stormwater system designs will comply with all design and permitting requirements of the Florida Department of Environmental Protection (FDEP) as well as those listed in the Unified Facilities Criteria (UFC):

- UFC 3-201-01, Civil Engineering
- UFC 3-201-02, Landscape Architecture
- UFC 3-210-10, Low Impact Development

C04.1.3 Warranty

Coordination of design and construction with Tyndall AFB staff, agencies, service providers and third-party contractors is critical to the successful implementation of planned improvements. All work is required to be warrantied regarding location and installation of materials in a manner consistent with the intent of the Landscape Master Plan and IFS, and to not create a conflict for installation of adjacent improvements by others. All potential conflicts will be identified by designers/contractors in respective sections of the Compliance Checklist and reviewed by Tyndall AFB Staff.

Co_{4.2} Design Objectives

The stormwater management system is designed to meet the following objectives:

- Provide a consistent design standard for stormwater and for ease of maintenance
- Provide pipes and open channels to convey the 10-year, 24-hour storm
- Design the stormwater management facilities to safely pass floodwaters for up to the 100-year, 24-hour storm event
- Design stormwater facilities that align with the objectives of Section B04,
 Integrated Land Management
- Create a balanced green and grey stormwater system that provides a sustainable, lower initial cost system with lower maintenance costs
- Comply with all UFC and FDEP design and permitting requirements.
- Comply with antiterrorism (AT) requirements.
- Comply with the required Design Flood Elevation for the base. This is 19 feet in the Support District, impacted by the Gulf of Mexico, and 14 feet on the Flightline District, is impacted by the St. Andrew Bay.



Stormwater management interfaces with many design components:

- Transportation and Roadway Drainage
- Architecture
- AT Protection
- Landscape Architecture
- Land Management

C04.2.1 Goals

- Use green and grey infrastructure to manage, treat, and convey stormwater runoff
- Manage the 10-year storm event per the UFC requirements
- Create a sustainable, low-maintenance system
- Minimize flooding potential on roads and building sites
- Maintain or improve stormwater quality, including in existing areas
- Comply with environmental permitting requirements

Co4.3 Design Approach

C04.3.1 Integrated Stormwater Management

The success of Tyndall AFB's integrated stormwater management approach requires a balanced relationship between integrated land management and nature-based Infrastructure. This combines conventional engineered infrastructure with natural landscape areas to manage stormwater through a vegetated treatment network. This hybrid of grey and green infrastructure design goes beyond the traditional "pipe-and-pond" infrastructure and considers the watershed and base hydrology. This concept produces a coordinated, natural system that has a lower environmental impact. It promotes individual site-level improvements to manage stormwater and provides solutions to enhance installation-wide and regional watersheds.

The base infrastructure is planned to include both grey and natural components that will work with nature to create sustainable conditions and climate-resilient solutions for increased mission resilience. This hybrid approach combines coastal and inland strategies that offer multiple lines of defense against storm surge and high-wind storms that often occur along Florida's Gulf coast. The inland strategies work in tandem with coastal solutions. Inland strategies manage stormwater and overland flooding by restoring the native Longleaf Pine forest and other naturalized and highly permeable landscapes. Once restored, the native areas that flourished before Tyndall AFB was developed will provide additional natural stormwater management.

Tyndall AFB's watershed must be analyzed on a case-by-case basis for all new construction and site rehabilitation efforts. Integrated land management designs must replicate natural hydrologic conditions and adequately mitigate onsite precipitation. This approach is in alignment with the requirements for low impact development and conservation design as outlined in the U.S. Environmental Protection Agency's *Technical Guidance on Implementing the Stormwater Runoff Requirements for Federal Projects* (under Section 438 of the Energy Independence and Security Act of 2007) and Northwest Florida Water Management District's *St. Andrew Bay Watershed Surface Water Improvement and Management Plan*.

Due to the range of stormwater requirements and the need for long-term guidance that will lead to consistency in implementation, a series of framework typologies, discussed in **Section C04.4**, were defined on four spatial delineations, salt marshes, bioswales, wet (retention) ponds, and dry (detention) ponds, as indicated in the adjacent photographs.



Salt Marsh



Wet (Retention) Pond



Parking Lot Bioswale



Dry (Detention) Pond

C04.3.2 Stormwater at Individual Building Sites

The "stormwater treatment train," as shown in Exhibit CO4-1, uses a systems-based design approach that considers vegetation, soils, water, and surface treatments as an integrated and connected system to manage and treat stormwater. This design approach reduces traditional stormwater capital and system maintenance costs, reduces damage to buildings due to storm surge, improves water quality, and establishes a more self-sustaining landscape for lower maintenance costs.

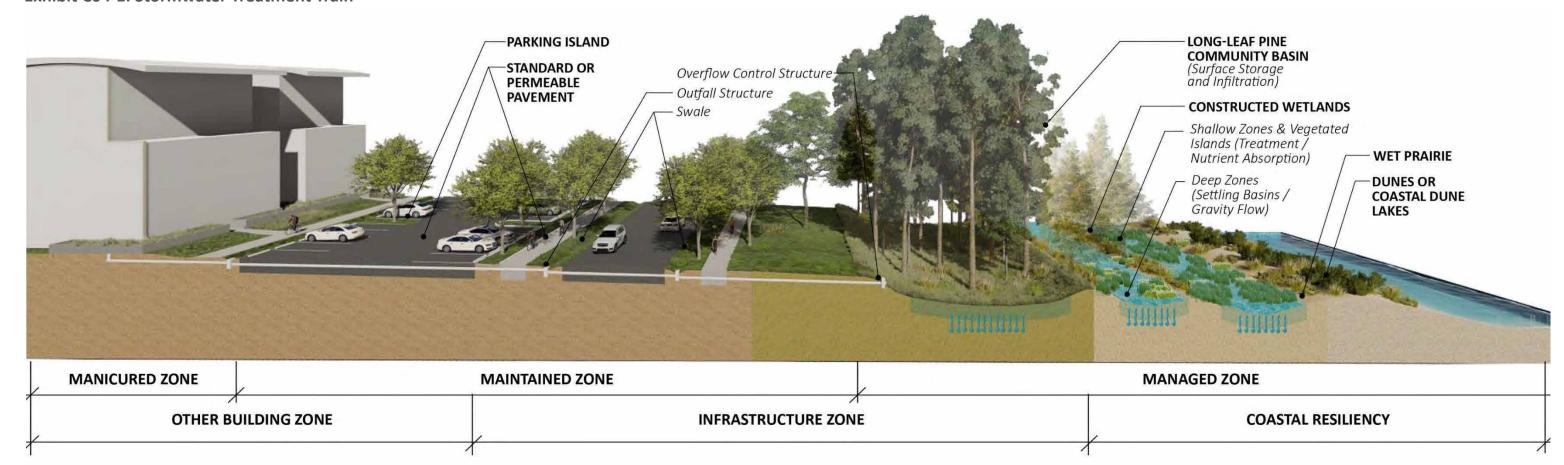
The stormwater treatment train begins at the buildings and their immediate surrounding sites. Building sites should incorporate natural and nature-based features (NNBF) or green infrastructure to manage stormwater flows and elevated surface temperatures from impervious areas when possible.

Incorporating more vegetation in the building sites will further improve air quality and improve quality of life, wellbeing, and walkability on the base. As a result, carbon emissions and energy use will be reduced, thus reducing the effects of climate change, witnessed today with rising sea levels and more frequent, severe storm events.

The next car of the stormwater treatment train is at the parking lot and roadway locations. Along these vehicular corridors, shallow swales should be used to treat runoff in the immediate area. These treatment areas will then flow into more regional basins, which are larger and contain native plant habitats. These regional basins increase permeation as well as sustain the plant communities.

The coastal zones are the final car in the stormwater treatment train. They are the last treatment area before discharge into the ocean. It is important to ensure that the stormwater that drains into the coastal areas is of high quality so as not to damage the coastal habitats.

Exhibit C04-1. Stormwater Treatment Train



C04.3.3 Groundwater

The depth to the groundwater table from the surface is generally 2 to 5 feet throughout the base, as shown on Exhibit C04-2. Stormwater elements should be appropriately located, designed, and/or raised to provide at least 12 inches of separation between their bottoms and the groundwater.

Groundwater Depths Less Than 4 Feet

Groundwater depths less that 4 feet are ideal for constructed wetlands and wet ponds. Other elements may be considered if they can be elevated, configured as broad and shallow, use impermeable liners or underdrains, and/or incorporate sand filters at the bottom. Bioswales should be designed as wet swales for conveyance, water quality, and/or pretreatment for other elements.

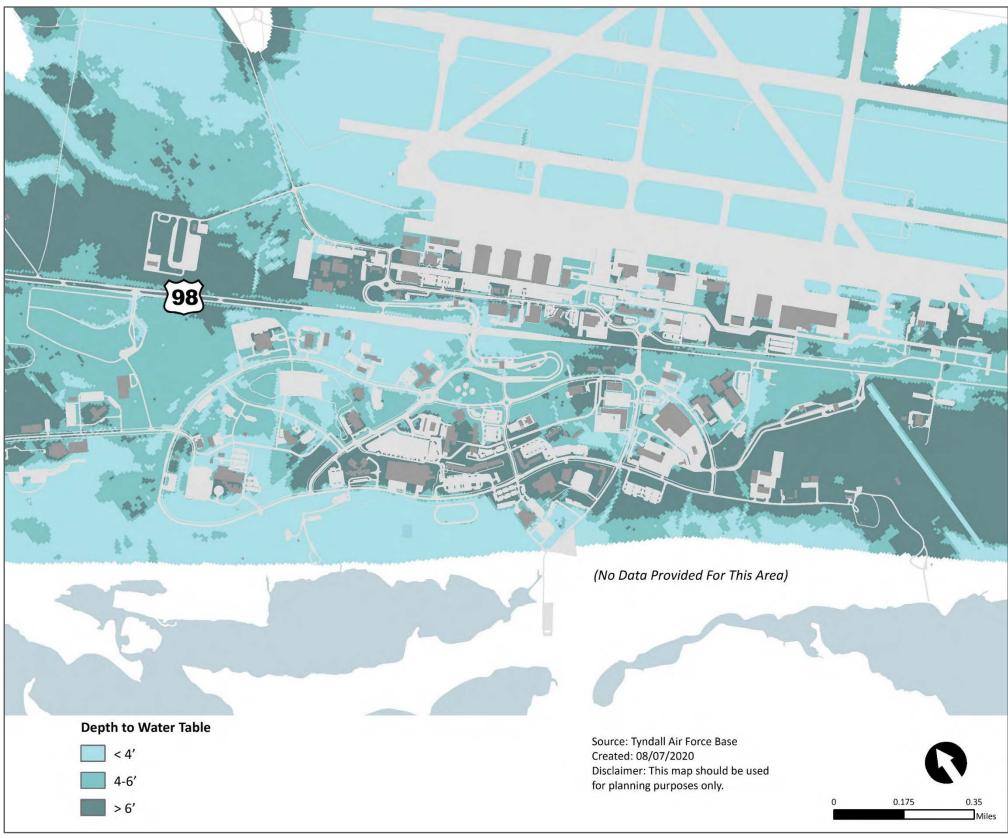
Groundwater Depths from 4 to 6 Feet

At groundwater depths between 4 and 6 feet, most stormwater elements are applicable, but some (bioretention, enhanced tree trench, stormwater planters, subsurface storage, and infiltration) may require broad and shallow configurations and/or impermeable liners or underdrains.

Groundwater Depth Greater Than 6 Feet

At groundwater depths of greater than 6 feet, most stormwater elements have high applicability (possible exceptions are constructed wetlands and wet ponds).

Exhibit C04-2. Depth to Water Table



The figure above is based on available data from Tyndall AFB and is for placing purposes only. Depth to groundwater should be verified for each project on Tyndall AFB.

Co4.4 Design Typologies

The following are typical solutions to treat stormwater at various locations of the site area. For the purposes on the diagram below, the major site components are presented as site design typologies.

Refer to **Section B04, Integrated Land Management**, for information regarding green infrastructure treatments, applications, components, and materials.

Legend



Building Perimeter

- Bioretention or bioswale (edge)
- Subsurface storage/infiltration



Open Space

- Forested basin (Longleaf Pine) / surface storage and infiltration
- Bioretention and bioswale (edges)
- Constructed wetland
- Meadow restoration
- Wet pond



Overflow Parking Areas

- Stabilized turf or pervious pavement
- Subsurface storage/infiltration



Site Parking Area Landscaping

- Bioretention or bioswale
- Stormwater planter



Site Sidewalks

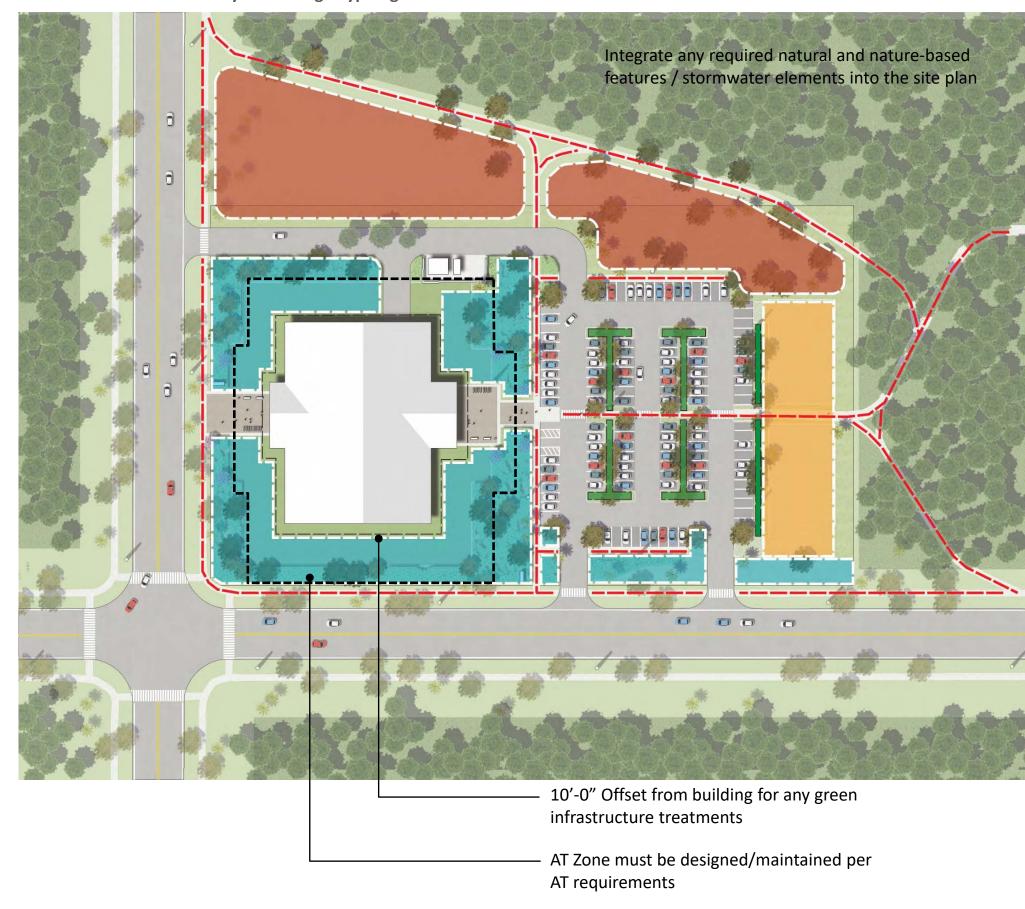
- Standard concrete pavement design
- Specialty paving can be pervious pavement
- Pedestrian walkways should not conflict with stormwater requirements



Corridors

- Bioretention
- Bioswale
- Pervious Pavement sidewalks

Exhibit C04-3. Stormwater System Design Typologies



Co_{4.5} Stormwater Typology Criteria

C04.5.1 Stormwater Criteria (SC)

The criteria in this section relate to specific design requirements, including IFS requirements, and guidelines for designers/contractors to follow and Tyndall AFB personnel to review. Additional criteria are provided in the other sections of this Landscape Master Plan and are not repeated in this section; however, the requirements for stormwater must be coordinated with other site elements. The sections that follow serve as worksheets, with supporting guidance and illustrations, for designers/contractors to use among their teams and in coordination with Tyndall AFB. These worksheets should be used to complete the Compliance Checklist submittal for each project. Each requirement includes a selection of check boxes to indicate the applicability of that requirement to a specific context, and to demonstrate compliance with the requirements.

,	<i>0</i> ,
coordination	with Tyndall AFB. These worksheets should be used to complete
the Complian	ce Checklist submittal for each project. Each requirement includ
a selection of	check boxes to indicate the applicability of that requirement to
specific conte	ext, and to demonstrate compliance with the requirements.
Yes No N/A	The designer/contractor either selects "Yes" if compliance has been met, "No" if it has not, or "N/A" if the requirement is not applicable to the project.

C04.5.2 General Stormwater Criteria

Yes No N/A	
SC 1.	Site stormwater management plan fully integrates, to the maximum extent technically feasible (METF), traditional "hard" infrastructure elements with NNBF to reduce flooding potential, enhance water quality, comply with the antiterrorism (AT) requirements, and generally provide a more livable and sustainable environment on the base.
SC 2.	Satisfy applicable requirements of UFC 3-201-01, <i>Civil Engineering</i> .
SC 3.	Satisfy requirements of UFC 3-210-10, Low Impact Development.
☐ ☐ SC 4.	Satisfy requirements of <i>Environmental Resource Permitting</i> Applicant's Handbook – Volume I.
SC 5.	Satisfy requirements of <i>Environmental Resource Permitting Applicant's Handbook – Volume II</i> , which provides specific sizing and design guidance for various stormwater elements.
SC 6.	Employ NNBF to the METF for stormwater that use or mimic natural processes to: (1) infiltrate and recharge, (2) filter and treat, (3) evapotranspire through biological uptake, and/or (4) harvest and use precipitation near to where it falls to earth.
SC 7.	Locate stormwater elements in such a way as to maximize stormwater runoff capture, align with site drainage patterns, integrate with proposed land uses, enhance safety, and ensure accessibility.
☐ ☐ SC 8.	Maximize the use of vegetated open channels and minimize the use of pipes for conveyance of stormwater runoff.
SC 9.	Minimize impervious surfaces and minimize turf areas.

SC 10.	Incorporate pervious pavement at overflow parking areas, walkways, plazas, and other large expanses of pavement with low traffic loads.
SC 11.	Locate, design, and/or raise (that is, configure as broad and shallow) stormwater elements in accordance with FDEP requirements to comply with minimum separation of seasonal high groundwater and bottom of facility.
SC 12.	Avoid stormwater treatment and storage sites in contaminant areas.
SC 13.	Perform a groundwater mounding analysis to document that the design will perform as required (not required for wet detention facilities) per the requirements listed in <i>Environmental Resource Permitting Applicant's Handbook – Volume II.</i>

Yes No N/A

C04.5.3 Stormwater Criteria for Building Perimeters

Through the collective use of plantings, naturally occurring element, and proper planning, the site will function as a cohesive system that achieves its maximum stormwater management potential.

Exhibit CO4-4 represents a stormwater management system that operates efficiently; it is intended that Tyndall AFB's environment achieve this success as described in this section.

Designers/contractors must think beyond the limits of their site and understand its context within the overall base and how individual actions may adversely impact sites downstream.

Yes No N	/A	
	SC 14.	Use Bioretention, Bioswale, and/or Subsurface Storage and Infiltration elements to the METF to reduce the need for
		pipes for conveyance.

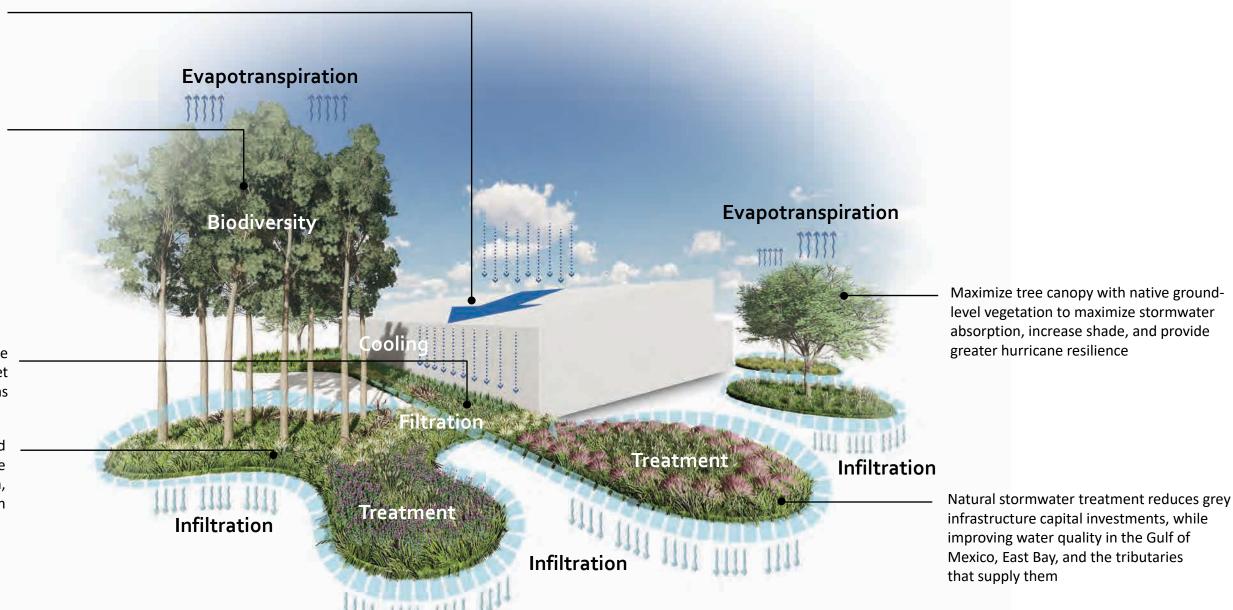
Exhibit C04-4. Efficient Stormwater Management System

Building perimeters must be designed to accept roof runoff to filter, convey, and store stormwater as a system

Longleaf Pine reforestation near building perimeters provides cooling evapotranspiration, and filters and absorbs stormwater, while providing high wind protection to base buildings and other structures

Locate natural subsurface stormwater strategies 10 feet away from building foundations

Wiregrass dominant ground planes of longleaf pine restoration provide absorption, infiltration, and filtration



Tyndall Air Force Base Landscape Master Plan | C. Site Development Criteria

C04. Stormwater

C04.5.4 Stormwater Criteria for Parking Areas

Within parking areas, NNBF can often be seamlessly integrated into landscaped areas along edges or within islands, as well as within no parking zones. With careful design that considers pedestrian and vehicular circulation patterns, such features will not only effectively capture and treat site runoff, but also provide increased shade, hurricane resiliency, and greater wellbeing.

In areas of Tyndall AFB with high groundwater elevations, soil depths can limit required tree soil volumes and stormwater storage areas immediately under the surface. In such conditions, stormwater elements are often most effective when configured to be broad and shallow at the surface and/or within subsurface areas under paved surfaces.

Yes No N/A

SC 15. Direct roof runoff into nearby stormwater element(s) where it can be treated and infiltrated.

SC 16. To the METF, use Pervious Pavement, Subsurface Storage and Infiltration, and/or Tree Pits/Trenches.

SC 17. Break up expansive impervious pavements with vegetated stormwater elements to increase shade and filter/infiltrate stormwater.

Exhibit C04-5. Typical Parking Area Stormwater Management Section

Maximize tree canopy with native ground plane Suspended pavement systems or vegetation for maximized stormwater absorption, structural soils under impervious increased shade, and greater hurricane resilience surfaces adjacent to vegetated areas in parking areas must be used to maximize soil volumes per Use pervious pavements in parking spots and in UFC 3-201-02 requirements and be overflow parking areas when conditions allow considered for stormwater subsurface storage design where depths allow Grade parking areas to direct flows towards tree islands and bioswale, bioretention, and/or planter areas Optional additional storage Optional additional storage under impervious pavement under impervious pavement Incorporate broad and shallow subsurface Incorporate bioswales, bioretention, and/or stormwater storage where soil depths allow stormwater planters in between drive and (minimum 12 inches above groundwater) parking aisles to break up impervious surfaces



C04.5.5 Stormwater Criteria for the Multi-Modal Spine

When integrated into the landscaped pedestrian areas such as the Multi-Modal Spine, NNBF can capture and filter runoff from sidewalks and roads, thus reducing the demand on traditional stormwater conveyance elements. Such features can also greatly enhance the health and longevity of site vegetation, provide much needed shade and lower temperatures, and create more walkable pathways.

Designing effective green infrastructure elements within corridors entails careful consideration of pedestrian and vehicular accessibility and safety. Such features incorporate the following: species that will not conflict with pedestrian or vehicular circulation; more robust/reinforced curb structure when adjacent to roads; fencing or other barriers to protect trees and plants; and safe crossings over and around depressed stormwater elements.

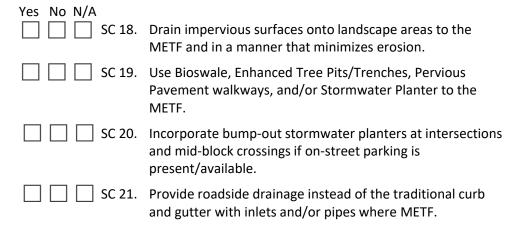
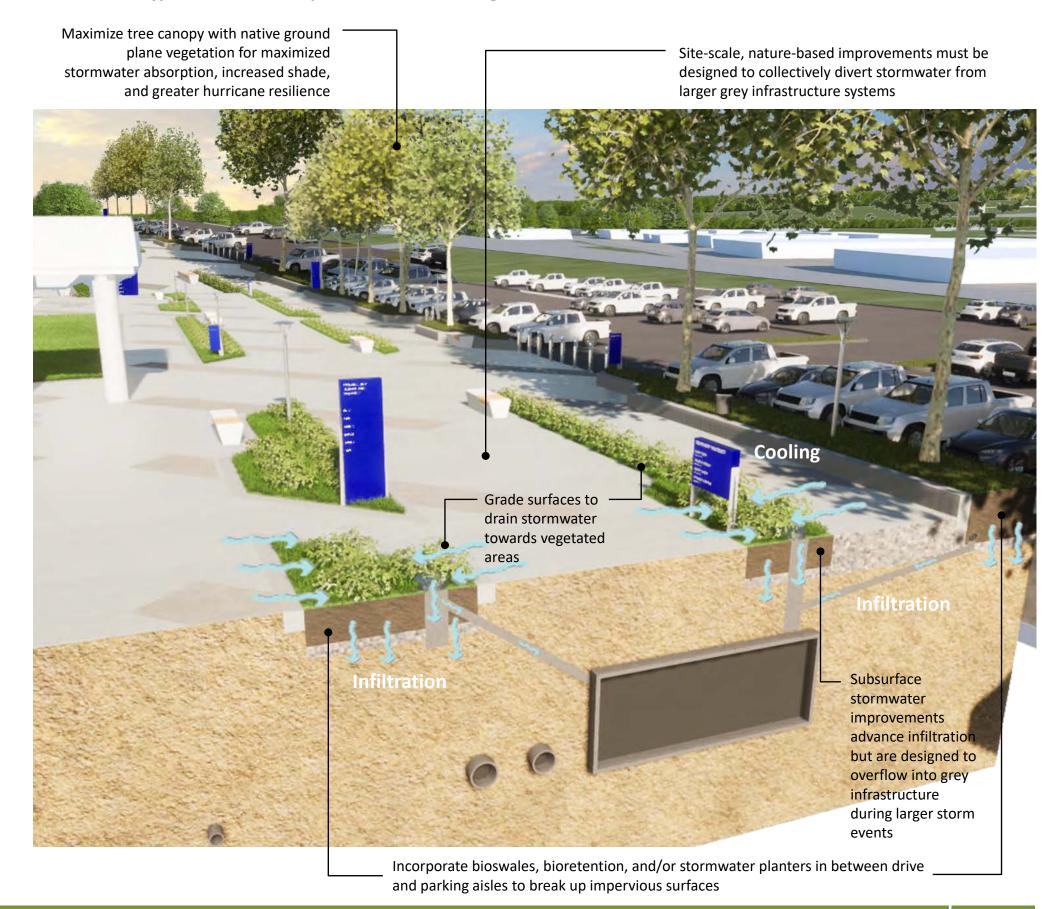


Exhibit C04-7. Typical Multi-Modal Spine Stormwater Management Section



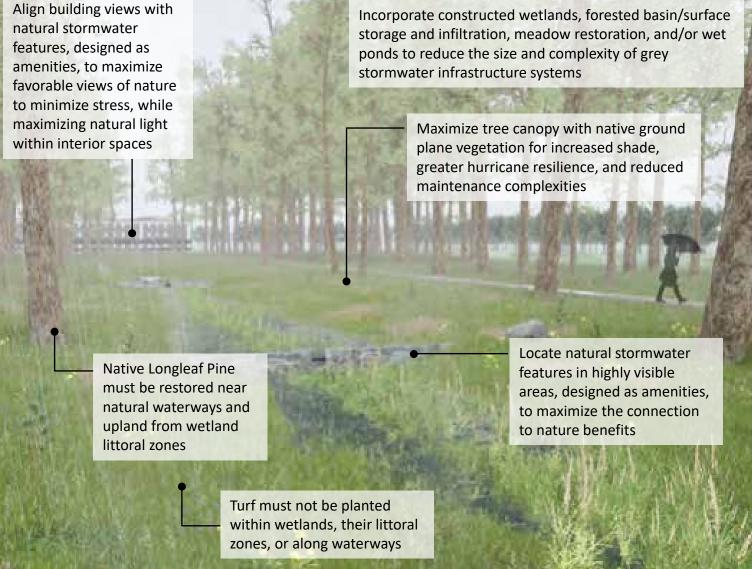
C04.5.6 Stormwater Criteria for Open Space

To improve water quality, manage flows, and decrease temperatures, open spaces shall incorporate NNBF that are integrated within urban design concepts. Designing stormwater elements within open spaces must acknowledge site context and existing conditions, realize the human scale, and balance aesthetics against green infrastructure performance. The goal is a site that incorporates and enhances surface and subsurface conditions, while creating a sense of place for users as an entire performance landscape system.

es No N/A	
SC 22.	Comply with Florida Department of Environmental Protection's technical requirements and revegetate the stormwater elements in these areas in accordance with the landscape requirement of this Landscape Master Plan .
SC 23.	Maximize surface flows/expressions and minimizes the use of piped drainage conveyance.
SC 24.	Design for desire paths and include components such as vegetative or physical barriers that discourage foot /

Exhibit C04-8. Typical Open Space Stormwater Management (Dry Weather/Wet Weather)





Co4.6 Stormwater Design Elements

The stormwater management typologies discussed in Section C04.5 incorporate various elements that work together to manage stormwater.

C04.6.1 General Stormwater Elements

Yes No N	/A	
	SC 25.	Use a maximum 3:1 side slope for vegetated stormwater elements.
	SC 26.	Design infiltration stormwater elements to infiltrate have level bottoms or else check dams to promote more uniform infiltration.
	SC 27.	Design infiltration stormwater elements to have not been placed on fill, but on uncompacted (or scarified) subgrade
	SC 28.	Design stormwater elements, including conveyance elements, to discharge in a controlled and non-erosive fashion, using level spreaders as possible to encourage sheet flow.
	SC 29.	Provide accessible means of observing performance of stormwater elements such as cleanouts, observation wells, and/or maintenance ports for maintenance purposes.
	SC 30.	Provide robust and easily maintainable pretreatment mechanisms, including approved proprietary BMPs, to protect natural conveyances or stormwater elements from clogging or degradation especially in areas potentially containing excessive levels of silt and sediment or contaminated with oils, fuels, or grease.
	SC 31.	Protect stormwater elements against erosion and facilitate vegetation establishment by utilizing energy dissipators at inflows and/or biodegradable erosion control matting.
	SC 32.	Provide stabilized and controlled overflow mechanisms for larger storm events and/or provide bypass/diversion structures (design stormwater elements to be "offline").

C04.6.2 Specific Criteria for Pervious Pavement

Yes No N/A SC 33.	Ensure anticipated vehicular loading has been factored into design (perform structural analysis) for Pervious Pavement and Subsurface Storage & Infiltration solutions.
SC 34.	Avoid placement in areas where there is the potential to contaminate existing soils (fuel areas, industrial storage, vehicle maintenance or service areas) or where there is high sediment loading potential.

Managing Water at the Site Scale



Bioretention & Bioswale

Bioretention and bioswale facilities are sunken landscape beds containing plants in a special soil mix that sits above a gravel drainage layer. They replicate the natural water cycle by allowing water to enter the soil, evaporate to the air, or be ponded for up to 2 to 3 days. These facilities use native or naturalized vegetation that can withstand both occasional dry periods and flooding. The vegetation provides natural filtration and treatment of stormwater runoff, removing many pollutants often found in urbanized environments.



Stormwater Planters

Stormwater Planters are sunken landscape beds containing native or naturalized plants in a special soil mix that sits above a gravel drainage layer, similar to bioretention facilities. But unlike bioretention, stormwater planters are enclosed by concrete, brick, wood, or other materials, and can be placed either above or below the adjacent ground elevation.



Pervious Pavement

Pervious pavement often looks like ordinary pavement but allows stormwater to drain through it and into an underlying storage system where it is detained until it can infiltrate into the soil, reducing runoff volume, attenuating flows, and filtering out pollutants in the process. A variety of pervious pavement types can be used depending on site conditions, including pavers and paver blocks, open grid pavers, and resin-bonded flexible pavements, among others. Pervious pavement has high applicability in locations such as overflow parking areas, sidewalks and walkways, plazas, playgrounds and basketball courts, and even emergency access drives.

C04.6.3 Specific Criteria for Constructed Wetlands

Yes No N/A SC 35. Include a safety shelf (aquatic bench) with shrubs and tall grasses around the perimeter. SC 36. Specify plant species and/or other features in accordance with BASH requirements. **C04.6.4 Specific Criteria for Wet Ponds** SC 37. Include a safety shelf (aquatic bench) with shrubs and tall grasses around the perimeter. SC 38. Specify plant species and/or other features in accordance with BASH requirements. C04.6.5 Specific Criteria for Forested Basins/Surface **Storage & Infiltration** SC 39. Use longleaf pine trees and wiregrass and other native

Longleaf Pine Community.

inches high.

SC 40. Vegetate Surface Storage & Infiltration Dry Ponds with

groundcover mix in the Forested Basin (Dry Pond) with

native grasses. Do not use trees or plants more than 8

Managing Water at the Site Scale



Constructed Wetlands

Constructed Wetlands are shallow marshes planted with native vegetation that improve water quality through plants absorbing pollutants in their roots (uptake) and water evaporating to the atmosphere (evapotranspiration). Constructed wetlands maintain a permanent water surface using flow control structures that regulate stormwater runoff discharges from the wetland. They are vegetated with native or naturalized plants that provide natural filtration and treatment of stormwater runoff, removing many common pollutants like phosphorous and nitrogen that can degrade water bodies like Saint Andrews and East Bay.



Meadow Restoration

Meadow or landscape restoration is the process of re-vegetating a site using native, prairie, or wildflower species. This practice reintroduces into the landscape native plant species that do not require significant maintenance by pesticides, herbicides, and fertilizers. Restoring the landscape with native vegetation has multiple other environmental benefits, including improved water quality, reduced volume of site runoff, increased volume of water uptake, improved soil conditions through organic material and macropore formation, enhanced infiltration, and natural sequestration of carbon.



Wet (Retention) Ponds

Wet ponds are among the most recognizable nature-based infrastructure practices in the state of Florida. They accept and hold stormwater runoff long enough to allow pollutants to settle out, resulting in cleaner water. Wet ponds are designed to maintain a permanent water surface (or permanent pool) through flow control structures that regulate discharge from the pond.



Subsurface Storage/Infiltration

Subsurface storage/infiltration systems temporarily hold stormwater runoff underground in material like gravel, highstrength plastic boxes/arches, largediameter pipes, or concrete chambers. This allows the stormwater to be detained until it either infiltrates into the soil or drains into the base's existing drainage system over 2 to 3 days. These systems can be placed under almost any type of finished surface, whether pavement, grass, landscaping, or other material and are often "fed" by surface drains and pipes.



Forested Basin / Surface Storage & Infiltration

Surface storage and/or infiltration of stormwater runoff can be provided over broad and shallow areas that are either forested (e.g. longleaf pine) or finished with lawn or more naturalized landscapes. These systems are designed to receive runoff from contributing areas and then slowly release it downstream over 2 to 3 days.



Dry (Detention) Ponds

Dry Ponds are often confused with detention basins with mowed grass. A dry pond is a vegetated low area with native plant species which is not mowed. The dry pond slows stormwater run off down and allows it to percolate into the ground slowly. It is wet for only a short period of time and is dry most of the time. The depth can be minimal 1-2 feet deep as ground water at Tyndall is high and if the area is too deep it will fill with ground water.



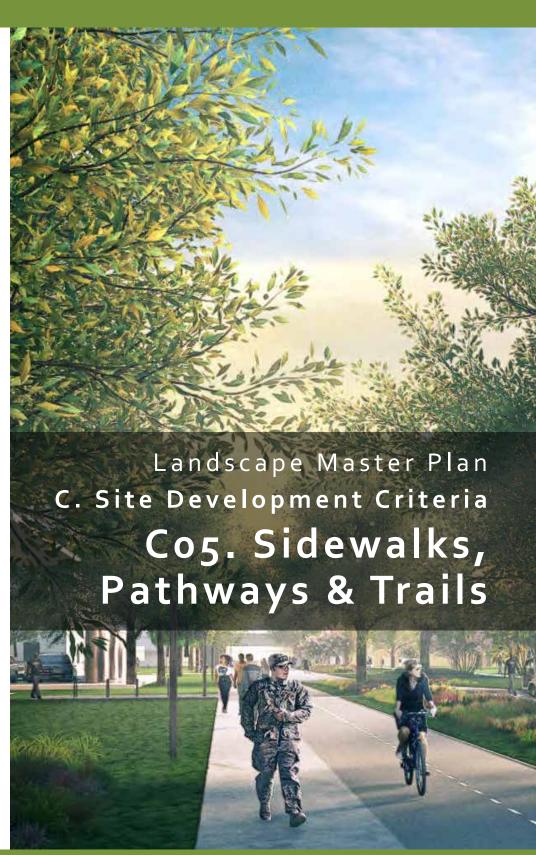
Tyndall Air Force Base Installation of the Future



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	C05.5.4.5 Sidewalk/Path Intersections	C05-10	C05.7.5 Coastal Zone Shelters &	
			Observation Platforms CO)5-16

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Co₅. Sidewalks, Pathways, and Trails

Co_{5.1} Introduction

One of the guiding principles for creating the Installation of the Future at Tyndall Air Force Base (AFB) is to encourage alternatives to privately owned vehicle (POV) travel for short trips within the base. Designing and promoting an active, walkable, and bikeable base environment involves creating a system of organized, easily navigable pathways and bikeways that offer users convenience, safety, efficiency, and accessibility. A key component of a walkable, bikeable base is the central Multi-Modal Spine, a coherent, connected bikeway and pedestrian network stretching across the majority of the Support and Flightline Districts.

