Table 2-11: Based Aircraft Baseline Forecast

Year	Single	Multi	Jet	Rotor	Total	TAF	FAA
2015	74	13	16	30	133	133	133
2020	74	13	19	33	139	133	136
2025	75	15	22	35	147	133	138
2035	75	17	26	38	156	133	144

Source: McFarland Johnson, 2015

2.8. AIRCRAFT FLEET MIX

In addition to the number of airline enplanements and operations at TTN, is the size and make up of aircraft fleet serving the market is an important planning consideration. Forecasting the fleet mix permits planners to estimate the need for airport facilities in terms of runway length, strength, and terminal building requirements. The future aircraft fleet mix for TTN can be found in Table 2-12.

Table 2-12: Aircraft Fleet Mix

Category	Existing (2015)	Future (2035)
Commercial Service	Airbus 319	Airbus 319/320 NEO
		Embraer 175/190 E2
		CRJ 700/900
	12.2%	13%
General Aviation Itinerant	Piper Navajo (PA-31)	Pilatus PC-12
	Citation Excel (525)	Citation Latitude
	Hawker 800	Gulfstream VI
	47.4%	48.3%
General Aviation Local	Cessna 172	Cessna Skycatcher
	Piper Cherokee (PA-28)	Cirrus SR22
	Mooney 20J	Diamond DA42
	37.9%	36.7%
Other	C-130 (Military)	C-130J (Military)
	Sikorsky S76	Sikorsky S76
	2.5%	2.0%

Source: McFarland Johnson, 2015

2.8.1. General Aviation Passengers

General aviation passengers are defined as those traveling to/from TTN (itinerant) using general aviation facilities (excluding pilots). Unlike commercial airline passengers and charters, this number is not accounted for nor quantified by either the FAA or the airport. A planning factor of 2.5 passengers per itinerant general aviation operation is used for airports similar to TTN. General aviation passengers at TTN include those utilizing pharmaceutical flight departments located at the airport.

Assuming half of all itinerant general aviation operations use FBO facilities, this equates to approximately 57,626 annual general aviation passengers, or roughly 157 per day will utilize FBO facilities at TTN. This passenger activity level is not counted towards to commercial passenger enplanements total and is meant to be used in the planning and sizing of general aviation facilities.

2.9. FORECAST SUMMARY AND COMPARISON

Table 2-13 presents a summary of the aviation demand forecasts at TTN. These forecasts are considered reasonable and achievable and will be used throughout the Master Plan Update in the development of facility requirements and the identification of alternatives.

Table 2-13: Aviation Demand Forecast Summary

	Actual 2014	FORECAST		
		2020	2025	2035
ENPLANEMENTS				
Airline	377,544	358,728	396,358	476,507
Peak Hour	276	345	414	490
AIRCRAFT OPERATIONS				
Air Carrier/ Air Taxi	9,599	10,239	10,895	12,364
General Aviation				
GA Itinerant	37,157	39,200	40,984	46,101
GA Local	29,716	30,961	32,264	35,019
Military	1,791	1,791	1,791	1,791
Total Operations	78,263	82,191	85,934	95,275

GENERAL AVIATION				
Airport Based Aircraft	133	139	147	156
Single	74	74	75	75
Multi	13	13	15	17
Jet	16	19	22	26
Rotor	30	33	35	38

Source: McFarland Johnson, 2015

2.9.1. Comparison with FAA Terminal Area Forecasts

As a check on reasonableness, Master Plan aviation forecasts are often compared with other aviation forecasts prepared for the airport and the region. Ideally, this report's forecasts should be reasonably consistent with other forecasts of future airport activity, and compatible with forecasts for the larger region. With Master Plan forecasts being much more specific to the airport, it is not unusual to see some variation from national forecasts. The most useful forecasts for comparison are those prepared by the FAA – the TAF and the national and regional forecasts previously references in this report. The TAF is prepared annually, and includes airport forecasts for all active NPIAS airports. The TTN forecast is available on an FAA website (http://www.apsm.faa.gov/). The table below, **Table 2-14**, visually displays the compared results between this forecast with that of the FAA's TAF.

The comparison shows that the results of the Master Plan forecast are within the allowances permitted by the FAA (10% within 5 years; 15% within 10 years) and is considered reasonable for planning purposes. As previously mentioned, small-hub and non-hub airports that have a tertiary proximity to a large-hub airport tend to be highly volatile in nature. Facility improvements associated with passenger enplanements may want to consider constructing in advance of the forecast years to avoid temporary facilities required from a short term spike in demand.

2.10. FUTURE DESIGN AIRCRAFT

The Runway Design Code (RDC) used in airport planning is derived from the features of the most demanding aircraft using the airport on a regular basis coupled with the best available instrument approach minimums. The first component, depicted by a letter, is the Aircraft Approach Category (AAC) and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the Airplane Design Group (ADG) and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive. The third component relates to the visibility minimums expressed by Runway Visual Range (RVR) values. **Table 2-15** displays the RDC criteria used in airport planning.

Table 2-14: Aviation Demand Forecast versus FAA Terminal Area Forecasts

Forecast/Component	Est 2016	FORECAST			Growth Rate[1]
		2020	2025	2035	
FAA TAF					
Enplanements	314,665	341,915	374,375	440,145	1.99%
Total Aircraft Operations	80,626	81,452	82,473	84,560	0.24%
Master Plan Forecast					
Enplanements	314,665	358,728	396,358	476,507	2.57%
Operations	78,263	82,191	85,934	95,275	1.09%
Percent Difference From TAF					
Enplanements		4.92%	5.87%	8.26%	
Operations		0.92	4.2%	12.67%	

[1] Average Annual Compound Growth Rate 2015-2035
Sources: FAA TAF, 2014 and McFarland Johnson, 2015

The most demanding aircraft to use TTN on a regular basis is the Frontier Airbus A319 which currently flies from TTN to Orlando, Fort Myers, Chicago, Charlotte, Raleigh/Durham, Detroit, Saint Augustine, Minneapolis, and Atlanta on a weekly basis. Frontier Airlines' fleet consists of A319 and A320 aircraft and it has 18 Airbus A319neo (new engine option), three (3) A320, 62 A320neo, and 19 A321 aircraft on order and are anticipating deliveries starting in 2015.

In November 2016, Allegiant is starting Airbus A320 year-round service from Trenton to Orlando Sanford, Punta Gorda, and St. Petersburg. This will make the Airbus A320 the design aircraft as it will have 728 annual operations.

With the new Allegiant A320 service, and the Frontier order for A320neo aircraft, the A320neo will be considered as the future critical design aircraft. The primary difference between the A320 and A320neo as it relates to TTN airport operations is the increased wingspan.

Table 2-16 shows 2014 operations by the largest aircraft. The A320/A320neo may have the same runway and taxiway design code criteria as the A319/A319neo, but it requires a longer landing length. Table 2-17 presents the A320's design details.

The A320 will be used for future design aircraft in this analysis. Other aircraft that can be accommodated include: Boeing 737-700, Boeing 737-800, Boeing 717-200, Bombardier C-Series,

Embraer 190 and all other regional aircraft. The larger Airbus 320 and/or Boeing 737-800 is capable of TTN operations depending on the operator, engine type and stage length. In addition, while detailed specifications are not currently available it is anticipated that the Airbus A320neo and Boeing 737 MAX family of aircraft can also be accommodated within the specified design characteristics.

At 4,800 ft the crosswind runway is too short to support commercial operations. A review of based aircraft records indicates that there are 10 based Gulfstream IV/V/VI (also Group III) series aircraft at the airport which conduct nearly 1,300 annual operations. These jets typically require 5,000-5,500 ft of runway for takeoff, and in many cases will use the primary runway. During crosswind conditions for less demanding missions, and crosswind landings during most weather conditions that do not warrant an ILS approach, these operations can, and often use the crosswind runway. In addition, the Gulfstream V serves as the design aircraft for the recently installed EMAS beds for Runway 16-34. The facility requirements chapter will have a greater discussion on the runway length requirements, but the existing based aircraft roster combined with the operations forecast warrant a C-III designation for both runways at TTN.

Table 2-15: Runway Design Code Characteristics

Aircraft Approach Category (AAC)	
Category	Approach Speed
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speed 166 knots or more

Airplane Design Group (ADG)	
Group	Tail Height (and/or) Wingspan
I	< 20′ // < 49′
II	20′ - < 30′ // 49′ - < 79′
III	30′ - < 45′ // 79′ - < 118′
IV	45′ - < 60′ // 118′ - < 171′
V	60′ - < 66′ // 171′ - < 214′
VI	66′ - < 80′ // 214′ - < 262′

Visibility Minimums (VIS)	
RVR (FT)	Flight Visibility Category (statute mile)
VIS	Visual Approaches
4000	Lower than 1 mile but not lower than ¾ mile (APV ≥ 3/4 but < 1 mile)
2400	Lower than 3/4 mile but not lower than 1/2 mile (CAT-I PA)
1600	Lower than 1/2 mile but not lower than 1/4 mile (CAT-II PA)
1200	Lower than 1/4 mile (CAT-III PA)

Source: FAA AC 150/5300-13A

Table 2-16: Critical Aircraft

Select C-III Operations	Annual
Airbus A319	6,145
Airbus A320	10 (728 in 2017)
Gulfstream V/G500	1,299
TOTAL	7,454
Category D Operations	**Annual**
Boeing 737-800	8
TOTAL	8

Source: McFarland Johnson, 2015

Table 2-17: Design Aircraft

Characteristic	Airbus 320NEO
Approach Category	C
Airplane Design Group	III
Taxiway Design Group	3
Length	123.3 feet
Cockpit to Main Gear	50.2 feet
Wingspan	117.5 feet
Tail Height	39.6 feet
Approach Speed	136
Seats	150-186

Source: AC 150/5300-13 and Airbus.com

3. Environmental Overview

3.1. INTRODUCTION

The operation and development of an airport has the potential to affect neighboring land-uses, natural, and human environments, which are of fundamental concern in the airport planning process. Therefore, it is imperative to identify the resources and potential impacts to the environment and surrounding community during the initial stages of the planning process. This allows airport planners and engineers to incorporate measures in accordance with federal, state, and local rules and regulations to avoid, minimize or mitigate potential impacts to the environment.

The National Environmental Policy Act (NEPA) of 1969 requires that all federal agencies consider the potential impacts their projects and policies have on the environment. The FAA, an agency of the United States Department of Transportation (USDOT), has issued Order 1050.1F, *Environmental Impacts: Policies and Procedures* (Effective Date July 17, 2015), which ensures all FAA actions comply with NEPA. The FAA has also issued Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions* (Effective Date April 28, 2006). FAA Order 5050.4B guides NEPA compliance specifically for major federal actions at public-use airports.

FAA Orders 1050.1F and 5050.4B identify environmental categories that must be considered in relation to a proposed action to determine whether a significant impact would result, and determine what actions would be appropriate to avoid or minimize an impact's effect. FAA Order 1050.1F specifies the threshold of significance for each of the categories addressed.

The following is a list of environmental impact categories identified in Order 1050.1F that may be applicable to FAA actions:

- Biological resources (including fish, wildlife and plants)
- Water resources (including wetlands, surface waters, wild and scenic rivers, floodplains, and groundwater)
- Coastal resources
- Department of Transportation Act, Section 4(f)
- Historical, architectural, archeological, and cultural resources
- Farmlands
- Land use
- Noise and noise-compatible land use
- Visual effects (including light emissions)
- Air quality
- Hazardous materials, solid waste, and pollution prevention
- Natural resources and energy supply
- Climate
- Socioeconomics, environmental justice, and children's environmental health and safety risks

This chapter provides a summary of the environmental conditions and constraints at the Trenton-Mercer Airport (TTN). The information provided in this chapter will be carefully considered as part of the Alternatives Analysis that will be completed for this Master Plan Update (MPU). Future airport development proposed in the MPU will be reviewed in further detail in the subsequent environmental documentation to satisfy the requirements of NEPA. The information provided in this chapter is based on information obtained from appropriate federal, state, and local agencies along with data collected during field investigations.

3.2. BIOTIC RESOURCES

Biotic resources refer to the various types of flora (plants) and fauna (fish, birds, reptiles, amphibians, mammals, etc.), including state and federally listed threatened and endangered species, in a particular area. It also encompasses the habitats supporting the various flora and fauna including rivers, lakes, wetlands, forests, and other ecological communities. Airport projects can affect these ecological communities and thereby affect vegetation and wildlife populations.

3.2.1. Ecological Communities

Most of the Airport and adjacent areas have been significantly disturbed by past Airport construction and the surrounding residential and commercial development. The majority of the habitat at the Airport consists of maintained grassland, wetlands and drainages, interspersed with paved airfield surfaces. The Airport Operations Area (AOA) consists primarily of grasslands dominated by grasses and forbs that are mowed frequently.