This section sets forth the objectives, strategies, and criteria to support base planners, consultants, design professionals, and stakeholders as they develop plans and designs that contribute to an integrated mobility framework and a pleasant, mission-focused installation.

C05.1.1 Opportunities

Travel by foot or bicycle is the exception at Tyndall AFB, not the rule—a reality underscored by the base's "Car-Dependent" designation and a community "Walk Score" of 0, the lowest score as compiled by walkscore.com. As outlined in Section B02, Integrated Mobility Framework, a primary outcome of the rebuild program is to create a walkable, bikeable, and heathy Tyndall Community with less reliance on automobiles. Creating a diverse network of sidewalks, pathways, and trails will allow users to choose alternative modes of traveling through the base. Prioritizing mobility options, such as pedestrian and bicycle modes, has numerous financial, operational, community, and resilience benefits.

C05.1.2 Authority

This document expands upon the requirements in the *Tyndall AFB Installation Facilities Standards* (IFS). In addition to code requirements and compliance standards, such as the American Association of State Highway Transportation Officials (AASHTO) and best practices outlined in the National Association of City Traffic Officials (NACTO), published guidance will be followed for all future bicycle and pedestrian facility planning and design.

C05.1.3 Warranty

Coordination of design and construction with Tyndall AFB staff, agencies, service providers and third-party contractors is critical to the successful implementation of planned improvements. All work is required to be warrantied regarding location and installation of materials in a manner consistent with the intent of the Landscape Master Plan and IFS, and to not create a conflict for installation of adjacent improvements by others. All potential conflicts will be identified by designers/contractors in respective sections of the Compliance Checklist and reviewed by Tyndall AFB Staff.

Co_{5.2} Design Objectives

Sidewalk, pathway, and trail design will promote base walkability and multimodal options for the health and wellbeing of Tyndall Community members through the following:

- 1. Standardizing materials and dimensions for mobility infrastructure to conveying clarity and coherence within the installation and contribute to the quality of open spaces and connections
- 2. Promoting an active, walkable, and bikeable base environment by networking and connecting a diverse hierarchy of sidewalks, pathways, and trail typologies
- 3. Supporting the placement and relationships of the sidewalk, pathway, and trail elements to provide a safe, efficient, and vibrant base environment.

Achieving the guideline objectives requires close coordination with other disciplines. To realize the full benefit of the investments in walkability and bikeability at Tyndall AFB, it is of utmost importance that designers and engineers of the pedestrian and bicycle facilities balance considerations for POV and non-POV mobility solutions on the installation.

The benefits of achieving the requirements for the typologies and elements in the following pages are to reduce crashes, improve health and wellbeing, enhance accessibility, foster community, limit non-POV use/parking, promote walkability, and increase sustainability performance for Tyndall AFB.



Encouraging pedestrian mobility promotes a healthy community



Flightline District's Multi-Modal Spine

Co_{5.3} Design Approach

This section describes the approaches used for the planning, layout, design, and coordination of the pedestrian and bicycle facilities across the installation now and into the future. Exhibit C05-1 illustrates the current and future planned improvements for all modes of mobility throughout the base. This section provides a guide for policy and programs and in the placement of sidewalks, pathways, and trails projects.

For guidance on locations and relationships of bicycle and pedestrian facilities, refer to **Section B02. Integrated Mobility Framework**.

The following sidewalks, pathways, and trails criteria expand on the requirements in the IFS. Each element of the pedestrian and bicycle network is closely coordinated and integrated so all connections and comfort are maximized, and all elements will match across the base for a unified look.

The following plan typologies and elements are described in this section:

Design Typologies:

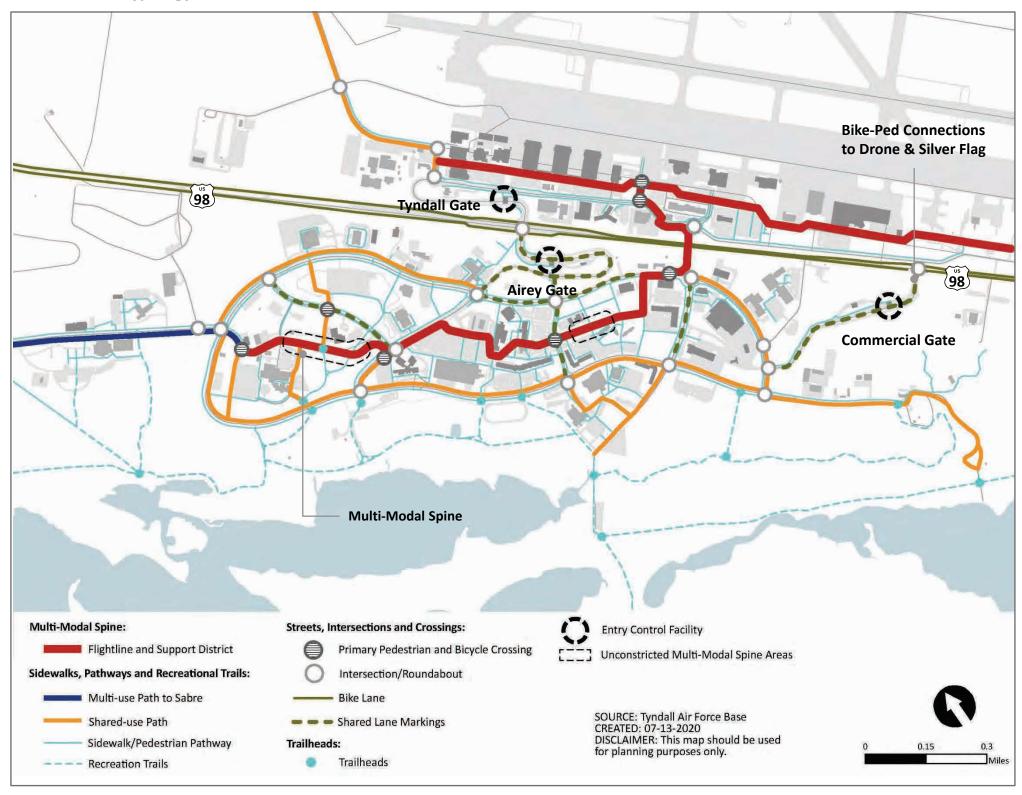
- Streets, Intersections, and Crossings
- Multi-Modal Spine
- Sidewalks, Pathways, and Trails
- Trailheads

Plan Elements:

Paving, walls, and screening materials

All typologies and elements are closely coordinated with the requirements set forth in all sections of the **Landscape Master Plan**. Designers/contractors must reference the other sections of this Plan, as well as the IFS Appendix *Design Intent: Architectural Image & Character* for requirements and details specific to those component plans.

Exhibit C05-1. Typology Framework



Co_{5.4} Design Typologies

Many systems—landscaping, lighting, signage, site design and furnishing and stormwater management—must function together to create Tyndall AFB's network of sidewalks, pathways, and trails. The typologies discussed in this section describe the unique features that create a safe, accessible, and integrated mobility system.

C05.4.1 Streets, Intersections & Crossings

The base's roadways are designed to accommodate all modes of transportation, with sidewalks and shared-use paths separated from the motorized vehicle lanes by medians, landscape buffers, or drainage swales. To foster a community that chooses walking or biking over driving, safety is a primary concern, especially where sidewalks and pathways cross streets, intersections, and roundabouts. Roadway designs include in-pavement lighting in lieu of traditional traffic signals, tactile warning surfaces and ramps as required by Architectural Barriers Act (ABA) criteria, and pavement markings on roadway shoulders to indicate dedicated bicycle lanes. Painted or concrete paver crosswalks clearly delineate pedestrian crossing zones. Enhanced pavements at roadway corners not only provide a visual cue to pedestrians, but also make pedestrian areas more visible to drivers.

C05.4.2 Multi-Modal Spine

The Multi-Modal Spine links the Support and Flightline Districts and provides distinct facilities for pedestrians, bicyclists, and operator-driven shuttles and eventual autonomous vehicles, providing the Tyndall Community ready access to residential, mission-related, dining, and entertainment facilities all within a 10- to 15-minute walk or bike ride. Because the Multi-Modal Spine accommodates various users, site amenities need to provide lighting, wayfinding signage, accessible features, and site furnishings that are appropriate for its many uses. In addition, the Multi-Modal Spine provides access between parking areas and buildings, so antiterrorism setbacks and landscaped medians must be incorporated in designs.

C05.4.3 Sidewalks, Pathways & Recreational Trails

The base's diverse mobility network includes sidewalk, pathway, and trail components that encourage a walkable and bikeable installation. Throughout the base, shared-use paths provided combined facilities for bicyclists and pedestrians with the same level of connectivity. Not only do these typologies promote a safe and active culture at Tyndall AFB, they also add to the base's resiliency. Pervious pavements are incorporated when applicable to manage stormwater. Trails and boardwalks provide access to the Coastal Zone's beautiful natural areas in a way that does not impact the sensitive environment.

C05.4.4 Trailheads

Small trailheads are provided where trails terminate at or cross intersections or roundabouts. These areas are set back form the sidewalk and include lighting, site furnishings, and secondary-type wayfinding signage to provide a restful, informative space.

Co_{5.5} Design Typology Criteria

The criteria in this section relate to specific design requirements, including IFS requirements, and guidelines for designers/contractors to follow and Tyndall AFB personnel to review. Additional criteria are provided in the other sections of this **Landscape Master Plan** and are not repeated in this section; however, the requirements for sidewalks, pathways, and trails must be coordinated with other site elements. The sections that follow serve as worksheets, with supporting guidance and illustrations, for designers/contractors to use among their teams and in coordination with Tyndall AFB. These worksheets should be used to complete the **Compliance Checklist** submittal for each project. Each requirement includes a selection of check boxes to indicate the applicability of that requirement to a specific context, and to demonstrate compliance with the requirements.

Yes No N/A	The designer/contractor either selects "Yes" if compliance has been met, "No" if it has not, or "N/A" if the requirement is not
	applicable to the project.

Exhibit C05-2. Sidewalks, Pathways & Trails Facility Criteria Summary

Typology Group	Facility Types	Criteria	Total Width	Material(s)	Mode(s)
	Crosswalks	C05.5.1.1; C05.5.1.3	varies	Paint on Existing Asphalt; Enhanced Paving	Varies
Streets, Intersections	Mid-block crossings	C05.5.1.1; C05.5.5.2	varies	Paint on Existing Asphalt; Enhanced Paving	Varies
& Crossings	Bike lanes	C05.5.1.2	6′	Asphalt	Bicycle
	Shared-lane markings	C05.5.1.2	N/A	Paint on Existing Asphalt	Bicycle
Multi Madal Spina	Flightline District Multi Modal Spine	C05.5.2	50'-80'	Concrete Pavers	Transit, Bicycle, and Pedestrian
Multi-Modal Spine	Support District Multi-Modal Spine	C05.5.3	32'-42'	CIP Concrete and Recycled Asphalt	Transit, Bicycle, and Pedestrian
	Shared-use pathways	C05.5.4.1	12'-14'	Recycled Asphalt	Bicycle and Pedestrian
	Multi-use pathways	C05.5.4.2	14'-16'	CIP Concrete and Recycled Asphalt	Bicycle and Pedestrian
Sidewalks, Pathways & Recreational Trails	Pedestrian paths	C05.5.4.3; C05.5.4.5	6′-10′	CIP Concrete	Pedestrian
	Sidewalks	C05.5.4.3; C05.5.4.5	Min. 6'	CIP Concrete	Pedestrian
	Recreational trails	C05.5.4.4	5′-10′	Per INRMP, (e.g. Crushed Stone, Shell and/or Hardwood Mulch)	Pedestrian
Trailheads	Trailhead	C05.5.5	Min. 30' Radius	CIP Concrete and Enhanced Paving	Bicycle and Pedestrian

C05.5.1 Streets, Intersections & Crossings

C05.5.1.1 Crossings

Yes No N/A	
SPTC 1.	Design pedestrian and/or bicycle crossings to be one vehicle length from roundabout points of entry. Include splitter islands for pedestrian/cyclist refuge.
SPTC 2.	Install Accessible Pedestrian Signal Systems at primary crossings and intersections. Use signalized systems, if applicable, and include Pedestrian Hybrid Beacons.
☐ ☐ SPTC 3.	Refer to applicable roadway design standards for crosswalk striping dimensions.
SPTC 4.	Include raised concrete crossings for all mid-block crossings.
SPTC 5.	Use concrete inset only at enhanced crosswalks and include all plan elements. See Pedestrian Pavement (Sections C05.6.4 and C05.6.5) for color guidance.

C05.5.1.2 On-street/Off-street Bicycle Facilities

Yes No N/A SPTC 6.	Include on-street bike lanes in new street designs that are a minimum of 6 feet wide.
☐ ☐ SPTC 7.	Use Shared-Lane Markings where bicycle lanes are not feasible.
SPTC 8.	Offset off-street bicycle facilities from the roadway so turning motorists have better visibility of the cyclists.

Exhibit C05-4. Mid-Block Crossing Key Plan

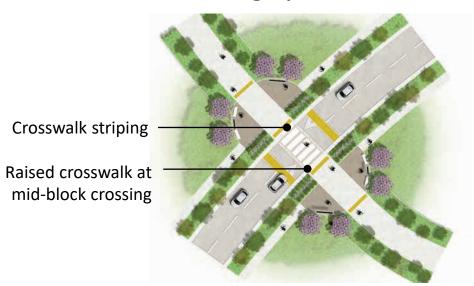


Exhibit C05-3. Raised Crosswalk at Mid-Block Crossing



Ground lighting along edge of crosswalk

C05.5.1.3 T-Intersection Plazas

Yes No N/A SPTC 9.	Design the T-intersection plaza to encompass the extent of the intersections of sidewalks/shared-use paths along roadways.
SPTC 10). Use two types of enhanced pavements at sidewalk intersections and in the plaza behind the sidewalk. Use concrete edging between pavers and the landscaped area.
SPTC 12	. Place a minimum of two benches and one bike storage rack when T-intersection is along a shared-use path or multi-modal path. See Section C07 , Site Furnishings for furniture style and character.

Yes No N/A

- SPTC 12. Include appropriate lighting at the T-intersection. See Section C09, Lighting, for lighting criteria.
 - SPTC 13. Include appropriate pedestrian wayfinding and informational signage. See Section C08, Pedestrian Signage, for criteria.
- SPTC 14. Design T-intersection plaza landscaping treatment to include a ring of flowering trees. Place flowering trees at 25 feet on center with ground cover underneath.
- SPTC 15. Use appropriate plant species; see the Maintained Zone Plant List.





Flowering trees (non-flowering trees in the Flightline District)

> Low maintained groundcover

Enhanced paving at intersection Ornamental native grasses

> Enhanced crosswalk treatment

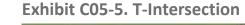
> > Crosswalk signal

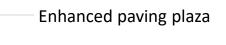
Crossing ramp

Enhanced paving at intersection

Flowering trees







Ornamental native grasses

Enhanced crosswalk treatment

Sidewalk

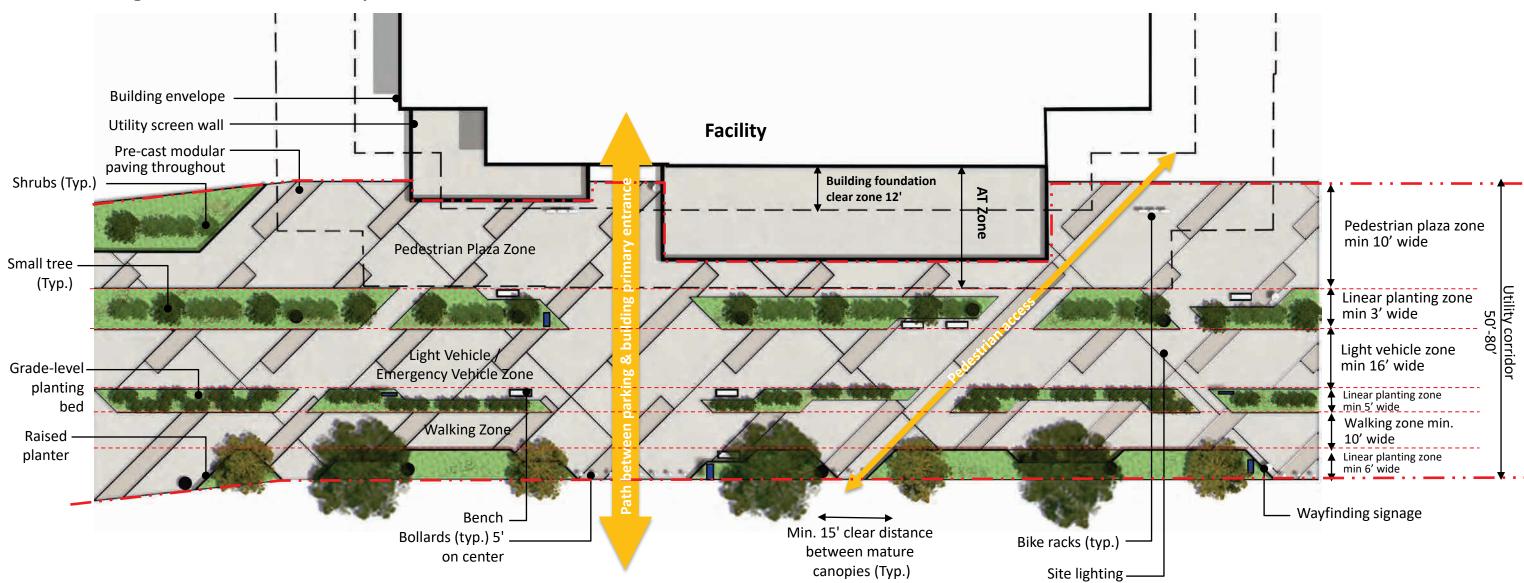
Enhanced paving at intersection Stop sign

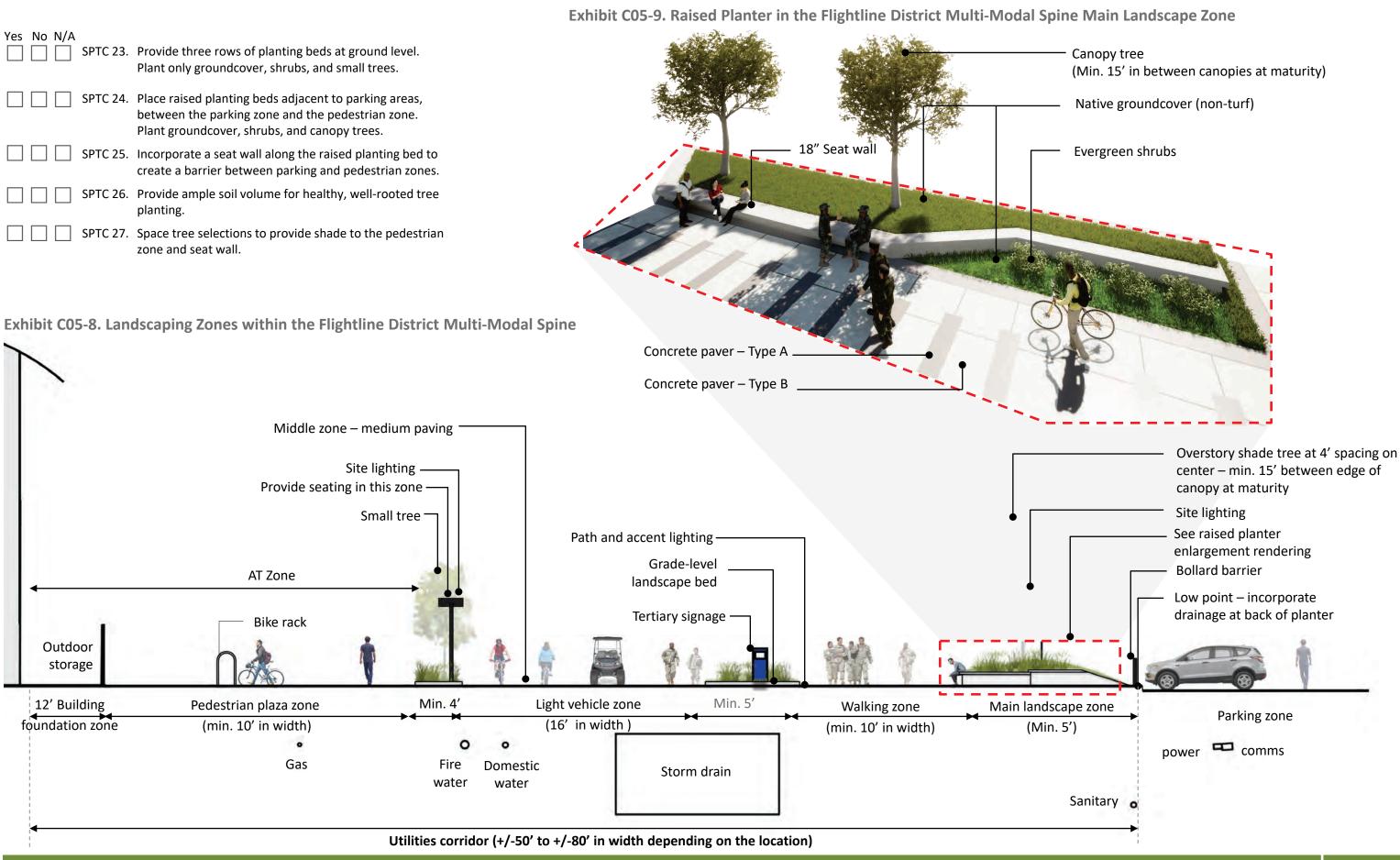
Streetlight

C05.5.2 Multi-Modal Spine: Flightline District

Yes No N/A The Flightline District Multi-Modal Spine contains three main zones: the SPTC 19. Use specialty pavers in the Flightline District Multi-Modal pedestrian plaza zone, light vehicle zone, and walking zone. Exhibit C05-7 shows Spine to facilitate easy access to underground utilities. the minimum width of each zone. SPTC 20. Place benches as indicated on the design drawings, based Yes No N/A SPTC 16. Maintain an open and direct path from parking to on adjacent building occupancy and Facility Group type. primary and secondary facility entrances. See Section C07, Site Furnishings for furniture style and character. SPTC 17. Design the Flightline District Multi-Modal Spine to meet pavement and width guidelines. Provide all required SPTC 21. Include appropriate lighting at the Flightline District Multielements (see plan/section checklists and reference Modal Spine. See Section C09, Lighting, for lighting other sections). criteria. SPTC 18. Design the multi-modal path to be 14 feet wide, SPTC 22. Include appropriate pedestrian wayfinding and comprising a 10-foot-wide shared-use path of recycled informational signage. See Section C08, Pedestrian asphalt and a 4-foot-wide concrete pedestrian path. Signage, for criteria.

Exhibit C05-7. Flightline District Multi-Modal Spine





C05.5.3 Multi-Modal Spine: Support District

To maximize user comfort and increase visual interest along the Support District's Multi-Modal Spine, the relationship of its autonomous vehicle (AV)/ shuttle track and the shared-use pathway components must be varied where additional space is available. Refer to Exhibit C05-1, Typology Framework, for recommended zones for the non-constricted and constricted layouts of the Support District's Multi-Modal Spine. The primary difference between the two options is that, where space allows, the non-constricted layout includes a landscape median between the bicycle and pedestrian zones and the future AV/shuttle vehicle pathway.

C05.5.3.1 Non-Constricted Condition

Yes No N/A SPTC 28. Design the non-constricted Multi-Modal Spine corridor to be a minimum of 72 feet wide. Include a right of way (ROW) that is a minimum of 32 feet wide. Provide a minimum 20-foot-wide landscaping zone on each side of the ROW. SPTC 29. Incorporate the antiterrorism (AT) setback within the SPTC 30. Locate the pedestrian path on the south and west sides of the Multi-Modal Spine. Incorporate pedestrian path along the entire length of the Multi-Modal Spine. Use crossing striping, lighting, signage, and other safety and directional measures as needed. SPTC 31. Incorporate a landscaping median between the bike path and the AV path when space is available (minimum 72-foot overall spine width, with minimum 32-foot ROW). Design the median to have a minimum width of 10 feet. Locate the edge of AV path pavement at least 10 feet from the artificial lot line.

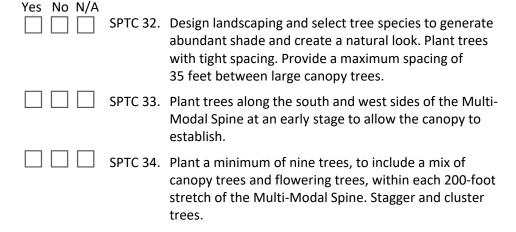
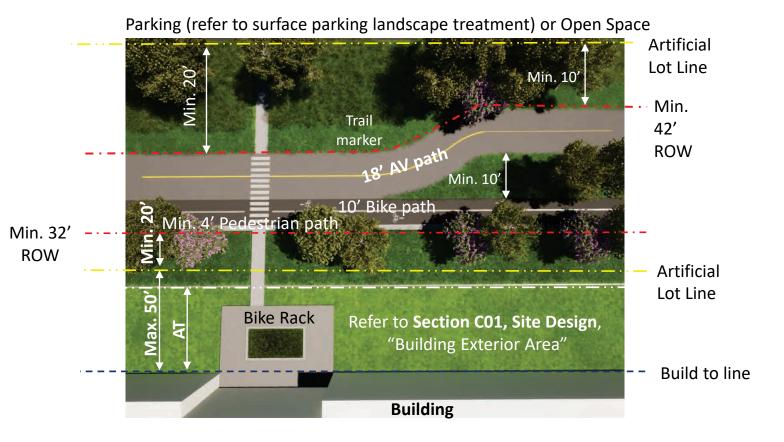


Exhibit C05-10. Non-Constricted 10-Foot Shared-Use Path Build-Out

Parking (refer to surface parking landscape treatment) or Open Space Artificial Lot Line Min. 32' ROW Artificial Lot Line Bike Rack Bike Rack Refer to Section C01, Site Design, "Building Exterior Area" Build to line Building

Exhibit C05-11. Non-Constricted 32-Foot Minimum Multi-Modal Spine Build-Out



C05.5.3.2 Constricted Condition

Yes No N/A SPTC 35. Design the constricted Multi-Modal Spine corridor to be a minimum of 42 feet wide. Include a ROW that is a minimum of 32 feet wide. Provide a minimum 5-footwide landscaping zone on each side of the ROW. SPTC 36. Locate the pedestrian path on the south and west sides of the Multi-Modal Spine. Incorporate pedestrian path along the entire length the Multi-Modal Spine. Use crossing striping, lighting, signage, and other safety and directional measures as needed. SPTC 37. Design landscaping and select tree species to generate abundant shade and create a natural look. Plant trees with tight spacing. Provide a maximum spacing of 35 feet between large canopy trees. SPTC 38. Plant trees along the south and west sides of the Multi-Modal Spine at an early stage to allow the canopy to establish. SPTC 39. Plant a minimum of nine trees, to include a mix of canopy trees and flowering trees, within a 200-foot stretch of the Multi-Modal Spine. Stagger and cluster trees.



Support District Multi-Modal Spine: The non-constricted condition is shown in the foreground, the constricted condition is shown in the background

Exhibit C05-12. Constricted Condition 10-Foot Shared-Use Path Build-Out

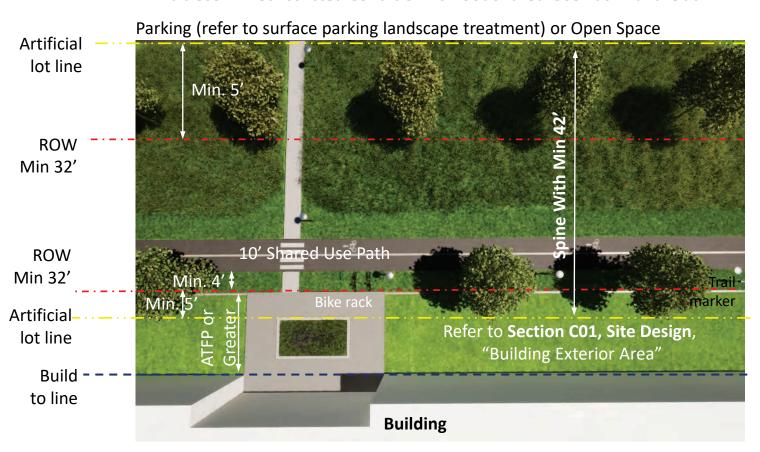


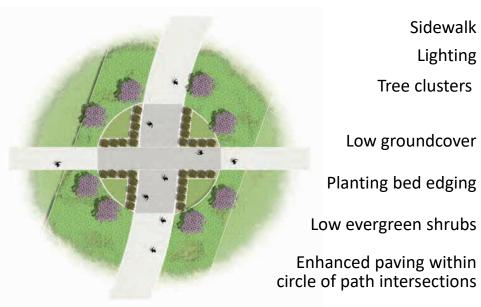
Exhibit C05-13. Constricted Condition 32-Foot Multi-Modal Spine Build-Out



C05.5.4 Sidewalks, Pathways & Recreational Trails

C05.5.4.1 Shared-Use Paths Yes No N/A SPTC 40. Provide code-compliant markings that clearly indicate travel direction and/or distinct bike and pedestrian zones. SPTC 41. Locate shared-use paths where there is clear visibility between the users and any vehicles. SPTC 42. Provide a landscape buffer between the shared-use path and the street. C05.5.4.2 Multi-Use Paths SPTC 43. Provide code-compliant markings and change of paving materials to clearly indicate travel direction and/or distinct bike and pedestrian zones. SPTC 44. Locate multi-use paths where there is clear visibility between the users and any vehicles. SPTC 45. Provide a landscape buffer between the multi-use path and the street.

Exhibit C05-14. Sidewalk/Shared-Use Path **Intersection Key Plan**



Tree clusters

Tree clusters

Low groundcover

Enhanced paving within circle of path intersections

Concrete edging

Shared-use path

C05.5.4.3 Sidewalks & Pedestrian Paths

Yes No N/A

SPTC 46.	Design sidewalks and pedestrian paths to be a minimum of 6 feet wide and to meet paving requirements.
C05.5.4.4 Recreat	tional Trails
SPTC 47.	Provide trailheads with all required elements (see Section C05.5.5, Trailheads).
SPTC 48.	Design recreational or coastal trails to be between 6 and 10 feet wide. Select INRMP-approved paving materials as defined by ecosystem.
SPTC 49.	Design boardwalks and coastal trails to meet all plan element guidelines and applicable codes.

C05.5.4.5 Sidewalk/Pathway Intersections

Yes No N/A	
SPTC 50.	Use enhanced paving within the intersection circle to create visual awareness and increase safety.
SPTC 51.	Provide a metal edging strip between the shrub and groundcover planting bed and the native grass area.
SPTC 52.	Design the intersection's planting layout to form a circle with a minimum radius of 30 feet.
SPTC 53.	Provide evergreen shrubs along the four sides of the intersection; each side must be a minimum of 20 long.
SPTC 54.	Provide low evergreen groundcover behind the shrubs.

Exhibit C05-15. Sidewalk/Shared-Use Path Intersection



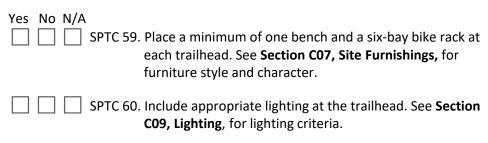
C05.5.5 Trailheads

Yes No N/A

C05.5.5.1 Typical Trailheads

	shared-use paths.
	Design the trailhead to be a minimum of 20 feet wide a its widest point and a minimum of 60 feet long, including concrete edging, along the sidewalk or path.
	Use pavers to provide enhanced pavement at trailhead locations. See Pedestrian Pavement (Section C05.6.4) f enhanced pavement and concrete edging treatment.
SPTC 58.	Plant one ring of flowering trees around the trailhead, with a minimum of five flowering trees per ring.

SPTC 55. Locate one trailhead every 1,000 feet along sidewalks and



SPTC 61. Include appropriate pedestrian wayfinding and informational signage. See **Section C08**, **Pedestrian Signage**, for criteria.



Exhibit C05-16. Typical Trailhead



Install native grass or refer to roadway amenity zone landscape when adjacent to roadway

Lighting

Bike rack

C05.5.5.2 Trailhead at Mid-Block Crossing

Yes	No N/A		Design trailhead to have a minimum 30-foot radius.
			Use pavers to provide enhanced pavement at trailhead locations.
		SPTC 64.	Install tactile warning surfaces before crosswalks. Refer to applicable roadway design standards.
		SPTC 65.	Place a minimum of two benches, one bike rack, and appropriate lighting at the trailhead. See Section C07 , Site Furnishings , for furniture style and character.
		SPTC 66.	Incorporate signage at the trailhead as necessary. See Section C08, Pedestrian Signage for signage criteria.

Yes No N/A SPTC 67. See Pavement section for enhanced pavement and concrete edging treatment. SPTC 68. Install a ring of flowering trees around the trailhead. Use a minimum of four flowering trees per ring. SPTC 69. Install a minimum of one row of low evergreen shrubs and two rows of ornamental native grasses in the roadway amenity zone. Place plants from the edge of the Multi-Modal Spine pavement to the edge of the trailhead, at a minimum length. Use a triangular layout. SPTC 70. Use appropriate plant species; see the Maintained Zone Plant List.

Exhibit C05-19. Mid-Block Crossing Key Plan

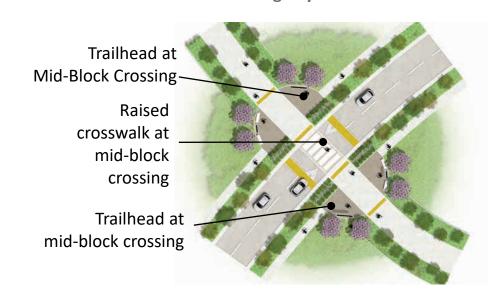


Exhibit C05-18. Trailhead at Mid-Block Crossing



Co₅.6 Design Elements

C05.6.1 Walls

Construct all walls using concrete masonry unit (CMU) or cast-in-place concrete. Use colors that are consistent with the adjacent buildings/architecture and in the neutral color family. Provide a 2-inch or thicker masonry cap for all walls.

C05.6.1.1 Tall Wall (Above 4 Feet in Height)

Yes No N/A	
	Construct tall walls (higher than 4 feet) of modular block and include batter and weep holes for drainage. See IFS Design Intent: Architectural Image & Character for colors
	Provide a safety railing depending on the exact height of the wall.
	Provide landscaping to break up the sheer vertical face of the wall structure.
C05.6.1.2 Short W	all (4 Feet and Below Height)
	Construct short walls (4 feet and lower) of cast-in-place concrete with an architectural finish.
C05.6.2 Screening	ng
SPTC 75.	ng Provide screening materials and structure that are hurricane wind-resistant, flood resistant, saltwater-resistant, cost-effective, and durable.
SPTC 75.	Provide screening materials and structure that are hurricane wind-resistant, flood resistant, saltwater-
C05.6.2.1 Outdoor	Provide screening materials and structure that are hurricane wind-resistant, flood resistant, saltwater-resistant, cost-effective, and durable.
C05.6.2.1 Outdoor SPTC 76.	Provide screening materials and structure that are hurricane wind-resistant, flood resistant, saltwater-resistant, cost-effective, and durable. **Utility Yard & Dumpster Enclosures** Provide dumpster enclosure doors that are painted or



CMU split-face wall



Precast architectural concrete wall



Concrete block screen around dumpsters to match building block

C05.6.3 Grade Transitions & Stairs

Staircases should generally consist of cast-in-place concrete treads. Non-slip broom finish may be enhanced in many ways based on function and location. For instance, a staircase leading into an adjacent building should offer detail in materials, finishes, and colors that are compatible with the building's architectural vernacular.

s No	N/A		
		SPTC 79.	Use cast-in-place concrete treads for stairways. Use non-slip broom finish, and enhance on based on the stairway's function and location.
		SPTC 80.	Design concrete stairs to be wide and provide anti-slip protection on the toe.
		SPTC 81.	Use materials, finishes, and colors on stairways leading to an adjacent building that are compatible with the building's architectural vernacular.
		SPTC 82.	Install incorporated aluminum tube handrails that are brushed finish and have stainless steel fasteners.



Cast-in-place concrete tread stair set

C05.6.4 Pedestrian Paving: Enhanced Paving

Use enhanced paving at pedestrian intersections, raised medians, intersection treatments, trailheads, plaza accents, building perimeters, crosswalks, and other areas where accent pavements are desired. See IFS *Design Intent: Architectural Image & Character* for colors and materials to used on Tyndall AFB. Below are the approved enhanced paving types:

C05.6.4.1 Concrete Unit Pavers

Yes No N/A		
SPT	a running bo	n grey color, 4-inch by 8-inch pavers placed in ond pattern. Coordinate with other facility nsure consistent grey color is used.
C05.6.4.2 Spe	ecialty Pavers	with Tabby
SPT	•	y pavers with tabby at walkways and plazas ilding's the immediate perimeter.
SPT	design style the anticipa	y pavers with tabby to match the basis of s. Pavers should be rated appropriately for ted structural load. See IFS <i>Design Intent:</i> of Image & Character appendix for approved materials.
SPT		rmat pavers and subbase designed to anional reactions aintenance vehicles.
SPT	C 87. Coordinate	paver colors with building aesthetics.
C05.6.4.3 Col	ored/Stamped	l Cast-in-Place Concrete
SPT		ete pavers in a running bond brick pattern dard brick size.
SPT	_	ral color concrete with manufacturer's color ing Pantone 4685C or similar.
SPT	C 90. Use concret	e border band, standard grey color
□ □ □ SPT		e colored/stamped concrete over utilities. Use the or pavers only.
C05.6.4.4 Cas	t-In-Place Con	crete with Integrated Tabby
SPT	C 92. Use standar aggregate.	d grey cement with integral crushed shell
SPT		posed crushed shell aggregate with non- proom finish.
SPT		control joints and bituminous/joint filler onstruction joints.
SPT	requiremen for intended limited to, s	propriate standards, specifications, ts, and engineering documents as delineated I pavement use of items including, but not lab thickness, pressure/hardness, joint I reinforcing.

C05.6.5 Pedestrian Paving: Primary Paving

C05.6.5.1 Cast-In-Place Concrete

The majority of pedestrian pavement (sidewalks, pedestrian walks, and plaza pavements) at Tyndall AFB should be cast-in-place concrete slabs for consistent aesthetics and the ease of construction and maintenance.

Yes No N/A

SPTC 96. Use cast-in-place concrete slabs for consistent aesthetics and the ease of construction and maintenance.

SPTC 97. Provide a broom or retardant finish, standard grey color with sawcut joints.



Regular cast-in-place concrete with broom finish and cut or tooled joints



Specialty paver with Tabby



Concrete unit paver



Cast-in-place concrete slab with integrated Tabby



Stamped concrete

C05.6.6 Pervious Pavement Guidelines

A variety of pervious pavement types may be used depending on the specific characteristics of the site, including pavers and paver blocks, open grid pavers, and resin-bonded flexible pavements, among others. Pervious pavement is considered for use in locations such as overflow parking areas, sidewalks and walkways, plazas, playgrounds, basketball courts, and even emergency access drives, where it can reduce stormwater that would otherwise run off pavement surfaces and into streets or receiving waters.

Applicable Types of Pervious Pavement

- Pervious pavers and more heavy-duty pervious paver blocks have wide applicability (parking, walkways, plazas) and can enhance site aesthetics
- Open grid pavers can be either plastic or concrete and filled with either stone or soil/grass; they are well-suited to overflow parking areas, can be less expensive than other pervious pavements, and can provide the benefits of vegetation (when filled with soil)
- Pervious resin-bonded flexible pavements have limited applicability (walkways and tree surrounds), but can have high aesthetic appeal
- Pervious concrete has limited applicability (walkways) and should be precast to ensure consistent finishing and texture
- Pervious asphalt is not permitted for vehicular and pedestrian uses; however, it may have applicability for recreational surfaces such as basketball courts

Note: compacted gravel is not considered pervious paving

Pervious Pavement Guidelines

Yes No N/A

SPTC 98. Use pervious pavers in earth-tone colors that correspond with the surrounding building designs. Use a simple running bond or square tile pattern.

SPTC 99. Design the pervious pavement area so the total area draining does not exceed the area of the pervious pavement itself. Provide sufficient pretreatment for larger areas that drain on to pervious pavement and send runoff directly into a storage reservoir.

SPTC 100. Provide backup surface drains as a secondary inflow mechanism to the storage reservoir in the event of pervious pavement clogging.

C05.6.7 Specialty Pavers

Refer to the IFS *Design Intent: Architectural Image & Character* section regarding "Tyndall AFB Colors and Materials" for the Pantone colors to be used for specialty pavers. Use Pantone colors to supplement, not replace, physical samples. Use basis-of-design samples to compare colors and finishes from multiple vendors.

Yes No N/A

SPTC 101. Use specialty pavers in the Multi-Modal Spine designed to be easily removed for maintenance and underground utility repair purposes and reinstalled. Provide lifting hardware that complies with ABA criteria.

SPTC 102. Select specialty pavers made of integral colored concrete in two different colors (A and B) and place in a running bond pattern.

SPTC 103. Select specialty pavers rated to withstand light vehicular loads.

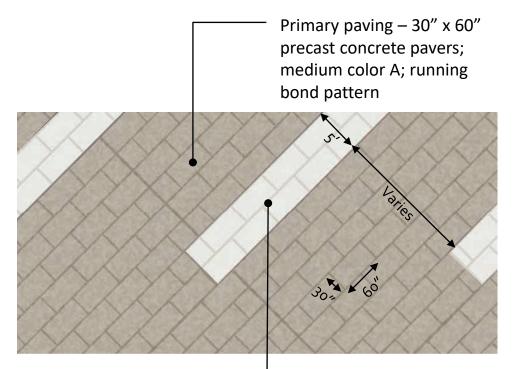


Open grid pavers



Pervious block pavers

Exhibit C05-20. Specialty Paver Enlargement



Vertical banding - 30" x 60" precast concrete pavers; light color B; running bond pattern



Pervious pavers

Co_{5.7} Design Elements – Coastal Zone

Due to the unique attributes of the Coastal Zone, the natural environment must be considered in the design, routing, and materials of the paths, boardwalks, and piers.

Refer to below documents for additional requirements:

- UFC 4-152-07, Design: Small Craft Berthing Facilities
- UFC 3-600-01, Fire Protection: Engineering for Facilities
- America Society of Civil Engineers Manual of Practice No. 50, Planning and Design Guidelines for Small Craft Harbors (MOP 50)
- National Fire Protection Association 303, Fire Protection Standard for Marinas and Boatyards
- Section C.09 Lighting, for lighting restrictions within the Coastal Zone

Criteria for the Coastal Zone pathway and trail elements include the following.

C05.7.1 Coastal Zone Pedestrian Surfaces

Yes	No N/A		Follow all regulatory requirements for the design and construction of improvements occurring in the Coastal Zone.
		SPTC 105.	Use only material suitable for a marine environment and resistant to fuels, oil, fire, flooding, heat, wind, and ultraviolet (UV) light.
		SPTC 106.	Construct paths using boardwalk or crushed compacted aggregate.
		SPTC 107.	Use poured-in-place concrete where hardened surfaces are required that matches the standards for pedestrian paving.



Coastal zone boardwalk

C05.7.2 Coastal Zone Boardwalks

Yes No N/A	
SPTC 108.	Follow state and local codes specific to the local condition and environment when selecting boardwalk materials, alignment, elevation, and relative height to grade.
SPTC 109.	Design boardwalks to comply with Americans with Disabilities Act (ADA) standards and incorporate handrails where necessary.
SPTC 110.	Use only material suitable for a marine environment and resistant to fuels, oil, fire, flooding, heat, wind, and UV light. Use materials and fasteners that are environmentally safe.
C05.7.3 Floating	& Fixed Piers
	Comply with wind load criteria.
SPTC 112.	Comply with criteria for water currents.
SPTC 113.	Design structures to withstand waves from locally generated wind, boat wakes, and swells from offshore storms.
SPTC 114.	Design structures to be resistant to impacts or accumulations from floating debris.
SPTC 115.	Design structures to withstand floods and surges that produce extreme water levels and currents.
SPTC 116.	Use concrete or composite (wood-plastic) surface material. Decking surface is textured for skid resistance.
SPTC 117.	Use surface material that resists abrasion, denting from dropped objects, and cracking. Provide positive drainage.

C05.7.4 Dock Surface & Piles

Yes No N/A	
SPTC 118.	Connect dock float sections using stainless-steel hardware; the connection system must account for fluctuation in water depth, wind, and wave exposure.
SPTC 119.	Use support piles composed of either precast, prestressed concrete piles no less than 12 inches square or composite piles no less than 12 inches in diameter with final sizing determined by structural loads.
SPTC 120.	Embed piles below the design water depth to resist all uplift and lateral loads resulting from the loads Provide a Factor of Safety of no less than 1.2 for the extreme wind, wave, and surge forces and no less than 1.5 for operating loads.
SPTC 121.	Provide a cone-shaped pile cap composed of galvanized steel, stainless steel, fiberglass, or composite material.
C05.7.5 Coastal	Zone Shelters & Observation
Platforms	
SPTC 122.	Follow all regulatory requirements for design and construction of improvements occurring in the Coastal Zone and its environs.
SPTC 123.	Locate shelters and platforms such that they provide convenient access to trails and boardwalks.
SPTC 124.	Design and locate all structures so they minimize any unsightly intrusion to the natural character of the area.
SPTC 125.	Design all shelters and structures to comply with ADA standards and incorporate handrails where necessary.
SPTC 126.	Use materials and fasteners that are suitable for a saltwater marine environment and are resistant to fuels, oil, fire, flooding, heat, wind, and UV light. Use materials and fasteners that are environmentally safe.

Tyndall Air Force Base Installation of the Future



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Co6. Landscape

Co_{6.1} Introduction

The strategic object of this plan is to create a resilient landscape through revegetation with native plant material to optimize co-benefits, including water quality.

C06.1.1 Opportunities

This plan focuses on revegetating Tyndall Air Force Base (AFB) with native plant materials that will result in optimized stormwater treatment, continued regulatory compliance, decreased maintenance costs and increased wellness and walkability.

- Apply the *Integrated Natural Resource Management Plan* (INRMP) land management strategies consistently across all developed portions of the base
- Enforce a restricted planting pallet that complies with INRMP and continues to drive out invasive species
- Plant tree species and revegetate with plant materials that are resilient to high winds and will not interfere with buried infrastructure
- Revegetate all land areas south of Mississippi Road, which is a critical zone for mitigating a storm event that includes both heavy rainfall and high surge
- Improve stormwater management and treatment and recover more quickly after storm events

C06.1.2 Authority

The governing authority of Tyndall AFB's INRMP is the Sikes Act.

C06.1.3 Warranty

Coordination of design and construction with Tyndall AFB staff, agencies, service providers and third-party contractors is critical to the successful implementation of planned improvements. All work is required to be warrantied regarding location and installation of materials in a manner consistent with the intent of the Landscape Master Plan and IFS, and to not create a conflict for installation of adjacent improvements by others. All potential conflicts will be identified by designers/contractors in respective sections of the Compliance Checklist and reviewed by Tyndall AFB Staff.



Maintained and Manicured Landscape Zones



Landscaping along the Multi-Modal Spine

Co6.2 Design Objectives

The landscape design guidelines are grouped according to the following five landscape zones:

- Manicured Zone
- Maintained Zone
- Airfield Zone
- Managed Zone
- Coastal Zone

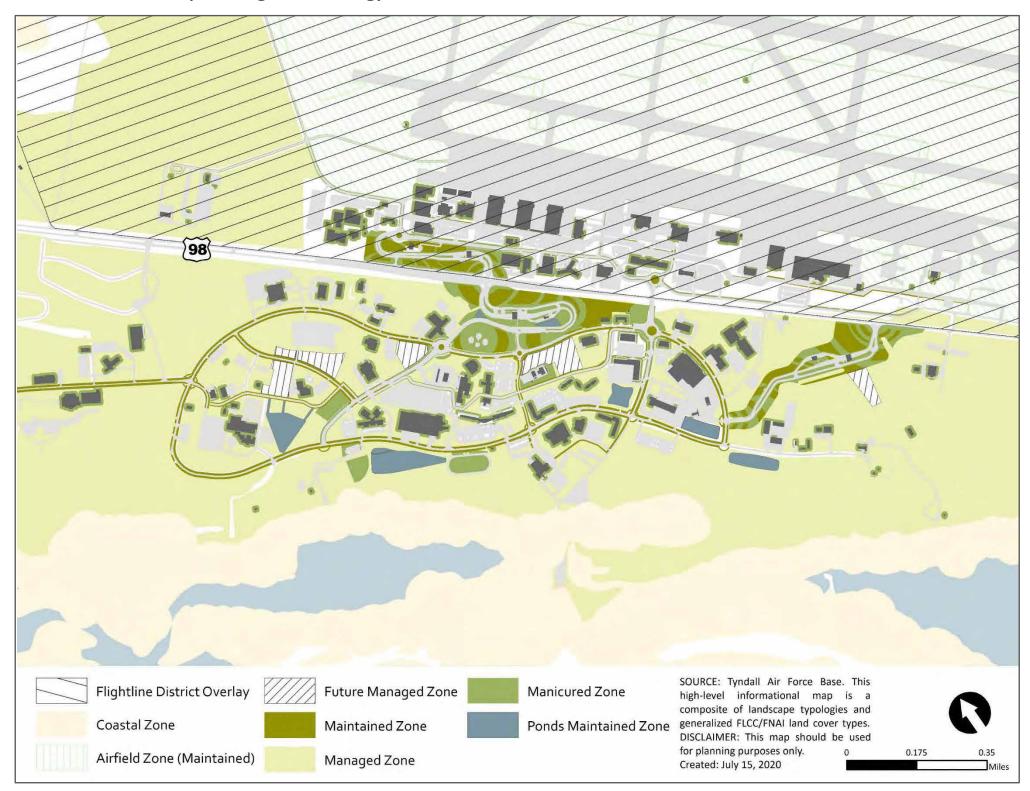
These zone guidelines are intended to be suggestive in nature. Photographs, maps, and illustrations are included to further explain the guidelines and principles expressed throughout this plan. Photographs are shown as examples to depict potential options; they are not final design solutions but provide designers/contractors with a greater understanding of the intended landscape character for Tyndall AFB.

The goals for the landscape character focus on the specifics required for each landscape zone:

- Design Strategy: What the landscape will look like in that zone
- Locations: Where each zone is located on base
- Plant Lists: Typical plant species for use in that zone

These design guidelines are meant to help designers/contractors have a clear vision of not only what the landscape character is within their construction boundaries, but also how all the construction zones interface with each other. They also explain other areas on the installation that will be preserved, improved, or developed outside of the general rebuilding areas. Tyndall AFB Natural Resources will perform revegetation in forest areas. Any area outside of forest areas must be performed by contract. This will result in the establishment of an overall sustainable and resilient natural landscape for the entire base.

Exhibit C06-1. Landscape Management Strategy



Co6.3 Design Approach

C06.3.1 Using Site Analysis to Inform Planting Design

A thorough understanding of a site and its context is key to a successful design and matching plant communities to site conditions. In general, a landscape site analysis considers factors like the site's context, target audience, soil types, sun and shade conditions, hydrologic zones, existing plant communities, and regulatory constraints.

C06.3.2 Choosing Native, Ecological & Functional Plants

Avoid invasive species at all costs. Species with local habitat and ecological value are encouraged. Biodiversity in landscape designs is critical because monocultures can make a landscaped area vulnerable to stressors such as disease, pests, and climatic extremes.

This section includes abridged plant pallets for areas within the built environment. The Master Plant List, available from Tyndall AFB, provides a comprehensive list of plants allowed on the base.

C06.3.3 Following the Method of Designed Plant Communities

The designed "plant community structure" approach recognizes that plants are overlapping populations that interact and evolve over time. Rather than prescribing blocks of single species, the method creates dense, layered plantings not by spacing plants closer together but by implementing a vertical layering system that includes both design (ornamental) and functional plant layers. The goal of the landscape plan must be a diverse functional layer (groundcover and filler species) supporting a design layer with aesthetic value (structural and seasonal theme species). The Flightline District is an outlier from this approach because of the limited species allowed from the Bird/Wildlife Aircraft Strike Hazard (BASH) regulations.

C06.3.4 Planting Design Components

See Section CO4, Integrated Land Management, for additional requirements.

Design Layers

- Seasonal Theme Plants: Intermediate species that provide seasonal interest.
 These species should be coordinated with each other to provide year-round seasonal interest in complementary or contrasting tones. This consists of perennials, ornamental grasses, and bulbs. The seasonal theme plants should make up approximately 30-40% of the plant community.
- Structural / Framework Plants: Large species that provide visual and functional backbone to the plant community. This consists of trees, shrubs, and large perennials. The structural plants should make up approximately 10% of the plant community.

Functional Layer

- Groundcover Plants: Low-to-the-ground, spreading species that function as an
 earth-covering component. This consists of grasses, sedges, and seed mixes
 that, in conjunction with the dynamic filler plants, form the green mulch for
 the plant community and remove the opportunity for the infestation of
 invasive species. The groundcover plants should make up approximately 3040% of the plant community.
- Dynamic Filler Plants: Low- to intermediate-height species that are used to fill
 gaps between the other plant species. In addition to providing this function,
 these species should also add a dynamic textural backdrop to the seasonal
 theme plants. The dynamic filler plants should make up approximate 10% of
 the plant community.

Co6.4 Landscape Typologies & Criteria

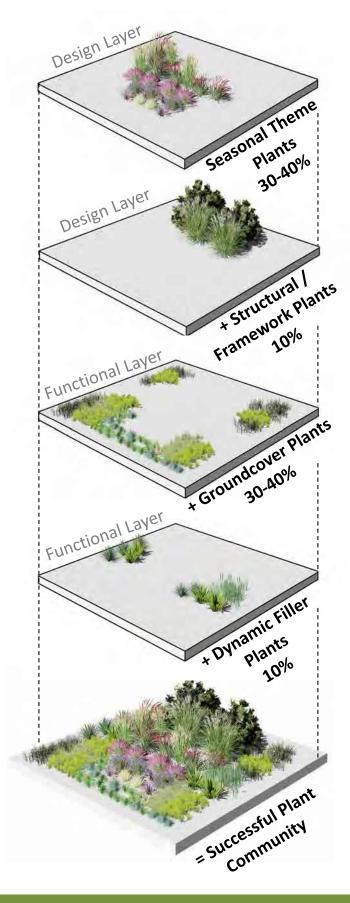
C06.4.1 Landscape Zone Criteria (LaC)

The criteria in this section relate to specific design requirements, including IFS requirements, and guidelines for designers/contractors to follow and Tyndall AFB personnel to review. Additional criteria are provided in the other sections of this Landscape Master Plan and are not repeated in this section; however, the requirements for landscape must be coordinated with other site elements. The sections that follow serve as worksheets, with supporting guidance and illustrations, for designers/contractors to use among their teams and in coordination with Tyndall AFB. These worksheets should be used to complete the Compliance Checklist submittal for each project. Each requirement includes a selection of check boxes to indicate the applicability of that requirement to a specific context, and to demonstrate compliance with the requirements.

Yes No N/A

The designer/contractor either selects "Yes" if compliance has been met, "No" if it has not, or "N/A" if the requirement is not applicable to the project.

Exhibit C06-2. Planting Design Components



C06.4.2 Manicured Zone

The Manicured Zone is the most highly maintained landscape on base. It is located between a building's immediate perimeter up to the edge of the Maintained Zone. The Antiterrorism (AT) Zone is a subzone of the Manicured Zone and extends out 20 feet from a building's immediate perimeter, as well as at base access gates and other areas as prescribed for security reasons. The Manicured Zone may extend beyond the AT Zone. Landscape in this zone will have vegetation that meets the AT regulations. Vegetation in the other areas of the Manicured Zone that extend beyond the AT Zone must be drought-resistant and contain native trees for shade and ornamental grasses and native shrubs for color and variety. Different plant lists are used for the Flightline and Support Districts because of their different mission requirements.

Typical Locations

This planting strategy applies to the following locations:

- Within the AT Zone that surrounds a building
- Between the building face and the interconnection with natural landscape of the Maintained Zone

Planting Design Strategy

- Laying out plantings in an informal layout, with smaller formal plantings highlighting building entrances and prominent circulation nodes
- Spacing plants at regular intervals
- Massing plants by species to achieve a maintained aesthetic

AT Zone Plantings

- No grass, groundcovers, or shrubs higher than 6 inches
- All trees must be limbed clear up to 3 feet

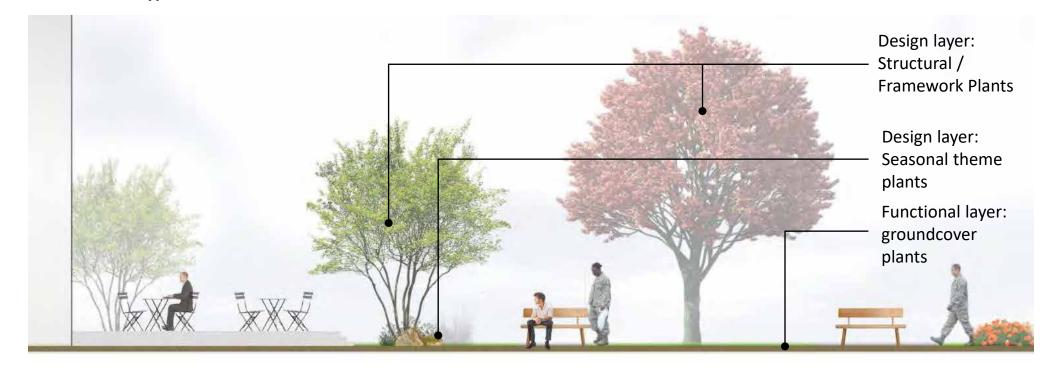
Benefits

- Reduces maintenance costs
- Increases resiliency to wind and storm
- Slows down stormwater runoff

Exhibit C06-3. Rendering of a Manicured Zone



Exhibit C06-4. Typical Section of a Manicured Zone



C06.4.2.1 Plantings Within the Manicured Zone

Plant a mix of native trees, shrubs, and grasses in the Manicured Zone based on the approved specifies identified in the Master Plant Palette. A sample plant list shown in Exhibit C06-6. Arrange plantings in a more formal manner with species grouped together to form patterns and use native grasses that can be mowed.



Low groundcover and limbed trees close to building



Mown lawn close to building, native grasses beyond



Mown lawn close to building, native grasses beyond



Mown lawn close to building, native grasses/trees beyond

Exhibit C06-5. Grasses Allowed in the AT Zone

Common Name	Botanical Name	
Turfgrasses		
Bermuda grass	Cynodon dactylon	
Bahia grass	Paspalum notatum	

Exhibit C06-6. Sample Manicured Zone Plant List

Botanical Name cer rubrum etula nigra	Notes 16' ht, min at install / 40' mature ht. 16' ht, min at install /
etula nigra	40' mature ht.
etula nigra	40' mature ht.
-	16' ht, min at install /
avodium distichum	single trunk only
axoulani distichani	20' ht. min at install
ex cassine	16' ht. min at install / 40' mature ht.
abal palmetto	18-24' ht. min. at install
ragrostis elliottii	Maintain ht. per AT requirements
ragrostis spectabilis	Maintain ht. per AT requirements
arex abscondita	Maintain ht. per AT requirements
arex atlantica	Maintain ht. per AT requirements
uncus bufonius	Maintain ht. per AT requirements
uncus elliottii	Maintain ht. per AT requirements
uncus marginatus	Maintain ht. per AT requirements
oreopsis Lanceolata	2" Plug / Seed
udbeckia graminifolia	2" Plug / Seed
hyla nodiflora	2" Plug / Seed
esuvium ortulacastrum	2" Plug / Seed
rotalaria rotundifolia	2" Plug / Seed
upinus villosus	2" Plug / Seed
ה ביני הייני ה	ex cassine abal palmetto agrostis elliottii agrostis spectabilis arex abscondita arex atlantica ancus bufonius ancus elliottii ancus marginatus areopsis Lanceolata adbeckia graminifolia ayla nodiflora asuvium artulacastrum

C06.4.2.2 Building Entrances

Building entrance landscape is within the Manicured Zone typology.

building entrance introduced is within the manifested 2011c typology.				
Yes No N/A LaC 1.	Place landscape so it frames the building entrance and highlights the front entry.			
LaC 2.	Use enhanced pavement at Group 1 buildings to form a small gathering plaza as part of the entrance.			
LaC 3.	Provide direct connections from the building entrance pedestrian routes to the base Multi-Modal Spine and/or shared-use paths.			
LaC 4.	Use plantings for housing/dormitories that create a safe and welcoming facility entrance.			
LaC 5.	Use plantings with color and interest to frame the entrances to Group 1 facilities and buildings of special importance.			







Provide plantings for housing/dormitories that make the facility entrances appear safe and welcoming



Plantings need to be simple and clean and easily maintained at Group 2 and 3 facilities



Provide plantings with color and interest to frame entrance to buildings of special importance in Group 1 facilities, such as Command Center or Visitor Center

C06.4.3 Maintained Zone

The Maintained Zone comprises native open upland prairie landscape. The Maintained Zones reduce the amount of existing area that is open lawn space that needs to be mowed. This zone is meant to look native in character and receive minimal maintenance. Nature-based infrastructure such as vegetated stormwater basins and vegetated swales are included in this zone. This area is part of the INRMP and maintained by the FWC. It is subject to either periodic mowing or burning as part of the INRMP guidelines. Areas such as parking area medians, paths, roadways, swales, and open areas beyond the Manicured Zone vegetated stormwater basins and vegetated swales are not part of the INRMP and are maintained under the direction of the 325 CES Operations Flight Grounds Maintenance.

Typical Locations

This planting strategy applies to:

- Roadway corridors (turf mow strips at the back of sidewalks are excluded)
- Parking area medians
- Building perimeter open areas (beyond the AT Zone)
- Areas where more natural looking planting is desired between buildings

Planting Design Strategy

Plants will be arranged in an organic pattern and spaced at irregular intervals with undefined edges between them. Three planting strategies include:

- Clustering trees along roadways
- Providing open areas of native grass and wildflower mix (with a maximum height of 24 inches)
- Layering a mix of grasses and shrubs

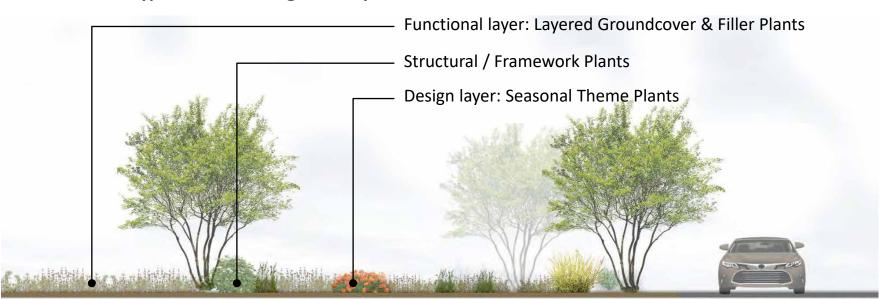
Benefits

- Reduces maintenance costs
- Increases resiliency to wind and storm
- Slows down stormwater runoff

Exhibit C06-7. Rendering of the Maintained Zone



Exhibit C06-8. Typical Section Along Roadways





Example of vegetation in the Maintained Zone

The following are landscape criteria are to applied along Maintained Zones roadway corridors, medians, around building perimeters (excluding AT zones), and other areas where a natural and native aesthetic is desired. Exhibit CO6-9 provides an abridged version of the Maintained Zone Plant List. The Master Plant List includes additional approved plants and information.

C06.4.3.1 Parking Area Islands

Yes No N/A		
	LaC 6.	Plant native shrubs and grasses less than 3 feet tall that can withstand periodic flooding.
	LaC 7.	Dip parking area islands to the center so they can collect water through curb cuts or other gaps in the curbing.
	LaC 8.	Use deciduous and evergreen mix for seasonal appeal.
	LaC 9.	Provide swales with an outlet from the parking area to accommodate overflow.
	LaC 10.	Comply with IFS requirements for Landscape Treatments, Site and Surface Parking, and Interior Surface Parking Landscaping Requirements.

C06.4.3.2 Trails, Bikeways & Open Areas

	LaC 11.	Provide a plant mix of native trees, shrubs, and grasses on both sides off trails.
	LaC 12.	Use grass that can be mowed for the first 5 feet on each side of the trail.
	LaC 13.	Use a seed mix of various native grasses, wildflowers, and shrubs in large open areas.

C06.4.3.3 Roadways

Yes	No N/A		
		LaC 14.	Plant the area between the curb and the sidewalk wit large and medium trees and a mix of native grasses ar flowers (maximum height of 24 inches).
		LaC 15.	Use plants that can withstand flooding in roadway swales.
		LaC 16.	Mow once a year to reduce weeds and help the wildflowers reseed.
		LaC 17.	Plant trees in a staggered, clustered pattern.
		LaC 18.	Plant trees at least 5 feet away from utilities.



Native plantings in parking area islands



Grasses that can be mowed on the first 5 feet of path edges



Native grasses, wildflowers, and trees in a swale along the road

Exhibit C06-9. Plantings within the Maintained Zone

Plant a mix of native trees, shrubs, wildflowers, ferns, vines and grasses in the Maintained Zone based on the approved specifies identified in the Master Plant Palette. A sample plant list shown below.

Common Name	Botanical Name	Notes
Canopy trees	'	
Red maple	Acer rubrum	16' ht, min at install / 40' mature ht.
River birch	Betula nigra	16' ht, min at install / single trunk only
Southern magnolia	Magnolia grandiflora	
Swamp tupelo	Nyssa sylvatica var. biflora	
Turkey oak	Quercus laevis	
Swamp chestnut oak	Quercus michauxii	
Willow oak	Quercus phellos	
Post oak	Quercus stellata	
Southern live oak	Quercus virginiana	
Pond cypress	Taxodium ascendens	
Bald cypress	Taxodium distichum	20 ht. min. at install
Understory trees		
Red buckeye	Aesculus pavia	
Wild olive; devilwood	Cartrema americanum	
Swamp dogwood	Cornus foemina	
American witchhazel	Hamamelis virginiana	
Dahoon	llex cassine	16' ht. min at install / 40' mature ht.
Myrtle dahoon	Ilex cassine var. myrtifolia	
American holly	Ilex opaca	
Sweetbay	Magnolia virginiana	
Southern bayberry; wax myrtle	Myrica cerifera	
Palms		
Cabbage palm	Sabal palmetto	18-24' ht. min. at install

Common Name	Botanical Name
Shrubs	
Bastard false indigo	Amorpha fruticosa
American beautyberry	Callicarpa americana
Virginia willow; virginia sweetspire	Itea virginica
Needle palm	Rhapidophyllum hystrix
Florida flame azalea	Rhododendron austrinum
Swamp azalea	Rhododendron viscosum
Dwarf palmetto	Sabal minor
Saw palmetto	Serenoa repens
Spanish bayonet; aloe yucca	Yucca aloifolia
Adam's needle	Yucca filamentosa
Grasses	
Splitbeard bluestem	Andropogon ternarius
Long leaf threeawn	Aristida palustris
Arrowfeather threeawn	Aristida purpurascens
Wiregrass	Aristida stricta
Longleaf woodoats	Chasmanthium laxum var. sessiliflorum
Hairawn muhly	Muhlenbergia capillaris
Switchgrass	Panicum virgatum
Little bluestem	Schizachyrium scoparium
Tall redtop	Tridens flavus
Sedges & rushes	
Longhair sedge	Carex comosa
Southern waxy sedge	Carex glaucescens
Walter's sedge	Carex striata
Wire sedge	Carex tenax
Leathery rush	Juncus coriaceus
Soft rush	Juncus effusus ssp. Solutus
Bighead rush	Juncus megacephalus
Needle rush	Juncus roemerianus

Botanical Name
Coreopsis linifolia
Coreopsis nudata
Echinacea purpurea
Iris tridentata
Liatris elegans
Liatris gracilis
Rudbeckia hirta
Salvia azurea
Solidago juncea
Vernonia angustifolia
Osmunda cinnamomea
Osmunda regalis
Pteridium aquilinum
Woodwardia areolata
Woodwardia virginica
Clematis reticulata
Lonicera sempervirens
Parthenocissus quinquefolia

C06.4.4 Airfield Zone

This zone includes the runways in the Flightline District, the natural areas between the runways, and the areas surrounding the runway perimeter extending to the pine forest. The following information has been provided by the Tyndall AFB BASH Team. Any changes or substitutions must be coordinated with the BASH Team.

Planting in this zone consists of native grass that is mown regularly to keep it low and prevent wildlife habitats. Birds, in particular, are hazardous to the aircraft and present a safety concern. Shrubs, groundcovers, and bunchgrasses used in the Airfield Zone must be selected and planted in a manner that prevents crowding and eliminates dense landscape that birds and other wildlife find attractive for nesting.

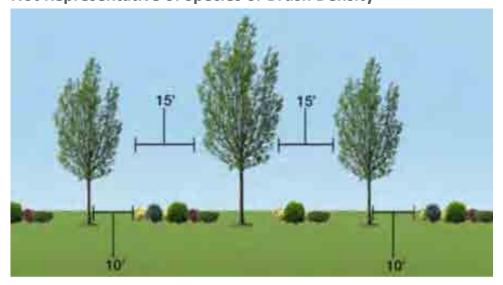
Benefits

- Increases safety and reduces aircraft hazards
- Slows down stormwater runoff
- Reduces habitat for birds and other wildlife



Example of Airfield Zone planting

Exhibit C06-10. Concept of Minimum Landscape Layout, Not Representative of Species or Brush Density



C06.4.4.1 Airfield Zone Planting Design Criteria

Exhibit C06-12 lists examples of plants and trees approved for use in the Airfield Zone landscape designs.

Zone landscape designs.		
Yes No N/A		
LaC 19.	Plant only native turf grasses from the approved plant list. Trees and shrubs are not allowed.	
☐ ☐ ☐ LaC 20.	Verify that all airfield planting is approved by Tyndall AFB.	
LaC 21.	Use shrubs that are a mix of deciduous and coniferous species.	
	Use shrubs that grow at various heights to prevent uniform and continuous habitat cover.	
LaC 23.	Use sterile (non-fruiting) varieties or male varieties of shrubs to prevent seeds and berries from attracting birds and wildlife.	
	Plant shrubs, groundcovers, and bunch grass in groups up to five individuals. Include a maximum of two individual Pinxster azaleas per group of shrubs, groundcovers, and bunch grass.	
	Plant shrubs a minimum of 10 feet from any other group of planting.	
□ □ □ LaC 26.	Maintain all trees in the Flightline in accordance with	

airfield obstruction standards.

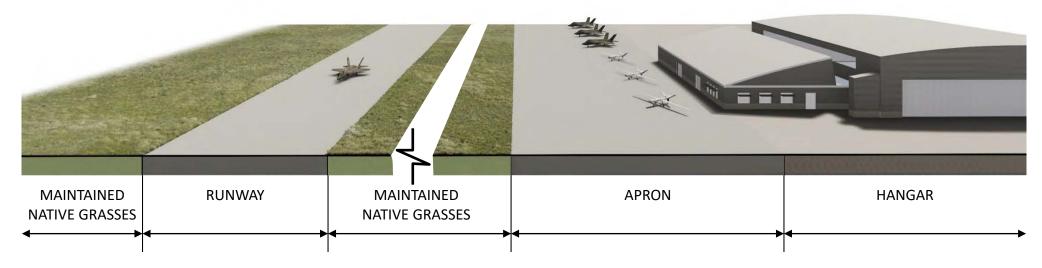
nearest runway center line.

LaC 27. Do not plant sycamore trees within 1,250 feet of the

Exhibit C06-12. Airfield Zone - Approved Plants

Common Name	Botanical Name
Canopy trees	
Loblolly bay	Gordonia lasianthus
Pond cypress	Taxodium ascendens
Understory trees	
Florida dogwood	Cornus florida
American witchhazel	Hamamelis virginiana
Shrubs, groundcovers, bunch g	grasses
Wind dancer love grass	Erarotis elliotti
Purple love grass	Erarotis spectabilis
Muhly grass	Muhlenbergia capillaris
Pinxster azalea	Rhododendron canescens
Scarlett sage	Salvia coccinea
Coontie	Zamia floridana
Turfgrasses	
Bermuda grass	Cynodon dactylon
Bahia grass	Paspalum notatum

Exhibit C06-11. Typical Section in the Airfield Zone



C06.4.4.2 Airfield Zone Multi-Modal Spine Design Planting Criteria

On the southern side of the Flightline District is the Flightline Multi-Modal Spine. This corridor is within the manicured landscape zone, but because it is within the Flightline District it has specific landscape restrictions that must be followed. This area includes trees and shrubs, but of a species and character that does not attract birds.

Benefits

- Reduces maintenance costs
- · Increases resiliency to wind and storm
- Slows down stormwater runoff
- Reduces habitat for birds and other wildlife
- · Provides much needed shade for length of walkway/building connector

Yes No N/A

LaC 28. Select and plant trees and shrubs in a manner that reduces attractiveness to wildlife.

LaC 29. Select tree species that are columnar in shape with vertical branching structures that minimize perching and nesting opportunities for birds. Use sterile (non-fruiting) varieties of trees.

LaC 30. Select trees that have varied canopy types and heights at

planting and at maturity. Design tree spacing so the crowns have a minimum separation of 15 feet once trees are mature. Install trees so canopy overlap into the clear space is not possible during any season.

LaC 31. Plant shrubs a minimum of 10 feet from any trees.

LaC 32. Select shrubs that are a mix of deciduous and coniferous species. Use sterile (non-fruiting) or male varieties of shrubs to prevent seeds and berries from attracting birds and wildlife.

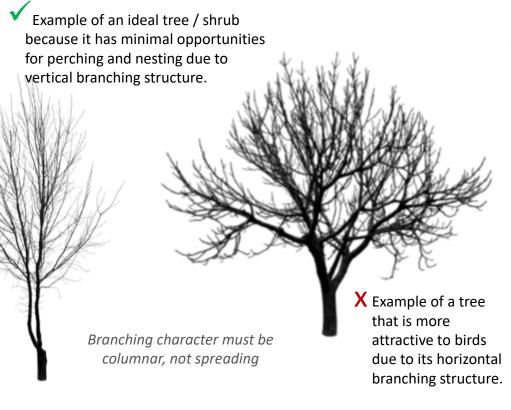
LaC 33. Verify that all planting is approved by the BASH Team.



Example of a nonfruiting shrub that is minimally attractive to wildlife because of its vertical branching structure and moderate density.

Exhibit C06-13. Flightline District's Multi-Modal Spine







Example of tree-lined walkway with columnar shaped trees; includes low shrubs, groundcover, and sitting walls and other bench types located along the walk

C06.4.5 Managed Zone

The Managed Zone encompasses all perimeter areas upland of the peninsula coastline, as well as large open areas in between facilities on the base located beyond the Maintained Zone. This zone includes areas of pineland plantations, mesic/wet slash flatwoods, wet prairie, freshwater wetlands, and inland ponds and lakes. This area is primarily controlled by standards set forth in the INRMP.

Planting Design Strategies

- Restoring damage to the base's forest habitat caused by Hurricane Michael
- Reducing fire hazards
- Restoring natural esthetics destroyed by wind
- Implementing low-intensity frequent fire as a management tool to restore and/or maintain the structure and function of the longleaf pine ecosystem and to reduce the wildfire hazard risk
- Improving habitat for wildlife

Benefits

- Increases resiliency to wind and storm
- Slows down stormwater runoff
- Enhances wildlife habitat

Resources

See **Section B04, Integrated Land Management,** for Restorative and Resilient Base Restoration approach.

C06.4.5.1 Managed Zone Planting Design Criteria

Yes No N/A

LaC 34. Align planting within the Managed Zone with the INRMP and support the installation's ecosystem initiatives as a part of a broader integrated resilient environmental infrastructure system.

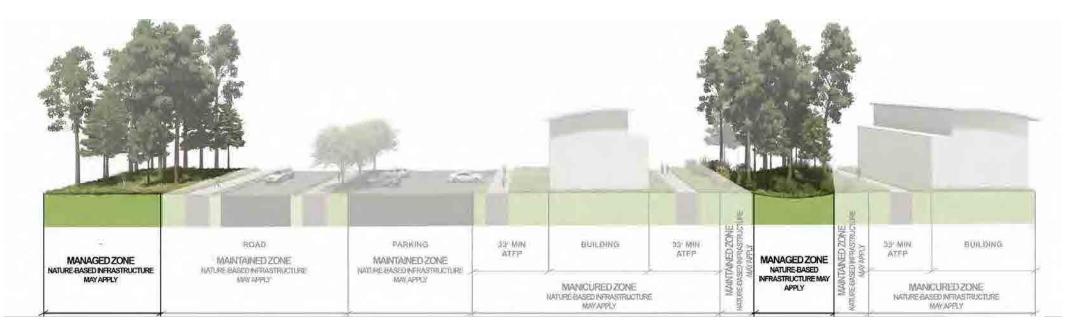


Wetlands



Longleaf Pine Forest

Exhibit C06-14. Managed Zone Areas Between Buildings



C06.4.6 Coastal Zone

The Coastal Zone encompasses all areas from the ocean shoreline back to the second line of defense, which includes sand beaches, coastal dunes, coastal wetlands, salt marshes, estuaries, coastal dune lakes, and coastal upland. The Coastal Zone provides critical natural infrastructure supporting mission readiness, overall resilience of built infrastructure, and a wealth of natural resources. This complex unique coastal ecosystem provides numerous yearround recreational opportunities vital to the health and well-being of Airmen and their families. The preservation, conservation, and enhancement of these critical waterfront ecosystems positively supports the many aspects of the base's current and future missions through a more resilient natural infrastructure.