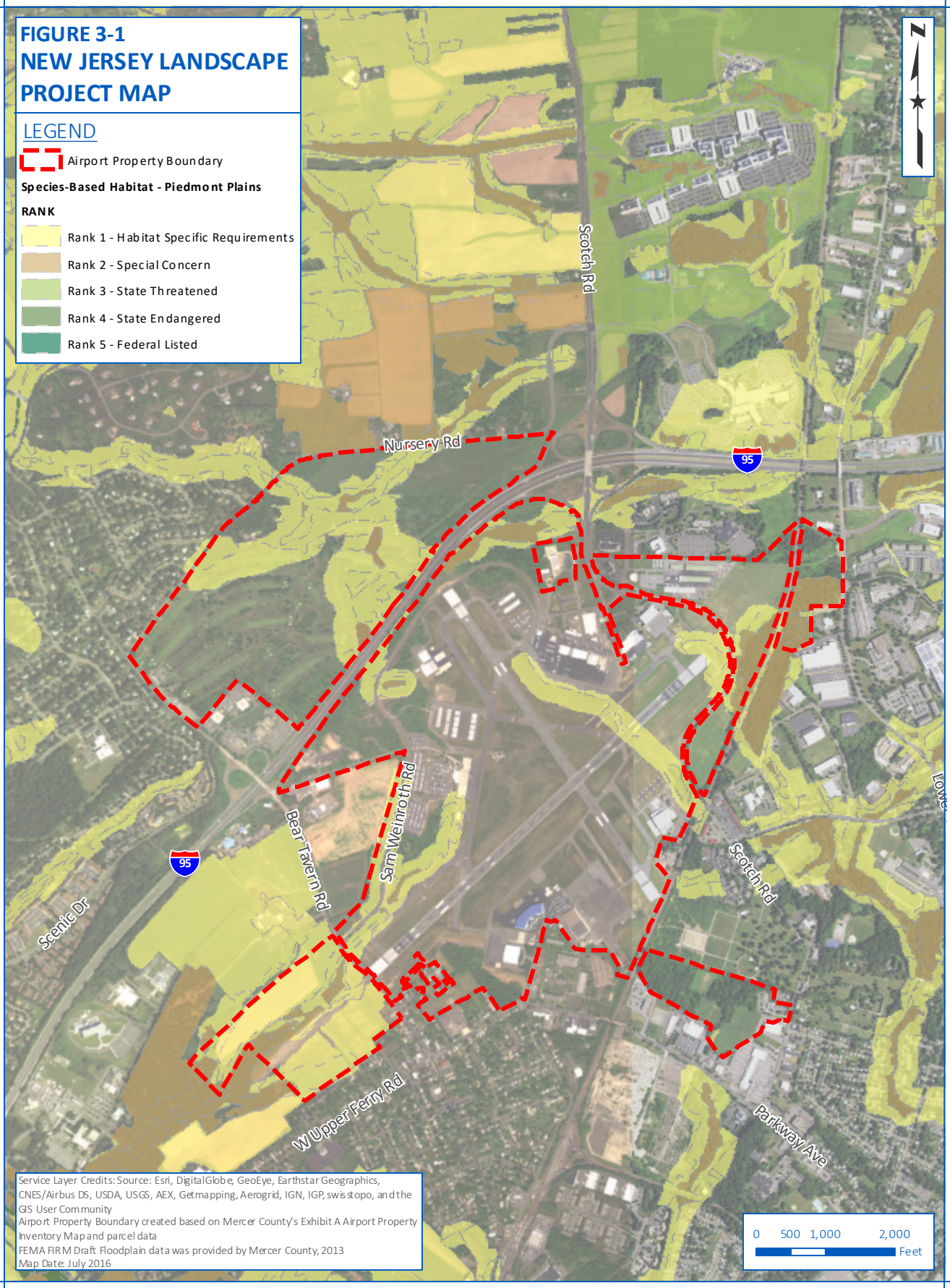
All habitats identified at the Airport are common and secure within the region.

According to NJ's Landscape Project the TTN property has been determined to contain the following vegetation classifications which are depicted on **Figure 3-1**.

- Rank 1 Habitat Specific Requirements
- Rank 2 Special Concern

In general, this ranking system is created by review of aerial photography and habitat type extracted from the New Jersey Department of Environmental Protection (NJDEP) Land Use/Land Cover (LU/LC) geographic information system data layer. Each habitat patch, identified by aerial photograph review, is delineated and assigned a unique identification number. Habitat patches are classified or ranked based upon the status of the particular species that is assumed to be present.

FIGURE 3-1
NEW JERSEY LANDSCAPE PROJECT MAP



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In addition, correspondence from the NJDEP Office of Natural Lands Management states that the New Jersey Natural Heritage Program (NHP) Database and the NJDEP Division of Fish and Wildlife (NJDFW) Landscape Project had records of potential vernal pool habitat on and in the immediate vicinity of the Airport. Potential vernal pool habitat areas were identified by Rutgers University Center for Remote Sensing and Spatial Analysis (CRSSA). However, not all potential vernal pool habitat sites/areas have been field checked by the NJDEP. The NJDEP GeoWeb indicates that the potential vernal pool habitat on Airport property is located north of the terminal building.

Vernal ponds are bodies of water that appear following snow melt and during spring rains but which disappear or are dry during the rest of the year. They are highly important sites for certain rare species of amphibians. A survey of the potential vernal pool habitat would be needed to determine the exact boundary and what species may be present. A Vernal Habitat Assessment of the area mapped as potential vernal habitat was conducted in Spring 2015 in accordance with NJDEP's Division of Land Use Regulation Freshwater Wetlands Vernal Habitat Protocol. The habitat assessment determined that the area does not contain habitat characteristics consistent with vernal pool classification. The area was delineated as a depressional wetland dominated by emergent vegetation.

There are no other habitats located on the Airport that are designated as "critical habitat" for any state or federally listed threatened or endangered species, or species of special concern. State or federally listed threatened or endangered species or species of special concern are discussed in Section 3.2.2.1. Further information regarding state and federally regulated waterways and wetlands is presented in Sections 3.3.2 and 3.3.3.

Further information on potential rare, threatened and endangered species is provided in the following sub-section.

3.2.2.1 Threatened and Endangered Species

The Endangered Species Act (ESA) directs all federal agencies to work to conserve federally listed endangered and threatened species and to use their authorities to further the purposes of the ESA. Section 7 of the ESA, titled "Interagency Cooperation," is the mechanism by which federal agencies ensure the actions they take, including those they fund or authorize, do not jeopardize the existence of any federally listed species. Endangered species are those which are in danger of extinction throughout their range or a significant portion of its range. Threatened species are those which are likely to become endangered within the foreseeable future throughout all or a significant portion of their range. Candidate species are species for which the United States Fish and Wildlife Service (USFWS) has sufficient information on the biological vulnerability and threats to support issuance of a proposal list, but issuance of a proposed rule is currently precluded by higher priority listing actions. Candidate species do not receive substantive or procedural protection under the ESA. However, USFWS does encourage federal agencies and other appropriate parties to consider these species in the planning process.

New Jersey protects threatened and endangered species and their habitats under the NJ Endangered and Non-Game Species Conservation Act N.J.A.S. 23:2a 1-15. This legislation manages a variety of wildlife species indigenous to New Jersey that have been found to be threatened or endangered and therefore are accorded special protection in order to maintain

and to the extent possible enhance their populations. Under NJ rules, an endangered species is one that has had its prospects of survival or recruitment in jeopardy or likely to be so within the foreseeable future due to the destruction, drastic modification, or severe curtailment of its habitat; over-utilization for scientific, commercial or sporting purposes; reduced in significant numbers by disease, pollution, or predation; other natural or manmade factors affecting its survival within the state; or is a federally listed endangered species or subspecies. Nongame species protected by NJ include any wildlife for which a legal hunting or trapping season has not been established or which has not been classified as an endangered species by statute or regulation by New Jersey. Consultations with the appropriate state agencies are also made in preparation of a project in order to avoid impacts to state listed species of concern and their habitats.

Correspondence from the NJDEP Office of Natural Lands Management – Natural Heritage Program states that the New Jersey Natural Heritage Database and the NJDEP Division of Fish and Wildlife (NJDFW) Landscape Project (Version 3.1) had records of occurrences of rare wildlife species on the Airport property and within ¼ mile of the Airport property (see Table 3-1 below). The letter also provided a list of rare plant species and ecological communities that have been documented in Mercer County. If suitable habitat is present at an Airport's project site, the species on the list may potentially be present. The letter and rare plant species and ecological communities list are provided in Appendix A - Agency Correspondence: *NJDEP Office of Natural Lands Management, May 16, 2016.*

The NJDEP GeoWeb indicates the northern, eastern and southern portions of the Airport property contain habitat areas that are listed as "foraging habitat" for a species of special concern, the Great Blue Heron (*Ardea herodias*). In addition, habitat areas on the southern portion of the Airport property, off of the Runway 6 end, are listed as "breeding sighting" habitat for the Cooper's Hawk (*Accipiter cooperii*). A majority of the above habitat areas are associated with wetlands and riparian corridors. Both the Great Blue Heron and Cooper's Hawk are listed with the State as Rank 2, species of Special Concern. The NJDEP Landscape Project also identifies riparian corridors, streams and riparian habitats, on Airport property that may be essential to imperiled and special concern wildlife. One riparian corridor identified bisects the northern portion of the airfield at TTN. The potential habitat areas for the Cooper's Hawk, Eastern Meadowlark (*Sturnella magna*) and Great Blue Heron are shown on **Figure 3-1**.

An Official Species List from the USFWS was obtained on June 1, 2016 and is also included in Appendix A. The list, as shown in **Table 3-1**, indicates that there are two listed species under the ESA within the vicinity of the Airport; the threatened northern long-eared bat (*Myotis septentrionalis*) and the endangered Indiana bat (*Myotis sodalis*). The correspondence also indicated that there are no critical habitats on Airport property.

Table 3-1: Threatened and Endangered Species On and In the Vicinity of the Airport

Common Name	Scientific Name	State/Federal Status
Cooper's Hawk	Accipiter cooperii	Special Concern/Not Listed (Breeding/Sighting)
Eastern Meadowlark	Sturnella magna	Special Concern/Not Listed (Breeding/Sighting)
Great Blue Heron	Ardea Herodias	Special Concern/Not Listed (Foraging)
Northern Long-Eared Bat	Myotis septentrionalis	Not Listed/Threatened
Indiana Bat	Myotis sodalis	Endangered/Endangered

Source: NJ DEP and USFWS Official Species List – Consultation Code: 05E2NJ00-2016-SLI-0562.

During summer months, northern long-eared bats and Indiana bats roost singly or in colonies beneath bark, in cavities, or in crevices of both live and dead trees, typically greater than 3 inches in diameter. Suitable roosting habitat for northern long-eared bats and Indiana bats is potentially present in the forested and treed areas on the County owned property. Northern long-eared bats and Indiana bats may also transit other portions of County owned property for foraging or other transient purposes.

As specific airport development alternatives are identified and considered, the potential to affect state or federally listed rare, threatened and endangered species will be re-assessed on an individual basis and in consultation with the NJDEP, USFWS and FAA.

3.3. WATER RESOURCES

This section discusses potential affects to water resources including groundwater, wetlands, surface waters (streams, rivers, ponds, and lakes), and floodplains.

3.3.1. Groundwater

Groundwater serves as an important potable water supply for many individual households, small communities, and larger municipalities. Potential impacts from airport development projects can include reduced groundwater recharge and potential contamination through chemical, toxin or other pollutant releases.

The Environmental Protection Agency (EPA) Sole Source Aquifer (SSA) program was established under the Safe Drinking Water Act (SDWA). According to the EPA, a SSA is defined as one that supplies at least 50 percent of the drinking water for its service area, and wherein which there is no reasonably available alternative drinking water sources should the aquifer become

contaminated. The SSA program allows for EPA review of federally funded projects that have the potential to affect designated SSAs and their source areas.

According to the NJDEP GeoWeb (http://www.nj.gov/dep/gis/geowebsplash.htm), Airport areas outside of the airfield are designated as groundwater recharge areas. A majority of the groundwater recharge rates surrounding the Airport are 8-10 in/year and 11-15 in/year. A few areas on the outskirts of the Airport property have a groundwater recharge rate of 1-7 in/year. The western portion of Airport property is located over the Coastal Plain SSA while the eastern portion of the Airport property is not located over a SSA.

According to the NJDEP GeoWeb, there are no community or non-community water supply wells on Airport property. However, a non-community well and Non-Community Wellhead Protection Area is located immediately northeast of the Airport property. A Wellhead Protection Area (WHPA) for a Public Non-Community Water Supply Well (PNCWS) in New Jersey is a calculated area around a well that delineates the horizontal extent of ground water captured by the well pumping at a specific rate over a two-, five-, and twelve-year period. Sole Source Aquifers and Wellhead Protection Areas are depicted on **Figure 3-2**.

If a project requires the disturbance of any historic fill within the infiltration area of an identified potable water well, the fill material must be analyzed as directed under N.J.A.C. 7:26 and the NJDEP requires a ground water investigation under N.J.A.C. 7:26E-3.12(c) and N.J.A.C. 7:26E-4.6(b)6.

3.3.2. Wetlands

The United States Army Corps of Engineers (USACE) regulates activities in wetlands that have a significant nexus to Traditional Navigable Waters of the United States (TNWs) under Section 404 of the Clean Water Act (CWA). The USACE requires that an area have hydrophytic vegetation primacy, hydric soils, and wetland hydrology present in order to be considered a wetland.

A set of Nationwide Permits (NWP) has already been authorized for projects that have already been deemed to have minimal environmental impacts. Larger projects that may have significant environmental impacts require an Individual Permit. Fundamentally, Section 404 permits cannot be authorized for the dredging of materials or the discharge of dredged or fill material into these waters if there is a practicable alternative that would be less damaging to the aquatic resources or if significant degradation would occur to federally regulated waters of the U.S. Permit review and issuance encourages avoidance of impacts, followed by minimizing impacts and, finally, requiring mitigation for unavoidable impacts to the aquatic environment.