Planting Design Strategies

- Arranging plantings in naturalized groupings
- Selecting plant species that support existing coastal zone plant communities
- Limiting impact of construction/installation impact within the environmentally sensitive Coastal Zone

Benefits

- Reduces maintenance costs
- Increases resiliency to wind and storm
- Slows down stormwater runoff
- Enhances wildlife habitat

Resources

See Section B05, Coastal Zone for overall Coastal Zone strategies.

C06.4.6.1 Coastal Zone Planting Design Criteria

Yes No N/A

LaC 35. Align planting within the Coastal Zone with the INRMP and support the installation's ecosystem initiatives as a part of a broader integrated resilient environmental infrastructure system.











Co6.5 Treatments For Specific Areas

C06.5.1 Driveway Landscape Treatments

Yes No N/A		Yes No N/A	
	Plant large canopy trees along the driveway access between sidewalks and the back of the curb.		Plant trees in a staggered form and use a mix of large canopy tree and small canopy tree in amenity zones tha
□□□□ LaC 3	7. Provide an amenity zone that has a minimum width of 10		are equal to or greater than 20 feet wide.
	feet.	LaC 40.	Use 3-foot horizontal clearance from edge of travel lane
LaC 38	3. Plant a single row of trees in amenity zones that are less than 20 feet wide, spaced at 30 feet on center.		and 2-foot horizontal clearance from the edge of sidewalks/shared-use paths.

Exhibit C06-15. Driveway Landscape Treatment

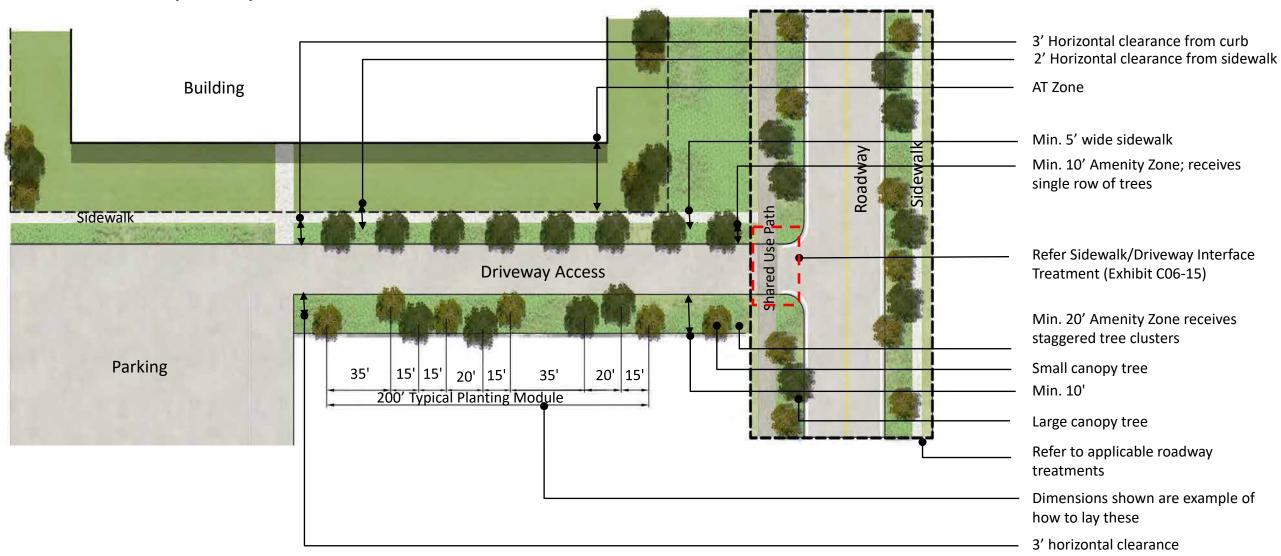
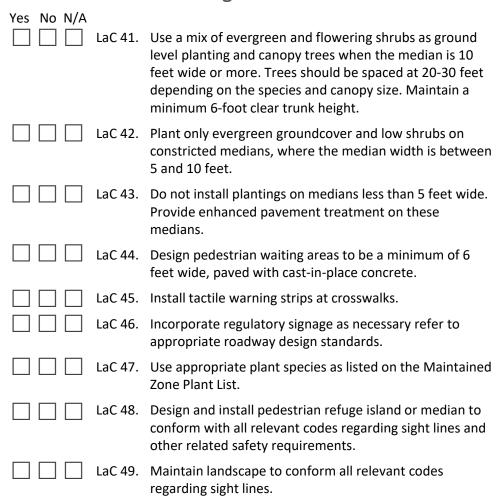


Exhibit C06-16.
Sidewalk/Driveway
Interface Treatment



C06.5.2 Pedestrian Refuge Islands & Medians





Example of crosswalk plantings

Exhibit C06-17. Constricted Medians with Evergreen Groundcover/Low Shrubs



Exhibit C06-18. Large Pedestrian Refuge Island with Mix of Groundcover/Low Shrubs and Trees



C06.5.3 Roundabout Center

C06.5.3.1 General Guidance Yes No N/A LaC 50. Use native grass as groundcover. LaC 51. Incorporate signage as necessary. LaC 52. Use appropriate plant species as listed on the Maintained Zone Plant List. LaC 53. Design planting layout in a simple and clean manner, conforming with roadway corridor and roundabout planting characters. Final planting layout should be approved by Design Review board. LaC 54. Design and install roundabout centers to conform with all relevant codes regarding sight lines and other related safety requirements. LaC 55. Maintain landscape to conform with all relevant codes regarding sight lines and other related safety requirements. LaC 56. Comply with applicable roadway design standards for

roadway and any traffic signage design.

C06.5.3.2 Tier I Roundabout Treatment

Tier I roundabouts are located near primary entry gates and other intersections of significant importance with high visibility and traffic volumes.

Yes No N/A

- LaC 57. Include two formal half rings of shrubs (one half ring evergreen one half ring flowering shrubs).
- LaC 58. Place a static display element or one flowering tree or canopy tree at the center of the roundabout.

C06.5.3.3 Tier II Roundabout Treatment

Tier II roundabouts are located near secondary entry gates and other internal intersections of importance and moderate to high visibility and traffic volumes.

- LaC 59. Include one formal ring of evergreen shrubs.
 - LaC 60. Include formal center sculptural element or one canopy tree in the center of roundabout.

C06.5.3.4 Tier III Roundabout Treatment

Tier III round about treatments occur at lower volume, internal intersections when feasible.

LaC 61. Simple circular evergreen shrubs layout around center to cover minimum 30% of the median.



Exhibit C06-19a. Tier I Roundabout Treatment

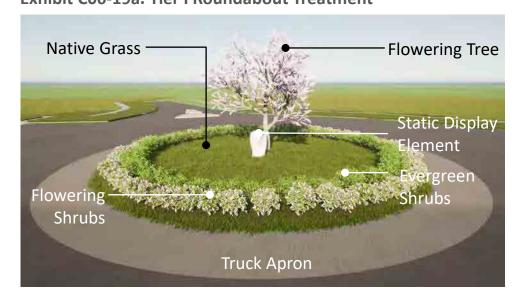


Exhibit C06-19b. Tier II Roundabout Treatment



Exhibit C06-19c. Tier III Roundabout Treatment



Tyndall Air Force Base Installation of the Future



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Co7. Site Furnishings

Co7.1 Introduction

The following site furniture requirements for Tyndall Air Force Base (AFB) expand upon the requirements found in the *Tyndall AFB Installation Facilities Standards* (IFS). Each element of site furniture must be purchased from a single source for all buildings and uses so that all elements match across the base for a unified look.

The following plan elements are described in this section:

- Benches
- Picnic Tables & Benches
- Outdoor Grills
- Security Bollards
- Bike Racks
- Flag Poles

- Fences & Gates
- Playground Equipment
- Fitness Equipment
- Safety Surfacing
- Site Furniture Coastal Zone
- Shade Structures

C07.1.1 Opportunities

A coordinated, consistent inventory of site furnishings positively contributes to the landscaped environment, overall images and character, and unique identity of Tyndall AFB. The selections presented in this site furnishings plan support the base's commitment to using materials that are durable, easy to maintain, visually unified, and compatible with the installation architecture.

C07.1.2 Authority

All site furnishing placement must comply with antiterrorist (AT) standoff distance requirements of UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*.

C07.1.3 Warranty

Coordination of design and construction with Tyndall AFB staff, agencies, service providers and third-party contractors is critical to the successful implementation of planned improvements. All work is required to be warrantied regarding location and installation of materials in a manner consistent with the intent of the Landscape Master Plan and IFS, and to not create a conflict for installation of adjacent improvements by others. All potential conflicts will be identified by designers/contractors in respective sections of the Compliance Checklist and reviewed by Tyndall AFB Staff.

Co7.2 Design Objectives

- Provide a consistent design standard for site furnishings and for ease of maintenance.
- Provide sustainable and durable outdoor amenities

Co7.3 Design Approach

The approach to the selection of elements is based on the following requirements:

- Can be exposed in a coastal salt environment
- Ease of maintenance
- Holds up to heavy public use
- Reasonable cost
- Reflects and is compatible with the architectural style and colors of the base
- Resilient to use and reduces environmental impacts
- Requires less maintenance
- Withstands hurricane-force winds
- Withstands flooding

Co7.4 Design Criteria

The criteria in this section relate to specific design requirements, including IFS requirements, and guidelines for designers/contractors to follow and Tyndall AFB personnel to review. Additional criteria are provided in the other sections of this Landscape Master Plan and are not repeated in this section; however, the requirements for site furnishings must be coordinated with other site elements. The sections that follow serve as worksheets, with supporting guidance and illustrations, for designers/contractors to use among their teams and in coordination with Tyndall AFB. These worksheets should be used to complete the Compliance Checklist submittal for each project. Each requirement includes a selection of check boxes to indicate the applicability of that requirement to a specific context, and to demonstrate compliance with the requirements.

Yes No N/A

The designer/contractor either selects "Yes" if compliance has been met, "No" if it has not, or "N/A" if the requirement is not applicable to the project.



The future of Tyndall AFB

Co7.5 Site Furnishing Elements

C07.5.1 Benches

Yes No N/A SFC 1. Coordinate all standards in this section with the Tyndall AFB Landscape Master Plan. Remove poorly located or redundant litter receptacles, bicycle racks, vending machines, walls, and fences to reduce visual clutter and to lessen the requirements for maintenance. SFC 2. Site furnishings will primarily be concrete, recycled materials, and in some cases hardwood parts. Generally, match the site furniture of adjacent facilities and the facility district. No metal will be used for bench seats and backs. Provide a coordinated consistent inventory of site furnishings to positively contribute to the visual environment, image, and identity of the base; ensure durability, low maintenance, reduced visual clutter, and compatibility with the adjacent architecture. SFC 3. Select high-quality architectural precast concrete benches for general areas that include wood seats and backs. Select Ipe wood seats and backs. SFC 4. When concrete benches are utilized, select benches that are white in color with an acid finish. SFC 5. Select plastic lumber benches made of polyethylene and mixed with wood fiber (WPC lumber) at boardwalk, beach, marina, and at locations where shade structures



are site or cost prohibitive.

C07.5.2 Picnic Tables & Benches

Yes No N/A

SFC 7. Place picnic tables and benches so they do not impede AT stand-off distances as required in UFC 4-010-01, DoD Minimum Antiterrorism Standards for Buildings.

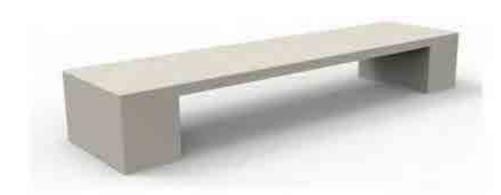
SFC 8. Select high quality architectural precast concrete picnic tables and benches.

SFC 9. Select concrete that is white in color.

SFC 10. If wood treatments are utilized in picnic tables and benches, select Jurrah wood.

SFC 11. If metal treatments are utilized in picnic tables and benches, select white metal.





C07.5.3 Outdoor Grills

Yes No N/A	SFC 13. Select grills that are 14-gauge heavy-duty steel construction finished with high heat, nontoxic, black enamel.
	SFC 14. Select grills that have covered hoods to reduce floating cinders for fire safety.
	SFC 15. Select grills that have 500 square inches of cooking surface with a 3-1/2-inch-diameter in-ground pedestal.
	SFC 16. Select grills that include a side utility shelf.
	SFC 17. Select grills that have latch options, if available, to deter bears.



C07.5.4 Security Bollards

Yes No N/A	,	Comply with UFC 4-022-02, <i>Selection and Application of Vehicle Barriers</i> , for bollards intended to provide crash resistance and other security measures.
		Select bollards based on the level of security desired – light, medium, or heavy.
		Select bollards based on whether they must be removable or fixed.
		Select bollards that are a minimum of 5 inches in diameter.
		Use Type 316 stainless steel appropriate for use in a marine environment.
		Verify that any bollard used for anti-ram protection is on the approved DoD Anti-Ram Vehicle Barrier List.

C07.5.5 Bike Racks

Yes No N/A	
	SFC 24. Select bike racks that are powder coated cast aluminum
	SFC 25. Select bike racks that are metallic silver in color.
	SFC 26. Select bike racks that have a curved top reflecting the architectural style of the base.
	SFC 27. Surface-mount bike racks on concrete.

C07.5.6 Flag Poles

Yes No N/A	
	SFC 28. Select flagpoles that comply with Air Force Instruction 34-1201, <i>Protocol</i> .
	SFC 29. Select flagpoles that are complete units from a single manufacturer and include fittings, accessories, bases, anchorage devices, finials, and lightning grounding.
	SFC 30. Verify that flagpoles are rated to withstand hurricane wind.
	SFC 31. Select flagpoles that are cone or entasis-tapered fabricated from seamless extruded tubing.
	SFC 32. Select flagpoles that have internal halyard, cam, and clear systems.
	SFC 33. Select flagpoles that are satin/silver metal finish.
	SFC 34. Provide manufacturer's standard foundation tube and sleeve for installation.
	SFC 35. Select flagpoles that meet National Association of Architectural Metal Manufacturers FP 1001-07, Guide Specifications For Design of Metal Flagpoles, and all

wind gusts.



regional wind velocity standards for sustained wind and

C07.5.7 Playground Equipment

Playground equipment needs meet the following requirements: Yes No N/A SFC 36. Conform to the requirements in all relevant Housing and Community Facilities UFC (Series 4-700) and Facilities Criteria (FC) (Series 4-700) for playground designs. SFC 37. Comply with requirements for play areas in the U.S. Access Board's Guide on Play Areas. SFC 38. Comply with requirements of UFC 4-740-14, Design: Child Development Centers, and FC 4-740-14N, Navy and Marine Corps Child Development Centers. SFC 39. Design playgrounds to meet current Americans with Disabilities Act (ADA) access criteria and International Play Equipment Manufacturers Association (IPEMA) safety criteria. SFC 40. Group play equipment together with elements for appropriate age groups: toddlers 6 to 23 months; preschool, 2 to 5 years; and grade school, 5 to 12 years. SFC 41. Provide equipment that has elements that are ADA accessible in meaningful way, not just access platforms. SFC 42. Provide shade furnishings that can withstand hurricane winds as part of the equipment. SFC 43. Provide surfacing under equipment that has appropriate fall zones and depth of material and that meets code for the height of the adjacent equipment. SFC 44. Provide water fountains at each playground. SFC 45. Provide benches at each playground.



C07.5.8 Fitness Equipment

Yes No N/A SFC 46. Locate fitness equipment in a single location similar to a playground or as single elements along a trail system. SFC 47. Select fitness equipment that addresses strengthening needs of both lower and upper body.

C07.5.10 Site Furniture – Coastal Zone

Tyndall AFB's Coastal Zone is an extremely dynamic, beautiful natural environment. Paths, trails, and boardwalks allow access to these areas, attracting Airmen, families, and visitors to the base.

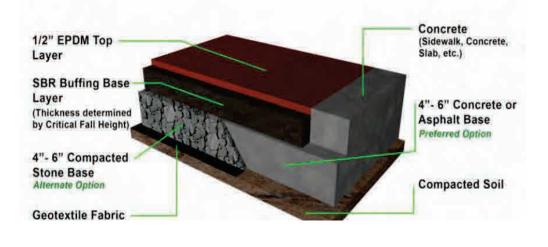
Site furnishings along a path or within a small plaza can provide much needed rest from the area's hot summer sun. Site furnishings should enhance the native environment while promoting safe and appealing use.

Yes No N/A		
	SFC 55.	Position site furnishings for users to enjoy spending time in the natural coastal environment.
	SFC 56.	Select furnishing types, colors, and placement to recognize and fit within the natural character of the coastal area.
	SFC 57.	Use finishes, materials, and assemblies that can withstand the area's extreme marine-environmental conditions.
	SFC 58.	Use only coastal zone site furniture as documented in this section unless otherwise approved by the Tyndall AFB

Design Review Board and the U.S. Fish and Wildlife Service.

C07.5.9 Safety Surfacing

Yes No N/A SFC 48. Comply with requirements for recreational facilities in the U.S. Access Board's Architectural Barriers Act Standards, Chapter 10, Recreational Facilities, and ASTM F1951, Standard Specification for Determination of Accessibility of Surface Systems Under and Around Playground Equipment. SFC 49. Select safety surfacing (see diagram at the right) for playgrounds that is a high quality poured-in-place rubber EPDM system bound with aliphatic binders. SFC 50. Select surfacing that is composed of two layers: a bottom cushion layer that meets the standards of IPEMA and ASTM F1292-13, Standard Specification for Impact Attenuation of Surfacing Materials Within the Use Zone of Playground Equipment. SFC 51. Use a top layer that is a colored wearing surface and other layers as shown in diagram to right. SFC 52. Use a base of surface of compacted stone, asphalt, or concrete base depending on soil conditions. SFC 53. Contain all outside edges using a flush concrete curb. SFC 54. Use a pitched surface to drain.



C07.5.11 Shade Structures



Example of large size structure for Group 1 facilities; masonry to match the adjacent building will be used to enhance structures for Group 1 facilities (note that stone is not a material used at Tyndall AFB)

Shade structures will match and complement the design style of the adjacent building materials and colors. They must not be a standalone style but should reflect the "family" of structures that are repeated throughout a certain area. Some use of curved forms is preferred to complement the surrounding architecture, not detract from it. Structures should be aluminum construction; steel options could be used in special circumstances, with approval from Tyndall AFB.

The structures should be sized according to building use and need. Not every building will need a shade structure. They will be used at buildings as directed by the Tyndall AFB. In general, Group 1 facilities will include a larger structure appropriate for larger gatherings of people. Group 2 and 3 facilities will use a medium size structure, and Group 3 facilities will use a smaller structure as shown above. Exceptions will be based on need. A shared shade structure can be considered for buildings that are close together, such as on the Flightline or the in the Community Commons. Outdoor eating facilities and recreation areas would be candidates for a larger structure.

Shade structures used for Group 1 facilities will be enhanced using a masonry surround on the column support. Note that stone is not used at Tyndall AFB; see the IFS *Design Intent: Architectural Image & Character* for material options.



Example of variation with overlapping wings; midsize structure used for most buildings in Groups 2 and 3



Example of a smaller scale structure for Group 3 facilities not needing large structure

Yes No N/A	
SFC 59.	Design shade structures to reflect the architectural style as outlined in the Tyndall AFB IFS <i>Design Intent:</i> Architectural Image & Character. For furnishings with wood elements a weather shelter or enclosure is required.
SFC 60.	Design shade structures to have curved metal roofs with a aluminum supports capable of withstanding Category 5 hurricane wind speeds.
SFC 61.	Use footing size and depth to meet the wind criteria. Footings must be designed by a structural engineer.
SFC 62.	Use a powder-coated aluminum finish. Design the metal roof color coordinate with the roof color of the adjacent building. Design the metal structure to coordinate with the metal color used on the outside of the building. Select masonry (if used) to match that of adjacent building.



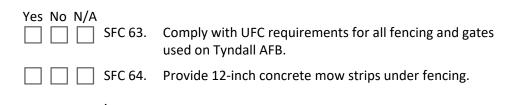
Type A – Powder-coated steel picket fence with a concrete mow strip. Use at Group 1 and 2 facilities.

Tyndall AFB uses various fence types, including fabric, frame, posts and gate materials, that are applicable for different base facilities. For maintenance purposes, include a 12-inch mow strip at the base of all fencing. Gray fencing is preferred, in keeping with the *IFS Design Intent: Architectural Image & Character*. All fencing on base must comply with UFC requirements.

Fence Type	Location
Туре А	Group 1 & 2 Facilities
Туре В	Group 3 Facilities
Type C	High Security Areas



Type B – Powder-coated welded wire fabric security fence with a concrete mow strip. Use at Group 3 facilities.



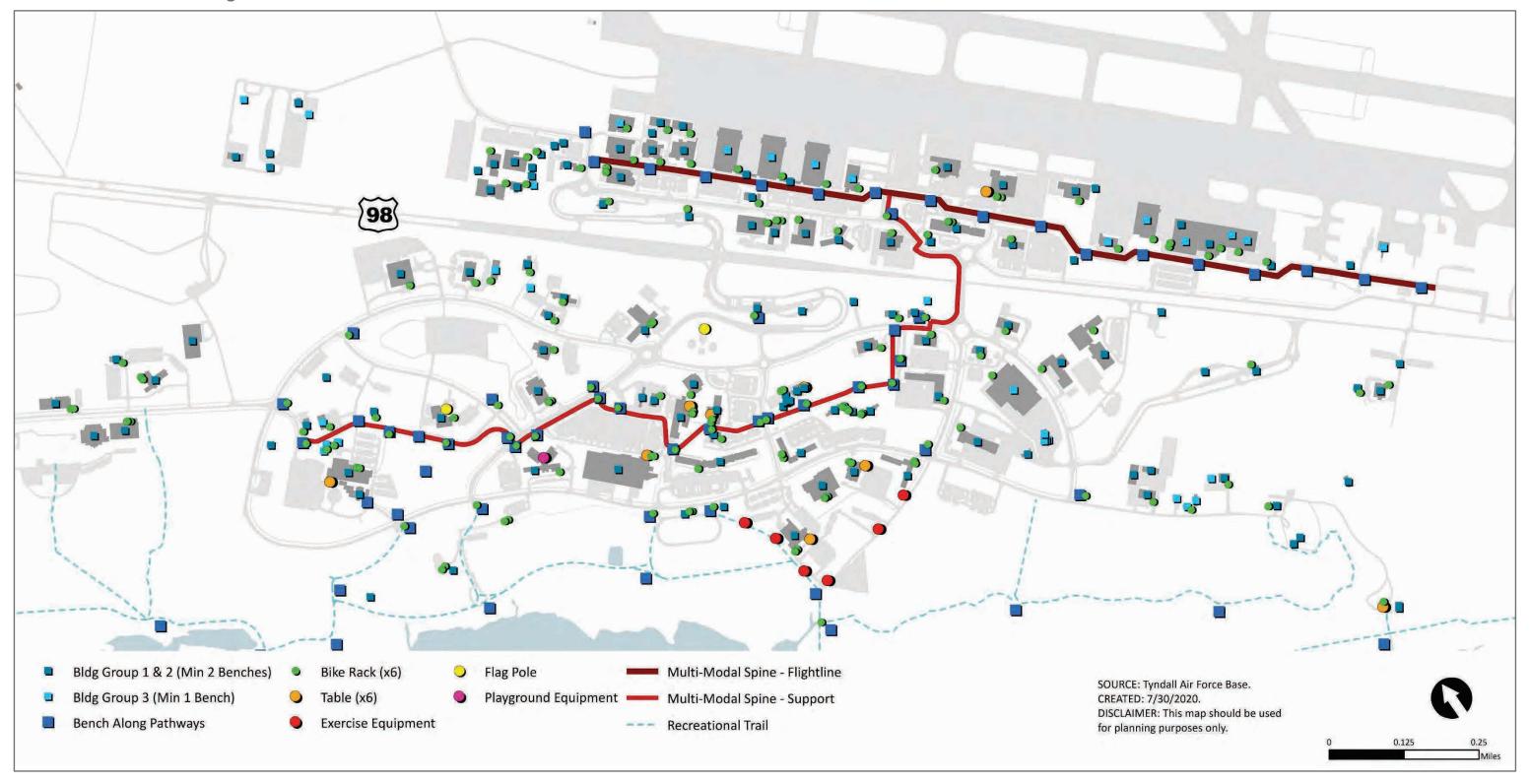


Type C – Powder-coated welded wire anti-climb security perimeter fence with a concrete mow strip.

Exhibit C07-1. Site Elements and Locations Per Building Type

Site Furnishing Elements	Location	Number of Elements Per Facility Type	Note
Benches	 Group 1 & 2 Facilities Group 3 & 4 Facilities Trailheads Along trails 	 Minimum of 2 Minimum of 1 Minimum of 1 As shown on trail plans 	Designer/contractor to use discretion if more benches are needed based on use of facility and number of occupants
Tables and Benches	All facility group types	Minimum of 6 per designated dining area	Designer/contractor to use discretion if more tables and benches are needed based on use of facility and number of occupants
Outdoor Grill	Outdoor dining areas or picnic areas	Minimum of 1 per table	Provide less if directed by Tyndall AFB
Bollards	All facility group types	As needed	
Bike Racks	All facility group types	Minimum of 6Minimum of 12 at certain buildings, see map	Designer/contractor to use discretion if more bike racks are needed based on use of facility and number of occupants
Playground Equipment	Child Development Center	Various based on age groups	
Exercise Equipment	Stationed along trail system	6 stations between housing and the athletic center	At other locations as directed
Safety Surfacing	Under all playground or exercise equipment	Size of area determined by safe zone required by code	Size of area determined by safe zone required by code
Flagpole	Command Center and Flag Park	3 at each facility	At other facility types as directed
Shade Structures	 Large structure - Group 1 Medium structure - Groups 2 & 3 Small structure - Group 3 	As directed Designer/contractor use discretion on on use of facility and number of occup	
	Fences		
Type A	Facility Groups 1 & 2	As directed	
Туре В	Facility Group 3	As directed	
Туре С	High Security Areas	As directed	

Exhibit C07-2. Site Furnishing Locations Plan



Tyndall Air Force Base Installation of the Future



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	C08.4.1 Level 1 Pedestrian Signage	C08-3	C08.8.1 Coastal Zo	one Pedestrian Signage	C08-8
	C08.4.2 Sign Placement Multi-Modal Spine	C08-4	C08.8.2 Conservat	tion Area Signage	C08-9
Co8.5	Design Elements	Co8-5	Co8.9 Pedestrian Signa	age Framework Plan	Co8-10
	C08.5.1 Material & Color Palette	C08-5			
	C08.5.2 Tenant Sign Design Guidance	C08-5			



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Co8. Pedestrian Signage

Co8.1 Introduction

C08.1.1 Context

This pedestrian signage plan provides guidance on wayfinding components within the designated Multi-Modal Spine and shared-use path networks for the rebuild and reconstruction of Tyndall Air Force Base (AFB).

Signage Opportunities

Assorted sign types are used on Tyndall AFB to provide direction, information, traffic control, and facility identification. Most of these signs were built and installed in accordance to the Unified Facilities Criteria (UFC) sign standards; however, many designs do not conform with current criteria. This Landscape Master Plan and pedestrian signage section provide an opportunity to create a unified aesthetic for the pedestrian signage used throughout the base.

Commercial Tenant & Marquee Signs

Various non-military commercial tenants with new and legacy facilities are located throughout Tyndall AFB. Signs are unregulated and fall outside UFC 3-120-01, *Design: Sign Standards*. This pedestrian sign plan provides tenants with additional guidance to achieve consistency in sign design. Design and construction of all commercial tenant signs, whether part of the Facility Sustainment, Restoration, and Maintenance program or MILCON program, will be coordinated with the Tyndall AFB Civil Engineer Squadron..

C08.1.2 Authority

The technical requirements for the pedestrian signage on Tyndall AFB are governed by UFC 3-120-01, *Design: Sign Standards*, and the IFS. Both documents provide specific guidance regarding sign dimensions, design colors, and placement.

This signage plan expands on the requirements of the UFC and the IFS to provide additional sustainability and resiliency guidance for the signage installed on Tyndall AFB.

Applicability

This document applies to signage proposed or implemented for pedestrian wayfinding and mobility. The included design guidance provides specific requirements to achieve functional and aesthetic consideration.

C08.1.3 Warranty & Maintenance

Coordination of design and construction with Tyndall AFB staff, agencies, service providers and third-party contractors is critical to the successful implementation of planned improvements. All work is required to be warrantied regarding location and installation of materials in a manner consistent with the intent of the Landscape Master Plan and IFS, and to not create a conflict for installation of adjacent improvements by others. All potential conflicts will be identified by designers/contractors in respective sections of the Compliance Checklist and reviewed by Tyndall AFB Staff.

Co8.2 Design Objectives

The overall objectives for pedestrian signage are to provide attractive wayfinding for safety and convenience. Specific objectives for pedestrian signage are defined below.

Aesthetic and Function: Develop cohesive and informative sign designs that reflect the aesthetic approach of the overall Tyndall AFB rebuild effort.

Design For All: Prioritize safe and accessible walking routes that support the entire Tyndall AFB community.

Local Distinctiveness: Develop a comprehensive signage system that defines and promotes the unique characteristics of Tyndall AFB.

Raise Awareness: Implement a pedestrian-centric signage program to raise pedestrian awareness on the base.

Reflects Innovation: Support the goals and vision of Tyndall AFB's Installation of the Future strategy.

Self-Monitoring Analysis and Reporting Technology (SMART): Support the use of connected and SMART systems to enhance two-way communications.

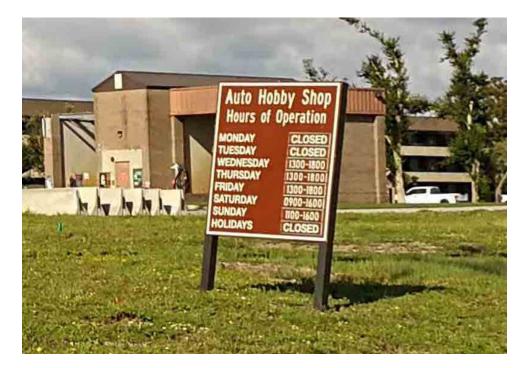
Sustainable and Resilient: Incorporate sustainable and resilient designs as well as a creative use of form to mitigate climate-related and geographical challenges.











Existing signage on Tyndall AFB (after Hurricane Michael)

Co8.3 Design Approach

This pedestrian signage design approach expands on the existing signage criteria and addresses the unique conditions of the multi-modal corridors, and that supports the distinctive pedestrian signage aesthetic of Tyndall AFB. Examples of the signage prototypes are shown in Exhibit C08-1.

C08.3.1 Compliance & Ordinances

This pedestrian signage plan serves as a component of the overall **Landscape Master Plan** strategy and provides additional design guidance to complement current signage standards outlined under the UFC 3-120-01. This plan is intended to address issues not included in the UFC or the IFS.

C08.3.2 UFC Signage Hierarchy

This pedestrian signage plan incorporates the specific parameters outlined in the UFC as indicated by the circled categories in Exhibit C08-2.

The signage typologies referred to as "Level 1" are intended for use throughout the Tyndall AFB. And enhanced "Level 2" design is also available and is intended specifically for select high-profile areas on the base. Level 2 signage, further discussed in **Section C08.6**, are to be installed in locations determined by Tyndall AFB Civil Engineer Squadron.

Exhibit C08-1. Sign Types for Tyndall AFB based on UFC/IFS Criteria



Exhibit C08-2. Installation and Gate Identification

- Primary
- Secondary
- Wall-Mounted
- Tertiary Gate

Building Identification

- Freestanding Building ID
- Building Entrance
- Building Mounted
- Commercial

Centralized Facilities Freestanding

Specialty Community ID

Water Tower Signage
Traffic Control

- Access/Entry Control
- Speed Limit
- Street name
- Parking

Directional + Wayfinding

Orientation / Wayfinding

Mandatory and Prohibitory Signs

- Accessibility Pathway
- Entrance

Informational and Motivational Signs

- Motivational and Morale
- Electronic Message
- Exhibit
- Specialty Informational
- Construction Project ID

C08.3.3 Commercial Tenant Signs

Tyndall AFB hosts many non-military commercial tenants in existing and planned facilities throughout the installation. Signage components for these facilities are unregulated and not subject to UFC requirements. The intent of this plan is to provide guidance that will enable Tyndall AFB to achieve uniform and consistent design throughout the installation, to include signage for commercial tenants.

C08.3.4 Pedestrian Signage Criteria (PSC)

The criteria in this section relate to specific design requirements, including IFS requirements, and guidelines for designers/contractors to follow and Tyndall AFB personnel to review. Additional criteria are provided in the other sections of this Landscape Master Plan and are not repeated in this section; however, the requirements for pedestrian signage must be coordinated with other site elements. The sections that follow serve as worksheets, with supporting guidance and illustrations, for designers/contractors to use among their teams and in coordination with Tyndall AFB. These worksheets should be used to complete the Compliance Checklist submittal for each project. Each requirement includes a selection of check boxes to indicate the applicability of that requirement to a specific context, and to demonstrate compliance with the requirements.

Yes No N/A

1 🗆 🗀

The designer/contractor either selects "Yes" if compliance has been met, "No" if it has not, or "N/A" if the requirement is not applicable to the project.

Community Center

Bowling Alley Cafeteria Gas Station Library Credit Union Post Office

Depicted concepts are not to scale



837 Florida Ave.



Categories that

apply to the

pedestrian

signage plan

Co8.4 Design Typologies

C08.4.1 Level 1 Pedestrian Signage

Tyndall AFB's goal to become the Installation of the Future is reflected in the sign typologies to be implemented throughout the base. Founded on UFC and IFS criteria, the innovative "next generation" pedestrian signage provides clear and consistent guidance and incorporates features that highlight the base's commitment to sustainability, resiliency, safety, adaptability and ease of maintenance, as described in Exhibits C08-3, C08-4, and C08-5.

Exhibit C08-3. Level 1 Secondary Sign Concepts Frontal View



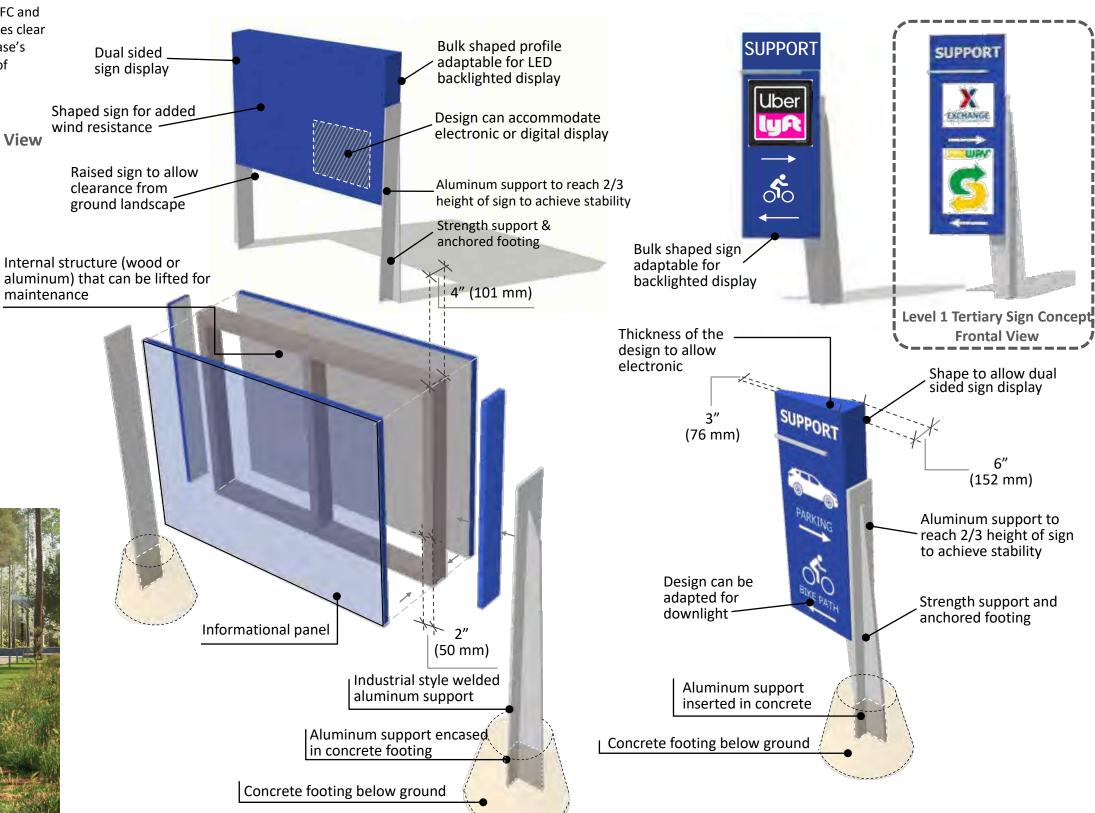
BX/COMMISSARY

CREDIT UNION

HOBBY SHOP **FITNESS CENTER**



Exhibit C08-5. Level 1 Tertiary Sign Concept – Cutaway View



Rendering of Level 1 sign in the Support District

C08.4.2 Sign Placement Multi-Modal Spine

Most pedestrian circulation in the Flightline and Support Districts will occur along the Multi-Modal Spine, which includes three mobility zones: pedestrian, bicycle (and autonomous vehicles in the future), and shuttle. The three Level 1 sign types are illustrated on Exhibit C08-3; on Exhibits C09-4 and Co9-5, the letters reflect how the sign types should be placed. Level 1 signs should be placed according to the following:

Yes No N/A

PSC 1. Place primary and secondary Level 1 sign types along the central bicycle and autonomous vehicle zone.

PSC 2. Place secondary and tertiary Level 1 sign types along pedestrian zone adjacent to parking areas.

PSC 3. Place tertiary Level 1 signs adjacent to facilities located along the Multi-Modal Spine.