The State of New Jersey NJDEP has been authorized by the federal government to administer the CWA Section 404 Permitting Program in delegable waters, as defined at N.J.A.C. 7:7A-1.4. In non-delegable waters, including but not limited to; Delaware River, Greenwood Lake and Hackensack Meadowlands Development Commission jurisdictional waters, the USACE retains jurisdiction under federal law. In addition, the state also protects wetlands under its own Freshwater Wetlands Protection Act, N.J.S.A. 13:9B (FWPA). In New Jersey regulations are referred to as Rules. The Rules based on the NJFWPA are enforced under the Freshwater Wetlands Protection Act Rules, N.J.A.C. 7:7A. Therefore, the FWPA permitting program satisfies the federal CWA Section 404 requirements. NJDEP administers the state's FWPA's permitting program that

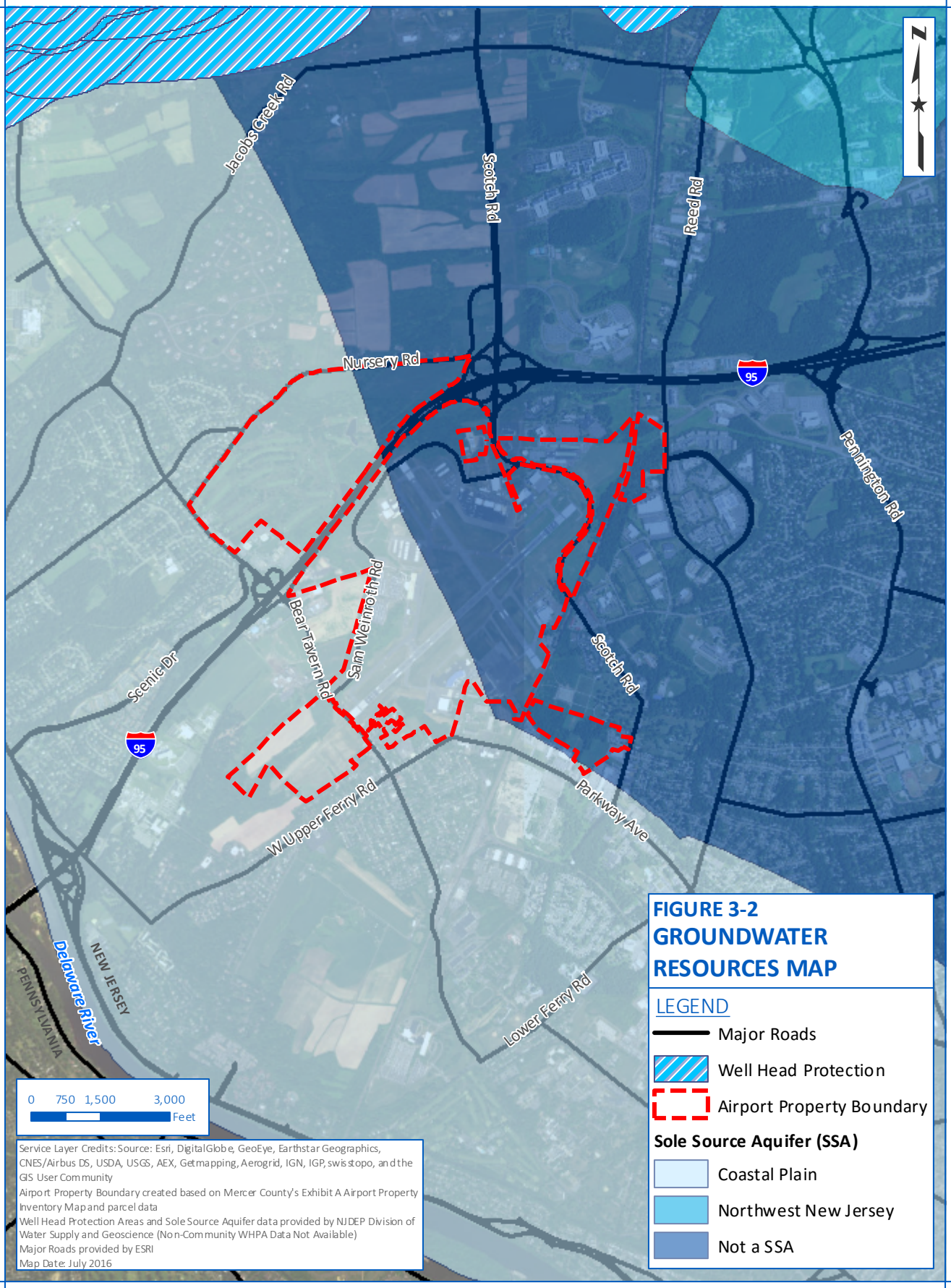
regulates all activities in freshwater wetlands, as well as in "transition areas", which are upland buffers adjacent to the wetlands under N.J.S.A. 13:9B-1.

FWPA Rules 7:7A-2.4 direct that the NJDEP to classify freshwater wetlands as "exceptional," "intermediate," or "ordinary" resource values. Wetlands classified as exceptional resource values are those that discharge into Freshwater-1 (FW-1) or FW-2 trout production waters and the tributaries. However, an exceptional value wetland designation can also be given to an ecosystem that currently or historically has been documented as providing suitable breeding, resting or foraging habitat for state threatened or endangered species. Documented evidence of species habitation or past utilization may include, but is not limited to, sightings of the species or its sign (skin, scat, shell, track, nest, herbarium records, identification of its call, etc.). NJDEP may also make a finding that the area remains suitable for use by a specific species during normal periods when the species would use the habitat. Under FWPA Rules 7:7A-2.5(c), (d), and (e), a 150 foot wetland transition area from the edge of a wetland of exceptional value is regulated. Exceptional value areas are subject to a higher burden of proof during the permit review process requiring the necessity weighing of the project impact against a compelling public need, extraordinary hardship, or the lack of any other alternative available to the project sponsor. Intermediate resource value wetlands have a transition area of 50 feet, while a transition area is not required adjacent to wetlands of ordinary resource value. Ordinary resource value wetlands are wetland ditches and swales.

TTN's facilities are surrounded by undeveloped uplands and wetlands inhabited by various species of flora and fauna. A wetland delineation completed in May-June 2015 determined that 51 acres of the Airport's 1,345 acres are wetlands. The Wetland Delineation Report is included in Appendix B. The official jurisdictional statuses and boundaries for all wetlands will need to be determined by the NJDEP. National Wetlands Inventory (NWI) mapping prepared by the USFWS indicated several large forested/shrub wetland areas along the outer edge of the Airport property, as well as a few emergent wetlands and ponds on the associated with the Mountain View Golf Course. Most wetland areas appear to be associated with the Delaware River, Ewing Creek and West Branch Shabakunk Creek tributaries located on the Airport property. NWI mapping does not have any regulatory consequence, but rather indicates areas that may meet federal wetland criteria as identified by the USFWS using aerial photography.

The locations of the delineated wetlands, along with NWI mapped wetlands are shown in **Figure 3-3**.

The FWPA requires the NJDEP to regulate virtually all activities proposed in wetlands and their transition areas, including cutting of vegetation, dredging, excavation or removal of soil, drainage or disturbance of the water level, filling or discharge of any materials, driving of pilings, and placing of obstructions. It is possible that previous activities on the Airport have already cumulatively affected over one acre of these regulated areas and therefore most future activities in proposed in wetlands would require an Individual Permit as opposed to NJDEP's Statewide General Permit program.



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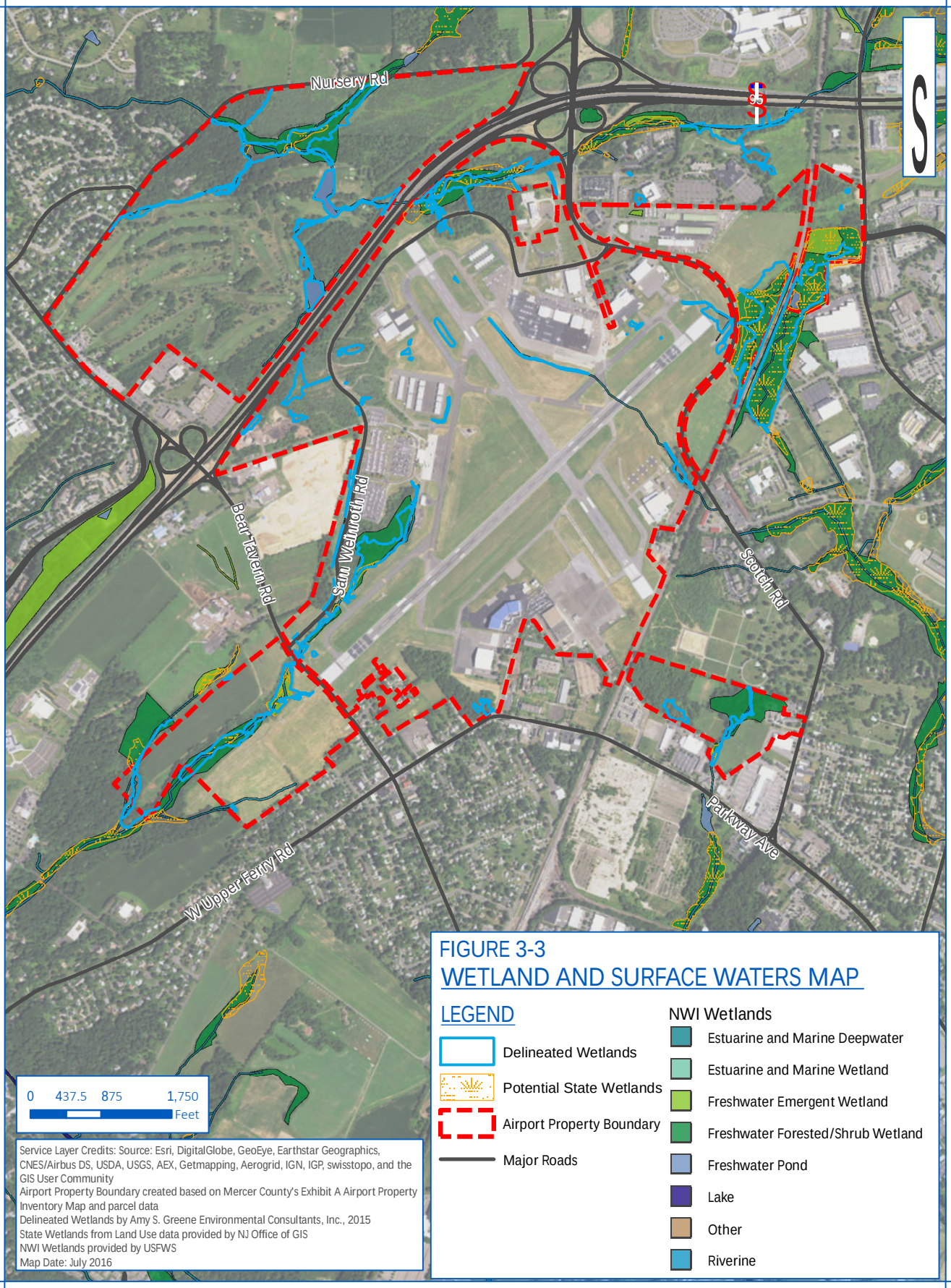

Service Layer Credits: Source: Esri, DigitalGlobe, GeoEye, Earthstar Geographics, CNES/Airbus DS, USDA, USGS, AEX, Getmapping, Aerogrid, IGN, IGP, swisstopo, and the GIS User Community
Airport Property Boundary created based on Mercer County's Exhibit A Airport Property Inventory Map and parcel data
Delineated Wetlands by Amy S. Greene Environmental Consultants, Inc., 2015
State Wetlands from Land Use data provided by NJ Office of GIS
NWI Wetlands provided by USFWS
Map Date: July 2016

FIGURE 3-3
WETLAND AND SURFACE WATERS MAP

LEGEND

- Delineated Wetlands
- Potential State Wetlands
- Airport Property Boundary
- Major Roads

NWI Wetlands

- Estuarine and Marine Deepwater
- Estuarine and Marine Wetland
- Freshwater Emergent Wetland
- Freshwater Forested/Shrub Wetland
- Freshwater Pond
- Lake
- Other
- Riverine

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In addition, Executive Order (EO) 11990- *Protection of Wetlands*, states that federal agencies shall provide leadership and shall take action to the destruction, loss or degradation of wetlands, and to preserve and enhance natural and beneficial values of wetlands in carrying out the agency's responsibilities. Under EO 11990, wetlands are defined as those areas that are inundated by surface or ground water with a frequency sufficient to support and under normal circumstances does or would support a prevalence of vegetative or aquatic life that requires saturated or seasonally saturated soil conditions for growth and reproduction.

Planning for any project on or near a delineated wetland on the Airport property must make every effort to avoid impacting wetlands and any associated transition areas. If complete avoidance or minimization is not feasible, under the N.J.A.C. 7:7A-15.2(b) the NJDEP may require mitigation from permitted in order to compensate for the loss of freshwater wetlands, state open waters or transition areas.

Under FWPA, mitigation is required if wetlands losses will exceed the 1 acre threshold for General Permits or if the proposed project cannot meet the General Permit program requirements. Most General Permits require mitigation for permanent wetland losses of greater than 0.1 acres or for less than 0.1 acres if the applicant fails to demonstrate that all activities have been designed to avoid and minimize impacts to wetlands. Certain General Permits, Hazardous Site Investigation and Cleanup (N.J.A.C 7:7A-5.4), require mitigation for all freshwater wetland disturbances. Such mitigation is required to fully compensate for acreage lost and for the loss of all ecological values and functions that would result from the project.

Compensatory wetland mitigation may be required as a permit condition depending on the specific details of the proposed project(s). According to N.J.A.C. 7:7A-15.8, NJDEP requires mitigation at a ratio of up to 2:1 or more as determined by the NJDEP and dependent on the mitigation alternative selected. Mitigation for disturbances of ordinary resource value wetlands or disturbances of 1.5 acres or less to freshwater wetlands or state open waters, NJDEP presumes credit purchase for mitigation, unless adequate on-site restoration, creation or enhancement of wetland is deemed more environmentally beneficial or off-site restoration, creation or enhancement of wetland is beneficial within the same or an adjacent hydrological system (HUC 11) or watershed management area. For projects affecting greater than 1.5 acres or disturbing intermediate or exceptional value wetlands, the same options and ratios apply, except that the priority is placed on on-site creation, restoration and enhancement of wetland areas. If on-site mitigation is not feasible, then the purchase of credits in the same HUC 11 as the disturbance, credit purchase from a mitigation bank approved by the Wetlands Mitigation Council, or off-site restoration, creation or enhancement in the same or adjacent HUC 11 is allowed. Compensation of these areas can be accomplished by the 2:1 acreage ratio of the on-site creation of equivalently valued new wetland; the 2:1 acreage ratio purchase of wetland credits; monetary contribution to the Wetland Mitigation Council per acre lost; or case-by-case land donation to the Council. If restoring or enhancing certain portions of the adjacent wetlands were deemed to be inadequate compensation relative to the context and intensity of the impact, then credit purchases would become the primary means of mitigating unavoidable impacts to any wetland loss.

Under Title 14, Code of Federal Regulations (CFR), Part 139, airports that have received federal grant-in-aid assistance must use the standards to reduce hazardous wildlife attractants as stated in the FAA's Advisory Circular (AC) 150/5200-33B *Hazardous Wildlife Attractants On or Near Airports*. Five federal agencies, including the FAA and USACE, signed a Memorandum of Agreement (MOA) in July 2003 to facilitate interagency cooperation on aircraft-wildlife strikes related issues, including wetland management at airports. As part of the MOU, the signatory agencies are required to diligently consider the siting criteria recommendations as stated in FAA AC 150/5200-33B. Mitigation must not inhibit the airport's ability to effectively control hazardous wildlife on or near the mitigation site or effectively maintain other aspects of safe airport operations. Enhancing wetlands for mitigation so that they consequently attract hazardous wildlife must be avoided. The FAA will review any onsite mitigation proposals to determine compatibility with safe airport operations.

FAA AC 150/5200-33B recommends separation distances between the AOA and potential wildlife hazards, including proposed wetland mitigation sites. These siting distances are:

- 5,000 feet of a runway that serves piston-powered aircraft
- 10,000 feet of a runway that serves turbine-powered aircraft
- 5 statute miles if the attractant could cause hazardous wildlife movement into or across the approach or departure airspace

The above siting criteria will also taken into consideration when considering potential wetland mitigation options and site selection.

Future proposed projects will take measures in design and construction to avoid, minimize or mitigate any possible adverse impacts to wetland resources to the degree possible. The use of Best Management Practices (BMPs) during construction project will minimize indirect impacts to wetland resources. Projects that have no practicable alternatives to avoid direct impacts to state and/or federally regulated surface waters will require permits.

3.3.3. Surface Waters

The USACE regulates surface waters under Section 10 of the Rivers and Harbors Appropriation Act (RHA) that are considered to be a TNW as defined specifically there within. The USACE also regulates surface water bodies through Section 404 of the CWA that have a significant nexus to a TNW as defined in Section 10 of the RHA or a TNW as defined Section 404 of the CWA. A significant nexus is generally defined as having more than an insubstantial or speculative effect on the chemical, physical, or biological integrity of a downstream TNW. Surficial open waterbodies, including streams, ponds and lakes, are delineated by their Ordinary High Water Mark (OHWM) as defined in Title 33, Code of Federal Regulations, Part 328 (33 CFR 328).

The eastern portion of the TTN property is located in the regional drainage basin known as the Assunpink Creek (below Shipetaukin Creek) while the western portion is located in the Alexauken Creek/Moore Creek/Jacobs Creek drainage basin. Both basins are located in the Central

Delaware Watershed Management Area (WMA) No. 11 as classified by the Division of Watershed Management of NJDEP. The WMA is characterized by agriculture and extensive suburban development. The northern portion of the Airport property is located in the subwatershed of Jacobs Creek, the eastern portion in Shabakunk Creek and western portion in Mercer (Calhoun Stream to Jacobs Creek).

Tributaries to the Delaware River, Ewing Creek and Shabakunk Creek are located throughout the property. The West Branch Shabakunk Creek and associated tributaries are located on the eastern portion of the Airport property and flow in a southeasterly direction. Tributaries to the Delaware River flow in a southwesterly direction across the southwestern portion of the Airport property and discharge to the Delaware River. Lastly, Ewing Creek tributaries are located on the northern portion of the Airport property and flow in a westerly direction to Ewing Creek which converges with Jacobs Creek.

Refer to Figure 3-4 for watershed and streams locations on and in the vicinity of the TTN property.

All of the streams on and in the vicinity TTN property are classified by the NJDEP as Freshwater 2 Non-Trout (FW2-NT) pursuant to the Surface Water Quality Standards, N.J.A.C. 7:7B.

All applicants for a federal license or permit must obtain a Section 401 WQC if the proposed activity may result in any discharge in navigable waters, including all wetlands, watercourses, and natural and man-made ponds.

3.3.4. Wild and Scenic Rivers

The National Wild and Scenic Rivers Act (Public Law 90-542) provides protection for several of the nation's free-flowing rivers that exhibit exceptional natural, cultural, and recreational values.

There are no state or federally designated wild, scenic or recreational rivers on or adjacent to Airport property.

3.3.5. Floodplains

TTN property contains floodplains associated with the Ewing Creek and the Gold Run. Gold Run is located south of the Airport property and flows south to the Delaware River. Tributaries of Ewing Creek are located on the northern portion of the Airport property and the County Golf Course and generally flow in a westerly direction to Ewing Creek, joining Jacobs Creek to the west. All of the above streams are part of the Alexauken Creek/Moore Creek/Jacobs Creek watershed.

Floodplains are low lying land areas typically associated with bodies of water that are likely to become inundated during a flooding event. Floodplains serve an important function in retaining storm waters to protect against downstream flooding, property damage, and potential loss of life.

Executive Order 11988, *Floodplain Management,* directs all federal agencies to avoid the direct and indirect support of floodplain development wherever there is a practicable alternative.

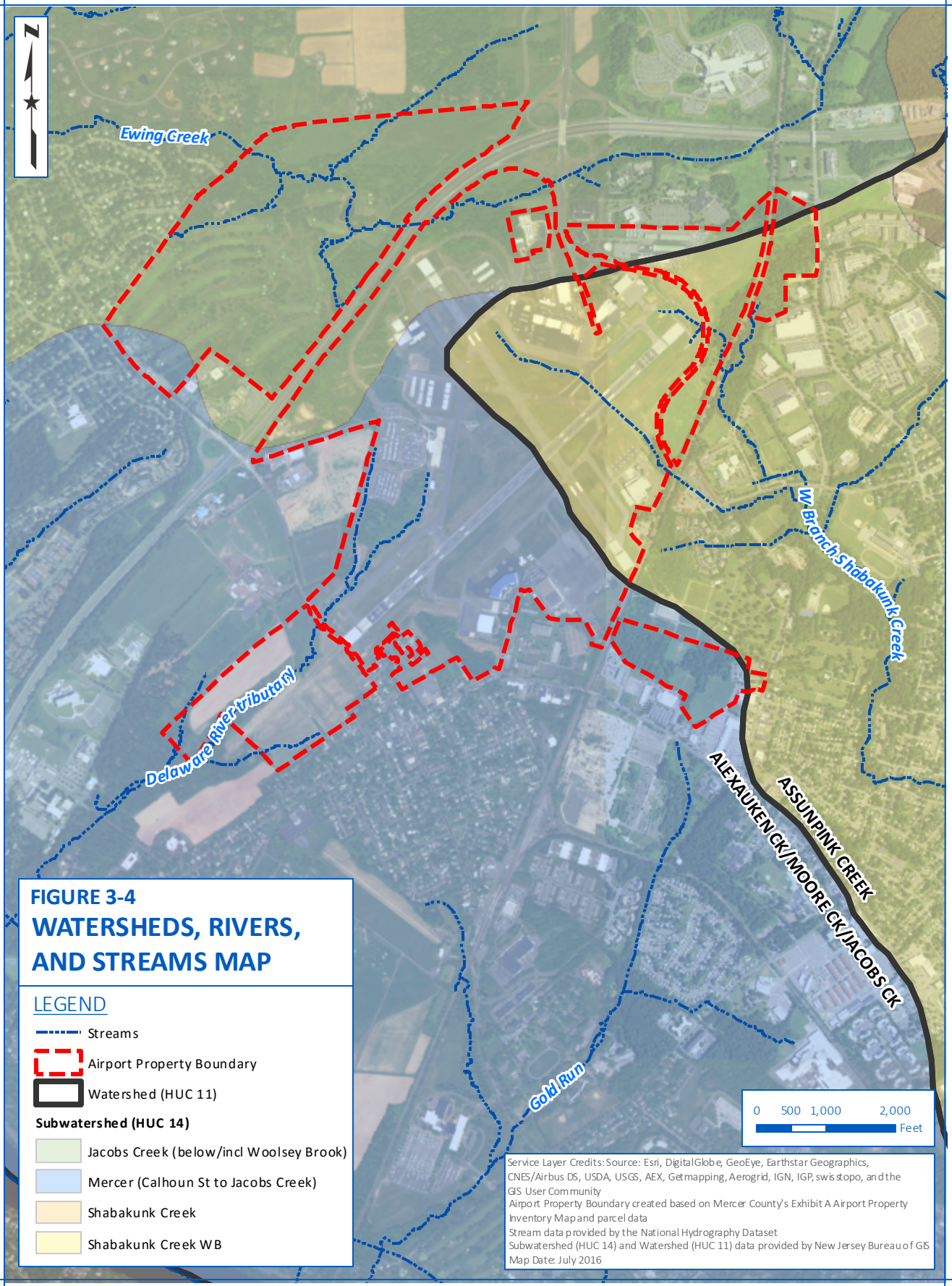

FIGURE 3-4
WATERSHEDS, RIVERS, AND STREAMS MAP

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The area or magnitude of a floodplain will vary according to the magnitude of the storm event as determined by the storm interval occurrences. For example, a five-year storm has a magnitude that can be expected once every five years. FEMA utilizes a 100-year storm interval for flood preparation. Flooding related to a 100-year storm statistically has a 1-percent chance of occurring during any given year. The 100-year period has been selected as having special significance for floodplain management because it is the maximum level of flooding that can reasonably be expected and planned for during a project's expected life span.

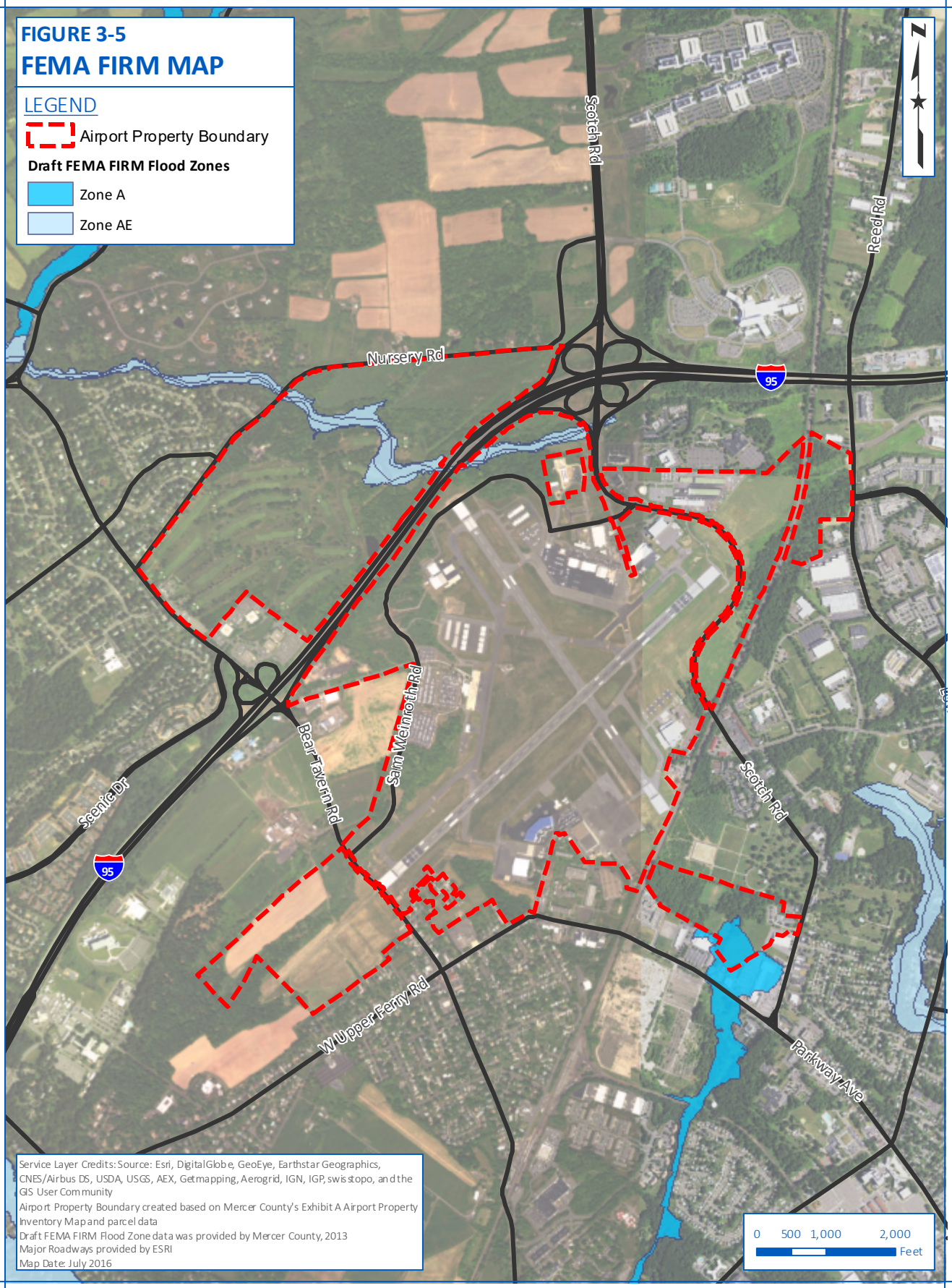
The Federal Emergency Management Agency (FEMA) administers the National Flood Insurance Program under the National Flood Insurance Act of 1968 (NFIP), as well as overseeing the federal floodplain management programs and flood hazard mapping. The NFIP is the federal program that enables property owners within participating communities to purchase insurance as a financial protection against flood losses. To participate, communities must adhere to federally mandated community floodplain management regulations that reduce future flood damages.