Exhibit C08-6. Level 1 Sign Types

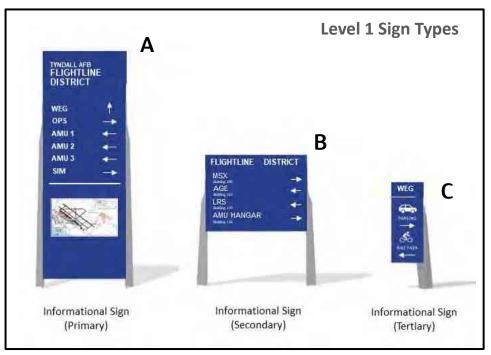
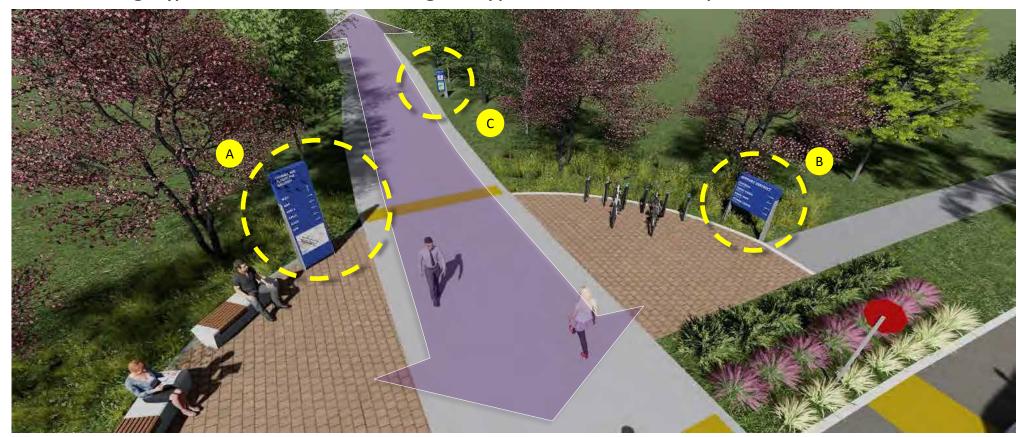


Exhibit C08-7. Sign Types and Intended Locations Along the Flightline District Multi-Modal Spine



Exhibit C08-8. Sign Types and Intended Locations Along the Support District Multi-Modal Spine



Co8.5 Design Elements

C08.5.1 Material & Color Palette

To capture Tyndall AFB's unique environment, a color palette was selected to represent the range of materials from the "tectonic" aspect of the architectural geometry to the "organic" nature of the coastal surroundings. Each color symbolizes an element, either human-made or natural, descriptive of the visual surrounding from sky, to land, to sea.

Yes No N/A PSC 4. Use the primary and base color Air Force Blue (PMS 287) to signify discipline and commonality to provide a visual link to the base's mission and identity. PSC 5. Use white, light gray, or carbon gray for lettering color against primary and base color signage to enhance contrast to the background color field and to improve overall visibility of the sign. PSC 6. Use secondary and accent colors sky blue, seafoam green, and dune sand to signify nature and the environment. Use these colors for signage accent strips, motifs, and panel infills. Secondary and accent colors can be used to identify location, zone, or district. PSC 7. Use black or dark color lettering against secondary and accent colors for contrast and visibility.

> PSC 8. Comply with UFC 3-120-01 Section 2.2, Font Standard, and Section 3.2.2, Material & Color, for font styles and sizes.



C08.5.2 Tenant Sign Design Guidance

The following guidance applies to marquee and commercial tenant signage.

Yes No N/A PSC 9. Use reinforced monument-type or a masonry base for primary and secondary sign types. Avoid signage designs that have single-pole support to comply with wind requirements. Incorporate material and color recommendations outlined in Section C08.5.1. PSC 10. Construct signs to be suitable for Florida Gulf Coast conditions and to withstand hurricane-force wind.

> PSC 11. Design signs to have maximum visibility from pedestrian flow but do not impede antiterrorism requirements for adjacent base facilities.

9' to 10' 8' to 9' 12-18" Welcome to Tyndall A.F.B. **Daily Updates** to 9' to 6' TYNDALL AIR FORCE BASE COVID-19 STATUS ∞ ∞

Digital Display Panel

Exhibit C08-11. Marquee Sign Guidance

Exhibit C08-10. Application of the Color Palette in Level 1 Marquee Signs



12" to 18"

Co8.6 Level 1 Pedestrian Signage Design Elements

C08.6.1 Level 1 Primary Informational Signs

Level 1 Primary informational signs are intended to be placed along the central bicycle and autonomous vehicle zone.

Yes No N/A

PSC 12. Locate signs at the start, terminus, and junction of primary corridors, or near the access points to facility sub-districts (F-35, WEG, AFNORTH).

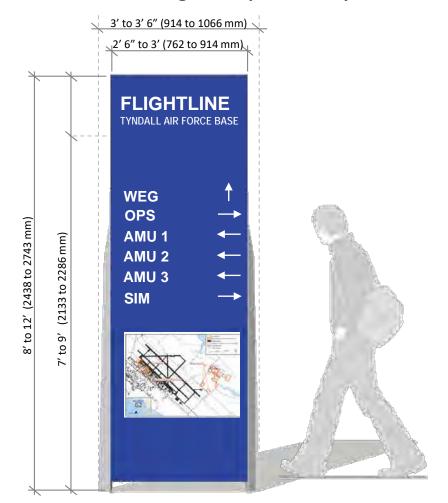
PSC 13. Place primary signs so they do not exceed 12 feet in height (measured from the ground up) or are visible above eyelevel from a distance of 100 feet or less.

PSC 14. Use reinforced supports and anchored footings capable of withstanding hurricane-force wind.

PSC 15. Include design allowances for electronic or digital display

Exhibit C08-12. Level 1 Sign Concepts - Primary

upgrades.



C08.6.2 Level 1 Secondary Informational Signs

Level 1 Secondary informational signs are intended to be placed at primary and secondary pedestrian pathways, especially at or near the junctions of roads and sidewalks or pathways.

Yes No N/A

PSC 16. Place secondary signs so they do not exceed 7 feet in height (measured from the ground up) and are visible at eye-level at a distance of 50 feet or less and maintain required landscape clearance.

PSC 17. Locate within 5 feet of the adjacent pavement edge but not in the path of mobility or movement.

PSC 18. Design secondary signs to be adaptable for use in the Sabre District housing area and the Morale, Welfare, and Recreation (MWR) developments outside the core installation.

PSC 19. Optimize sign design for simplified fabrication.

PSC 20. Design signs to be wind resistant and include reinforced anchors and support elements.

| | | PSC 21. Include design allowances for electronic or digital display

C08.6.3 Level 1 Tertiary Informational Signs

Level 1 Tertiary informational signs are intended to be located adjacent to facilities located along the Multi-Modal Spine.

Yes No N/A PSC 22. Locate at tertiary signs for informational and directional use at primary, secondary, and tertiary pedestrian pathways. PSC 23. Place signs so they do not exceed 4.5 feet in height (measured from the ground up) and are visible at or below eve-level with a distance of 20 feet or less. PSC 24. Design tertiary signs to have a minimal amount of text. PSC 25. Install tertiary signs on paved areas. Install on unpaved area when suitable for coastal development to minimize footprint. PSC 26. Locate sign within a 3-foot perimeter from the pavement edge but not in the path of mobility or movement. PSC 27. Design secondary signs to be adaptable for use in the Sabre District housing area and the MWR developments outside the core installation. PSC 28. Optimize sign design for simplified fabrication and installation.

Exhibit C08-13. Level 1 Sign Concepts – Secondary

upgrades.

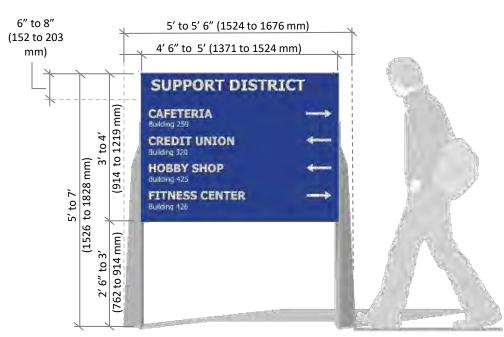
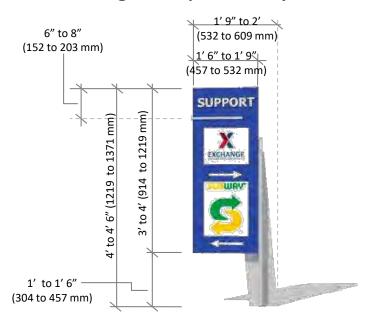


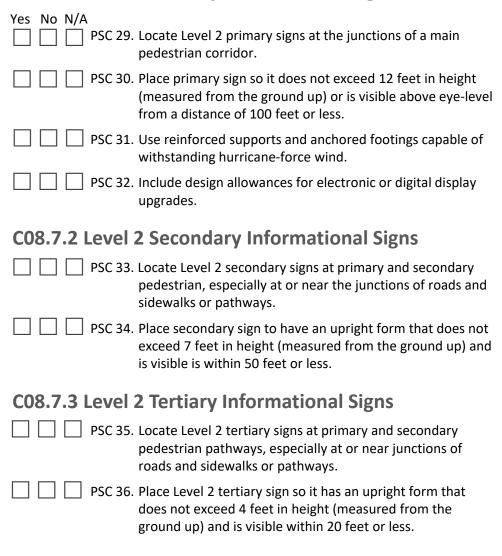
Exhibit C08-14. Level 1 Sign Concepts - Tertiary

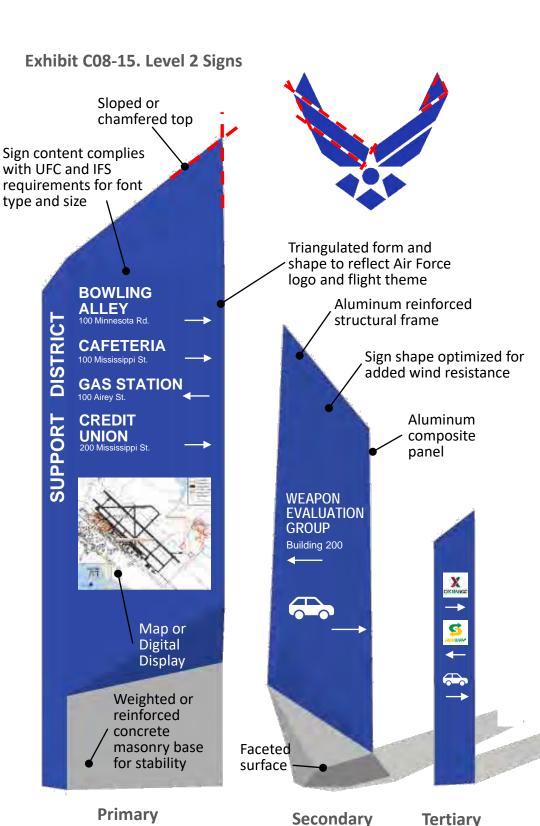


Co8.7 Level 2 Pedestrian Signage Design Elements

For select locations at Tyndall AFB such as the Community Commons, an enhanced Level 2 signage design offers a unique architectural form that is influenced by the UFC standard. The use and construction of a Level 2 sign requires coordination with and approval from Tyndall AFB Civil Engineer Squadron. Level 2 signs are recommended for future developments outside of the base's mission and operational districts. See Exhibit C08-21 for the area where Level 2 signage would be applicable.

C08.7.1 Level 2 Primary Informational Signs







Rendering of Level 2 sign in the Support District

Co8.8 Coastal Zone Pedestrian Signage Design Typology

C08.8.1 Coastal Zone Pedestrian Signage

The Coastal Zone, as discussed in **Section B05**, **Coastal Zone**, consists of large stretches of largely undeveloped areas along St. Andrew Sound, Shell Island Beach, and Beacon Beach Trail. Consisting of pristine dune beaches, coastal woodlands, and nature preserves, the Coastal Zone includes protected conservation areas with restricted public access, but also has areas designated for low-intensity recreational use. The Coastal Zone is managed and maintained by the Tyndall AFB Natural Resources Section.

Access to these recreational areas is provided by a network of pedestrian boardwalks and nature trails, constructed as an extension of the MWR amenities for the Tyndall Community. As expected, signage provision for these types of pedestrian pathways must be sensitive to the natural environment and conservation efforts. Additional considerations for the signage design located the Coastal Zone's recreational area are as follows:

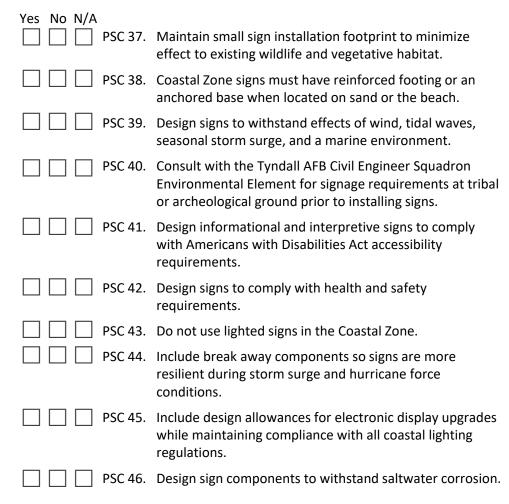


Exhibit C08-16. Pedestrian Signage Installed at the Boardwalk

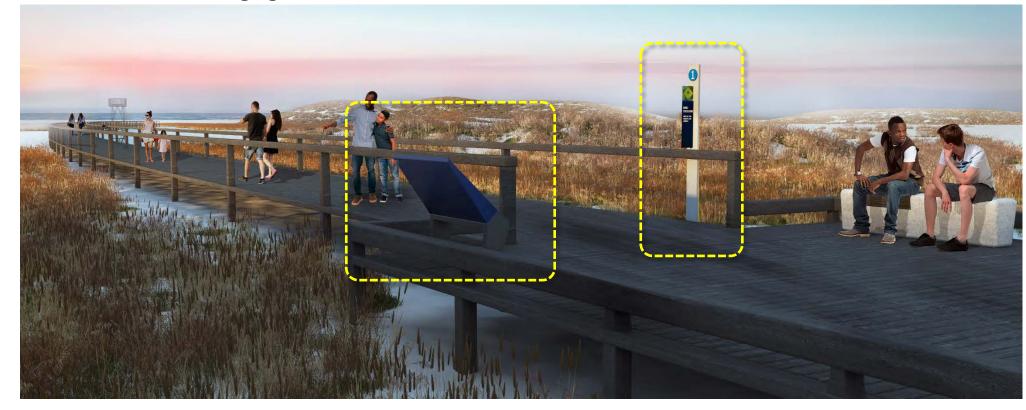


Exhibit C08-17. Trailhead Signs



Exhibit C08-18. In-water Sign



C08.8.2 Conservation Area Signage

Signage in the Coastal Zone's sensitive conservation must adhere to the design criteria presented in Sections CO9.4 and CO9.5, and must be used to present important information and direction for area visitors. Signage construction must maintain a minimal environmental footprint and limit disturbance to coastal wildlife habitat. Signage design and construction must consider seasonal storm surge and hurricane condition. Coastal Zone signage should consider the integration QR code tied to digital or web-based information, and health and safety information. Lighting, if used, must adhere to the criteria outlined in **Section CO9, Lighting**.

The following are additional provisions for signage related to coastal area conservation:

Yes No N/A

PSC 47. Locate interpretive signage at point of interests such as dune restoration sites, tribal heritage sites, habitat protection sites, and typical coastal native vegetation areas. Provide educational and recreational information on interpretive signs.

PSC 48. Locate wayfinding signage at trail heads and boardwalk heads. Incorporate wayfinding signage in parking and marina areas as needed. Provide directional information

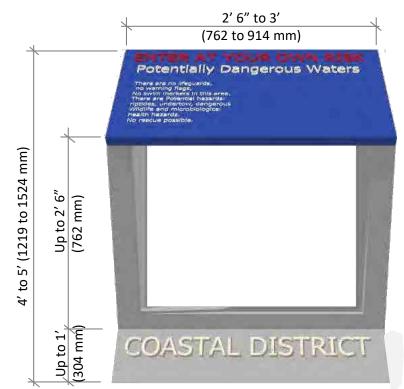
on wayfinding signs.

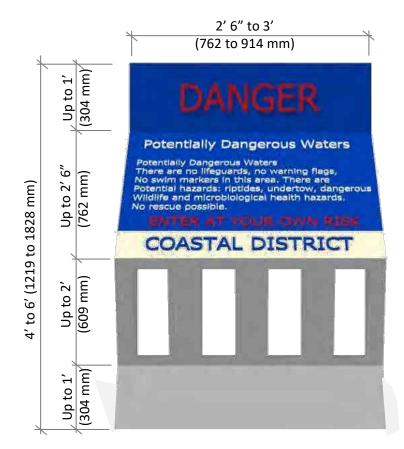
Exhibit C08-19. Coastal Zone Signage





Exhibit C08-20. Coastal Interpretive Signage



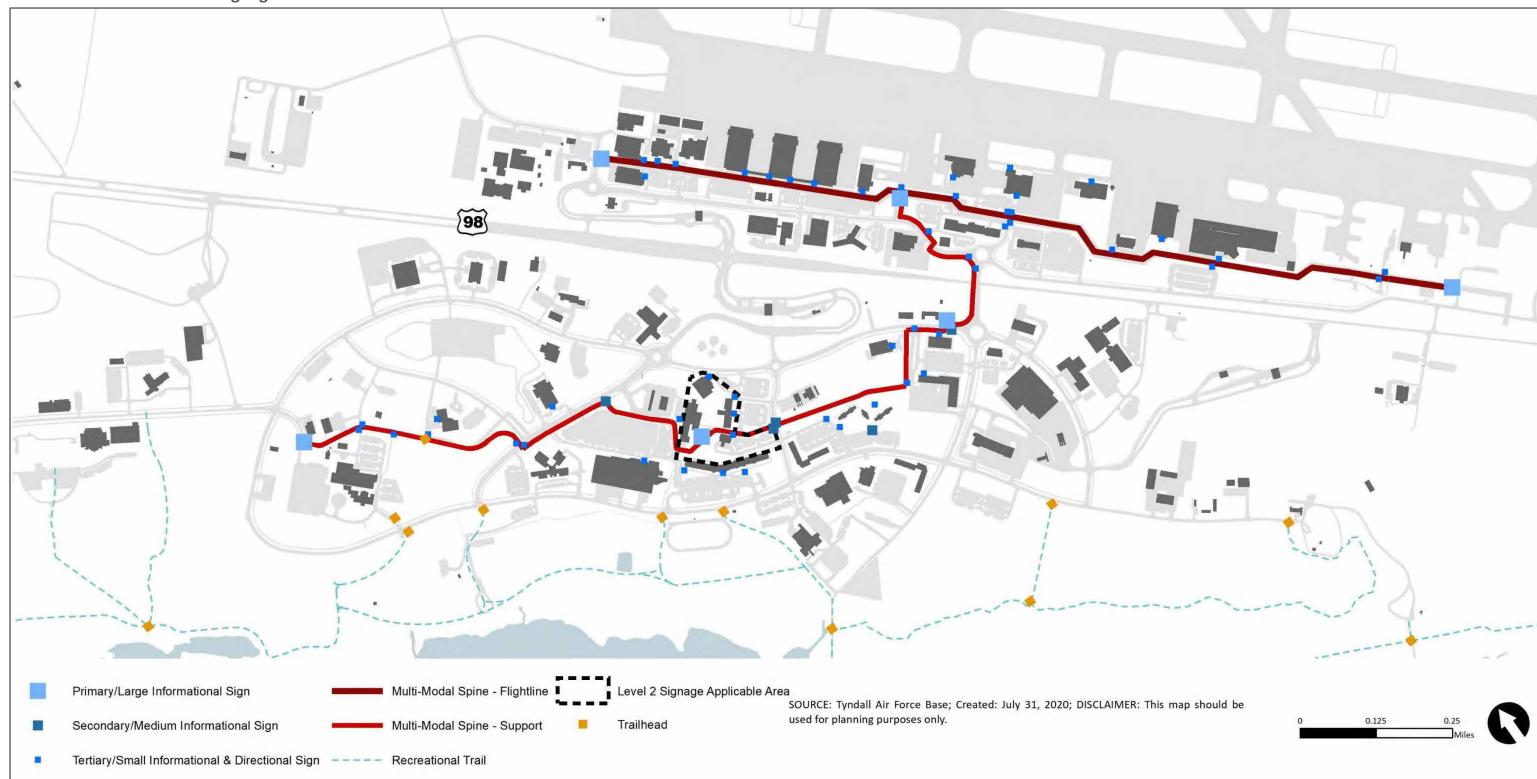


Allow water pass through the sign

Co8.9 Pedestrian Signage Framework Plan

Exhibit C08-21 illustrates approximate locations for the typical Level 1 signs described in this section. Potential locations for Level 2 signage are also shown.

Exhibit C08-21. Pedestrian Signage Framework Plan



Tyndall Air Force Base Installation of the Future



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Co9. Lighting

Cog.1 Introduction

This lighting plan expands the lighting requirements for Tyndall Air Force Base (AFB) found in the *Tyndall AFB Installation Facilities Standards* (IFS), and presents design and specification criteria for luminaires, lighting design, and controls. These criteria were developed based on the current lighting technologies available, local and federal lighting ordinances, and environmental regulations and protections.

C09.1.1 Opportunities

This lighting plan enables a consistent and uniform lighting design approach throughout Tyndall AFB. It is intended to harness the following opportunities:

- Standardize the various light fixtures used throughout the base to add consistency to the base's light fixtures, lamp wattages, and pole types and height
- Apply consistent lighting design standards throughout the base, including criteria for turtle-friendly lighting
- Convert older high-intensity discharge (HID) light fixtures to light-emitting diode (LED) fixtures

The utility provider Gulf Coast Electric Cooperative (GCEC) operates and maintains all pole-mounted lighting on base. In coordination with GCEC, light fixtures and poles were selected based on current inventory and to establish a concise and uniform selection of products for use throughout Tyndall AFB.

C09.1.2 Authority

Tyndall AFB lighting requirements are governed by the following, most current, documents:

- Unified Facilities Criteria (UFC) 3-530-01, Interior and Exterior Lighting Systems and Controls
- UFC 4-022-01, Entry Control Facility Access Control Points
- Surface and Distribution Command/Transportation Engineering Agency (SDDCTEA) Pamphlet 55-15, Traffic and Safety Engineering for Better Entry Control Facilities
- Illuminating Engineering Society of North America (IESNA) Handbook
- National Fire Protection Agency (NFPA) 70 / National Electric Code (NEC)
- Florida Building Code (FBC)
- 20191004 HQ USAF/A4C memorandum.

The local code ordinances for the surrounding cities of Panama City, Panama City Beach, and Callaway were also evaluated when developing this lighting plan. Although local lighting codes are not enforced on Tyndall AFB, they were considered and included as best practices in developing this lighting plan. These codes include considerations for turtle-friendly lighting, light trespass, and placement of light fixtures on streets and intersections.

C09.1.3 Warranty

Coordination of design and construction with Tyndall AFB staff, agencies, service providers and third-party contractors is critical to the successful implementation of planned improvements. All work is required to be warrantied regarding location and installation of materials in a manner consistent with the intent of the Landscape Master Plan and IFS, and to not create a conflict for installation of adjacent improvements by others. All potential conflicts will be identified by designers/contractors in respective sections of the Compliance Checklist and reviewed by Tyndall AFB Staff.

C09.1.4 Design Objectives

The following design objectives support the overall base vision and the four key planning strategies described in **Section B, Master Plan Framework**:

- Provide energy-efficient solutions
- Provide uniform lighting criteria to ensure even illumination throughout the base
- Provide turtle-friendly lighting requirements
- Standardize light fixtures, poles and bollards to be used throughout the Base for ease of maintenance

C09.1.5 Design Approach

The lighting approach is based on the following:

- Establishing lighting typologies specific to Tyndall AFB and its districts that promote consistent lighting applications
- Providing consistent lighting materials
- Complying with the UFC requirements
- Complying with other relevant guidelines, including those defined in the Illuminating Engineering Society (IES) Recommended Practices

C09.1.6 Lighting Controls

GCEC will provide lighting controls. Lighting will be controlled by a central lighting 277V contactor system located at each lighting transformer (also provided by GCEC). This type of contactor system typically serves 20 to 30 lights and includes the ability to connect to the utility Supervisory Control and Data Acquisition (SCADA) network, which will connect back to the Utility Operations Center (UOC) to control the lights. From the UOC, each contactor system will be able to turn on/off the group of lights from this centralized location.

C09.1.7 Compliance & Ordinances: Sea Turtle Lighting

Tyndall AFB is located adjacent to a beach that is a common nesting area for sea turtles, which are a federally listed species. Because sea turtles use moonlight as a guide to move toward the sea, disrupting a naturally dark nighttime environment can alter their behavior. To protect sea turtles and other wildlife, the Florida Fish and Wildlife Conservation Commission (FWC) regulates lighting near beaches.

Sea Turtle Friendly Lighting will be implemented on the side of Tyndall AFB west of Highway 98. Within this area, lights will be amber-colored with a wavelength of 560 nanometers (nm). Areas to the east of Highway 98 and other exceptions will be 4000 Kelvin (K) and 80 Color Rendition Index (CRI) to ensure optimal visual acuity at night.

C09.1.8 Compliance & Ordinances: Dark Skies & Light Trespass

Local ordinances do not have requirements for dark skies or light trespass beyond recommendations noted in UFC 3-530-01, which states that all exterior lights must have a BUG rating of U0. BUG rating stands for Backlight, Uplight, and Glare ratings. An Uplight rating of U0 indicates no light is directed above 90 degrees.

Light pollution is a growing concern. As more artificial light turns on, the ability to see stars at night has diminished. Light pollution is caused by excess lighting toward the sky, which blanches out the natural sky. To mitigate light pollution on Tyndall AFB, all light fixtures should be U0 type, and the Backlight and Glare ratings of the fixtures should be minimized to ensure light only shines in the area where it is needed and not beyond.

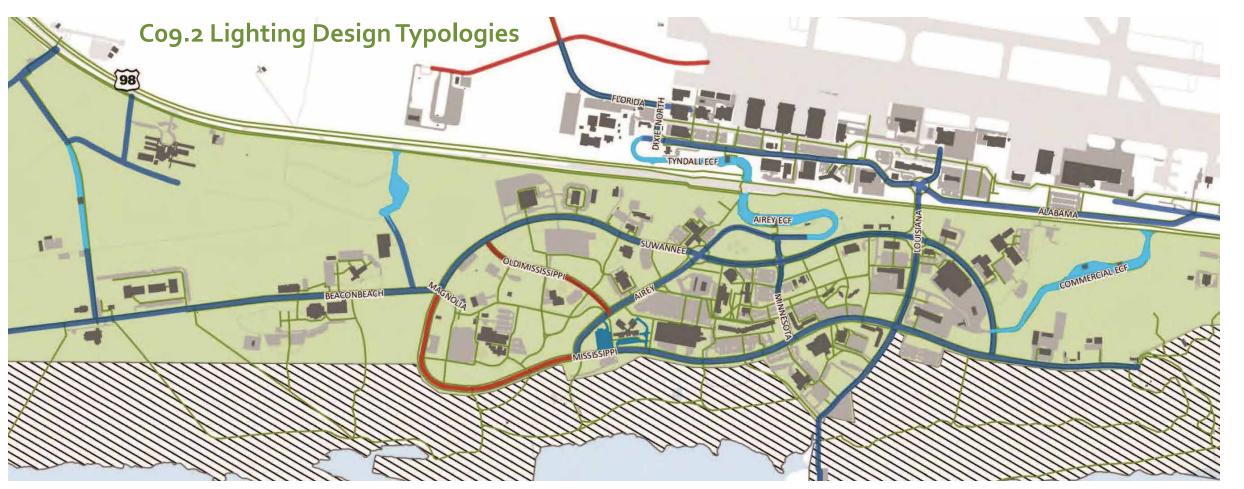


Exhibit C09-2. Lighting Zone Criteria Map

Pathway/Walkway/Bikeway

Entry Control Facility Collector

Low Pedestrian Street Local Low

Collector Pedestrian Street

Child Development Center

Parking

Sea Turtle Friendly Zone

Coastal Zone

C09.2.1 Lighting Typologies Overview

Due to range of lighting requirements and the need for long-term guidance that will lead to consistency in implementation, a series of lighting typologies were identified based on the unique needs of the base and its users.

The unique lighting Street Classification typologies are as follows:

- Flightline
- Street Collector and Local
- Sidewalk/Pathway/Walkway/Bikeway Child Development Center (CDC)
- Entry Control Facility (ECF)
- Parking Area

C09.2.2 Lighting Criteria (LiC)

The criteria in this section relate to specific design requirements, including IFS requirements, and guidelines for designers/contractors to follow and Tyndall AFB personnel to review. Additional criteria are provided in the other sections of this Landscape Master Plan and are not repeated in this section; however, the requirements for lighting must be coordinated with other site elements. The sections that follow serve as worksheets, with supporting guidance and illustrations, for designers/contractors to use among their teams and in coordination with Tyndall AFB. These worksheets should be used to complete the Compliance Checklist submittal for each project. Each requirement includes a selection of check boxes to indicate the applicability of that requirement to a specific context, and to demonstrate compliance with the requirements.

Yes No N/A The designer/contractor either selects "Yes" if compliance has been met, "No" if it has not, or "N/A" if the requirement is not applicable to the project.

Exhibit C09-2. Lighting Design Criteria

Street Classification	Pedestrian Activity Classification	Average Illuminance Footcandles (FC)
Collector	Low	4
Local	Low	3

Exhibit C09-2. Maintained Illuminance Values for Pathway/ Walkways/Bikeways

		Average Illuminance Footcandles (FC)
Pathway/Walkway	Pedestrian	2 Minimum
Bikeway	Only	5 Average

Table Sources: IES RP-8-18 and UFC 3-530-01

C09.2.3 Street Typology - Lighting Criteria

Because the base has an extensive pathway network, most of the streets are considered collector-type with low pedestrian activity classification.

Yes No N/A		
	LiC 1.	Design lighting along streets as indicated on the lighting zone map.

LiC 2.	Provide street-type light fixtures along all streets. Refer to
	luminaire specifications for light fixture style and pole
	heights.

LiC 3.	Use light fixtures in the Sea Turtle-Friendly Lighting Zon
	that meet the wavelength and color requirements.

LiC 4.	Point light fixtures in the Sea Turtle-Friendly Lighting Zone
	away from the beach. Provide light fixtures along both
	sides of the street (as necessary) in other zones.

C09.2.4 Sidewalk/Pathway Typology - Lighting Criteria

The base will have a variety of different sidewalk widths. Criteria listed below are for sidewalks intended as pathways for walkers and bikers. The Multi-Modal Spine is considered a street typology.

LiC 5.	Provide pedestrian-scale luminaires along sidewalks
1.00	The set of the Head of the second Heat of the second set 25 and 4

Cog.3 Lighting Elements - Luminaire Specifications

C09.3.1 Luminaire Specifications Overview

The luminaire requirements noted on this page are based on the GCEC inventory used on base. Each fixture was selected for ease of maintenance and to provide consistency across the base. The optics and wattage of each fixture should be selected based on the street application to meet the lighting criteria described in **Section C09.2.1 Design Typologies.**



C09.3.2 General Light Fixture Requirements

Yes No N/A LiC 39. Provide optics suitable for application. All fixtures, poles, and arms must be bronze finish and bollards to be gray finish. All poles must be rated to withstand 170-mile per hour winds. LiC 40. All fixture housings attached to the building shall not be brown or bronze. Fixture housings can be clear coat aluminum (preferred), light grey or white. C09.3.3 Streetlighting LiC 28. **Pole:** Round, tapered aluminum pole, direct-bury, tenon top breakaway pole, bronze powder coat finish, with a 20-foot mounting height for use in the Support District and a 30-foot mounting height for use in the Flightline District. Use Hapco #RTA Pole or equivalent. LiC 29. Arm: Aluminum, 4-foot up-sweep streetlight arm, bronze powder coat finish. Use Action Manufacturing AMI-196-A or equivalent. LiC 30. Luminaire: AEL Autobahn Fixture #ATB2-xxLEDxx-MVOLT-P7 with bronze finish and 7-pin receptacle. LED lamps must be turtle-friendly in the Support District and 4000K color temperature and 80 color rendition index (CRI) in the Flightline District. **C09.3.4 Pedestrian Lighting** LiC 31. **Pole:** Round, tapered aluminum pole, direct-bury, tenon top breakaway pole, bronze powder coat finish, with a 10foot mounting height. Hapco #RTA pole or equivalent. LiC 32. Luminaire: Decorative post top, Invue Arbor #ARB xx LED D1 AP PER7, with bronze finish and 7-pin receptacle. LED lamps must be turtle-friendly in the Support District and 4000K color temperature 80 color rendition index (CRI) in the Flightline District. C09.3.5 Bollards LiC 33. Decorative 36-inch with a gray finish. LED lamps must be turtle-friendly in the Support District and 4000K color temperature and 80 color rendition index (CRI) in the Flightline District. LiC 34. Use Invue Arbor #ABB xx LED 36 xx Taman's D1 A AP.



Pedestrian Luminaire



Bollard

C09.3.6 Lighting Criteria for Parking Areas

Parking lot lighting levels will follow UFC 3-530-01, Interior and Exterior Lighting

Systems and C indicated belo		Precise design requirements applicable to Tyndall AFB are
	LiC 19.	Use streetlight-style fixtures in all parking areas.
	LiC 20.	Use wall-mounted lights at building entries. Follow UFC 3-530-01 for lighting requirements.
	LiC 21.	Refer to Section C09.3.1, Luminaire Specifications , for light fixture style and pole heights.
	LiC 22.	Use light fixtures in the Sea Turtle-Friendly Lighting Zone that are amber in color. Use fixtures that have a 4000K color temperature in all other zones.
	LiC 23.	Place light fixtures in the Sea Turtle-Friendly Lighting Zone such that the light source is always pointed away from the beach.
	LiC 24.	Anchor lights around parking lots should using a 30-inch pedestal to avoid damage from vehicles.
	Parkin	g Area Lighting
Yes No N/A		
	LiC 35.	Pole: Round, tapered aluminum pole, direct-bury, tenon top pole, bronze powder coat finish, with a 20-foot mounting height for use in the Support District and a 30-foot mounting height for use in the Flightline District. Hapco #RTA pole or equivalent. Alternately, use a 4-bolt anchor base-type pole, tenon top, dark bronze finish.
	LiC 36.	Single Arm: Aluminum, single, horizontal, tenon top bracket bronze powder coat, Action Manufacturing AMI-21-A or equivalent.
	LiC 37.	Double Arm: Aluminum, double, horizontal, tenon top bracket bronze powder coat, Action Manufacturing AMI-22-A or equivalent.
	LiC 38.	Luminaire: AEL Autobahn Fixture #ATB2-xxLEDxx-MVOLT-BZ-P7 with bronze finish and a 7-pin receptacle. LED lamps must be turtle-friendly in the Support District and 4000K color temperature and 80 color rendition index (CRI)in the Flightline District.
C09.3.8 L	.ightir	ng Criteria for CDCs
CDCs require	special	lighting considerations.
	LiC 25.	Comply with all exterior lighting requirements detailed in UFC 4-740-14, Design: Child Development Centers.
	LiC 26.	Provide lighting fixtures that are 5 foot-candles average at all CDC driveways, walkways, and parking areas and that have photocell controls to turn lights on at sunset and off at sunrise.

C09.4.1 Street Lighting Calculation Report

Street lighting calculation reports are required for design approval and must demonstrate conformance with lighting requirements described for typologies per the UFC, as illustrated on Exhibit C09-4 below and Exhibits C09-5 on the next page. Reports are to follow IES RP-8-18, Recommended Practice for Design and Maintenance of Roadway and Parking Facility Lighting, Chapter 3.

All lighting calculations are to use a Light Loss Factor (LLF) of 0.9.

The lighting calculation summary for streets and sidewalks must show the following information listed below. Parking area lighting calculations may exclude luminance and veiling luminance ratio.

- Average Luminance (in candela per square meter)
- Average Illuminance (in foot-candles)
- Uniformity Ratio Average/Minimum
- Uniformity Ratio Maximum/Minimum
- Veiling Luminance Ratio
- Mounting Heights (grade to source of light)

C09.4.2 Photometry & IES Files

The street lighting calculation report must include an IES file for each luminaire used in the calculations. IES information is available from luminaire manufacturers. Exhibit CO9-3 shows an example IES file, which should include the following information listed below. If all criteria listed below cannot be shown within the calculation IES file, supplemental files may be attached to the calculation report to demonstrate compliance.

- Test Number
- Test Lab
- Test Date
- Test Method
- Issue Date
- Manufacturer
- Exact Luminaire Part Number
- Number of Lamps
- Lumens to Lamps
- Multiplier
- Number of Vertical Angles
- Number of Horizontal Angles
- Photometric Type
- Unit Type
- Unit Width
- Unit Length
- Unit Height

C09.4.3 Streetlights Lighting Criteria

Exhibits C09.4.2 and C09.4.3 illustrate the desired spacing and setup for a typical street. The goal of this lighting typology is to provide lighting that is uniformly spaced throughout the various streets. The pole spacing will vary based on the desired lighting levels, pole heights, and fixture optics.

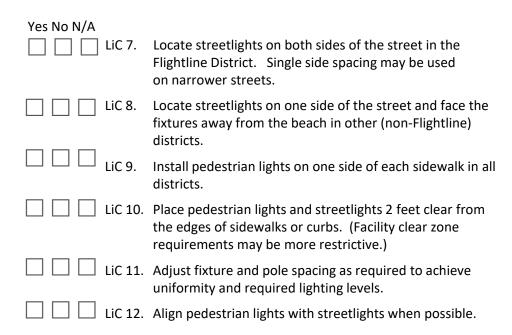


Exhibit C09.4.1 Sample Illustration of Lighting Calculations

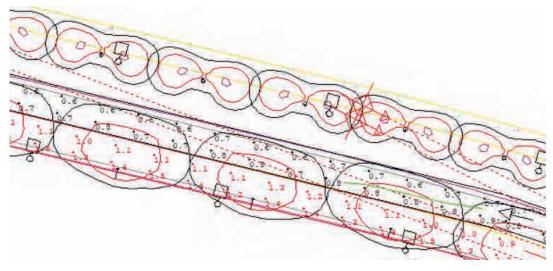


Exhibit C09.4.2 Light Fixture on Both Sides of the Street

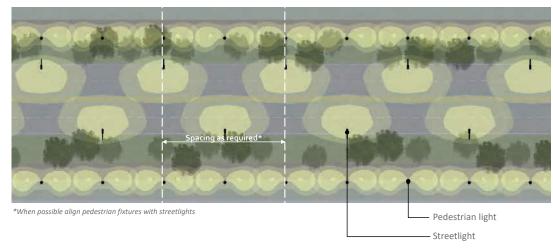
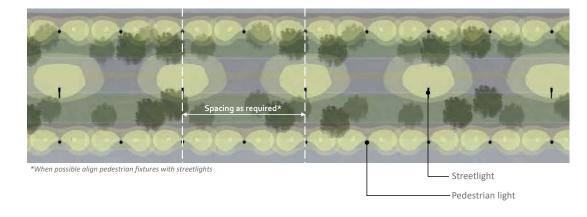


Exhibit C09.4.3 Light Fixture on One Side of the Street



C09.5.1 Lighting for Entry Control Facilities (ECF)

UFC 4-022-01, Security Engineering: Entry Control Facilities / Access Control Points, dictates the lighting guidelines for ECFs. Each zone within the ECF requires a different lighting approach. Refer to UFC guidance for exact requirements within each ECF zone. However, the ECF's total lighting must be uniform, continuous, and complete; the lighting plan must transition from one area to the next so as not blind the driver nor interfere with the Defender's mission. Specific illumination level(s) is compulsory for each of the explicit areas which comprise the ECF. Separate override lighting control system(s) fully compatible with all exterior and interior lighting components are located in the guard facility of a designated ECF. Lighting control(s) must support 24/7/365 operation accounting for all environmentally and non-environmentally induced factors.