Federal flood hazard areas are identified on community specific Flood Insurance Rate Maps (FIRM). **Figure 3-5** presents the FIRM map associated with TTN. A small portion of the Gold Run floodplain extends onto the Airport property and is designated as a 100-year floodplain-Zone A, meaning no base flood elevations have been determined. The floodplain associated with Ewing Creek is designated as a 100-year floodplain-Zone AE. The AE designation indicates that FEMA has established specific peak flood water elevations for such an event. As defined by FEMA, a 100-year flood event (a base flood event) has a 1% annual chance of occurring every 100 years or a 26% (1 in 4) chance of occurring over the life of a 30-year mortgage. A regulatory floodway is the channel of a watercourse and the adjacent land areas that must be reserved in order to discharge a base flood without cumulatively increasing the peak water surface elevation more than a designated height (generally one foot).

The State of NJ protects residents and property from the flood hazards under its Flood Hazard Area Control Act (FHA) which tends to be more stringent than federal standards in regard to development in flood hazard areas and riparian zones adjacent to surface waters throughout the state. The Act is implemented under the FHA Rules N.J.A.C. 7:13. The rules regulate human disturbance to land and vegetation within the FHA of regulated waters and their associated riparian zones. The FHA is intended to control development in these areas in order to reduce flood damage by maintaining flood storage capacity; decreasing stormwater runoff rates; and removing obstructions to floodwater movement. On-airport FHA areas are shown on Figure 3-3, NJDEP Flood Hazard Area. Most waters that have a drainage area greater than 50 acres are regulated under this act. These waters are considered to possess a flood hazard area which is comprised of the floodway and opposing flood fringe on both sides of the floodway plus a riparian zone on each side of the channel. The width of a regulated riparian zone along both banks is dependent upon the regulated water's category under the FHA Rules. The riparian zone for any Category One water Surface Water Quality Standards under N.J.A.C. 7:9B includes the channel plus land and vegetation from the top of either bank for 300 feet. A riparian zone of 150 feet from the top of bank is allocated on streams designated as trout production waters; trout maintenance waters; waters documented as habit for threatened or endangered species of flora or fauna; or a segment of water flowing through acid producing soils. All other streams are allotted a 50-foot wide riparian zone from the top of each bank.

FIGURE 3-5

FEMA FIRM MAP



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The Ewing Creek and Gold Run are listed by the NJDEP as FW2-NT (Freshwater, Category 2, non-trout classification). Under the Surface Water Quality Standards (SWQS) in N.J.A.C. 7:9B, Category 2 streams have 150 feet wide protected riparian zones that extend from the tops of both banks along both waterways.

Under NJ rules, the flood hazard area is the land and the space above the land which lies below the FHA design flood elevation. These hazard areas generally are superimposed over the riparian channel and usually the adjacent land, however the flood hazard areas and the riparian areas are not equivalent to each other. NJ flood hazard areas are based upon peak flood water elevations equal to the FEMA 100-year flood elevation plus an additional amount of water in fluvial areas that accounts for future flow increases due to development or other factors. In NJ, the FHA Rules designate six methods that can be used to determine flood hazard areas and floodplains for a particular site for permitting and other actions.

In addition, in order to minimize flooding impacts as the result of uncontrolled development, under N.J.A.C. 7:13, the state has instituted a 0% net-fill change in the maximum total percentage of flood storage volume displacement lawfully allowed, including offsite credits.

Typical airport projects such as, but not limited to, any airport project that would incorporate selective tree cutting, stormwater facility maintenance, utility line crossings, or stormwater outfalls draining less than 50 acres in areas of the regulated flood hazard area or riparian zone would require FHA permitting under N.J.A.C. 7: 13. If there have been previous projects completed at the Airport that cumulatively exceed the maximum acreage thresholds allowed under the FHA General Permits, future projects at the airport within delineated flood hazard areas that would involve the placement of any aboveground structure in or above a floodway; the placement of fill in a floodway; raise the ground elevation in a floodway; that would obstruct the passage of floodwaters in a floodway; or is otherwise regulated by the FHA would require an Individual FHA Permit. The net loss of flood water retention capacity is prohibited. In addition, FHA requires that a permittee must properly execute an approved mitigation compensation and/or restoration proposal designed to adequately mitigate any loss of vegetation or aquatic biota caused by the permitted activity. Compensation must also be made for any displaced or lost flood storage capacity as the result of such a project. The loss may be mitigated by the creation of either on-site or off-site flood storage that adequately matches in volume and flood plain function as directed in N.J.A.C. 7: 13-10.2 through 10.4 for riparian zones, floodways and flood fringes. Opportunities for mitigation on this airport property are very limited.

As specific Airport developments are identified, and analyzed as part of this MPU and through future NEPA documentation requirements, their potential to encroach upon a state and federal designated floodplains will be evaluated.

3.4. COASTAL RESOURCES

The federal Coastal Barrier Resources Act provides for review of federally funded projects undertaken within the Coastal Barrier Resources System (CBRS). The CBRS contains undeveloped coastal barriers along the coasts of the Atlantic Ocean, Gulf of Mexico, and Great Lakes.

The Airport is not located within a CBRS and the Coastal Barrier Resources Act will not apply to any proposed improvements at the Airport.

3.5. DEPARTMENT OF TRANSPORTATION SECTION 4(F) RESOURCES

Section 4(f) of the Department of Transportation Act of 1966 protects publicly owned parks, recreation areas, wildlife and waterfowl refuges, and historic sites of national, state, or local significance from development unless there are no feasible alternatives.

Publicly owned parks and conservation lands are located within the vicinity of the Airport. Municipally owned parks surrounding the Airport include the following parks located east of the Airport; John S. Watson Park, Veterans Memorial Park and Armstrong Park. Banchoff Park, also owned by Ewing Township, is located west of the Airport. Other publicly owned parks include recreation fields associated with the Lore Elementary School and the Fisher Middle School located to the west and east of the Airport, respectively. These parks serve the surrounding residential areas.

The Mountain View Golf Course, owned by Mercer County, is located on the western portion of the Airport property.

There are no wildlife or waterfowl refuges in the immediate vicinity of the Airport. The nearest refuge is the Charles H. Rogers Wildlife Refuge located fourteen miles to the northeast.

An impact to historic sites of national, state, or local significance on or near the Airport may be considered a use under Section 4(f). As specific developments are identified, and analyzed as part of this MPU and through future NEPA documentation requirements, their potential to effect historic resources or other resources protected under Section 4(f) will be assessed on an individual basis.

3.6. HISTORIC, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

According to 36 CFR Part 800, a historic property is “any prehistoric or historic district, site, building, structure, or object included in or eligible for inclusion in the National Register of Historic Places (NHRP).” Section 106 of The National Historic Preservation Act (NHPA) requires that federal agencies, such as the FAA, consider the effects of their actions on historic properties via consultation with the State Historic Preservation Office (SHPO).

The NJDEP GeoWeb was reviewed for information on historic and or archeological sites on or in the vicinity of the Airport. The NJDEP GeoWeb indicated that two separate facilities had cultural and/or architectural surveys performed to determine if they were eligible for listing on the state or national historic register. According to the NJDEP GeoWeb, a Phase IB Cultural Resources Survey was conducted for a former inspector-instructor facility associated with the U.S. Marines Reserve located northeast of the Runway 16 end. Information on the NJDEP GeoWeb also indicates an Architectural Survey and Evaluation was conducted for the Army National Guard facility located east of the intersection of Runway 16-34 and Runway 6-24. Both facilities on Airport property were determined to be Not Eligible for listing on the National Register. Historic resources within the vicinity of the Airport include the Aeronautical Turbine Laboratory Complex Historic District, home of the Naval Air Warfare Center, which is located south of the Airport on Parkway Avenue. Two areas east of the Airport are eligible for listing and include the First Presbyterian Church and Cemetery of Ewing located on Scotch Road and the Burt/Hendrickson/Atchley Farmstead located on Pennington Road.

Consultation with the NJ SHPO office will be conducted whenever specific projects for the Airport are identified in the future. When a specific Airport development is proposed, the required documentation, including detailed descriptions and pictures of structures to be affected, will be sent to the NJ SHPO for a determination of that project's potential effect on historic or cultural resources as part of future studies to comply with NEPA.

3.7. FARMLANDS

The Farmland Protection Policy Act (FPPA), 7 CFR Part 658, requires federal agencies to consider project alternatives that will minimize unnecessary and irreversible conversion of farmland to nonagricultural uses. For the purposes of the FPPA, farmland refers to soils classified as prime farmland, unique farmland, and land of statewide or local importance. According to the U.S. Natural Resource Conservation Service (NRCS) *Web Soil Survey,* accessed on June 13, 2016, approximately 43.3% of the Airport is classified as not prime farmland, 2% is classified as Farmland of statewide importance, if drained, 33.5% is classified as Prime Farmland, 19.7% is classified as Farmland of statewide importance, and 1.6% is classified as Farmland of local importance. Farmland soil classification on Airport property is shown on Figure 3-6.

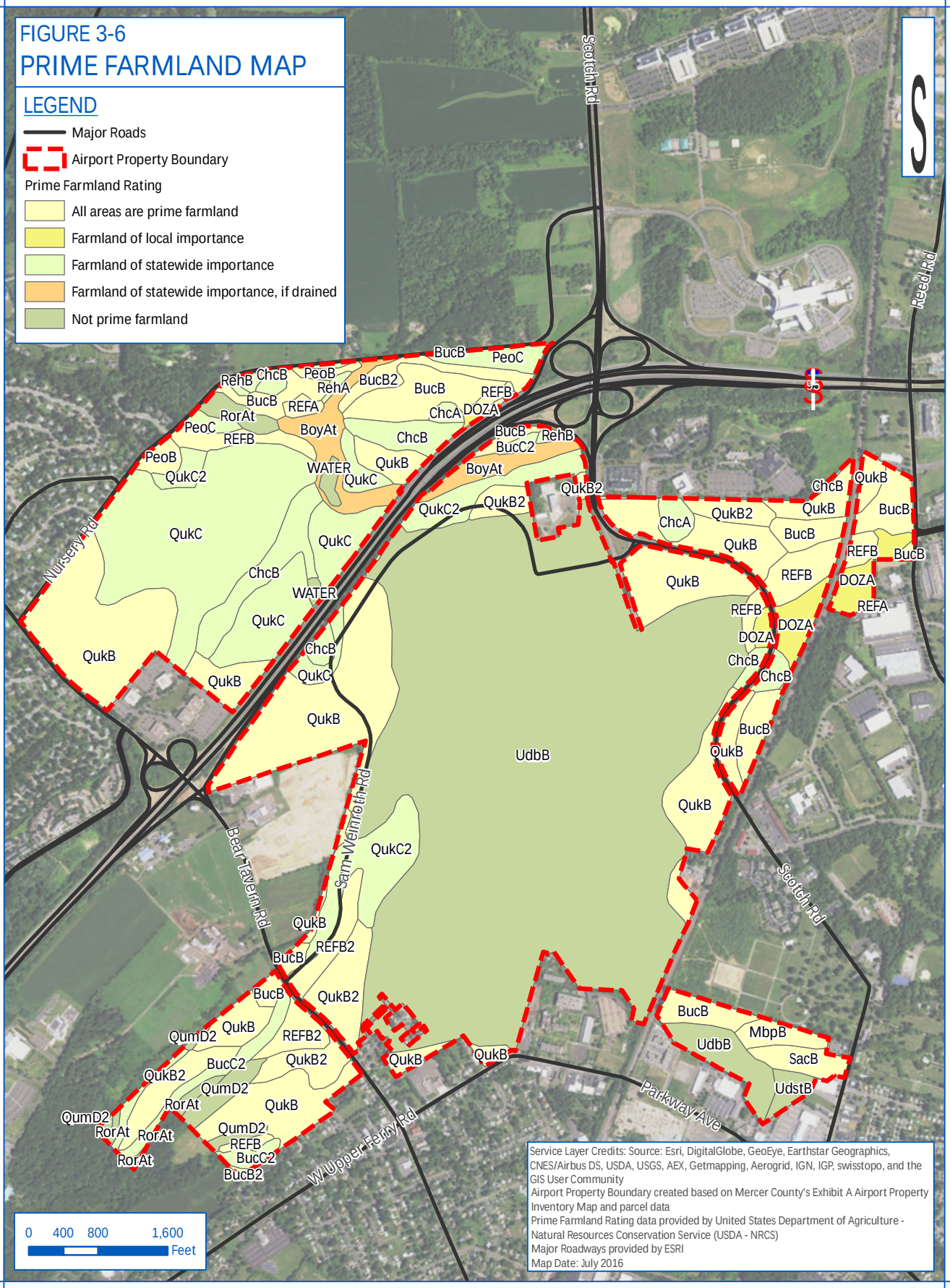
The FPPA does not apply to land already committed to "urban development or water storage". A majority of the Airport property has already been previously committed to urban development or current airport utilization and development and would not be subject to the FPPA regulations.

In New Jersey, local municipalities also have the authority to regulate certain activities in agriculture zones under the Municipalities Planning Code (P.L. 805, Act No. 247, as amended). However, there are no zoned agricultural areas in the vicinity of the Airport.

3.8. LAND USE

When considering improvement projects that meet airport development goals, it is important early in the planning process to identify potential impacts to existing land uses on airport property and in the surrounding area and to determine how potential airport projects will affect future land use and development patterns. This will enable the project to incorporate measures into the future design and layout of airport developments that will avoid or minimize land use conflicts as well as improve on existing conflicts when practicable.

FIGURE 3-6
PRIME FARMLAND MAP



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Some land uses that are considered more susceptible to impacts from airport development include, but are not limited to, residential areas, schools, religious institutions, hospitals, and certain public places such as parks, recreational areas, and cemeteries, where quiet is an expected part of the user experience. There are parks, schools, churches, cemeteries, and many residences in the vicinity of the airport that are considered noise sensitive. Alternatively, there are some land uses that can negatively impact the operation of the airport and are considered incompatible with airport activity. These land uses can include park and recreational areas, golf courses, landfills, open water areas, and other land uses that have the potential to serve as wildlife attractants, and commercial and industrial facilities that generate high-voltage electricity, utilize bright lights, or create a significant amount of glare, smoke or steam.

FAA AC 150/5200-33B, *Hazardous Wildlife Attractants On or Near Airports* provides guidance on certain land uses that have the potential to attract hazardous wildlife on or near public-use airports. Potential wildlife attractants and congregation areas can include areas such as shopping malls, agricultural fields, livestock operations, golf courses, parks, waste handling facilities, waterbodies, wetlands, and water management facilities.

TTN is located in a moderately developed area of Mercer County and is surrounded by a mix of residential, agriculture, recreational, industrial, and commercial land uses. Land use located to the east of the Airport is a mix of commercial & services, industrial, residential and transportation, including the CSX freight rail line which runs in a north-south direction. Located to the south and west of the Airport, land use consists of a mix of residential, commercial and agriculture. Recreational and forested areas are located to the west and northwest.

The Mountain View Golf Course, owned by Mercer County, is located on Airport property west of Interstate 95. Typically golf courses attract hazardous wildlife, particularly Canada geese and some species of gulls. Wetlands and streams are located on and in the vicinity of the Airport. In addition, Delaware River is located approximately 1.5 miles south of the Runway 6 end. The river and wetlands serve as major wildlife attractants for a variety of bird species that can be hazardous to aircraft operations, such as gulls, wading birds, shorebirds, and waterfowl.

FAA AC 150/5300-13A, *Airport Design,* identifies several land uses that are compatible with an airport's Runway Protection Zone (RPZ). The RPZ functions to enhance the protection of people and property on the ground and the area is maintained clear of incompatible objects and activities. Land uses incompatible with the RPZ include buildings and structures (including residences, schools, churches, hospitals, and industrial buildings), recreational areas, transportation facilities (including roads), fuel and hazardous materials storage facilities, wastewater treatment facilities, and above-ground utility infrastructure.

Currently at TTN, all four runway ends are not consistent with the recommendations of the AC 150/5300-13A due to the Airport's developed location. Non-compatible land uses within the RPZs include roads, residences, and commercial facilities. The RPZs and non-compatible land uses are further discussed in Chapter 4 – Facility Requirements.

As future improvements are considered as part of this MPU, the presence of incompatible land uses within the vicinity of the Airport will be considered.

3.9. NOISE AND NOISE-COMPATIBLE LAND USE

Aircraft noise emissions, inherent to the operation of an airport, can adversely impact land use compatibility between an airport and surrounding properties, particularly in the presence of noise-sensitive receptors. Churches, hospitals, schools, amphitheaters, and residential districts are receptors that are sensitive to elevated noise levels. Recreational areas and some commercial uses are moderately sensitive to elevated noise levels. Therefore, it is important to predict any change in noise levels associated with airport development, to determine the significance, if any, of the impact to noise sensitive land-uses. Then, abatement measures can be incorporated into airport development plans to avoid or minimize the impacts.

In order to evaluate the noise impacts of aviation activity on surrounding areas, the FAA has developed the Aviation Environmental Design Tool (AEDT), Version 2B. The noise modeling component within AEDT identifies locations that are exposed to specific levels of aircraft-generated noise and is based on algorithms which use aircraft specific data to estimate noise accounting for specific operation mode, thrust setting, and source-receiver geometry, acoustic directivity and other environmental factors. Inputs into AEDT can include aviation activity forecasts and runway configurations for various scenarios, as well as terrain and weather information. This computer model calculates cumulative aircraft noise at ground level expressed in decibels (dB), using the Day-Night Average Level (DNL). The DNL is the yearly day-night average sound level. All operations that occur between 10:00pm and 6:59am, also known as nighttime operations, incur an additional 10 dB weight within the model. Decibels are measured in A-weighted units, which approximate the range of human hearing. The FAA considers the 65 dB DNL level to be the threshold of impact for noise-sensitive areas. In order to help put the 65 dB DNL into perspective, the typical ambient noise level in suburban residential areas is 55 dB DNL. **Table 3-2** shows the typical noise levels associated with specific areas commonly encountered every day. **Table 3-3** presents the Day-Night average noise levels (DNL, dB), that are used by the FAA to evaluate land use compatibility with respect to airports.

Table 3-2: Typical Outdoor Day-Night Noise Levels

DNL Day-Night Noise Level (dB)	Location
50 dB	Small town residential area or quiet suburban area
55 dB	Suburban residential area
60 dB	Urban residential
65 dB	Noise urban residential area
70 dB	Very noisy urban residential area
80 dB	City Noise (Downtown of a Major Metropolitan Area)
80 dB	3rd Floor Apartment in a Major City Next to a Freeway

Source: "Noise Fundamentals Training Document, Highway Noise Fundamentals", U.S. Department of Transportation, Federal Highway Administration.

Table 3-3: Land Use Compatibility

Land Use	Yearly Day-Night Average Noise Level (DNL, dB)		
	Compatible Below 65	Compatible Between 65 and 70	Compatible Between 70 and 75
Residential	YES	NO*	NO*
Mobile Home Parks	YES	NO	NO
Transient Lodgings	YES	NO*	NO*
Schools	YES	NO*	NO*
Hospitals/Nursing Homes	YES	YES*	YES*
Churches/Auditoriums	YES	YES*	YES*
Governmental Services	YES	YES	YES*
Transportation/Parking	YES	YES*	YES*
Offices/Business/Professional	YES	YES	YES*
Wholesale and Retail	YES	YES	YES*
Utilities	YES	YES	YES*
Communications	YES	YES	YES*
Manufacturing	YES	YES	YES*
Photographic/Optical	YES	YES	YES*
Agriculture and Forestry	YES	YES*	YES*
Livestock Farming	YES	YES*	YES*
Mining/Fishing	YES	YES	YES
Outdoor Sports Arenas	YES	YES*	YES*
Outdoor Music Shells	YES	NO	NO
Nature Exhibits/Zoos	YES	YES	NO
Amusements/Parks/Camps	YES	YES	YES
Golf Courses/Stables	YES	YES	YES*

Source: 14 CFR 150, Airport Noise Compatibility Planning

** - Measures must be incorporated into the design of the structure or use that will allow this activity to continue at the indicated noise exposure level*

A review of aerial photography, along with land use and zoning maps of the area, indicates that most of the land surrounding the Airport would be considered noise sensitive, including residential areas to the south and east and recreational areas in the vicinity of the Airport.

A noise analysis will be completed as part of Land Use Plan included in the Airport Layout Plan set. This analysis will include the forecasted number of future operations and will utilize a fleet mix anticipated to occur at the Airport, and will be based on the final infrastructure improvements recommended as part of this Master Plan. The Land Use Plan will identify land uses of adjacent properties and the noise contours generated will be utilized to identify any potential impacts associated with the proposed development.

3.10. VISUAL EFFECTS

A visual effect refers to the potential effects due to light emissions, as well as the potential effects to visual resources and character.

3.10.1. Light Emissions

TTN is classified as a Part 139 Class I (scheduled Large Air Carrier Aircraft) and is required to follow the Airport Safety guidelines as stated in 14 CFR 139, *Certification of Airports*. These guidelines include lighting and signage utilized both on the ground and in the air as well as other airport procedures. Airport improvements may include the installation of additional lighting or change the location of lighting on airport property to meet the requirements of 14 CFR 139 or to accommodate the construction of the infrastructure improvement. These installations can alter the existing lighting conditions both on-airport and in the vicinity of the airport. Light emissions are typically one of the greatest concerns for residents in neighborhoods, as well as users of other parcels adjacent to an airport that could be directly impacted by a change in lighting.

Given the Airport's size, location, history, and surrounding land use, an increase in light emissions is unlikely to be significant for the installation or replacement of lighting on airport. Additionally, if obstruction removal (i.e. tree clearing) is proposed, resulting visual changes and potential impacts would also be considered and evaluated.

3.10.2. Visual Resources and Character

TTN is located in a moderately developed area consisting of a mix of residential, commercial, recreation, industrial, and agriculture land uses. Historic and eligible historic sites near the Airport that are potential visual resources consist of, the Aeronautical Turbine Laboratory Complex Historic District, located south of the Airport, the First Presbyterian Church and Cemetery of Ewing located to the east and the Burt/Hendrickson/Atchley Farmstead located to the northeast. There are no natural or manmade landscape features that are visually important or have unique characteristics in the vicinity of the Airport. Any potential development at the Airport would be in character with surrounding area and would not negatively affect the visual character of the surrounding area.

3.11. AIR QUALITY

Under Section 176(c) of the Clean Air Act (CAA) Amendments of 1977, the FAA is responsible for ensuring that federal airport actions conform to the State Implementation Plan (SIP), which protects against regional air pollution impacts. The criteria and procedures for implementing this conformity are detailed in Title 40 of the Code of Federal Regulations, Part 93, *Determining Conformity of Federal Actions to State or Federal Implementation Plans.* Many federal actions on an airport are considered to be general conformity actions. Presently, the general conformity rules only apply in areas that have been determined by the United States Environmental Protection Agency (EPA) to be in nonattainment or maintenance for the CAA's National Ambient Air Quality Standards (NAAQS) of the six priority pollutants (ozone, carbon monoxide, nitrogen dioxide, sulfur dioxide, particulate matter, and lead). Under NEPA, the FAA may be required to

prepare detailed air quality analysis for proposed projects whose air quality emissions have the potential to cause violations of the NAAQS for the six criteria pollutants.

The EPA lists Mercer County in an area of nonattainment or maintenance for NAAQS. Most Airport projects will not cause or create a reasonably foreseeable emission increase, which can be sufficiently documented and disclosed through a qualitative air quality assessment to satisfy the requirements of the CAA and NEPA and to conform to the conditions of the applicable State Implementation Plan (SIP), also known as General Conformity. An increase in vehicle exhaust emissions, caused by development related increases in aircraft activity and automobile traffic, may affect air quality. If large scale projects are proposed that may create an increase in emissions, a full emissions inventory will be required.

3.12. HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

3.12.1. Hazardous Waste

A Hazardous Waste/Contaminated Material (HWCM) desktop screening was conducted to determine the potential for the presence of HWCM on or in the vicinity of Airport property. The screening involved the review of online governmental databases and an Environmental Database Reports provided by NETROnline Environmental Database Network (NETROnline). An environmental regulatory agency records review of this nature is based on publically available information from state and federal agencies.

The General Motors Facility on Parkway Avenue, south of the Airport, is listed as a Resource Conservation and Recovery Act (RCRA) facility undergoing corrective action for releases of toxic chemicals, such as, acetone, chromium, and cooper, commonly associated with the production of auto parts. Buildings on the site were demolished and the Township of Ewing received funding for remediation. The site is currently undergoing remediation under the supervision of the NJDEP.

The NJDEP maintains a list of Known Contaminated Sites where contamination of soil or groundwater has been confirmed at levels equal to or greater than applicable standards. The Environmental Database Reports indicated there are thirteen Known Contaminated Sites on and within the vicinity of the Airport. Six of the thirteen sites are located on Airport property and include Mercer Armory, Ronson Aviation, Inc., Mercer County Department of Public Works, Crest Ultrasonics Corporation, Unisys Aviation Department and Johnson & Johnson. Also associated with the Known Contaminated Sites, are two areas on Airport property that the NJDEP established as Classification Exception Areas (CEA) where groundwater contamination has been identified. The Mercer County Airport site is approximately 1 acre in size and the Johnson & Johnson site is approximately 0.25 acre and are both located on Scotch Road. In addition, the Naval Air Warfare Center site located immediately south of the Airport property is designated as a CEA and is approximately 38 acres in size. This CEA is approximately 300 feet deep and impacts the Stockton-Lockatong Aquifer. An environmental cap has been installed as an engineering control north of the Naval Air Warfare Center site.

Review of the Environmental Database Reports indicated that there are five locations within 0.5 mile of the Airport that are listed under the NJ Underground Storage Tank Database. However, there are no reports of leaking underground storage tanks.

Given the potential for soil and groundwater contamination to exist on or in the vicinity of Airport property, as each individual project is proposed, they will be evaluated for their specific potential to encounter chemical, petroleum, or hazardous materials in direct consultation with NJDEP and EPA. In the event that previously unidentified chemical, hazardous or petroleum related wastes are encountered during the construction of any future proposed projects, the NJDEP will be notified the wastes will be handled and disposed of based on consultation with the NJDEP and in accordance with all applicable federal, state, and local regulations.

3.12.2. Historic Fill

The N.J.A.C. 7:26 *Administrative Requirements for the Remediation of Contaminated Sites* stipulates that the disturbance of soils considered to be historic fill material must be preceded by sampling and analysis as directed in N.J.A.C. 7:26E-4.6(b). Historic fill must be characterized on a per project basis. Under NJ rules in Brownfield and Contaminated Site Remediation Act (N.J.S.A. 58:10B-1 et seq), historic fills specifically refer to non-indigenous materials of undocumented origins placed on a site to raise its topographic elevation. The NJ Historic Fills Mapping is for informational purposes only and show areas where such fill covers over 5 acres.