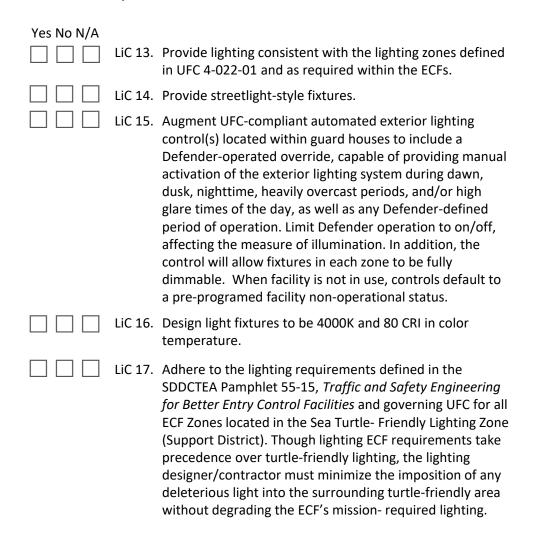
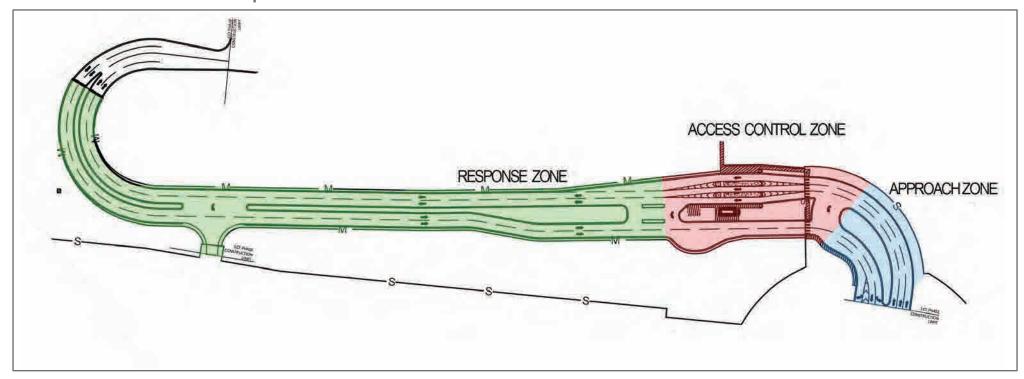


Exhibit C09.5.1 TAFB Gate Complex with ECF Zones Labeled



Tyndall Air Force Base Installation of the Future



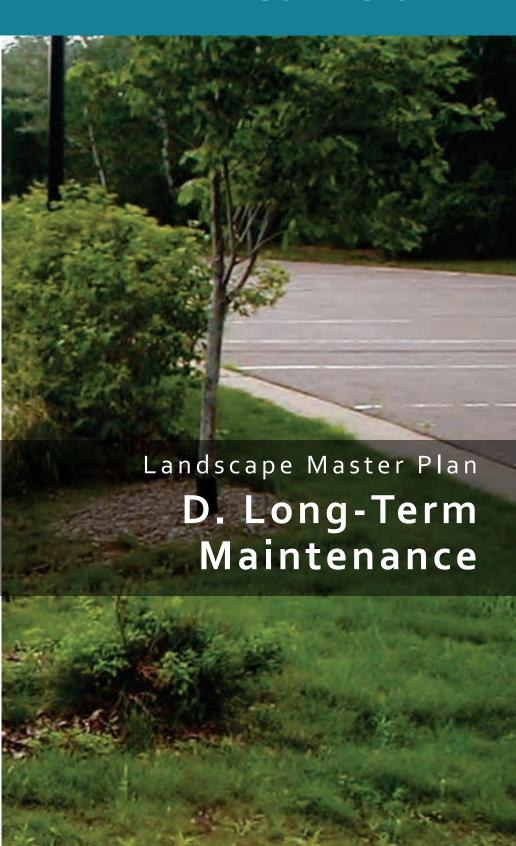
Tyndall Air Force Base Installation of the Future



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Do1. Landscape Maintenance Approach

Do1.1 Purpose

This document uses a Sustainable Landscape Initiative as a guide to maintaining the landscape and hardscape of Tyndall Air Force Base (AFB). It outlines the standards to be followed both by Tyndall AFB maintenance staff and outside landscape contractors engaged to maintain the base's landscape assets.

Do1.2 Guideline Alignment

Tyndall AFB has partnered with the Florida Fish and Wildlife Conservation Commission to develop a Sustainable Landscape Plan for the installation that is based on Tyndall AFB's *Integrated Natural Resources Management Plan* (INRMP). The primary objective of Tyndall AFB's Natural Resources program is to ensure continued access to the land and airspace required to accomplish the Air Force's mission while maintaining the natural resources in a healthy condition. The INRMP ensures that natural resources management and mission activities are integrated and align with state and federal mandates. The INRMP integrates and prioritizes wildlife, fire, and forest management activities to sustain and restore the base's ecosystems and ensure "no net loss" in the operational capability of these resources to support the base's mission activity.

Do1.3 Sustainable Landscape Initiative

The Sustainable Landscape Initiative is a comprehensive forward-thinking approach to landscape design, maintenance, and operations. The initiative addresses five program categories:

- Sustainable lawn maintenance and landscaping
- Reduction of use of pesticides and herbicides
- Eradication of invasive species
- Selection of native plant species
- Conservation, retention, and recycling of water

Do1.4 Growth & Future Development

These maintenance guidelines focus on future activities once rebuild construction is complete and Tyndall AFB has achieved the functionality and aesthetic as the Installation of The Future. The maps in this document represent landscape zones or planning districts and are the best representation of these areas and zones at the time this document was produced. The buildings and other vertical items are also not an exact alignment, or location. The Landscape Master Plan will continue to evolve and modify as Tyndall AFB moves closer to becoming the Installation of The Future.



Tyndall AFB, 2019

Do1.5 Landscape Image & Character

The design intent for the landscape at Tyndall AFB is to create a more natural appearance that resembles the native landscape already in existence on a large portion of the base. The shift in approach from large areas of maintained lawns to a more wooded and native shrub and native grass landscape enhances the natural beauty of the native landscape, reduces overall maintenance costs, and establishes a more sustainable and resilient approach to landscaping.

The work of the landscape contractor is primarily maintenance work in the Manicured, Maintained, and Airfield Zones.



Tyndall AFB – Landscape Rebuilt

Do2. Maintenance - Authority

Everyone involved with the maintenance of Tyndall AFB needs to be familiar with the following regulations and codes:

Do2.1 Air Force Standards

- Air Force Instruction (AFI) 32-7064, *Integrated Natural Resources Management*
- Unified Facilities Criteria (UFC) 3-201-02, Landscape Architecture, https://www.wbdg.org/ffc/dod/unified-facilities-criteria-ufc/ufc-3-201-02
- Unified Facilities Guide Specifications (UFGS)
 https://www.wbdg.org/ffc/dod/unified-facilities-guide-specifications-ufgs
- 31 32 11, Soil Surface Erosion Control
- 32 96 00, Transplanting Exterior Plants
- 32 92 19, Seeding
- 32 92 23, *Sodding*
- 32 92 26, Sprigging

D-2

- 32 93 00, Exterior Plants
- 32 05 33, Landscape Establishment

Do2.2 Department of Defense Standards

- Protective Coatings: UFC 3-190-06, Protective Coatings and Paints
- Asphalt & Concrete: UFC 3-270-01, O&M Manual: Asphalt and Concrete Pavement Maintenance and Repair
- Fences: UFC 4-022-03, Security Fences and Gates

Do2.3 Tyndall AFB Standards

- Air Force Common Output Level Standards (AF COLS) Ground Maintenance (Tyndall AFB): The current standard under which the base operates for landscape maintenance
- The Master Plant List, which provides a comprehensive list of plants allowed on the base, is available from Tyndall AFB. The complete Master Plant List is provided as an appendix to the *Tyndall AFB Installation Facilities*Standards (IFS) and is included on the IFS website (www.tyndallifs.com).

Do2.4 Florida Marine Turtle Protection Act Requirements

Sea turtles are listed as either Endangered or Threatened. They are protected under the Federal Endangered Species Act of 1973 and <u>Florida's Marine Turtle Protection Act</u> (379.2431, Florida Statutes). Florida Statutes restrict the take, possession, disturbance, mutilation, destruction, selling, transference, molestation, and harassment of marine turtles, nests, eggs or habitat.

UNIFIED FACILITIES CRITERIA (UFC)

LANDSCAPE ARCHITECTURE



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Do2.5 Antiterrorism Landscape Guidelines

Landscape contractors will require their staff and site managers to follow the guidelines outlined in the most current version of UFC 4-010-01, *DoD Minimum Antiterrorism Standards for Buildings*, as it relates to landscape and maintenance.

Do2.6 Additional Resources

The following additional resources applicable to Florida and the Southern United States were consulted in the development of the Tyndall AFB Sustainable Landscape Initiative maintenance plan:

- Office of Federal Sustainability, *Guidance for Federal Agencies on Sustainable Practices for Designed Landscapes*, May 2017
- University of Alabama, Landscape and Grounds Strategic Plan, 2018
- University of Florida Extension Florida-Friendly Landscape Program, Florida-Friendly Landscaping Guidelines for Selecting a Landscape Contractor
- University of Florida, Institute of Food and Agricultural Sciences (UF/IFAS)
 Extension, various documents are included and cited in this plan

Do2.7 Regulated Landscape Maintenance Activities

The following maintenance activities are regulated by the U.S. Air Force as well as the State of Florida:

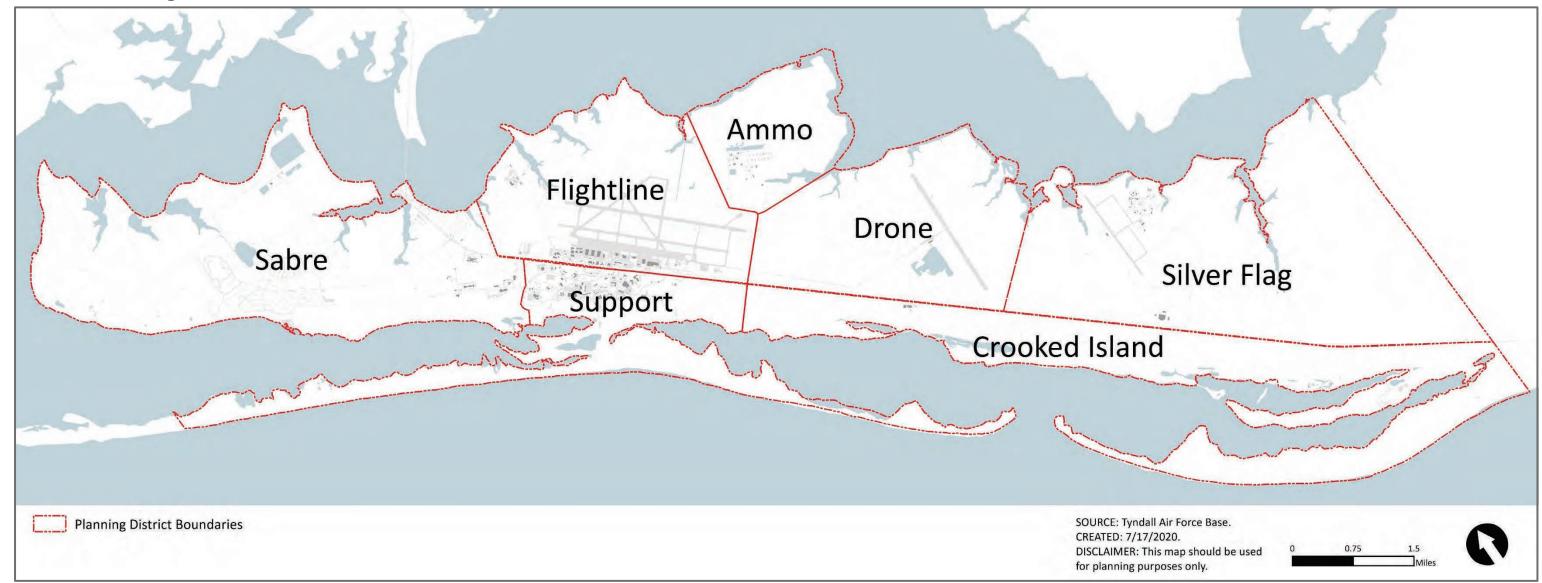
- Adhering to noise ordinances related to motorized equipment
- Applying herbicides, pesticides, and/or fertilizer
- Complying with worker safety requirements (Occupational Safety and Health Administration [OSHA])
- Disturbing areas above a certain size or installing hardscape larger than a certain area
- Installing certain plants known to be invasive
- Removing trees above a certain caliper
- Working in or near wetlands, wet ponds, living shorelines, tidal, or nontidal areas
- Working requiring erosion and sediment control measures, permits, inspections
- Working within a vegetative buffer zone

Do3. Land Planning Districts

Tyndall AFB is divided into seven districts that represent specific geographical and mission uses. Understanding the boundaries of these districts is useful when discussing specific areas and maintenance needs of the base:

- Sabre District
- Flightline District
- Support District
- Ammo District
- Drone District
- Silver Flag
- Crooked Island

Exhibit D-1. Planning Districts



Do4. Landscape Zone Description

Tyndall AFB is divided into five Landscape Zones: Manicured, Maintained, Managed, Airfield, and Coastal. As described in this section, each zone has specific characteristics and aesthetics related to land management and planning. This translates into different and specific landscape maintenance requirements for each zone. Most of the maintenance work is contained within the Manicured, Maintained, and Airfield Zones.

Do4.1 Manicured Zone

The Manicured Zone is the most highly maintained landscape on base and is located between a building's immediate perimeter up to the edge of the Maintained Zone. The Antiterrorism (AT) Zone is a subzone of the Manicured Zone and is located from a building's immediate perimeter outward to a minimum width of 20 feet, as well as at access gates and other areas as prescribed for security reasons. The Manicured Zone may extend beyond the AT Zone's 20 feet, but at a minimum it must include the entire 20-foot width of the AT Zone. Landscape in this zone will have vegetation that meets the AT regulations for the first 20 feet. Vegetation in the Manicured Zone areas that extend beyond the 20-foot AT Zone must be drought-resistant and include native trees for shade and ornamental grasses and native shrubs for color and variety. Different plant lists are used for the Flightline and Support Districts because of their different mission requirements. All Manicured Zone landscaping must be maintained. The landscape contractor is responsible for all maintenance tasks outlined in the contract for this zone.

Do4.2 Maintained Zone

The Maintained Zone comprises native open upland prairie landscape and areas near buildings such as parking, driveways, and roadways. Maintained Zones reduce the amount of open lawn spaces that need to be mowed. This zone is meant to look native in character and receive minimal maintenance. This zone includes nature-based infrastructure such as vegetated stormwater basins and vegetated swales that are to be maintained on an annual basis, which includes removing all silt accumulation, removing trash or debris, and removing other items that impact the flow of water. This zone also requires annual cleaning of all stormwater drains and structures. Tyndall AFB determines the planting palette. Plantings must comply with AT criteria. The landscape contractor must verify current standards at the time of installation. The contractor will use the Master Plant Palette included in the IFS in consultation with Tyndall AFB 325 Civil Engineer Squadron Operations Flight (325 CES/CEO) Grounds Maintenance. Maintenance activities by the landscape contractor in the Maintained Zone are limited to yearly mowing to a specified height, annual cleaning, and trash removal.

Do4.3 Managed Zone

The Managed Zone encompasses all perimeter areas upland of the peninsula coastline, as well as large open areas in between the base's facilities. This zone includes areas of wooded pineland plantations, mesic/wet slash pine flatwoods, wet prairie, freshwater wetlands, and inland ponds and lakes. According to the INRMP, this zone requires work to transform Slash Pine areas into native Longleaf Pine plantations. This effort has expanded in size and scope due to the damage from Hurricane Michael. Base-wide landscape will first and foremost aim to restore itself to a condition in which it can sustain the demands of nature and society. Tyndall AFB determines the planting palette. Plantings must comply with AT criteria. This area will be maintained by Tyndall AFB and mainly includes yearly burning. There is no maintenance requirement in this area by the landscape contractor; the description of this zone is included for information only. Any request for maintenance in this zone must be at request of Grounds Maintenance.



Do4.4 Airfield Zone

This zone includes the runways in the Flightline District, the natural areas between the runways, and the areas surrounding the perimeter extending to the Longleaf Pine forest. Work in this area also includes the Flightline. The landscape in this zone must not support wildlife, especially birds because they can cause damage to aircraft and present a safety issue. Air Force standards must be met regarding vegetation that is restricted and allowed in this zone.

Grass for use at the Airfield Zone for utility repair will be Bahia grass sod. Use sod or plugs only. No seeding is allowed in this zone due to attracting birds. The landscape contractor is responsible for mowing the grassed areas at specific times of day and on certain days of a week, as coordinated with the base. Grassed areas in this zone will be mowed on a monthly basis. The landscape contractor is responsible for keeping all drainage channels clear from debris and silting. Cleaning all storm drainage structures on an annual basis is included in the maintenance of this zone.

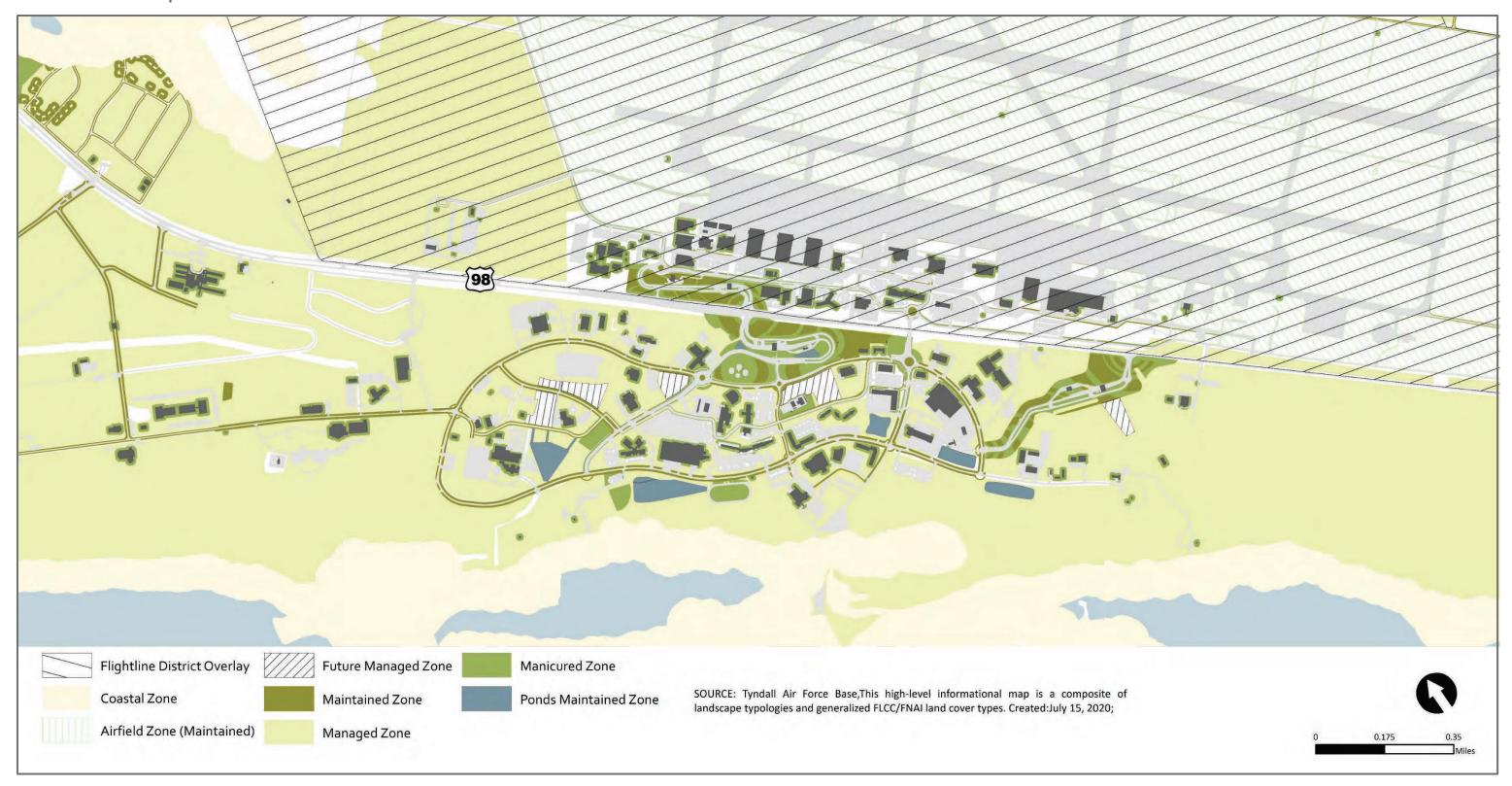
Do4.5 Coastal Zone

This zone encompasses all areas from the ocean shoreline back to the second line of defense, including beaches, coastal dunes, coastal wetlands, salt marshes, estuaries, coastal dune lakes, and coastal upland. Any work or maintenance proposed in this zone is part of the INRMP or Coastal and Marine Construction Guidelines contained in the IFS. There is no requirement for maintenance by the landscape contractor as part of maintenance guidelines and is included for information only. Any request for maintenance in this area by the landscape contractor will be an additional service requested by the base.



D. Long-Term Maintenance Landscape Master Plan Tyndall Air Force Base

Exhibit D-2. Landscape Zones



Do5. Maintenance Activities

Do_{5.1} Softscape & Turf Areas

D05.1.1 Turf General

Turf maintenance includes all mowing, edging, trimming, and cleaning up of lawn areas. Whenever possible, turf maintenance operations in each district are to be completed the same day they are started. High traffic and high profile areas such as facility entrances, front doors, main entry gate, and amenity areas will be completely mowed, edged, trimmed, and cleaned up. Mowing is not performed during inclement weather and will be rescheduled as soon as weather and site conditions permit. Inclement weather includes periods of excess rainfall as well as periods of drought, which make the turf susceptible to damage during normal mowing operations.

Weekly Mowed Areas

Prior to each mowing, all trash, sticks, and other unwanted debris must be removed from lawns and all other areas to be mowed. Manicured lawn areas are to be maintained at a height according to the Air Force Common Output Level Standards (AF COLS). It is not recommended to mow during extremely dry or wet conditions. During the mowing season, all lawn areas will be mowed weekly as weather conditions dictate and as outlined in the Maintenance Schedule. When possible, use mulching mowers on all maintained lawns. Keep mower blades sufficiently sharp so they do not "tear" the grass. Vary the mowing pattern where feasible to prevent rutting and minimize compaction. Avoid using power equipment that is too large or heavy for the task at hand, because it causes soil compaction onsite.

Caution must be used to avoid any flying debris. Safety glasses, ear protection, hard hats, gloves, and steel-toe boots must be worn during this operation by all workers. The mowing operation includes trimming around all obstacles, removing excess grass clippings, and removing debris from walks, curbs, and parking areas.

DO NOT allow string trimmers to come in contact with the bark of the tree. Take special care to prevent damage to plant material as a result of the mowing operations. Any damage caused by the mowing team's equipment will result in the replacement of damaged material at the landscape contractor's cost.

UF/IFAS-Recommended Mowing Heights

Suggested mowing heights and mower types for Florida lawns are shown in Exhibit D-3. Frequency of cut varies based on species and time of year.

Exhibit D-3. Mowing Requirements

Grass Type	Mowing Height (in.)	Mower Type
Native grass	4-6	Reel/Rotary
Bermuda grass	0.5–1.5	Reel/Rotary
St. Augustine grass	2.5–4.0	Rotary
Zoysia grass (Coarse types)	2.0–2.5	Rotary
Bahia grass	2.5–4.0	Reel/Rotary

Suggested Mower Types Based on Areas to be Mowed



Riding mowers for majority of open lawn spaces



Tractors for large open fields



Push mowers around trees and for smaller areas

Yearly Mowed Areas

The Maintained Zone includes areas of native grasses that require minimal maintenance during the year. The landscape contractor is responsible for mowing these areas once a year in mid to late winter before the grass starts to reactivate. Walk the area prior to mowing to locate any larger objects that could damage to the mowing equipment or bystanders from flying objects. Mow the grasses to a height of 4 to 6 inches. Use safety equipment, shields, and protective clothing and gear to prevent injury from flying debris or other hidden elements in the vegetation not visible to the operator or others nearby.

Edging

Edge all sidewalks, curbs, and other paved areas once every other mowing. The edging will be between 1 to 1½ inch deep and ¾ inch wide from the sidewalk, curb, or edge of hard surface. After mowing and edging an area, fine-tune by weed-eating any undesirable, unappealing leftover grass, groundcover and weeds in hard-to-get-to areas such as sidewalk and curb cracks, around poles and bollards, and close to buildings and signs. Blow off the entire area to it is clear of debris (such as sidewalks, streets, patio, and steps). Blow toward landscape beds and not into streets or drainage structures.

Mowing and Edging Clean Up

Leave all lawns, walks, trails, plazas, parking lots, and other highly visible use areas in a clean and neat-looking condition from mowing and edging activities. Do not blow debris toward or around pedestrians and vehicles. Blow debris on paved areas in one central location, then rake and/or vacuum and remove the debris from the area. Follow this same blowing and removal process when removing leaves from the grounds. Do not place debris in trash dumpsters. Transport debris to either the city dump or the current compost site on base. Remove debris from the edging operations and sweep or blow the areas clean. Use caution to avoid any flying debris. Safety equipment for protection must be worn during this operation.



Blow off all sidewalks, streets, and other paved areas



Edge all lawn next to curbs, sidewalks, other paved areas



Always wear proper safety equipment



Edge between 1 to 1½ inch deep and ¾ inch wide from the sidewalk, curb, or edge of hard surface

Turf Fertilization

Follow current UF/IFAS guidelines for turfgrass fertilization. Organic fertilizer is preferred but not required. Ensure that the fertilization schedule does not exceed the fertilizer rate prescribed on the label and complies with state and local ordinances. It is important to note that local fertilizer regulations may prohibit the use of nitrogen fertilizers during the summer months. Be aware of local ordinances to avoid fines or citations (https://ffl.ifas.ufl.edu/fertilizer).

Apply the minimal amount of fertilizer needed. Submit a schedule of materials to be used under this program as well as application rates to Grounds Maintenance. A yearly program will include a minimum of 4 pounds of nitrogen per 1,000 square feet. The fall fertilization will include a minimum of 30% slow-release nitrogen and a high potassium blend to promote root development. Do not add phosphorus unless soil samples indicate insufficient phosphorus levels are present. Fertilizer used will contain the following:

- Nitrogen and potassium in equal parts or in a 2:1 ratio
- Very little phosphorus
- Slow-release nitrogen

Include a complete minor and trace element package with each application to ensure that all the requirements of grasses are met. If soil samples indicate a high pH, all fertilizers used will be Sulphur-coated products. Notify Grounds Maintenance of any turfgrass nutrient deficiency symptoms and recommend measures for correction. Treat deficiencies of specific nutrients by applying the lacking nutrient in accordance with UF/IFAS recommendations until the deficiencies are corrected. The fertilizer application rate and number of applications depends on the type of lawn. If the soil in a lawn is compacted, aerate the soil before applying fertilizer.

Application

Use only fertilizers for urban turf that are formulated and have application instructions in accordance with requirements and directions provided by Florida Administrative Code Rule 5E-1.003, *Labeling Requirements for Urban Turf Fertilizers*. Apply fertilizer only when plants are actively growing and according to the Maintenance Schedule.

A soil analysis must be obtained before planting, seeding, or sodding for the area to be impacted. Analyze the soil samples for pH, lime requirement, and available plant nutrients (P, K, Ca, and Mg). A soil pH test will indicate whether pH adjustment is necessary. For more information on soil sampling and testing, go to (http://soilslab.ifas.ufl.edu/ESTL%20Home.asp).

Use deflector shields on all application equipment to minimize inadvertent applications of fertilizer to non-plant areas. Blow, sweep, or wash back into the landscape any fertilizer deposited on paved or impervious surfaces immediately to prevent staining of pavement. Use and enforce the "Ring of Responsibility" around or along the shoreline of canals, lakes, ponds, wetlands, or coastal waterways to reduce risk of fertilizers and other lawn chemicals directly coming into contact with surface waters. This includes complying with all state and local ordinances related to fertilizing close to water bodies and staying a minimum 100 feet away from the edge of the water.

Store nitrate-based fertilizers separately from solvents, fuels, and pesticides, because nitrate fertilizers are oxidants and can accelerate a fire. Grounds Maintenance will work with landscape contractors to secure fertilizers and other chemicals stored at the worksite.

After fertilizing (unless water restrictions are in place or a rain event is predicted), irrigate the area with at least 1/4 inch of water to avoid the loss of nitrogen and increase uptake efficiency. If water restrictions apply, then irrigate the area as permitted, but do not to exceed 1/2 inch of water following fertilization.



All spreaders must have shields to prevent fertilizer from getting on paved areas



Avoid fertilizer stains on concrete

Do5.2 Pesticide Application

D05.2.1 Integrated Pest Management

Integrated Pest Management (IPM) is a natural systems approach to seeking the least harmful methods of managing all types of landscape pests, including insects, weeds, plant pathogens, or vertebrates. IPM refers to protecting biodiversity and habitat by minimizing the use of pesticides.

Use pesticide applications in accordance with the rules and regulations governing use of pesticides in the State of Florida. Follow all provisions of Florida Statute 482 and will use IPM principles and methods (http://edis.ifas.ufl.edu/ in109). Follow current UF/IFAS pest management recommendations for implementing an IPM program as per IFAS Publication ENY-298, Landscape Integrated Pest Management (http://edis.ifas.ufl.edu/in109) as well as other applicable pest-specific information available through UF/IFAS Extension. All landscape workers must wear all required OSHA-standard protection gear while working with pesticides.

Only intervene with chemical pest control when the pest is causing, or is expected to cause, more damage than can be reasonably and economically tolerated. The control strategy must reduce the pest numbers to an acceptable level while minimizing risks to non-targeted organisms.

Post appropriate pesticide application signs following each treatment, in compliance with Florida Department of Agriculture and Consumer Service regulations. Per Florida statutes, the contractor will arrange for all persons living or working on the base to be notified 7 days before treatment.

Keep records of pest problems identified, location, and control treatment applied. Document whether the control measures reduced or prevented pest damage, were economical, and minimized risks. Provide a copy of the records to Grounds Maintenance. Refer to past corrective actions when making similar decisions in the future. Dispose of used containers in compliance with label directions to prevent water contamination.

Treat fire-ant mounds individually with bait formulas as they occur. Surround each mound with fresh bait without disturbing the mound itself. Use broadcast baiting and broadcast treatment in recreation and common areas only as needed.

Monitor insects, including southern chinch bug, fall armyworm, tropical sod webworm, hunting billbug, grubs, and mole crickets, using UF/IFASrecommended soapy water flushes and scouting for symptoms of plant damage. See http://edis.ifas.ufl.edu/ig001 for turfgrass pest-specific recommendations.

D05.2.2 Plant Diseases

On occasion, plants can become stressed due to natural or unnatural events. If this happens, the competitive edge that the plant once had is given away to such pests as weeds, fungi, and insects. When any of these pests invade a plant, applying the appropriate chemical is necessary to combat the pest and restore the plant's ability to maintain its health. Safety is the upmost importance and the first rule when working with these chemicals. Applying seed and granular fertilizers takes time and skill, but the process for applying pesticides is much more difficult and requires the closest attention to detail by the applicator. There is no room for error, and the application must be done correctly the first time; failure to do so can be disastrous, as well as costly. Along with safety, the timing of pesticide applications is also extremely important. A poorly timed application will, more times than not, fail.

Notify Grounds Maintenance of any fungal disease outbreaks that occur. If disease is significant and persistent, the contractor may apply an appropriate fungicide if Grounds Maintenance approves. Plant diseases occur when excessive moisture is present for extended periods. Correct cultural practices are the key to control of plant diseases.





Remove invasive species



The landscape contractor will monitor all plantings for diseases and pests and report issues to Grounds Maintenance

Do_{5.3} Trees, Shrubs, Perennials, Groundcovers, Ornamental Grasses

Although the available sustainability literature does not usually focus on tree maintenance, the International Society of Arboriculture (ISA) offers many helpful brochures on its website relative to tree planting, mulching, and watering. Follow these routine tree maintenance tasks to reduce street tree mortality:

- Remove stakes from newly planted trees after one season, or no later than
 1 year after planting. If not removed in time, wires on new fast-growing trees
 will girdle and kill young trees. Most new urban trees do not need staking at
 all except in high wind areas.
- Mulch properly. Never practice "volcano mulching" and keep mulch at least 3 inches from the trunk. Mulch so water is directed to the tree, not shed away from it.
- Check for girdling roots at the tree's base and remove them before they harm the tree, taking care not to damage the trunk.
- Fill slow-release watering bags regularly during the growing season and remove them after the growing season. The warm damp space between the bag and the tree trunk can attract damaging insects.
- Keep mowers and string trimmers away from all tree trunks, no matter how large the tree.
- Provide newly planted trees with at least 25 gallons of water per week for the first two growing seasons.

D05.3.1 Approved Master Plant Palette

Tyndall AFB's approved Master Plant Palette lists the only species allowed to be planted on the installation. The palette was developed to meet the goals of the INRMP. The palette's lists consist of native and adapted native plants that have proven to grow in the area. **Section C06**, **Landscaping**, includes sample lists of approved palette plants that are appropriate use in the Manicured, Managed, and Maintained Zones. Because of the specific mission requirements in the Flightline District, the Master Plant Palette includes a list of approved plants that may be used in the Flightline and Airfield.

The comprehensive Master Plant Palette is provided as an appendix to the IFS and is included on the IFS website (www.tyndallifs.com).

D05.3.2 Undesirable Plant Species

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The Master Plant Palette includes a list of invasive, noxious weed, non-native, and undesirable plant species that should not be used on Tyndall AFB. If any of the listed undesirable plant species are located during the course of the work, the landscape contractor will notify Grounds Maintenance as to their location and will request direction on how to proceed.



Remove old mulch around trees before adding new to avoid "volcano mulching"



Avoid getting mowers close to trees and damaging the bark



Keep crown of tree roots exposed



Keep water bags filled with water

D05.3.3 Pruning

Tree Pruning

All pruning and trimming will conducted be under the direction of a Floridacertified arborist. When pruning, the landscape contractor will use current techniques and standards approved by UF/IFAS and the International Society of Arboriculture. Prune selectively to improve the tree's structure and health and to enhance fruiting, flowering, or appearance. When preforming corrective pruning, maintain the structural integrity, natural shape, and characteristics of the species. Disinfect pruning tools before and after each property and plant to prevent disease transmission.

Maintain the central leader (trunk) of each tree (no topping/heading, hat-racking, or shearing). Remove interfering or crossed limbs and remove all branches using "collar cuts." Follow <u>UF/IFAS pruning recommendations</u>.

Use pruners (not herbicides) to remove sucker growth at the base of. Perform aesthetic pruning by removing dead and broken branches as often as necessary so that trees always appear neat and remain safe. Maintain branches and limbs a minimum of 2 feet away from all buildings, especially roofs. Maintain trees near sidewalks and parking lots to provide clearance for pedestrians and vehicles. Follow FDOT pruning recommendations.

The landscape contractor will inform Grounds Maintenance of trees that are diseased or dying and need to be considered for removal.

Hardwood Trimming

Correct pruning of trees includes removing weak branching patterns and providing corrective pruning for proper development, and cutting back to branch collar without leaving stubs. Proper pruning provides a clean and flush cut with no tearing of the tree bark. Tree trimming includes all trees taller than 12 feet in height. Maintain any tree shorter than 12 feet in overall height during the regular maintenance activities.

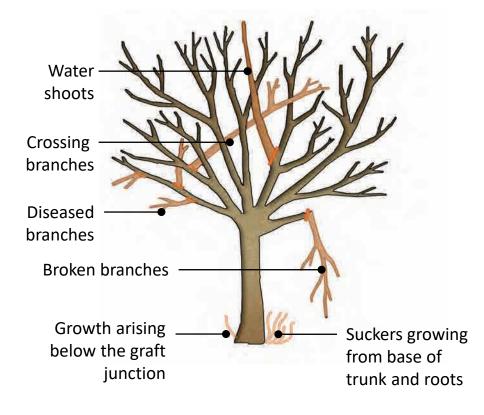
Shrub Pruning

Lightly prune shrubs based on the need of each species. Pruned shrubs must look natural in character and not be trimmed into balls, flat tops, or square shapes. Certain flowering shrubs have specific times when they should or should not be pruned. Use hand pruners to prune shrubs as needed to provide shape and fullness and promote flowering. Do not prune spring-flowering shrubs until after the bloom period. Maintain shrubs to avoid contact with structures and provide clearance of 12–18 inches from any vertical wall or element. Power shears may be used to prune formal hedges. Ensure the top of the hedge is maintained at a width that is narrower than the bottom to allow sunlight to reach lower foliage. Remove dead or broken branches when noted. Selective removal of small sections of branches as a form of insect pest control is also acceptable, providing the natural shape of the shrub is maintained. Do not prune during or immediately after growth flushes.

Groundcover Pruning

Groundcovers require minimal pruning. Use plant beds to confine and maintain groundcovers. Do not allow groundcover to grow over paved areas. After all pruning operations make all reasonable efforts to remove all cuttings and debris relative to groundcover type and ensure an aesthetically clean appearance.

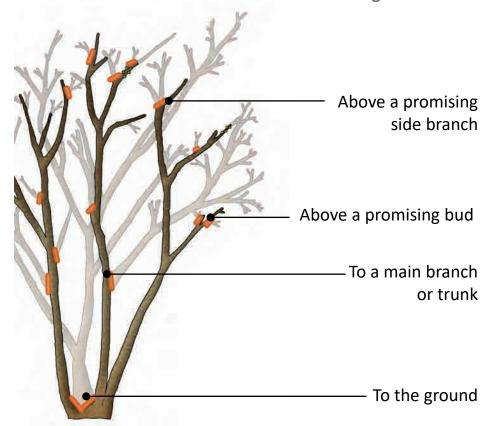
Exhibit D-4. Where to Make Cuts when Pruning Trees





Avoid severe pruning or topping of Crape Myrtles which only weaken the shrub and can lead to disease and rot

Exhibit D-5. Where to Make Cuts when Pruning Shrubs





Tree pruning must be done only by certified arborist

D05.3.4 Trees

Tree Removal

Specific criteria are established and applied to the removal and/or pruning of trees, shrubs and/or vegetation located on the base within the Manicured and Maintained Zones. The criteria are used to evaluate the overall public benefit of the proposed work. In all cases, safety concerns receive the highest priority. Priority will be given to limiting removal, increasing forest canopy, and preserving appropriate vegetation on the base. In order for a tree to be removed, it must meet the following criteria:

- Is in either the Manicured or Maintained Zone
- Is dead or have reached or exceeded their useful lifespan and may present danger to life and property
- Poses a safety hazard
- Poses a hazard to utility lines
- Interferes with construction of facilities
- Is growing in an inappropriate place, such as too close to structures, sidewalks, or parking lots
- Is damaged from natural causes
- Is inconsistent with the master plan
- Can be replaced with an equal number of caliper inches

Hazardous Tree Management

Public health, safety, and general welfare will be maintained using generally accepted professional practices of evaluation and treatment to reduce risks to people and property from hazardous trees. Pay attention to proper selection, planting, and maintenance of new trees to reduce long-term risk.