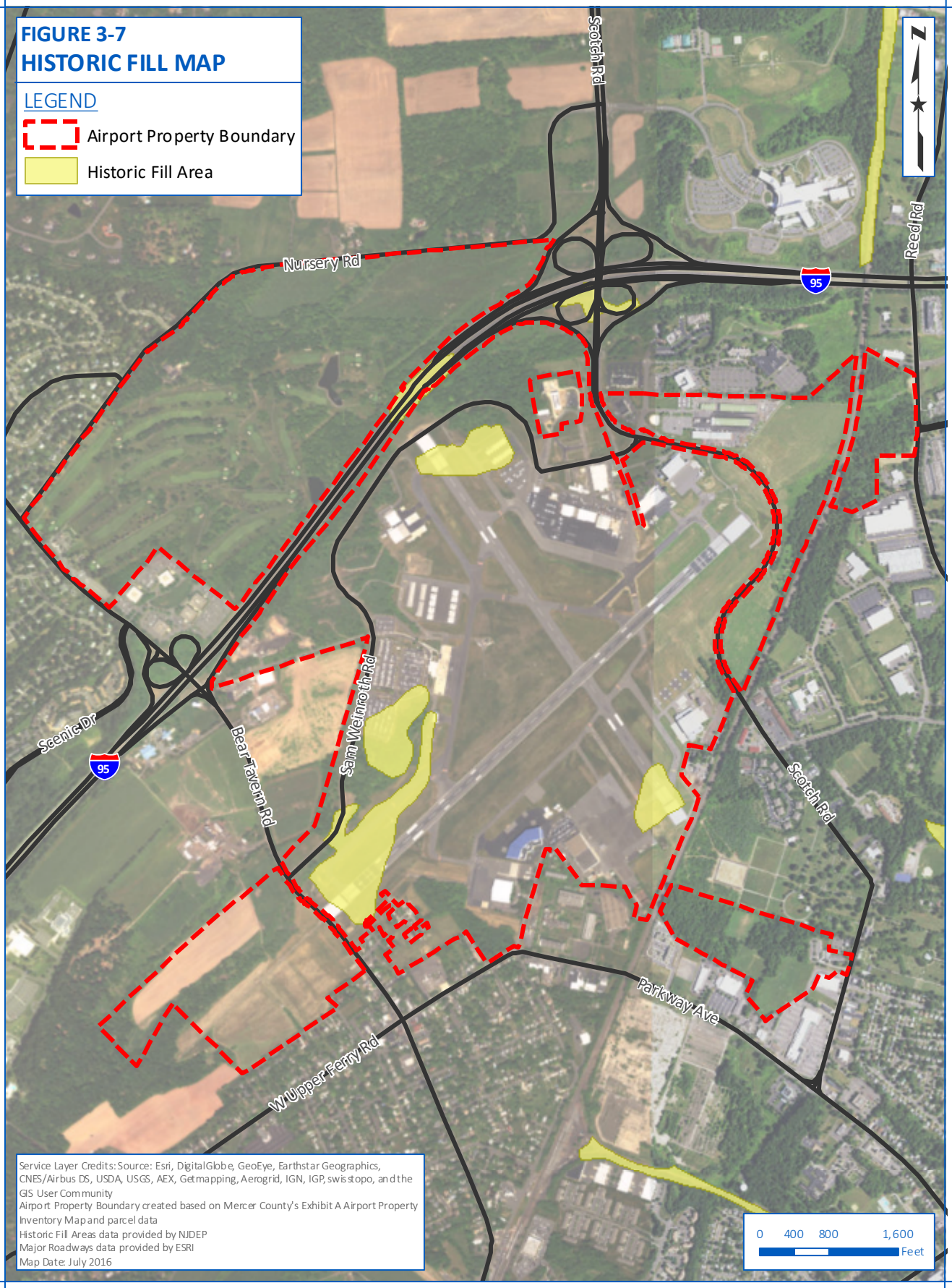
The Airport was opened to the public in 1929 and further developed to allow testing of the WWII Avenger Torpedo Bomber. A portion of the Airport parking area and runway ends 6, 16, and 34 and other elevated airport facilities footprints were filled with materials to either provide better support for foundations or to raise the ground elevations to a consistent level (see **Figure 3-7**).

Under NJ rules, fill is presumed to be contaminated unless proven otherwise. Any use of these fill materials will need analytical verification according to the N.J.A.C. 7:26E *Technical Requirements for Site Remediation* to verify the lack of contaminants before the fill can be used or relocated.

3.12.3. Solid Waste

Currently, the Airport has a contract with Central Jersey Waste, a local waste management company. All solid waste is transported approximately 5 miles southeast to the Mercer County Improvement Authority transfer station located in Ewing, which is then transported to the Tullytown/GROWS Landfills in Falls Township, Pennsylvania. Tullytown/GROWS Landfills are commercial landfills owned and operated by Waste Management. It is assumed that the landfills have sufficient capacity for the disposal of solid waste attributable to Airport development. However, if a future Airport project requires solid waste disposal, the landfill capacities will be confirmed.

FIGURE 3-7
HISTORIC FILL MAP



Document Path: K:\Trenton\T-18113.00 Trenton Master Plan - Urban\Draw\GIS\Environmental\3-7 Trenton Historic Fill Map.mxd

3.12.4. Pollution Prevention

The Clean Water Act authorizes EPA and states, which are delegated the authority by EPA, to regulate point sources that discharge pollutants into waters of the United States through the New Jersey Pollutant Discharge Elimination System (NJPDES) permit program. So-called "point sources" are generated from a variety of municipal and industrial operations, including treated wastewater, process water, cooling water, and stormwater runoff from drainage systems. In New Jersey, the NPDES program is delegated to NJDEP. The County presently holds an approved NJPDES Individual Permit for stormwater discharges (NJG0085961) which authorizes pavement de-icing at TTN. The following Airport tenants operate under a Basic Industrial Stormwater General Permit (5G2), Air Hangar, Inc., Merck, Johnson & Johnson Aviation, Unisys Corporation, TAC Technical Instrument Corporation, and Ronson Aviation. The FBO de-ices aircraft at the FBO's apron. The spent deicing fluid is collected with at vacuum truck and deposited into a tank equipped with an oil/water separator.

Under the Oil Pollution Prevention Act amendment to the Clean Water Act, owners of non-transportation related AST facilities with a total aboveground capacity greater than 1,320 gallons of petroleum based products are required to maintain a Spill Prevention, Control and Countermeasure (SPCC) plan. A SPCC plan describes the operational procedures that have been developed for preventing, containing and controlling a spill or release to a navigable water. Currently, the County does not have any aviation fuel storage facilities. The FBO and tenants, including Air Hangar, Inc., Johnson & Johnson and Merck have their own fuel storage and airlines contract with the FBO/tenants for fuel needs.

The FBO and several tenants, including Air Hangar, Johnson & Johnson, Merck, operate and maintain fuel farms. Owners/operators of ASTs that exceed the 1,320 gallon threshold must maintain an SPCC plan in accordance with federal regulations.

New Jersey's Spill Compensation and Control Act (N.J.S.A. 58:10-23.11) requires owners of AST facilities with a total aboveground capacity greater than 20,000 gallons of hazardous substances other than petroleum products or 200,000 gallons or more of all hazardous substances to develop and submit a Discharge Prevention, Containment and Countermeasure (DPCC) plan and a Discharge Cleanup and Removal (DCR) plan to the NJDEP. The DPCC/DCR plans describe the procedures that have been developed for preventing, containing and controlling a spill or release, along will protocols for notification of the NJDEP, local emergency agencies, and all municipalities and predetermined water uses within 20 miles downstream of facility.

3.12.5. Stormwater

Airport development projects may potentially affect surface and groundwater quality. The implementation of stormwater management measures, designed to avoid or minimize the impacts to water quality during a project's construction and operation phase, is required for many types of development projects. The specific stormwater management measures required are dependent upon the magnitude of the impact.

The Statewide Industrial Stormwater Permitting Program for construction activities is administered by the NJDEP, Bureau of Nonpoint Pollution Control in coordination with the NJ Department of Agriculture and the State Soil Conservation Committee. Any project that proposed one-quarter acre of new impervious surface and/or one or more acres of earth disturbance must comply with the Stormwater Management Rules of New Jersey (N.J.A.C. 7:8). An Individual NJPDES (Individual Permit NJG0088315) or General NJPDES Permit for Stormwater Construction Activities (General Permit NJG0088323, 5G3) is issued by the NJDEP. The NJDEP issues NJPDES stormwater permits under the New Jersey Water Pollution Control Act (N.J.S.A. 58:10A-1). The issuance of a NJPDES permit for stormwater discharges associated with construction activities requires the preparation of a Stormwater Pollution Prevention Plan (SPPP). The SPPP identifies the Best Management Practices (BMPs) to control stormwater discharge during the construction phase. The SPPP consists of a soil erosion and sediment control component and also must include a construction site waste control component identifying how materials will be managed to prevent or reduce waste and the handling of waste.

Earth disturbances that will result in the disturbance of greater than 5,000 square feet are also regulated under Soil and Sediment Control Act of 1976. The Act stipulates that any project proposing more than 5,000 square feet of soil disturbance must have a Soil Erosion and Sediment Control Plan certified by the local Soil Conservation District (SCD) to ensure that the project meets State Standards.

Future projects that could result in the disturbance of greater than 5,000 square feet of earth disturbances will require coordination with NJDEP and Mercer County SCD to determine the level of specific stormwater management measures and permits required.

3.13. ENERGY SUPPLIES AND NATURAL RESOURCES

Use of energy supplies and natural resources is closely linked to construction of airport improvements and operations. Anticipated growth and development at the Airport is likely to increase the use of energy and natural resources. However, energy and natural resources are available in New Jersey and neighboring Pennsylvania and planned growth at the Airport is not of sufficient magnitude to alter regional energy demand or limit natural resource availability.

Each proposed project, including those that will lead to an increase in aircraft operations, will be evaluated for the potential effect upon these resources and methods to reduce potential energy uses will be developed and considered during the review process.

3.14. CLIMATE

Climate change is a global phenomenon that has been attributed to increasing concentrations of greenhouse gases (GHGs) in the atmosphere. GHGs include carbon dioxide CO2, methane (CH4), nitrous oxide (N2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and sulfur hexafluoride (SF6).

Under Executive Order 13693, *Planning for Federal Sustainability*, federal agencies must make efforts to measure, report, and reduce their GHGs emissions from direct and indirect activities.

The FAA has not identified a significance threshold for GHG emissions as there is no current accepted method of determining the level of significance applicable to airport projects given the small percentage of emissions they contribute. Any increase in emissions of GHGs as the result of a proposed action at the Airport would be considered negligible in comparison with U.S. annual emissions and therefore would not have a significant impact on global climate change.

3.15. SOCIOECONOMICS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Under the Council on Environmental Quality (CEQ) regulations implementing NEPA (40 CFR Part 1500-1508), federal agencies are required to consider the effects to the area population's health, safety risks to children, and socioeconomic impacts. Under 40 CFR 1508.14, the CEQ requires that the human environment be considered for federal projects to address the relationship of people with their natural and physical environments.

3.15.1. Socioeconomics

Principal impacts to be considered include the displacement of families or businesses, effects to neighborhood characteristics, dividing or disrupting established communities, changing ground transportation patterns, disruption of orderly planned community developments; or creating measurable changes in employment. If land acquisition were necessary for proposed Airport development alternatives, it would be accomplished in accordance with 49 CFR Part 24, *Uniform Relocation Assistance and Real Property Acquisition Policies Act* (Uniform Act) and FAA AC 150/5100-17, *Land Acquisition and Relocation Assistance for Airport Improvement Program Assisted Projects*. The Uniform Act standardizes real property acquisition policies and requires the uniform and equitable treatment of persons relocated due to a federally assisted project.

Proposed projects will be evaluated for the potential effects to the community economy, social structure, and necessary community health and safety services as specific alternatives are developed during the design process.

3.15.2. Environmental Justice

Environmental justice evaluations consider the potential of federal actions, including those involving federally obligated airports, to cause a disproportionate and adverse effect upon low-income or minority populations.

TTN, located in Ewing Township, in Mercer County is situated in north-western New Jersey. A comparison of select demographic data is shown in Table 3-4. Based on information provided by the U.S. Census 2010-2014 5-Year Estimates, the populations for Mercer County and the Township of Ewing has increased by approximately 1% since 2010. The Township of Ewing has a higher percentage of its population identifying themselves as minority races than compared to county, state and national percentages. However, the reported median household income is higher in the Township of Ewing than reported at county, state and national levels. Ewing has a higher percentage of its population reported as older than 65 years compared to county, state and national levels. In addition, the Ewing has a lower percentage of reported individuals living below the poverty levels compared to national levels.

Table 3-4: Demographic Profiles

Census Category	United States	New Jersey	Mercer County	Township of Ewing
Minority Population	26.2%	31.3%	37.6%	38.5%
Population Under Age 5	6.4%	6.0%	5.9%	4.3%
Population Age 65 & Older	13.7%	14.1%	13.2%	14.4%
Individuals Below Poverty Level	15.6%	10.7%	11.7%	12.4%
Median Household Income	$53,482	$72,062	$74,118	$77,479
Percent White	---	68.6%	61.4%	63.1%
Percent African American	---	13.7%	20.3%	27.6%
Percent Asian	---	8.3%	8.9%	4.3%
Percent American Indian	---	0.3%	0.3%	0.3%
Percent Hispanic Origin	---	17.7%	15.1%	7.6%

Source: U.S. Census Bureau American FactFinder- 2010-2014 American Community Survey 5-Year Estimates

Throughout New Jersey, the most ethnically and racially diverse areas are located in the State's largest cities, especially in close proximity to the New York and Philadelphia metropolitan areas. The racial and ethnic makeup in the vicinity of TTN is less diverse; however, Ewing Township is 27.6 percent African American, which is higher than the County and State percentages. Otherwise, Ewing is racially and ethnically less diverse than Mercer County or the State of New Jersey.