Topping Disallowed

"Topping" destroys the natural appearance of a tree and does not contribute to the base aesthetics. Because topping trees can cause permanent damage by promoting decay and causing an unnaturally dense and weak branching structure, it is prohibited except under special circumstances.

Tree Retention and Protection On Construction Sites

Having healthy trees is a top priority to keep Tyndall AFB beautiful. Misuse of all trees is prohibited. Examples of misuse include, but are not limited, to climbing, use of ropes, wire, hammocks, slack-lines, zip-lines, nails, tape, and signage. These issues cause stress, scaring and, often broken branches, which can lead to disease and/or death of an otherwise healthy tree. In addition, it is strictly prohibited to intentionally climb in or on base trees, break off limbs, and branches for personal convenience (such as for setting set up a tent or placing other equipment on a tree on base).

Conserve trees on construction sites wherever possible. Protect trees designated for retention from construction impacts according to standard plans and specifications. No equipment or vehicle will be parked, or construction materials stored, or substance poured or disposed within the tree protection area (known as the drip line). Contractors will comply with construction and grounds management practices (fencing, feeding, watering, and limiting traffic over roots) throughout the entire construction process. Once construction projects are complete, provide deep root fertilization treatments for all trees designated for protection for 2 years after project completion (once during the spring and again during the fall for 2 years). Damage to tree roots on a construction site often does not show up until years later. These fertilization treatments help ensure the overall health of the tree following any construction activities.



Storing dirt piles or having equipment under trees will kill them

Exhibit D-6. Tree Protection Barricade

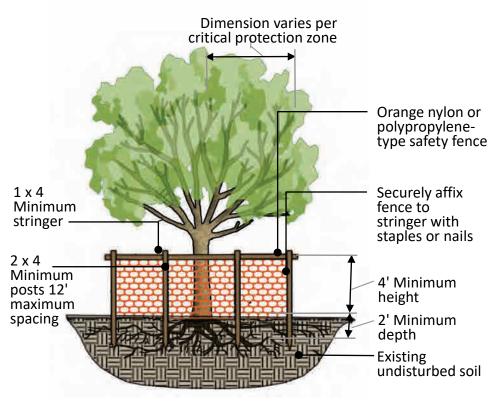
2 x 4 Wood posts

2 x 4 Wood stringers
nailed securely to wood
posts

Tree trunk

Dimension varies per
critical protection zone

Note: For groups of trees, place barricades between trees and construction activity



Notes: The "critical protection zone" is the area surrounding a tree within a circle described by a radius of 1 foot for each inch of the tree trunk diameter at 54 inches above finished grade. For groups of trees, place barricades between trees and construction activity.

Tree protection barricades must be located to protect a minimum of 75% of the critical protection zone.

Conservation of Rare Specimens

Individual trees that are considered rare because of size, species, or historical significance will be given extra protection and consideration for retention.

Diseased or Infested Plants That Pose Risk to Trees

Whenever possible, take action to effectively decrease risk to other trees from pests and diseases. This may include removal and destruction of infected materials, pesticide treatments and/or alternative cultural practices. Other knowledgeable agencies, such as Local and State Cooperative Extensions, may be consulted as needed.

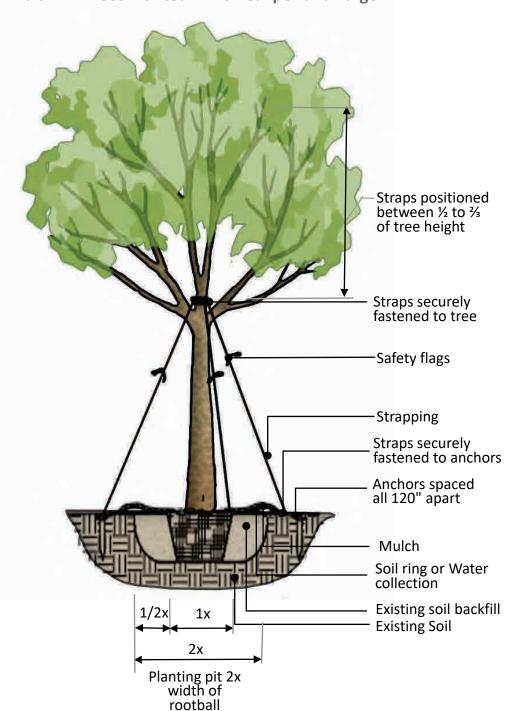
Tree Replacement

Existing trees that must be removed for construction from the Flightline or Support Districts must be replaced in kind. However, the location of the replacement tree(s) may not always be the same as the location of the removed tree. Replace any trees that are to be removed in construction areas, so that the tree volume is equal to the existing replacement tree(s)/species. Measure trees to be removed at breast height to determine the caliper inches of the tree. Replace the removed trees using a 1-inch to 1-inch ratio. For example, if an 8-inch caliper tree is to be removed it must be replaced with 8 inches of tree caliper; either in one tree or more that equal the 8 inches being removed. Locations will be selected to maintain the overall mature canopy volume, to coincide with the overall landscape and building/facility needs, or to maintain the overall aesthetics of the base.

Tree Planting/Transplanting

Plant or transplant trees in a manner that ensures the overall health of the tree. The best time to plant or transplant trees is from September to the end of February. This gives the tree the best chance of survival. Not all instances occur where trees will be able to be planted or transplanted during this timeframe. In these instances, monitor any tree planted or transplanted on a regular basis and water daily until tree has established its root system. Trees that are staked when planted will have stakes checked in 6 months after installing to ensure cables are not cutting into tree bark. If cables are no longer needed for the tree, remove them. Where cables are still needed, loosen them so they do not cut into the tree bark and reevaluate the need for cables in 6 months.

Exhibit D-7. Trees Planted 4-inch Caliper and Larger





Transplanting trees will be done using a tree spade to prevent damaging the tree roots

D05.3.5 Tree & Shrub Fertilization

Follow current UF/IFAS guidelines for tree fertilization. Organic fertilizer is preferred but not required. All contractor employees who specify, handle, or apply fertilizer must have a valid FDACS LUFAC. Fertilization scheduling must not exceed the fertilizer label rate prescribed and must comply with state and local ordinances. Local fertilizer regulations may prohibit the use of nitrogen fertilizers during the summer months. Be aware of local ordinances to avoid fines or citations (https://ffl.ifas.ufl.edu/fertilizer).

Trees and shrubs are a valuable asset to any landscape and when properly selected, planted, and taken care of by watering, pruning and fertilizing they can be expected to last many years. Many native plants do no need the same amount of watering and fertilizing like some other non-native plants.

Fertilizer should not be mistaken as plant food. Plants produce food in the form of sugars through photosynthesis. Fertilizer provides minerals that are deficient and needed for photosynthesis and growth. Fertilizer must only be used when plants are showing signs of decline. An arborist should be consulted to make sure the plant in question is not in decline due to disease or pest, but is a lack of a proper mineral that needs adjustment in the soil. Fertilizer should only be applied in the right amount and the right time to avoid further damage to the plants.

The contractor will notify Grounds Maintenance of any tree or shrub that exhibits symptoms of a nutrient deficiency and will recommend measures for correction.

Treat specific nutrient deficiencies by applying the lacking nutrient in accordance with UF/IFAS recommendations until deficiencies are corrected. The fertilizer application rate and number of applications depends on the type of plant material. Apply the minimal amount of fertilizer needed and adjust fertilizer rates according to the health, maturity, and desired growth patterns.

Need For Fertilizing

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The contractor must consider the following conditions before deciding to fertilize trees and shrubs:

<u>Soil Test:</u> Have a sample of the soil tested through the University of Florida Extension Service or other certified testing lab. Follow the recommendations for the testing lab for adding soil amendments. A soil test determines the acidity or alkalinity (pH) of the soil as well as the levels of nutrients that are present and what may be missing or need boosting.

Growth: Watch for plants that show signs of poor growth, yellow leaves, turning color early before fall, or dieback of twigs or ends of branches. These symptoms are not always signs of a plant's need for fertilizer; other conditions can cause these symptoms, as well. Consult with an arborist before taking any action.

<u>Planting Age:</u> Fertilize new trees when they planted to help to speed their growth. Use slow-release fertilizers as recommended.

<u>Location:</u> Trees located in lawns do not need fertilizing because they get the nutrients they need from the lawn when it is fertilized. Only fertilize trees and shrubs that are located in planting beds.

Commonly Applied Nutrients

The most commonly applied nutrients are nitrogen (N), phosphorus (P) and potassium (K.) Sometimes iron deficiency can be a problem. Only apply the nutrient that is deficient.

Type of Fertilizer to Use

Use a typical blend such as 16-4-8, 12-6-6, or 12-4-8, unless the soil test reveals that phosphorus and potassium are adequate and don't need to be applied. Some fertilizers called "weed-and-feed" contain herbicides that can damage groundcovers, vines, shrubs, and trees. Read the labels and follow the directions.

Amount of Fertilizer to Apply

Only apply fertilizer at the recommended rate as noted in the soil testing recommendations. Do not guess about the amount and frequency of fertilizer application. Shrubs and trees can receive up to 2 to 4 pounds of nitrogen per 1,000 square feet of root spread area per year. The root spread area occupies 1½ times the area of the crown spread (3.14 x radius²). Do not exceed the amount of fertilizer recommended for a year. Fertilizer should be applied in regular intervals over the time period recommended by the soil analysis. Avoid misapplication, which can harm the tree or shrub as well as adjacent plantings or lawn—it can even contaminate a nearby water source. Be cautious around wetlands. Never fertilize within 100 feet of a wetland.



Fertilizer for trees is not food. Only fertilize when determined by professional that it is needed



Smaller areas like shrub beds can be fertilized using hand spreaders

Application Methods

Most plants root zones are located within the first 12 inches of soil. Apply fertilizer to entire root zone not just near the tree trunk. Many roots are located just beneath the mulch on the soil surface. Apply fertilizer to the surface of the soil or mulch. Irrigate immediately after applying fertilizer to wash any misdirected fertilizer from the leaves and to help nutrients dissolve and penetrate through the mulch and soil to the roots.

<u>Direct Fertilization:</u> The most effective method of directly fertilizing trees is broadcasting. Use a cyclone or drop-type spreader, scatter the recommended amount over the entire root zone area. Apply half of the recommended amount in one direction and then the other half in the other direction.

When to Apply

The optimal time to apply fertilizer coincides with active root growth and adequate soil moisture. Fertilize trees and shrubs in early spring. Avoid fertilizing trees and shrubs stressed by drought during the summer. If water is unavailable, do not fertilize at all because plants will not be able to absorb the nutrients.

D05.3.6 Maintaining Landscape Beds

Mulching

The proper technique and process of applying mulch to trees, shrubs, and beds on base adds beauty to the landscape, provides extra moisture during period of high heat, and protects plants during inclement weather. Applying a protective cover is one of the most beneficial processes that can be accomplished for the health of plants, especially trees and shrubs. However, all plant material, including flowers, can benefit from mulching.

Mulch materials can help keep plants healthy, maintain the correct amount of and reduce plant stress, especially for young plants. Applied at the proper thickness, mulch insulates soil, retains moisture, prevents weeds, averts soil compaction, reduces lawnmower damage to the plant, and improves the landscape aesthetic. In addition, it improves soil structure, oxygen levels, surface/ground temperature and moisture availability for the plants it surrounds. To prepare all on-base beds (including trees, shrubs, and flowers) for mulch application, install a trench-cut border on the outer-side perimeter of the bed. This style deep trench cut/edge will be a depth of approximately 4 inches. It will provide a trough or moat that will serve as a catch basin to keep debris (such as mulch, dirt, and leaves) from spreading sporadically on streets, drives, sidewalks, and surrounding landscape after heavy winds or rain. It also makes it easier to place the material back into the beds after inclement weather.

This outer side edge around trees and shrub/flower beds must be a clean, straight cut that follows the outline of the bed. The goal is to apply mulch to all necessary beds, shrubs, and trees on a yearly basis. The technique to accomplish this added plant protection is as follows:

- Remove any grass or weeds within the mulch area
- Place the mulch material (bark, chip, or pine needles) around the root zone of the shrub/tree
- Ensure the mulch does not touch the shrub's trunk
- Layer the mulch material up to 3 inches in depth and slope toward the trunk to leave crown of tree exposed
- Water to maintain adequate moisture

Maintain mulch at a depth of at least 3 inches after settling. When additional mulch is necessary, the contractor must present a separate bid for Tyndall AFB approval.

USE mulches made from sustainable materials:

- 1. Hardwood mulch
- 2. Pine needles
- 3. Pine bark

DO NOT USE mulches made from inert materials:

- 1. Grade B cypress mulches made from whole-tree wood
- 2. wood containing remains of wood pallets
- 3. Gravel of any type.
- 4. Volcanic Rock

Apply mulch to bedded areas and around trees and palms, leaving a 2-inch space between the trunks of plants and the mulch. Mulch within at least a 12- to 18-inch radius from the trunk for any size of tree. Avoid creating volcano mounds around tree; remove old mulch build up before applying new mulch.

Apply new mulch in a level profile consistent with pre-existing grades so the final uniform mulch depth comprised of both existing and new layers is a minimum of 2 inches but does not exceed 3 inches. Do not apply new mulch material against trunks or plant stems but tapers down to the soil at those locations. In all locations where the existing mulch bed is in contact with a paved surface (such as sidewalks, roadway edges, or curbing and driveways), lightly trench the bed line between the mulch and the hard surface to better contain the existing and applied mulch.

Rake or sweep mulch off paved areas and turfgrass into beds as the mulch application progresses. Rake smooth any mounded areas so depth does not exceed 3 inches.

If mulch is installed improperly, the contractor will correct any problems at no additional charge to Grounds Maintenance.

Weeding

Weed shrub and groundcover beds weekly to remove all unwanted weeds according to the Maintenance Schedule. Pull weeds by hand and dispose.

Leaf Removal

Remove all leaves according to the Maintenance Schedule. Remove leaves from all lawn areas and shrub beds within the Manicured Zone. Leaves will be raked and collected to be disposed of at compost area on the base.

Tree Staking/Guying

Stake all trees subject to a windy conditions at time of planting. Remove all staking after the first growing season. For staking details, see Planting Details.



Spread mulch by hand to a 3-inch depth.

D05.3.7 Temporary Irrigation

Temporarily irrigate all lawns, shrub beds, groundcovers, and trees within the Manicured Zone. The water can be part of an overall rain water harvesting system designed to supply the water required to run the system and be supplemented by base water at times when water reserves are low.

This temporary system must be capable of keeping all lawns and plants alive for a period of one year until they are established. Do not cut off irrigation in the middle of a hot or dry period.

Set the controller to provide only as much water as the plants need. Different plants have different water needs. In Florida, this is generally equivalent no more than 3/4 to 1 inch total precipitation per week.

Make sure the run times do not exceed the soil infiltration rate. If available, use cycle and soak to apply water deeply and not cause runoff.

Change the controller settings with the seasons so plants are watered at the correct frequency for the time of year. Plants tend to need less water during cooler weather, when their growth has slowed, and water evaporates more slowly. Turn off the controller during the rainy season.

If possible, set the controller to run any overhead sprinklers in the early morning or overnight.

- Water Slowly: Never apply water faster than the infiltration rate of the soil. Slow and even irrigation allows for proper soil moisture to be maintained in the root zone, providing for the best growing conditions for plant material while eliminating or minimizing runoff and potential erosion.
- Water Deeply: Irrigate each plant variety long enough for water to reach the full depth of the root zone.
- Water Infrequently: Deep watering promotes deeper roots, further reducing irrigation requirements.



Example of temporary irrigation

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Gray Water System

Tyndall AFB has an existing gray water system used to supply non-potable water for various uses. Landscape contractors should be familiar with the workings of the system before working on it.

Maintenance

To keep a gray water system working properly, all treatment and reuse systems require some level of operation and maintenance. Grounds Maintenance will provide specific guidelines for maintaining their system. Some general guidelines follow:

- Clean the effluent screen at least annually
 - Remove the screen and spray residuals off into a large bucket
 - Once the effluent screen has been replaced into the settling tank outlet, slowly pour wash water back into the settling tank
- Remove accumulated solids from the settling tank
 - Contact a wastewater pumper to pump out the solids
 - Remove solids when they occupy about 25% of the tank's depth or about every 3 to 5 years
- The gray water system may not be needed during the entire year; during seasons it is not used, set the diversion valve to direct flow to the onsite wastewater treatment system or to the municipal sewer
- If a laundry/gray water surface-discharging system is used, periodically move the drag hose to prevent gray water from ponding in the landscape
- If a pressurized system is used, periodically replace the pump as it fails
- The particular technology used to distribute gray water will have specific operation and maintenance requirements; coordinate with Grounds Maintenance
- Waste characterization should be conducted for solids removed from gray water systems

Gray water must be stored in tanks that meet the structural standards of the 2004 American Water Works Association (AWWA) standards (Look for the AWWA stamp) and have the following attributes:

- Are labeled clearly as non-potable
- Have restricted access
- Eliminate habitat for vectors
- Can be cleaned



Gray water systems for irrigation use purple pipe to identify them as using non-potable water; the heads, valves, and valve boxes will use the same purple color for identification

The gray water system must use piping that identifies the water as non-potable; such piping may be purple pipe, pipe painted purple, or pipe taped with purple metallic tape.

Do not apply gray water at a rate that may result in ponding, pooling, or runoff across property lines or onto paved surfaces.

Do not use gray water in a manner that creates a nuisance or damages the quality of surface water or groundwater.

Do5.4 Planting Soil

Use modified planting soil for tree and shrub bed plantings only in the Manicured Zone.

Soils that meet this soil specification are combinations of native loam, clay loam, or sandy loam soils, mixed with ASTM C-33 concrete sand and Seal of Testing Assurance (STA) certified compost. As a guideline, a general mix ratio that often meets this specification would be a "by volume" mixture of 50% sand, 25% soil, and 25% compost. These ratios can vary depending upon the ingredients being used. The final mix will conform to the specified sand, silt clay, organic matter, infiltration rates, and other parameters. Acceptable Organic Soil Amendments are to be used in existing soils if needed to achieve soil criteria as set within these requirements. Composted organic matter will be STA certified and have the following criteria:

- Percentage of organic matter by weight: 5 to 8%
- Soil reaction: pH of 6 to 7.5
- CEC of total soil: Minimum 10 meq/100 mL at pH of 7.0
- Nutrients:
 - Nitrogen: 10-20 mg/kg nitrate-nitrogen (medium fertility levels)
- Phosphorus: 20-40 mg/kg using Mehlich III test
- Soil infiltration rate: 2-6 inches per hour per ASTM F1815
- Material will be thoroughly, mechanically mixed to create a uniform, homogeneous soil



Modified planting soil will be used for tree and shrub bed plantings only in the Manicured Zone

Exhibit D-8. Planting Soil Composition

Compost Quality Characteristic	Test Method*	Value
рН	TMECC 04.11-A	6.5-8.5
Soluble salts (dS/m)	TMECC 04.10-A	0-10
Moisture content (% wet weight)	TMECC 03.09-A	40-60
Organic matter content (% dry weight)	TMECC 05.07-A	35-60
Maturity (seed emergence) (% relative to positive control)	TMECC 05.05-A	80 or above
Maturity (seedling vigor) (% relative to positive control)	TMECC 05.05-A	80 or above
Stability (mg CO ₂ -C/g OM per day)	TMECC 05.08-B	5 or below
Pathogen Salmonella (most probable number per 4 grams dry weight basis)	TMECC 05.08-B	< 3
Pathogen Fecal coliform (most probable number per gram dry weight basis)	TMECC 07.01-B	<1,000
Physical contaminants (% dry weight) Plastic, glass, and metal	TMECC 02.02-C	Combined total: <0.5
Physical contaminants (% dry weight) sharps	TMECC 02.02-C	None detected

^{*}TMECC refers to Test Methods for the Examination of Composting and Compost, published by the U.S. Department of Agriculture and the U.S. Compost Council (USCC).

Particle size for compost must comply with the requirements shown in the following table.

Particle size distribution according to ASTM D6913 (Standard Test Method for Particle-Size Analysis of Soils):

- Coarse Sand (2.0 to 4.75 mm) 15% maximum (percent by dry weight).
- Medium Sand (0.425 to 2.0 mm) 60 85% (percent by dry weight).
- Fine Sand (0.075 to 0.425 mm) 10-20% (percent by dry weight).
- Silt/Clay (less than 0.075 mm) 10% maximum (percent by dry weight).

Acceptable Organic Soil Amendments are to be used in existing soils, if needed to achieve soil criteria as set within these requirements. Composted organic matter will be STA certified and have the following criteria:

Exhibit D-9. Composted Organic Matter

Quality Characteristic	Test Method*	Percent Passing	
		Min.	Max.
Fine Compost (dry Weight)	TMECC 02.02-B		
2-inch Sieve		98	
3/8-inch Sieve		95	

Do6. Maintenance of Specific Areas

Do6.1 Streetscape Corridors

If a trail or sidewalk is adjacent to a Maintained or Managed Zone, maintain a minimum 5-foot-wide area of turf on both sides of trail or sidewalk by mowing and edging the turf along the pathway. If the path is located in the Manicured Zone, then mow and edge all turf.

Keep all swales next to roadways clean of trash and debris and receive other periodic maintenance as outlined in this document. Mow the edge of the vegetation along the roadway edge in a 2-foot-wide strip.

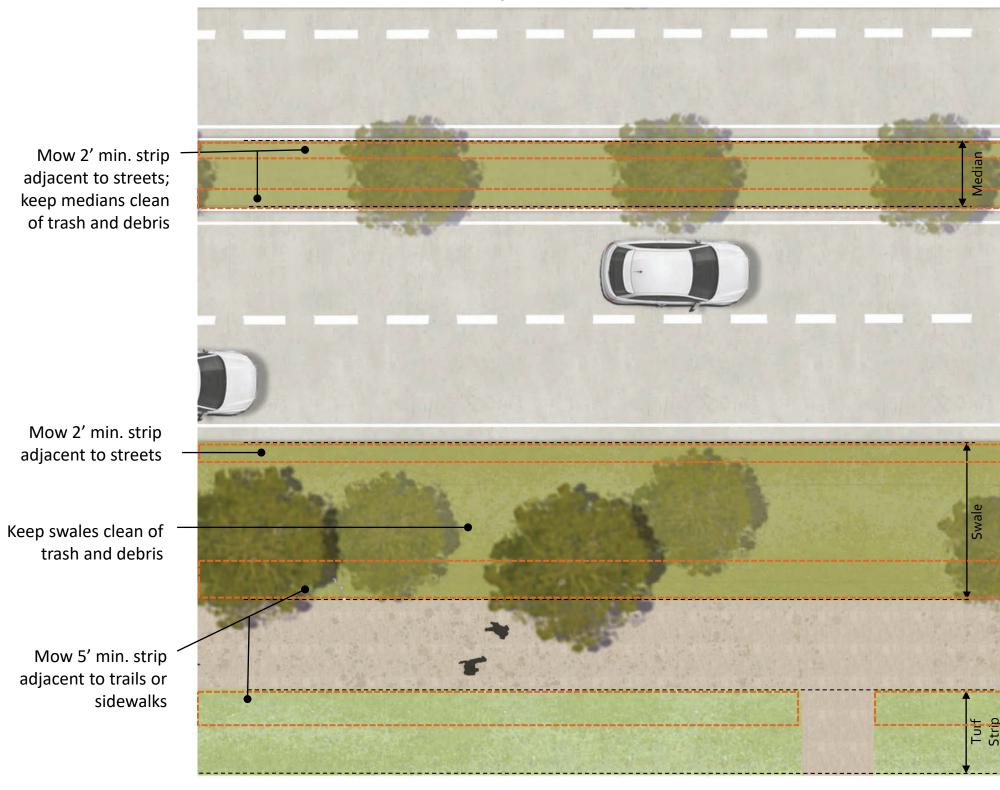
Do_{6.2} Medians

Mall turf in medians between roads unless told otherwise. If instructed not to mow, then at a minimum mow a 2-foot-wide strip next to each curb edge and edge between the lawn and the curb. If the area is planted in groundcover, then leave as is and trim any overhanging groundcover on top of curb.



Mow medians between curbs and sidewalks if they are less than 10 feet; otherwise mow a 2-foot strip along walks and curbs

Exhibit D-10. Maintenance of Streetscape Corridors and Medians



Do6.3 Parking Area Islands

If a trail or sidewalk is located in the parking area island and the island is planted with native grass, then maintain a 2-foot-wide minimum area of turf on the side facing vegetation or both sides facing vegetation by mowing and edging the turf along the pathway. If the island is planted with native grasses or shrubs, then keep a 2-foot-wide zone along curb edges mowed to a 6-inch height to accommodate car bumper overhangs.

Keep all swales located in islands clean of trash and debris and perform other periodic maintenance as outlined in this document. Keep trees limbed up a minimum of 7 feet from the ground plane.

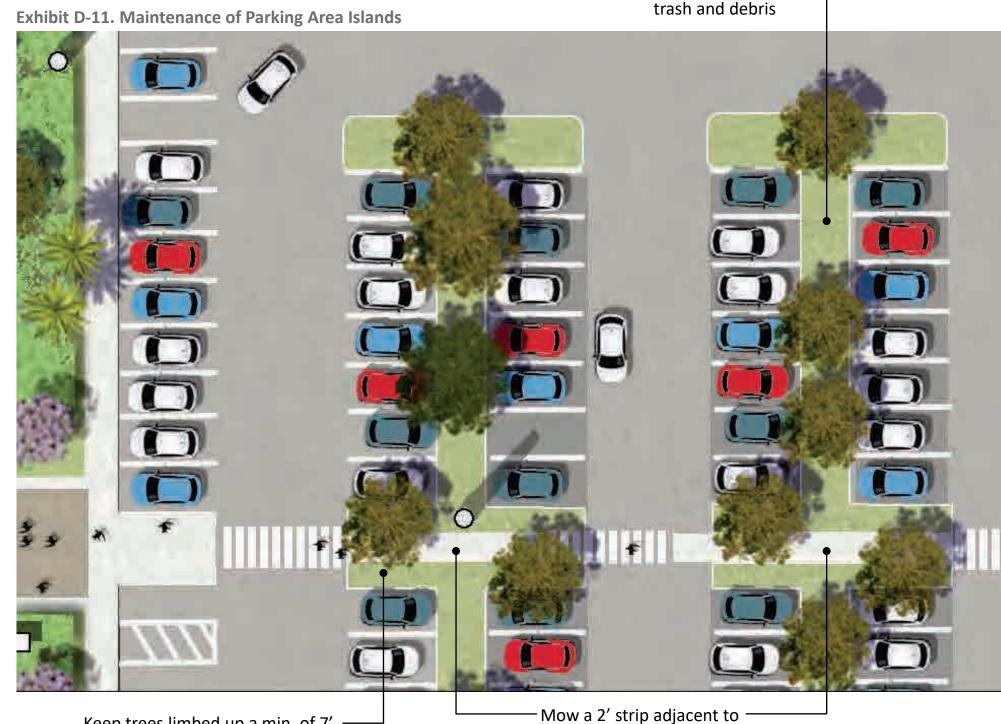




Keep native plantings in islands free from trash and weeds

Keep island swales clean of trash and debris

trails or sidewalks



D. Long-Term Maintenance

from the ground plane

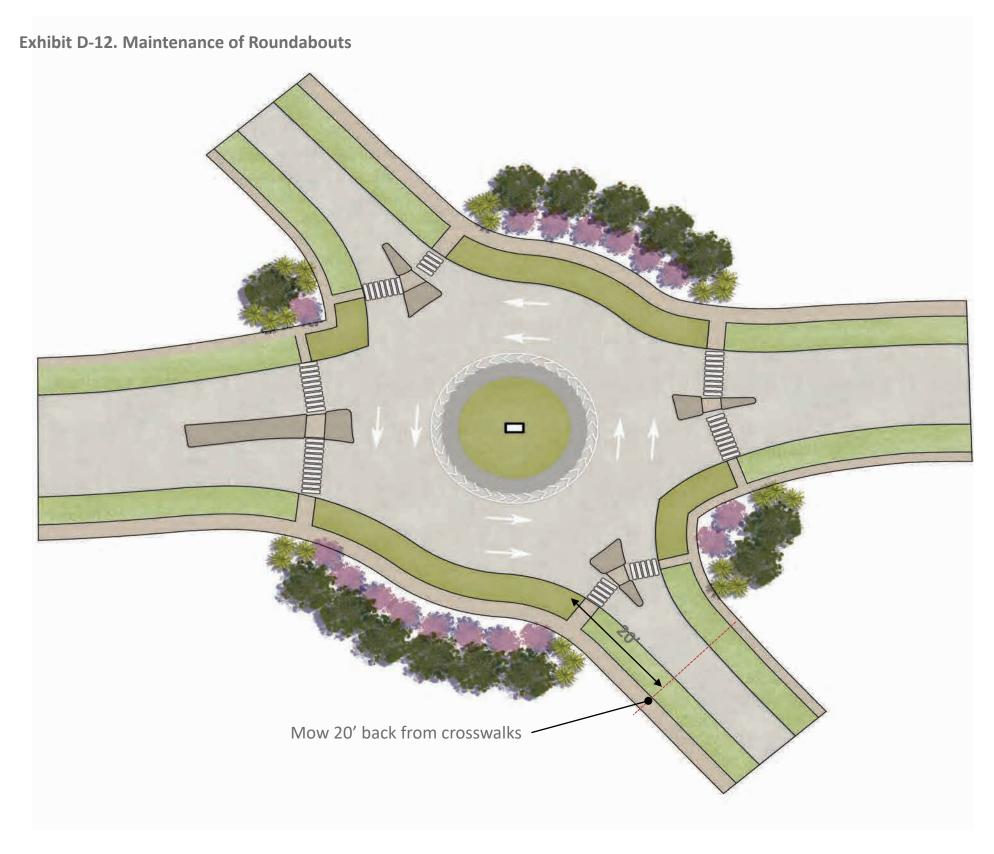
Keep trees limbed up a min. of 7'

Do6.4 Roundabouts

Mow all turf in the center circle of roundabouts unless they are planted with shrubs or ornamental grasses. If that is the case, keep them trimmed back so they do not stick out over curb edge.

Mow all turf between trails or sidewalks and the faces of street curbs. Start mowing at 20 feet back from crosswalks.





Do6.5 Other Areas

D06.5.1 Playgrounds

The landscape contractor is responsible for inspecting playgrounds weekly for any malfunction of equipment or failures of equipment that would pose a danger to a child. Report any needed repairs to Grounds Maintenance. If the item poses a danger, then use yellow warning tape to tape off the piece of equipment in question. General maintenance will include removing any trash or storm debris, emptying trash receptacle, mowing any grass, and edging all edges.

D06.5.2 Boardwalks

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Visually inspect the boardwalks located in the Coastal Zone for any damage to the boardwalk or railings and report all damage to Grounds Maintenance for repair.

D06.5.3 Trails/Trailheads

The landscape contractor is responsible for performing weekly inspections of the trails and trailheads. Remove any trash or storm debris along the route, empty trash receptacles, mow grass 2 feet wide on both sides of trails, and edge all edges. Blow paths clean.

D06.5.4 Vegetative Waste Disposal

Federal sustainable landscaping guidelines say, "The site maintenance plan will incorporate composting and/or recycling 100% of vegetation trimmings and appropriate compostable organics on-site, where feasible." The SITES™ v2 Rating System offers a credit for recycling organic matter on site or within 50 miles, with the intention to, "support nutrient cycling, improve soil health, and reduce transportation costs and materials going to landfills." Include a the strategy for dealing with organic waste sustainably. One exception to organic matter recycling is diseased or toxic plants, which, depending on the disease, must be bagged separately as trash; if they are regulated, like emerald ash borer, take diseased plants to the appropriate facility. Giant hogweed disposal may also be regulated by your state or jurisdiction. Never compost poison ivy, which poses a health risk to humans. Some toxic plant materials may need to be treated as hazardous waste. Always check for guidance from local public officials.

Composting or recycling vegetative waste should be quantified and reported to the base recycling program for diversion reporting.



Keep areas in Manicured, Maintained and Airfield Zones clean of trash and debris



Sanitize playground equipment with anti-bacterial spray



Sanitize playground equipment with anti-bacterial spray



Use pavement sweepers sized for area – smaller sweepers for paths and trails

D. Long-Term Maintenance Landscape Master Plan Tyndall Air Force Base

Do7. Hardscape Maintenance Activities

Do7.1 Porous Pavement

D07.1.1 Porous Pavement Vacuuming

Porous pavement vacuuming is done in order to remove sediment that may lead to a clogging of the porous surface, preventing water from infiltrating through the pavement into the stone reservoir. Porous pavement vacuuming applies to several types of porous pavements described below.

Porous Pavers: An alternative to traditional hardscape paving that allows water to infiltrate between the pavers and through permeable layers below ground. When vacuuming porous pavers, adjust the setting to a lower power in order to prevent complete removal of aggregate between voids (unless more intensive vacuuming is required to alleviate clogged areas).

Porous Concrete: A type of concrete that has a high porosity due to an increased void space to facilitate water infiltration through the porous concrete into a stone reservoir and then into the ground.

Porous Asphalt: A type of asphalt that has a high porosity due to an increased void space to facilitate water infiltration through the porous asphalt into a stone reservoir and then into the ground.

Frequency: Annually - Vacuum porous concrete, porous asphalt, and for porous pavers each spring.

Porous Pavement Vacuuming Maintenance Procedure

- Safety set-up: Set up safety perimeter. Ensure no vehicles are parked in the
 vicinity of the location and that area is closed to the public. Public notice
 announcing area closing needs to be posted per base standards
 of notification.
- 2. Inspect: Visually inspect porous pavement for damage, including holes, cracks, excessive scuffing, settlement, and areas of standing water. Inspect status of aggregate between voids in porous pavers before and after vacuuming to see if additional replacement aggregate is needed. Record observations/damage in the Maintenance Report Log, include photos if possible, and report as necessary.
- 3. Prepare site for vacuuming: Remove (by hand) bulky debris and waste materials from surface of porous pavement that may be too large to be picked up and/or block/clog the vacuum hose (litter, tree branches, wire, car parts) prior to using vacuum. Use a rigid street broom to loosen debris as needed. Pay attention to pavement edges and heavily loaded areas.

- 4. Vacuum: Vacuum porous pavement per the vacuum manufacturer recommendations. If vacuuming porous pavers, set the vacuum at a lower power in order to prevent complete removal of aggregate between voids (unless more intensive vacuuming is required to alleviate clogged areas). Adjust the vacuum machine speed so the vacuum draws out the first inch or so of stone and dirt in the openings between porous pavers, because this is where most unwanted sediment/debris typically collects. Follow all steps in the Manufacturer's Operation Checklist for the specified vacuum. Engage the Water Feature/ Water Dust Control Option of the vacuum (or equivalent on specific vacuum model). Drive the vacuum over the porous pavement, operating at a slow speed setting not greater than 5 miles per hour. Overlap the edges of the vacuum runs and make two passes over the entire porous pavement area. Frequently check and empty the filter bag (located above the debris bag) when vacuuming areas with excessive sediment.
- 5. Post-vacuuming inspection: After two passes, visually inspect porous pavement to ensure adequate debris removal. Any areas with visible debris/ sediment still present must be vacuumed again until debris is removed. If the surface of the porous pavement becomes clogged with fine dirt or sand, follow maintenance tasks outlined in Section D07.1.2, Porous Pavement Power Washing. Record observations in the Maintenance Report Log.
- **6. Review checklist:** Follow all steps in the post-operation checklist for the specified vacuum.
- 7. Measure debris removal prior to disposal: Remove material/debris from vacuum bag and hopper and put into a labeled trash bag. Label bag with date and project location and note the weight on the Maintenance Report Log.
- **8. Clean up:** Clean work area and vacuum equipment (per Manufacturer's Operation Manual).



Vacuum trucks specifically made to clean porous pavements

D07.1.2 Porous Pavement Power Washing

Porous pavement power washing applies to several types of porous pavements described below. Power wash if porous pavement surfaces become clogged with fine dirt or sand. Power washing the pavement surface allows partial restoration of the original void space and, therefore, permeability and must immediately follow the porous pavement vacuum task (once every three years or more often as necessary). Never power wash of porous pavers because it may damage the pavers and/or remove aggregate between pavers.

Porous Concrete: A type of concrete that has a high porosity due to an increased void space to facilitate water infiltration through the porous concrete into a stone reservoir and then into the ground.

Porous Asphalt: A type of asphalt that has a high porosity due to an increased void space to facilitate water infiltration through the porous asphalt into a stone reservoir and then into the ground.

Frequency: Once every three years (perform immediately after thorough vacuuming) or more frequently if necessary. Spring is the recommended time.



Wear OSHA-required clothing and equipment to power wash pavement surfaces

Porous Pavement Power Washing Maintenance Procedure

- Safety set-up: Set up safety perimeter. Ensure no vehicles are parked in the vicinity of the location and that area is closed to the public. Public notice announcing area closing needs to be posted per City/County standards of notification.
- 2. Inspect: Visually inspect porous pavement for damage, including holes, cracks, settlement, excessive scuffing/raveling and areas of standing water. Record observations/damage in the Maintenance Report Log, include photos, if possible, and report as necessary.
- **3. Prepare site for power washing:** Remove (by hand) bulky debris and waste materials from surface of porous pavement that may block or impede power washer access to the surface (litter, tree branches, wire, car parts). Use a rigid street broom to loosen debris as needed. Pay particular attention to pavement edges and heavily loaded areas.
- **4. Power wash:** Follow manufacturer's recommendations for use of the power washer unit with the clarifications noted below. Ensure the water inlet valve and pump are both on. Set the pressure levels to be no greater than 500 pounds per square inch. Perform two passes over surface of pavement, with wand spraying at a 45-degree angle. Do not keep water flow on one location for longer than 5 seconds.
- **5. Vacuuming:** Power washing may need to be followed immediately by vacuuming. Refer to Porous Pavement Vacuuming for detailed instructions. If sediment is exposed (brought to the surface) during power washing, this sediment must be immediately removed through vacuuming instead of allowing the sediment to migrate and re-enter the porous pavement.
- **6. Post-power washing inspection:** Visually inspect porous pavement to ensure adequate sediment/debris removal. Any areas with visible debris/sediment still present must be washed again until debris is removed. Note if water remains ponded in any areas of the porous pavement. Record observations in the Maintenance Report Log.
- **7. Safety completion:** Remove safety perimeter and re-open lot for parking/public access.

D07.1.3 Porous Paver Aggregate Maintenance (Restoring Aggregate)

Safety set-up: Set up safety perimeter. Porous pavers are an alternative to traditional hardscape paving which allows water to infiltrate between the pavers and through the permeable layers below them. Pavers are laid out on the surface and clean-washed aggregate material (also called screening or gravel) are placed in the spaces (voids) between paver units to provide stability and surface drainage while keeping unwanted debris out of the system. Refill the voids between pavers with additional aggregate material to replace any material that has been lost by vacuuming and/or due to natural migration, settlement and erosion.

Frequency: As needed and when gravel infill is not within 1/2 inch of the paver surface. Immediately after vacuuming.

Porous Paver Aggregate Maintenance Procedure

- **1. Safety set-up:** Ensure no vehicles are parked in the vicinity of the location and that area is closed to the public. Public notice announcing area closing needs to be posted per City/County standards of notification.
- 2. Inspect: Visually inspect porous pavers for damage, including broken pavers, cracks, settlement, and any areas of standing water or evidence of standing water. Inspect status of aggregate infill material in the voids between porous pavers to see if additional replacement aggregate is needed. Evaluate if voids (joints) between porous pavers are clogged or not. Inspect to see if pavers themselves are missing from any areas and note need for replacement pavers. Record observations/ damage in the Maintenance Report Log, include photos if possible, and report as necessary.
- **3. Prepare site:** Remove (by hand) bulky debris and waste materials from surface of pavers.
- **4. Cleaning Clogged Voids:** If voids (joints) between porous pavers are still clogged even after area has been vacuumed (Porous Pavement Vacuuming), use a manhole pick to tool out joint until clean aggregate is found. Follow aggregate replacement instructions below.
- **5. Add aggregate:** Using a shovel, spread aggregate over the surface of the pavers. Using a broom, sweep aggregate into the voids between porous paves, taking care to fill in any obvious holes. Once the aggregate has been added to the pavers, and the voids have been filled, perform a final sweeping pass with the hand broom to remove any excess gravel from the paver surface.
- 6. Clean up: Clean-up work area.
- **7. Safety completion:** Remove safety perimeter and re-open area for parking/public access.



Clean joints between porous pavers and replace aggregate as necessary

Do7.2 Pressure Washing Concrete or Other Solid Pavers

Perform visual survey of hardscape pedestrian surfaces for spills and stains. Identify necessary cleaning method and perform work as needed. Schedule deep cleanings in designated locations based on volume of foot traffic, gum removal on plazas, walkways, and patios.

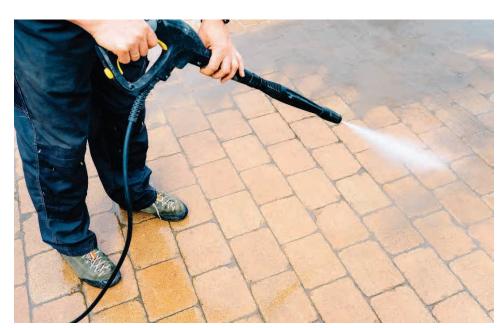
Frequency: Quarterly – react swiftly to clean up spills and stains throughout property. Clean highly used areas such as building entrances every 6–8 weeks.

Do7.3 Asphalt & Concrete Pavement Maintenance & Repair

UFC 3-270-01, *O&M Manual: Asphalt and Concrete Pavement Maintenance and Repair*, provides information on materials, equipment, and procedures for repairing and maintaining hot mix asphalt and portland cement concrete (PCC) pavements. Typical maintenance and repair (M&R) methods, and problems that might be encountered in using these methods, are discussed. Guidance is provided for using each of these M&R methods.

This UFC is intended for use as a field UFC for airfield and roadway pavement repair for all U.S. Navy, Army, and Air Force pavements. The described techniques are applicable for airfields, roads, parking lots, and other pavement uses. Probable causes of pavement problems are discussed, and suggested M&R measures described in order to correct pavement surface problems at the source.

Not covered in UFC 3-270-01 are maintenance and repairs of surface water drainage systems, pavement markings, ground lighting, and unpaved margins.



Set the pressure levels to be no greater than 500 pounds per square inch; perform two passes over surface of pavement, with wand spraying at a 45-degree angle

Do7.4 Security Fences & Gates

UFC 4-022-03, Security Fences and Gates, provides information for a unified approach for the design, selection, and installation of security fences and gates for Department of Defense (DoD). This document applies to all construction, renovation, and repair projects including expeditionary or temporary construction that include security fencing and gates for DoD. Consult with current Service policies, location of facility, and threat level for specific requirements.

Maintenance Procedure: As noted in UFC 4-022-03, also reference UFC 3-190-06, *Protective Coatings and Paints*.

Do7.5 Site Furnishings

Perform visual survey of site furnishings for spills and stains. Includes elements such as benches, picnic tables, seat walls, bollards, signage, and trash receptacles. Identify necessary cleaning method and perform work as needed. Schedule power-wash deep cleanings in designated locations based on volume of use.

D07.5.1 Light Pole Cleaning

In addition to routine lamp replacement in light poles the overall fixture requires cleaning and maintenance. This includes cleaning the luminaire and pole, painting nicks or chips in the finish coating, and clearing debris from the fixture.

D07.5.2 Building Façade Cleaning

The landscape contractor will hire an experienced and trained professional to power wash the outside of each building once per year to remove all dirt, grime and algae that has accumulated. All procedures must be according to State of Florida standards and in compliance with use of chemicals and safety equipment, and OHSA procedures as to working above one level. Use the proper pressure rating to avoid damaging the building exterior materials. Provide protection for any element within the spray zone surrounding the building.

Prior to starting work cover all plants to protect them during washing process. Pre-soak the surface with a low-pressure spray to loosen dirt before pressure washing. Pre-treat bad mildew spots by scrubbing with a solution of bleach and commercial mildewcide in water. Use hot water instead of cold water for pressure washing. Hot water cleans more effectively with less detergent. Always rinse detergent off the wall before it dries. Move the nozzle closer or further from the wall surface to adjust the cleaning force and water heat. Spider webs are nearly impossible to remove with a power washer spray. Use a broom instead.

When using a pressure washer, wash the walls from the bottom up with a high-pressure spray of detergent solution. Flush the machine and rinse the walls with plain water from the top down. When washing, work in sections, moving the water stream from side to side. Spray the water at an angle to the wall surface, not straight up or straight on. In heavily soiled areas, use a water-powered scrub brush attachment, if available, for scouring such areas. If the area is within reach, scrub it by hand.



Use proper lift equipment to clean building face



Remove mold from building faces

Do8. Stormwater Maintenance of Specific Areas

Do8.1 Stormwater Structure

D08.1.1 Stormwater Structure Cleaning

Stormwater structures capture runoff, connect pipes, provide access, control the water level in stormwater management systems, and/or allow excess runoff to discharge or overflow in a controlled manner.

Stormwater structures may include the following:

- Catch basin
- Inlet
- Sediment trap
- Maintenance hole
- Overflow structure with or without removable weir
- Observation well
- Clean-out
- Domed riser

Frequency: Semiannually (spring and fall)

D08.1.2 Stormwater Structure Maintenance Procedure

- **1. Safety set-up:** Set up safety perimeter.
- 2. Inspect: Visually inspect stormwater structure and adjacent area for any immediate damage or potential problems, including any upstream pollution sources or locations of existing or potential vegetation debris. Inspect stormwater structure for signs of accumulated sediment, leaf litter, and/or debris. Look for signs of settlement and/or washout around structures and attached pipes. Record all observations in the Maintenance Report Log and report as necessary. If possible, take photographs to document site conditions.



Inspect structures at least annually

- 3. Prepare site for servicing: Remove any debris that has accumulated on top of the structure. Remove structure lid (inlet grate, manhole cover, or observation well cover) and set aside. Visually inspect interior of the structure for defects and evidence of illegal dumping. If illegal dumping has occurred, notify the proper authorities as necessary. Record observations/damage in the Maintenance Report Log, include photos if possible, and report as necessary.
 - » Examine structure for any unintended or excessive standing water. Inspect for signs of mosquito larvae. If sediment trap is in place and contains standing water, inspect the drainage orifices for signs of clogging. These orifices are usually 1-inch diameter and located at the base of the structure. Remove any and all material clogging these orifices.
 - » Observe if the structure has a filter insert and follow separate guidelines in Inlet Filters for maintenance and replacement of filter insert.
- 4. Cleaning: If using a vacuum truck, clean the interior of the structure and remove all debris or sediment contained in sump. Leave the weir in place. Properly train employees in use of the vacuum truck and follow all vacuum truck manufacturer recommended guidelines. If a removable weir is present and not sufficiently cleaned, use wrench/screwdriver or other tool to remove the bolts, lift it up and out of the structure, and set it to the side and repeat cleaning.
- 5. Disposal: Ensure that the removed waste/sediment is properly disposed of and securely contained as to not run back into the stormwater system. Follow guidelines for disposal of waste/sediment on the local, state, and federal levels.
- **6. Record:** Make a note of any recorded observations in the Maintenance Report Log.
- **7. Replace:** Replace the stormwater structure cover and confirm it is tightly secured.
- **8. Safety completion:** Remove safety perimeter.

Inlet Filter Insert Cleaning

Manufactured filter inserts are designed to trap sediment, debris, trash, oil and grease. Filter inserts are located inside a catch basin or stormwater inlet. Clean filter inserts quarterly. Replace the filter insert pouch at least annually, or as necessary, during a cleaning task.

Frequency: Quarterly, unless established that a particular inlet requires less frequent cleaning.

Inlet Filter Insert Maintenance Procedure

- 1. Safety set-up: Set up a safety perimeter.
- 2. Inspect: Remove catch basin lid/grate with manhole pick and set safely aside. Visually inspect filter insert for evidence of defects and deterioration. Extensive damage to the filter (torn liner or mesh) requires immediate replacement. Record all observations in the Maintenance Report Log and report as necessary.
- **3. Clean filter liner/mesh:** Use an industrial vacuum or vacuum truck hose to remove any collected materials from the liner. Follow vacuum manufacturer's directions for operation of the vacuum.
- **4. Inspect filter hardware:** After removal of collected materials from the filter, remove the filter insert as per manufacturer's instructions. In many filters, this is done by unsnapping the tether from the D-ring. Set inlet filter insert to one side. Inspect the filter liner, gaskets, stainless steel frame, and mounting brackets, etc. for continued serviceability. Refer to the manufacturer's manual to assist in locating these items. Correct minor damage and/or defects found during inspection. Record all damage and corrective actions undertaken in the Maintenance Report Log.
- **5. Insert filter:** After thoroughly inspecting the filter insert pouch for damage and continued serviceability, reattach the pouch tethers to the liner's D-ring (or equivalent part).
- **6. Replace grate/lid:** Replace the catch basin grate/lid and make sure it is secure.
- 7. Safety completion: Remove safety perimeter.

Inlet Filter Insert Pouch Replacement

Manufactured filter inserts are designed to trap sediment, debris, trash, oil and grease. Filter inserts are in the interior of a catch basin or inlet. Replace the filter insert pouch least annually, or as necessary, in conjunction with cleaning task.

Frequency: Annual check, replace as needed.

Annually:

- 1. Safety set-up: Set up a safety perimeter.
- **2. Remove lid/grate:** Remove catch basin lid/grate with maintenance hole pick and set safely aside.
- **3. Remove and replace pouch:** Remove and replace filter insert pouch. Properly dispose of removed pouches and debris according to local, state and federal regulations. Record observations in the Maintenance Report Log, include photos if possible, and report as necessary.
- **4. Replace lid/grate:** Replace the catch basin grate/lid and make sure it is secure.
- **5. Safety completion:** Remove safety perimeter

Do8.2 Swales/Rain Gardens/Open Channels

Bioswale failure rates within the first 5 years are very high due to insufficient maintenance. Since bioswale's function is an important component of every jurisdiction's watershed improvement plan, or Watershed Implementation Plan (WIP), more frequent and higher quality maintenance is sorely needed. Some common and easily controlled performance issues affecting vegetation are unwanted standing water in a BMP, water not reaching certain parts of the Best Management Practices (BMP), side slope sedimentation, inlet clogging, etc. Mandated periodic BMP inspection is required to be aware of the needed maintenance issues and respond as appropriate. The following charts have common failures or problems that can occur in bioswales or raingardens and provide suggested maintenance activities and tasks.

Exhibit D-13. Typical Maintenance Activities for Vegetated Filter Strips Bioswales, Open Channels, and Grass Channels

Frequency	Maintenance Tasks
As Needed	 Mow grass channels and dry swales during growing season to maintain grass heights between 4-6 inches. Look for and stabilize any bare soil or sediment sources in contributing drainage area (CDA).
4 Times a Year	 Keep CDA, Inlets and facility surface areas clear of debris. Keep CDA stabilized. Spot seed where needed. Remove sediment and oil/grease from inlets, pretreatment devices, flow diversion and overflow structures. Repair undercut and eroded areas at inflow and outflow structures.
Annually	 Add reinforcement planting to maintain 90% turf or vegetative cover. Re-seed any alt killed vegetation. Remove accumulated sand or sediment deposits behind check dams. Inspect upstream and downstream check dams for undercutting or erosion. Remove trash or blockages at weep holes. Inspect channel bottom for erosion, braiding, excessive ponding or dead grass. Inspect inflow points for clogging and remove any sediment. Inspect side slopes and grass filter strips for evidence of any rill or gully erosion and repair as needed. Inspect elevation of turf as related to the inflow surface to ensure turf doesn't block inlet.



Remove all slit and trash from swales and channels



Remove all trash and debris from channel

Exhibit D-14. Typical Maintenance Bioretention Practices

Frequency	Maintenance Tasks
Upon Establishment	 During the first 6 months after installation inspect at least twice after storm events greater than 1/2 inch of rainfall. Conduct needed repairs or stabilization. Water as needed during plant establishment phase. Remove and replace dead plants, checking warranty periods.
4 Times a Year	 Mow grass filter strips and bioretention with turf cover. Check curb cuts and inlets for accumulate debris, trash, leaves that impede or prevent infiltration. Weed by hand as needed. Remove trash, debris, sediment. Perform maintenance inspection.
2 Times During Growing Season	Rake mulch
Annually	 Conduct a quality control inspection (independent of crew) Cut back herbaceous vegetation only in early spring (Feb-March) Remove sediment in pretreatment cells, inlets, and outlets.
As Needed	 Add plants to maintain vegetation density. Remove dead, diseased, and/or invasive plants. Stabilize the Contributing Drainage Area to prevent erosion.

Do8.3 Inlet Filter

D08.3.1 Maintenance Procedure

- 1. Safety set-up: Set up a safety perimeter
- **2. Inspect:** Visually inspect the stone edge/stone gutter for any areas that are bare and/or need to be replenished or replaced. Inspect for signs of weed growth, dumping of debris, or plow damage. If possible, take photographs to document site conditions.
- **3. Remove trash/debris:** Remove any large debris and trash that has accumulated in the stone edge/stone gutter
- **4. Remove trash/debris:** Remove any large debris and trash that has accumulated in the stone edge/stone gutter area.
- **5. Weed:** Remove any obvious weed growth that has established itself within the limits of the stone edge/stone gutter. The edge must be free of vegetative growth.
- **6. Rake:** Gently rake stone edge/stone gutter to re-establish an even surface and even out any irregular depressions or high points (stones may have moved or shifted during the year).
- **7. Replenish:** Add new stone only if shallow and/or bare areas exist after raking has been completed. Add only enough stone to bring it to a consistent and level grade.
- **8. Record:** Make note of any unrecorded observations in the Maintenance Report Log.

Exhibit D-15. Typical Wet Pond Maintenance Activities

Frequency	Maintenance Tasks
During first year as needed	 Inspect at least twice after storm events greater than 1/2 inch of rainfall Plant the aquatic benches with emergent species Stabilize any bare or eroding areas in the CDA or pond bugger Water during growing season as needed to establish plants
4 times a year (or after major storms)	Remove debris and blockagesRepair undercut, eroded, and bare soil areasMow embankment
Twice a year	Mow buffer and pond embankment
Annually	 Shoreline cleanup to remove trash, debris, and floating items Complete maintenance inspection Open riser to access and test valves Repair broken mechanical components, if needed
Once during second year after construction	 Add pond buffer and aquatic bench reinforcement plantings as needed

Do8.4 Wetlands

The successful long-term function of constructed wetlands and wet ponds requires a combination of periodic inspections, routine maintenance, and corrective actions. This is beyond the inspector's ability and must be reported to Grounds Maintenance. Structural issues requiring further inspection and/or action by an engineer or specialized contractor may be encountered.

Permanent pools may be too low or too high. Vegetation may require managing. Excessive quantities of mosquitoes may be encountered requiring further action by a certified pesticide applicator. Always check local regulations before taking corrective measures involving chemicals. Detailed guidance may be found in the U.S. EPA Stormwater Wet Pond and Wetland Management Guidebook. Table 2.2 in this publication presents a useful list of both inspection maintenance items. Unlike many BMPs, constructed wetlands are designed to be wet most of the time. Constructed wetlands that are maintained regularly can remain healthy and functional for many years. Exhibit D-17 indicates the typical maintenance tasks for constructed wetlands.



Vacuum truck for cleaning porous pavement



Removing silt and debris from channel

Exhibit D-16. Typical Constructed Wetlands Maintenance Activities

Activities	
Frequency	Maintenance Tasks
During first year as needed	 During first 6 months inspect site twice after storm events greater than 1/2 inch of rainfall. Stabilize bare or eroding areas in the CDA around the wetland buffer with grass cover. Water plants weekly or more often depending on weather conditions. Replant dead or diseased plants.
Quarterly	 Mow embankments Inspect low flow orifices and other pipes for clogging. Check area for floating debris and undesirable plants and remove.
Twice a year	 Measure sediment accumulation in forebays and micro pools. Remove sediment deposits as needed. Monitor growth and survival of emergent wetland, tree and shrub species and note presence of invasive species Inspect stormwater inlets for damage, eroding, and under cutting. Inspect upstream and downstream banks for sloughing, erosion, or conditions undermining embankment integrity. Inspect outfall channel for erosion and undercutting. Inspect principal spillway and riser for evidence of spalling, joint failure or leakage. Ensure maintenance access is free of woody vegetation and that manholes and locks can be opened and operated. Inspect side slopes for evidence of sparse vegetation, erosion or slumping. Remove large stands of reeds and seek outside professional help to remove invasive species. Remove trash, debris, and floatables. Ensure mechanical components are functional. Inspect riser, barrel, and embankment for damage. Inspect all pipes.

Dog. Maintenance Management

Dog.1 Equipment List

The equipment list must include equipment name, size, type, and quantity. The list will demonstrate the landscape contractor's ability to meet Grounds Maintenance's requirements.

Sustainable tools and equipment reduce environmental impact and cause no physical harm to landscape maintenance workers or site inhabitants. To accomplish this, select or phase in vehicles and equipment that:

- Reduce fossil fuel use by increasing fuel efficiency
- Use hybrid or electric power
- Are water-efficient, when applicable
- Rely more on hand tools than power tools
- Mulch grass clippings in place, rather than bag and remove them

Office of Federal Sustainability's <u>Guidance for Federal Agencies on Sustainable</u>
<u>Practices for Designed Landscapes</u> (May 2017), Section XII, Operations and
Maintenance (items e, f, and g), contains a detailed list of energy efficient
qualities to select for in tools and equipment. A more concise list may be found
in the SITES™ v2, rating system checklist, Section 8.1 Operations + Maintenance,
item 6.

Dog.2 Maintaining Tools and Equipment

Establish routine periodic equipment monitoring and documentation that maintains the following:

- Keep tires properly inflated
- Lubricate moving parts
- Keep blades sharp
- Keep combustion engines tuned up
- Maintain combustion engine fluid levels

No landscape maintenance can be performed correctly without properly functioning equipment. All Tyndall AFB contractor-leased landscape and grounds equipment (the term "equipment" includes vehicles in this document) will be maintained in an efficient and safe operating condition while performing work on the base. All equipment, without exception, will have proper safety devices maintained at all times. If any equipment does not contain proper safety devices, that equipment will be removed from service, without delay, until the deficiency is corrected to the satisfaction of the Grounds Maintenance. The same is true for the unsafe operation of any equipment by personnel employed or contracted by Tyndall AFB when working on the base.

Dog.3 Quality Control

Landscape contractors will submit an effective and complete Quality Control Plan that adequately addresses requirements needed to ensure quality service. The plan will include as a minimum:

- The roles and authorities of the Quality Control personnel
- Methods to be used to identify and prevent defects before non-conforming performance occur.
- Procedures used to identify, prevent, and ensure non-recurrence of non-conforming services to include root cause analysis processes used and how corrective action plans will be developed

Dog.4 Extra Work

D09.4.1 Notification and Proposal Regarding Need for Extra Work

"Extra Work" means any work that is not set forth in the Contract. If Landscape contractor discovers that any Extra Work is necessary to maintain in a superior condition any landscape areas, irrigation systems, or drainage systems, then the contractor will notify Grounds Maintenance of the need for Extra Work as soon as is practically possible after the contractor's discovery. If Grounds Maintenance notifies the contractor that Extra Work is necessary, the contractor may submit to Grounds Maintenance an itemized, written cost proposal relating to the Extra Work. Grounds Maintenance retains the right to reject any cost proposal and to perform any Extra Work through Grounds Maintenance's forces or other contractors.



Perform routine equipment maintenance

D09.4.2 Approval Regarding Performance of Extra Work

Only if the total charge to Grounds Maintenance for Extra Work is less than \$_____ during a month, the contractor will perform the Extra Work without first getting Grounds Maintenance's approval. If the total charge to Grounds Maintenance for Extra Work is more than \$_____ during a month, the contractor will not perform the Extra Work unless Grounds Maintenance approves the Extra Work in advance and in writing.

D09.4.3 Time Frame for Beginning and Completing Extra Work

If Grounds Maintenance approves any Extra Work and unless the parties agree to a different deadline for the contractor's beginning the Extra Work, the contractor (1) will begin the work no later than _____ days after the date that the contractor receives the written approval from Grounds Maintenance and (2) complete the work in a reasonable amount of time.

D09.4.4 Coordination of Extra Work with Other Contractors

If Grounds Maintenance contracts for Extra Work to be done by someone other than the contractor, then the contractor will coordinate with the new contractor to ensure that the work is performed in a timely manner.

Dog.5 Emergency Work

D09.5.1 Emergency Contact Information

The contractor will supply to Grounds Maintenance the name and appropriate contact information, including phone numbers, of any employee responsible for emergencies. Grounds Maintenance will provide the contractor with emergency numbers for Grounds Maintenance's personnel who are fluent in English.

D09.5.2 Notification Regarding Need for Emergency Work

If the contractor discovers that Extra Work is required at the Worksite due to an emergency (Emergency Work), then the contractor will notify Grounds Maintenance of the need for the Emergency Work as soon after the contractor's discovery as is practically possible.

D09.5.3 Performance of Emergency Work

If Grounds Maintenance notifies the contractor of the need for Emergency Work, the contractor will make reasonable efforts to perform the Emergency Work in a timely manner or will notify Grounds Maintenance as soon as possible of the contractor's inability to timely perform the Emergency Work.

Dog.6 Program Management

The contractor will submit a Program Management Plan to describe the proposed management approach to the entire contract effort inclusive of a staffing plan and equipment plan. The contractor will also submit a yearly Maintenance Schedule (see sample at end of document) for approval by Grounds Maintenance.

D09.6.1 Function & Qualifications of Supervisor

The contractor will assign a supervisor to oversee any work performed at the Worksite and to act as contractor's liaison with Grounds Maintenance. The contractor will ensure the supervisor (a) inspects the Worksite daily (Monday through Friday) except on legal holidays and (b) provides direction to the contractor's employees and subcontractors. The contractor will ensure any supervisor (a) speaks, writes, reads, and understands English and (b) is capable of writing schedules and monthly reports and of noting any deficiencies that need correcting. The contractor will ensure that any supervisor has at least 3 years of landscape maintenance supervision experience.

D09.6.2 General Protection Efforts

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The contractor will use reasonable efforts to protect the worksite from damage, including all existing plant materials, structures, facilities, utilities, and natural areas, both above and below ground. As soon as possible after the contractor discovers any damage to the worksite, the contractor will report the damage to Grounds Maintenance. If the contractor causes any damage to the worksite, the contractor will, at the contractor's expense, ensure that the damaged object or area is restored to the state that it was in before the contractor caused the damage.

D09.6.3 Air Force Common Output Level Standards Transition Management

Offerors must be prepared to transition between AF COLS Levels annually and will submit a transition management plan which outlines their strategy for transitioning between levels of service. This plan will include as a minimum a detailed description of the strategy for adjusting both staffing and equipment to adjust to an increased or decreased level with approximately 6 months' notice. For instance the U.S. Government could require the contractor to transition from AF COLS Level 4 in FY19 to AF COLS Level 1 in FY20, and back to AF COLS Level 4 in FY21, or any other levels at the U.S. Government's sole discretion. As a reminder, the U.S. Government anticipates notifying the contractor of the new AF COLS Level at least 6 months prior to a level of service change via contracting officer memorandum and will formally follow up with a task order at the new level.

D09.6.4 Contaminant Spills

The contractor will use best efforts to protect Grounds Maintenance's property from chemical, fuel, oil, or other contaminant spills. If a spill occurs, the contractor will notify Grounds Maintenance and seek direction. No spill will be touched or remedy attempted without proper safety equipment, clothing, masks, or other items as required by OSHA.

Chemicals

Herbicide use is regulated and will be done with care and by certified individuals. Two of the most common herbicides are glyphosate and triclopyr (sold under a variety of brand names). Application of chemicals on woody plants is done in various ways depending on the plant. Three methods are: (1) the basal bark method, (2) the cut stem method, and (3) the foliar spraying method. Herbicide and pesticide certifications and permits may be required depending on the situation.

Environmental Cleanup

The contractor will conduct any environmental cleanup needed as a result of any chemical or fuel spill that occurs in the course of business

Blowing & Washing of Materials

The contractor will not blow or otherwise place into any storm water drain or structure any soil, chemicals, litter, mulch, soil amendments, or other materials.

D09.6.5 Policing/Morning Cleanup

The contractor will scout grounds for trash and leaf debris around all walkways, courtyards, landscape beds, lawns, and parking lots If necessary, blow or sweep debris into a pile and remove from site.

Inspect all palm trees for seedpods and palm fronds in need of removal using a pole saw. Taking care not to damage understory plantings. Sweep up debris as needed. At this time scout for spider webs in the landscape beds and trees, on lampposts and buildings.

Scout all landscape beds, brick paver walkways, and parking lots for weeds and remove them by hand.

D09.6.6 Protection of Contractor's Property

The contractor understands that Tyndall AFB is not an insurer and that the contractor is responsible for securing, safeguarding, and protecting against damage and theft the contractor's and any of the contractor's employees' or subcontractors' material and operations. Some states have their own OSHAapproved plans, which may have different or more stringent requirements.



Perform routine quality site assessments

D09.6.7 Quality Site Assessment

Weekly, the contractor's Account Manager will communicate with the property representative on any landscape issues requiring immediate attention. Standard practice is for the contractor to perform monthly inspections of the property to ensure that performance of this agreement meets the standards required by the contractor's Scope of Work and protects the overall wellbeing of the property's landscape. These inspections are called the Quality Site Assessment (QSA). The standard QSA will include maintenance tasks to be completed with completion dates along with photo-documentation. There will be no carryover items from month to month. QSA inspections will include a representative of the property.

D09.6.8 Staffing Plan

The contractor will provide a staffing plan with proposed workforce composition (to include seasonal hiring) showing labor category, contractor manning equivalents (CMEs), and associated number of hours for each functional area to meet all Grounds Maintenance requirements for the base period and all option years. The contractor may provide a staffing matrix which includes labor category descriptions and, if applicable, include information on cross utilization of CMEs across functional areas. The staffing plan will also outline what steps the contractor will take to ensure qualified personnel with the required clearance/investigations are available to satisfy the contract security requirements by for the duration of the contract vehicle.

Safety Measures and Programs

The contractor will comply with all applicable federal and state laws, ordinances, rules, regulations, and orders of any public authority, including OSHA, related to the safety of persons and protection of property. The contractor will initiate, maintain, and supervise all safety precautions and programs in connection with the landscaping services.

General Safety Resources

Avoid toxic landscape products or materials whenever possible. Crew leaders will carry documentation on emergency contacts for all crewmembers, including themselves, in the event of a medical emergency, including any known drug allergies.

Worker Safety

Every landscape maintenance worker, whether a full-time or temporary worker, has the federally protected right to a safe work environment. OSHA is the agency that sets and enforces safety standards and has specific standards for landscape and horticultural services. The contractor will adhere to personal safety standards to include ear, hand, and foot protection, power tools, respiratory protection, and more. OSHA stipulates that training must be conducted in the language spoken by workers, which means Spanish for a large segment of the local workforce.

Safety Data Sheets

Safety Data Sheets (SDSs), which were called Material Safety Data Sheets (MSDSs) until 2015, are designed to provide workers and emergency personal with the proper procedures for handling or working with a particular substance. Any chemical used in the landscape industry will have an online searchable SDS. A brief by OSHA, Hazard Communication Standard: Safety Data Sheets, explains how to read an SDS. All chemicals used for landscaping are required to be tracked through the base Hazardous Materials Office.

Dig Safe - 811

The three-digit hotline, 811: Know what's below. Call before you dig, was created to provide a nationwide, easily accessible resource for contractors, home owners, farmers, and landscape maintenance crews. The 811 call center manages requests in all 50 states.

Uniforms and Vehicles

The contractor will ensure that the contractor's employees wear uniform shirts with the contractor's name or logo clearly visible, proper shoes, and equipment required by State Safety Regulations. The contractor will ensure that uniforms are maintained in a neat and presentable condition. The contractor will ensure that each of contractor's vehicles has a readable sign stating the contractor's (a) telephone number and (b) name or logo. The contractor will ensure that all the contractor's vehicles at the worksite are in a clean and presentable condition.

Function and Qualifications of Supervisor

The contractor will assign a supervisor to oversee any work performed at the worksite and to act as the contractor's liaison with Grounds Maintenance. The contractor will ensure that the supervisor (1) inspects the worksite daily (Monday through Friday) except on legal holidays, and (2) provides direction to the contractor's employees and subcontractors. The contractor will ensure that any supervisor (1) speaks, writes, reads, and understands English and (2) is capable of writing schedules and monthly reports and of noting any deficiencies that need correcting. The contractor will ensure that any supervisor has at least 3 years of landscape maintenance supervision experience.

Use of Subcontractors

The contractor may subcontract a portion of the work once approved by Grounds Maintenance and provided security access. The contractor will ensure any subcontractor's name and qualifications are submitted to Grounds Maintenance no later than 5 days before the date the subcontractor begins working at the worksite. The contractor will supervise any subcontractor and guarantee the subcontractor's work quality and safety pursuant the Contract.





All workers are required to wear OSHA approved protective gear and clothing

Dog.7 Maintenance Program Schedule

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This Maintenance Schedule is intended to assist both contractors and Tyndall AFB Maintenance Crew in meeting its standards and guidance for maintaining the base. This form lists all required activities to maintain the base's landscape and hardscape as outlined in this section. Each line corresponds to the various required tasks and is based on number of times per week the task would be performed per month in a typical calendar year. Because each year the number of weeks vary from month to month the times per month will change each calendar year.

Each contractor is expected to complete the following actions in addition to the guidance provided in **this Landscape Master Plan**:

- 1. Comply with all other regulations and policies defined by the UFC, IFS, AFICS, IDP, and other documents and procedures provided by Tyndall AFB staff
- 2. Coordinate all maintenance work with Tyndall AFB to ensure compliance with current and future planned improvements and to reduce re-work due to lack of coordination

Exhibit D-17. Tyndall AFB Monthly Maintenance Program Schedule

Softscape Service Description	Visits	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ОСТ	NOV	DEC
Mow Turf Areas (Weekly)	42	2	3	4	4	4	4	4	4	4	4	3	2
Mow Native Planted Areas (Annually)	4	0	0	0	0	0	0	0	0	0	0	2	2
Mow Strip (5 ft sides of Trails, Walks; 2 ft Roads, Medians)	20	1	1	2	2	2	2	2	2	2	2	1	1
Edge Sidewalks, Curbs, Building mow strips	40	2	2	3	4	4	4	4	4	4	4	3	2
Back Pack Blow/Clean-up Vegetative Debris	40	2	2	3	4	4	4	4	4	4	4	3	2
Ballfield Maintenance	38	1	2	4	4	4	4	4	4	4	4	2	1
General Site Litter Control	48	4	4	4	4	4	4	4	4	4	4	4	4
Weekly Weed Control Shrub and Planting Beds	32	0	0	2	4	4	4	4	4	4	4	2	0
Shrub Pruning	8	0	0	1	1	1	1	1	1	1	1	0	0
Turf Fertilization	3	0	0	1	0	0	1	0	0	1	0	0	0
Pre-emergent Turf Weed Control	3	0	1	0	0	0	1	0	0	0	0	1	0
Tree & Shrub Fertilization	2	0	0	1	0	0	0	0	0	0	1	0	0
3 inch Mulch Application Shrub Beds, Tree Rings	2	0	1	0	0	0	0	0	1	0	0	0	0
Spot-Treat Fire Ant Control	4	0	0	1	0	1	0	1	0	1	0	0	0
Ground Cover Fertilization	1	0	0	1	0	0	0	0	0	0	0	0	0
Cut Back Ornamental Grasses	1	0	0	0	0	0	0	0	0	0	1	0	0
Cut Back Perennials	1	0	1	0	0	0	0	0	0	0	0	0	0
Seasonal Color Planting	3	0	1	0	0	0	1	0	0	0	1	0	0
Leaf Removal	6	1	1	1	0	0	0	0	0	0	0	2	1
Disease Control Lawns, Trees, Shrubs	3	0	0	1	0	0	1	0	0	1	0	0	0
Limb Up Tree Canopies to 7 ft.	2	0	0	0	1	0	0	0	0	0	1	0	0

D. Long-Term Maintenance Landscape Master Plan Tyndall Air Force Base

Exhibit D-17. Tyndall AFB Monthly Maintenance Program Schedule (continued)

Softscape Service Description	Visits	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ОСТ	NOV	DEC
Plants Insect Control	7	0	0	0	1	1	1	1	1	1	1	0	0
Spray for Mosquitoes	4	0	0	1	0	1	0	1	0	1	0	0	0
Litter Pickup	15	2	1	1	1	1	1	1	1	1	1	2	2
Clean & Sweep Parking Lots	12	1	1	1	1	1	1	1	1	1	1	1	1
Weed Control for Aquatic Planting Zones	10	0	1	1	1	1	1	1	1	1	1	1	0
Maintain Security Fences/Firebreaks	24	2	2	2	2	2	2	2	2	2	2	2	2
Lawn Renovation (as requested)	0	0	0	0	0	0	0	0	0	0	0	0	0
Emergency Tree and Stump Removal (as requested)	0	0	0	0	0	0	0	0	0	0	0	0	0
Emergency Tree Pruning (as requested)	0	0	0	0	0	0	0	0	0	0	0	0	0
Emergency/Special Event Services (as requested)	0	0	0	0	0	0	0	0	0	0	0	0	0
Weekly Quality Control Inspections by Manager	44	2	2	3	4	5	4	4	5	4	5	4	2
Hardscape Service Description	Visits	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	ОСТ	NOV	DEC
Porous Pavement Vacuuming	1	0	0	0	1	0	0	0	0	0	0	0	0
Porous Pavement Power Washing	0.3	0	0	0	0.3	0	0	0	0	0	0	0	0
Porous Paver Maintenance (Restoring Aggregate)	0.3	0	0	0	0.3	0	0	0	0	0	0	0	0
Stormwater Structure Inspection and Cleaning	2	0	0	1	0	0	0	0	0	0	1	0	0
Inlet Filter Insert Cleaning or Filter Insert	4	0	1	0	0	1	0	0	1	0	0	1	0
Swale, Ditch, Channel, Dry Pond Cleaning	1	0	1	0	0	0	0	0	0	0	0	0	0
Site Furnishings Cleaning	4	1	0	0	1	0	0	1	0	0	1	0	0
Concrete Paver Pressure Washing	4	1	0	0	1	0	0	1	0	0	1	0	0
Security Fencing and Gates	0	As note	d in UFC										
Asphalt and Concrete Pavement Maintenance and Repair	0	As note	d in UFC										
Light Pole Cleaning	1	0	0	1	0	0	0	0	0	0	0	0	0
Power Wash Building Facades	1	0	0	0	1	0	0	0	0	0	0	0	0
Clean Signs	2	0	0	0	1	0	0	0	0	1	0	0	0
Total Visits	515												

Dog.8 Sample Maintenance Report Log

The contractor must submit weekly report logs to Grounds Maintenance Manager for all items in the Monthly Master Schedule completed each week. Below is a sample of what will be submitted.

Exhibit D-18. Sample Maintenance Report Log

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Task Number:	Weather Conditions:
Location Name:	
Task Code:	100 house 190 hours 2000 120 house 2000 120 hours 100 100 100 100 100 100 100 100 100 10
Task Start Date:	S CHARLESCOLOGICA CONTROL (** ** **) PROSECT CONTROL C
Task End Date:	Personnel/Task End Time:
Labor Personnel Name:	
Tools Used:	Item No:
Broom	
Flat	
Shovel	
Rake	
Dust Pan	
Other:	
Other:	
Materials Used: Plastic Bag	
Other:	 Item No Qty:
Other:	Item No Qty:

	raint priotos il tiecessary) la	sk Code:
Vacuum Type/Manufact	urer	
Hour Meter Start:	Hour Meter End:	Number of Passes:
Weight/Amount of Mate	rial Collected (# bags x pou	nds or gallons/bag):
Description of Collected	Materials:	
Description of Vacuume	d Materials:	
Notes:		
A		
Amount of Aggregate Us	sed to Refill Voids:	
Notes:		
Notes:REFILLING EDGE MAINT	ENANCE (Please submit pho	
Notes:	ENANCE (Please submit pho verstone and Amount of We	otos if necessary) Task Code:
Notes:	ENANCE (Please submit pho verstone and Amount of We iverstone? (YES/NO):	otos if necessary) Task Code:eed Growth:
REFILLING EDGE MAINT Existing Conditions of Ri Weeds Removed from Ri Type/Specification of Riv	ENANCE (Please submit pho verstone and Amount of We iverstone? (YES/NO): verstone Used to Replenish	otos if necessary) Task Code:eed Growth:

D. Long-Term Maintenance Landscape Master Plan Tyndall Air Force Base