Based on the aforementioned information, Airport development is not likely to result in a disproportionately high and adverse human health or environmental effect to children, elderly, minority or low-income populations.

3.15.3. Children's Environmental Health and Safety Risks

Pursuant to Executive Order 13045- *Protection of Children from Environmental Health Risks and Safety Risks*; federal agencies are directed to make identification and assessment of environmental health and safety risks that may disproportionately affect children a high priority.

Federal agencies are encouraged to ensure that their policies, programs, and activities address any disproportionate risks children may incur from environmental health and safety risks. These risks are generally attributable to products or substances that a child is likely to come in contact with or ingest, such as air, food, drinking water, recreational waters, soil, or products they might use or to which they may be exposed.

The Airport development alternatives under consideration will not disproportionately affect children, or products and substances they are likely to come in contact with.

4. Facility Requirements

This chapter presents the airside and landside facility requirements necessary to accommodate existing and forecasted demand at Trenton-Mercer Airport (TTN) in accordance with Federal Aviation Administration (FAA) design criteria and safety standards. The facility requirements are based upon several sources, including the aviation demand forecasts presented in Chapter 3, *Forecast*, and, FAA Advisory Circular (AC) 150/5300-13A, *Airport Design,* and 14 CFR Part 77, *Objects Affecting Navigable Airspace.* The findings of this chapter serve as the basis for the formulation of airport alternatives and development recommendations. The major components of this chapter are listed below:

- Airfield Capacity Analysis
- Airside Facilities
- Passenger Terminal Area Facilities
- General Aviation and Landside Facilities
- Facility Requirements Summary

4.1. AIRFIELD CAPACITY ANALYSIS

Airfield capacity refers to the ability of an airport to safely accommodate a given level of aviation activity. The FAA has prepared a number of publications and computer programs to assist in the calculation of capacity. This report will use the methodologies described in AC 150/5060-5, *Airport Capacity and Delay*.

Capacity is described through the use of three terms: annual service volume (ASV), visual flight rules (VFR) hourly capacity, and instrument flight rules (IFR) hourly capacity. The ASV is a reasonable estimate of the annual capacity, or the maximum annual level of aircraft operations that can be accommodated, at an airfield. It should be noted that airports could, and often do, exceed their stated ASV. However, delays begin to increase rapidly once the ASV has been exceeded. For prudent planning purposes, once airport operational levels reach 60 percent of the ASV, planning for capacity-increasing measures should take place. Once an airport reaches 80 percent ASV, construction of capacity-increasing measures should begin or demand strategies be put in place.

The VFR and IFR hourly capacities are the maximum number of aircraft operations that can take place on the runway system in one hour under VFR or IFR conditions, respectively. When hourly demand approaches or exceeds the hourly capacity, delays may force traffic into the succeeding hours or cause aircraft to divert to other airports.

4.1.1. Factors Affecting Capacity

It is important to understand the various factors that affect the ability of an air transport system to process demand. Once these factors are identified and their effect on the processing of demand is understood, efficiencies can be evaluated. The airfield capacity analysis considers several factors that affect the ability of the Airport to process aviation demand. These factors include:

- Meteorological Conditions
- Runway/Taxiway Configuration
- Runway Utilization
- Aircraft Fleet Mix
- Percent Arriving Aircraft
- Percent Touch-and-Go operations
- Exit Taxiway Locations
- Peaking Characteristics

Meteorological Conditions

Meteorological conditions specific to the location of an airport not only influence the airfield layout, but affect the use of the runway system. As weather conditions change, airfield capacity can be reduced by low ceilings and visibility. Runway usage will change as the wind speed and direction change, also impacting the capacity of the airfield.

Capacity is affected adversely as weather deteriorates. To better understand the impact of deteriorating weather on capacity, a brief synopsis of aviation flying conditions is provided. For the purposes of capacity evaluation, these flying conditions are described as VFR conditions, IFR conditions, and poor visibility and ceiling (PVC) conditions. VFR conditions occur whenever the cloud ceiling is at least 1,000 feet above ground level and the visibility is at least three statute miles. IFR conditions occur when the reported cloud ceiling is at least 500 feet but less than 1,000 feet and/or visibility is at least one statute mile but less than three statute miles. PVC conditions exist when the cloud ceiling is less than 500 feet and/or the visibility is less than one statute mile. Decreasing cloud ceiling and visibility require an increase in aircraft spacing, as mandated by the FAA. This increase in aircraft spacing causes decreases in the frequency at which aircraft can land and depart the airfield over a specified period of time.

In order to better understand the impact that inclement weather has on the Airport, climate data from the National Climatic Data Center (NCDC) was obtained and analyzed to determine the ceiling and visibility characteristics at this site. Based upon this data, VFR conditions occur at the Airport approximately 80 percent of the time and IFR conditions occur approximately 20 percent of the time. Finally, PVC conditions are present at the Airport approximately zero percent of the time.

Wind direction and speed determine the desired alignment and configuration of the runway system. If possible, aircraft normally desire to takeoff and land into the wind, taking advantage of aircraft design. On departure into the wind, the air flowing over the wings allows the airplane to become airborne much sooner than under a no-wind or tail-wind condition. An aircraft landing into the wind will be able to slow down on approach much easier and land at a slower ground speed. Runways not orientated to take the most advantage of the prevailing winds at the site will restrict capacity of the airport to varying degrees as aircraft have long takeoff rolls and landings.

Runway/Taxiway Use Configurations

The configuration of the runway system refers to the number, location and orientation of the active runway(s), the type and direction of operations and the flight rules in effect at a particular

time. Trenton has two runways: Runway 6-24 is the primary runway and Runway 16-34 serves as the crosswind runway.

Although not a traditional full-length parallel taxiway, Taxiways B and J provide access to the north-side of runway ends 24 and 6, respectively. The southwest side of the ends of Runways 6 and 24 are not currently served by an end of runway taxiway connection. The Runway 16 end is served by Taxiway G and H and the Runway 34 end is served by both Taxiways D and E.

For airports such as TTN, which have over 20,000 annual operations, a traditional full-length parallel taxiway should be provided for at least the primary runway. The previous master plan recommended providing full-length parallel taxiways for both runways, a recommendation that will be revisited in this master plan.

Runway Utilization

As discussed in the meteorological conditions section, aircraft generally desire to takeoff and land into the wind. Based on all-weather wind data obtained at the Airport, Runways 24 and 34 are the primarily used runway ends (approximately 60-70 percent of the time) and Runways 6 and 16 are used approximately 30-40 percent of the time. In IFR conditions, Runways 6 and 16 are the primarily used runways at approximately 60-70 percent of the time.

Aircraft Fleet Mix

The capacity of a runway is also dependent upon type and size of aircraft that use it. Per AC 150/5060-5, aircraft are placed into one of four classes (A through D) when conducting capacity analysis. These classes are based on the amount of wake vortex created when the aircraft passes through the air. They differ from the classes used in the determination of the aircraft approach category (AAC). Small aircraft departing behind larger aircraft must hold longer for wake turbulence separation. The greater the separation distance required, the lower the airfield's capacity.

For the purposes of capacity analysis, Class A consists of aircraft in the small wake turbulence class, single engine and a maximum takeoff weight of 12,500 pounds or less. Class B is made up of aircraft similar to Class A, but with multiple engines. Class C aircraft are in the large wake turbulence class with multiple engines and with takeoff weights between 12,500 pounds and 300,000 pounds (including the Gulfstream V and Airbus A320). Class D aircraft are in the heavy wake turbulence class and have multiple engines and a maximum takeoff weight greater than 300,000 pounds. Typically, Class A and B aircraft are general aviation single engine and light twin engine aircraft. Class C and D consist of large jet and propeller driven aircraft generally associated with larger commuter, airline, air cargo, and military use.

The aircraft fleet mix is defined by the percentage of operations conducted by each of these four classes of aircraft at Trenton. The approximate percentage of operations forecasted at Trenton by each of these types of aircraft is shown in Table 4-1.

Table 4-1: Aircraft Fleet Mix

Aircraft Type	2015 Percent of Operations	2035 Percent of Operations
Class A	35%	34%
Class B	51%	51%
Class C	14%	15%
Class D	0%	0%

Source: McFarland Johnson Analysis

The mix index for an airport is calculated as the percentage of Class C aircraft operations, plus three times the percentage of Class D operations (%C + 3D). Since there are no Class D aircraft forecast to use the Airport, the mix index is equal to the percentage of Class C operations. At the Airport this is approximately 15 percent of the forecasted activity. At airports with only Class A and B aircraft, the separation distance required for air traffic is lower than at airports with use by aircraft in Class C or D, as small aircraft (Class A and B) departing behind larger aircraft must hold longer for wake turbulence separation. The greater the separation distance required, the lower the airfield's capacity.

Percent Arriving Aircraft

The capacity of the runway is also influenced by the percentage of aircraft arriving at the airport during the peak hour. Arriving aircraft are typically given priority over departing aircraft; however, arriving aircraft generally require more time to land than departing aircraft need to takeoff. Therefore, the higher the percentage of aircraft arrivals during peak periods of operations, the lower the ASV. Discussions with airport personnel indicate that operational activity at the Airport is well balanced between arrivals and departures. Therefore, it is assumed in the capacity calculations that arrivals equal departures during the peak period.

Percent Touch-and-Go Operations

A touch-and-go operation refers to an aircraft maneuver in which the aircraft performs a normal landing touchdown followed by an immediate takeoff, without stopping or taxiing clear of the runway. A touch-and-go is counted as two operations. These operations are normally associated with training and are included in the local operations. Touch-and-go operations are estimated at 50 percent of local general aviation operations (approximately 18 percent of forecasted total aircraft operations) at the Airport.

Exit Taxiway Locations

A final factor in analyzing the capacity of a runway system is the ability of an aircraft to exit the runway as quickly and safely as possible. The location, design, and number of exit taxiways affect the occupancy time of an aircraft on the runway system. The longer an aircraft remains on the runway, the lower the capacity of that runway.

Runway 6-24 has four exit taxiways, one at either threshold, and two exit/crossover locations. A Runway 6 landing aircraft has approximately 4,610 feet to exit at Taxiways C and F and 6,006 feet

until Taxiway B. A Runway 24 landing aircraft has approximately 4,500 feet to exit at Taxiway A (which is not a right-angle taxiway) and 6,006 feet to Taxiway J.

Runway 16-34 has five exit taxiways. Aircraft landing on Runway 16 have approximately 3,500 feet to exit at Taxiway F and 4,800 feet to Taxiways D and E at the threshold. An aircraft landing on Runway 34 has approximately 2,800 feet to land and exit at Taxiway C, 3,700 feet to exit at Taxiway A, and 4,800 feet to the Runway 16 threshold (Taxiways G and H). Not all of these taxiways are right-angle taxiways. FAA AC 150/5300-13A provides guidance regarding the number and location of exit taxiways.

As shown in Table 4-2, most Class A aircraft can exit a runway under dry and wet conditions with the current runway length and exit locations. Most Class B aircraft can exit a runway under dry conditions, but only approximately 41 percent of Class B aircraft can exit the runway under wet conditions when landing on Runway 16 at Taxiway F. At all other runway exit taxiways, most Class B aircraft can exit under wet and dry conditions. Category C aircraft identified in this analysis (based of standard FAA guidance) encompass a large variety of aircraft from 12,500 pounds (a small business jet) up to 300,000 pounds (wide-body Boeing 767). With a maximum landing weight of approximately 172,000 pounds, the A320 weight represents approximately 57 percent of the total weight category. The airport planning manual for the Airbus 320 was consulted to verify if the weight correlation to the analysis is accurate and usable. Reviewing the aircraft performance charts for dry runways and applying a 15 percent factor for wet runways, the Airbus 320 requires approximately 5,500 feet to land at Maximum Landing Weight (MLW).

Table 4-2: Exit Taxiway Cumulative Utilization Percentage

Distance Threshold to Exit	Wet Runways			Dry Runways		
	Right and Acute Angle Exits			Right Angled Exits		
	A	B	C	A	B	C
3,500	99	41	0	100	81	2
4,000	100	80	1	100	98	8
4,500	100	97	4	100	100	24
4,800*	100	99	9	100	100	39
5,000	100	100	12	100	100	49
5,500	100	100	27	100	100	75
6,000	100	100	48	100	100	92

*interpolated

A – small, single engine (<12,500 pounds); B – small, twin engine (<12,500 pounds); C – large (12,500 pounds to 300,000 pounds)

Source: FAA AC 150/5300-13A (Table 4-13) and McFarland Johnson, 2015.

Peaking Characteristics

Peak periods are defined in terms of peak month and peak hour operations, with a focus on the number of aircraft accommodated on the ramp(s) at any given time. For the Airport, the planning peak hour was calculated by taking 10 percent of annual operations, dividing that number by 30 days per month, and assuming 10 percent of those operations would occur during the peak hour. These numbers are shown in Table 4-3.

Table 4-3: Annual Operations Forecast

Year	Demand		Capacity			Percent Peak Hour		Percent ASV
	Annual	Peak Hour	ASV	Hourly VFR	Hourly IFR	VFR	IFR	
2015	78,263	26	230,000	98	59	27	44	34
2020	82,191	27	230,000	98	59	28	46	36
2025	85,934	29	230,000	98	59	30	49	37
2035	95,275	32	230,000	98	59	33	54	41

Source: McFarland Johnson Analysis, 2015.

4.1.2. Capacity Calculations

FAA AC 150/5060-5 provides guidance used to calculate airfield capacity and provide planning estimates on hourly airfield capacity under both VFR and IFR conditions, which are the theoretical maximum number of aircraft operations (takeoffs and landings) that can take place on the runway system in one hour under VFR or IFR conditions, respectively. The various capacity elements are then consolidated into a single figure, the ASV for the Airport. The ASV is the theoretical maximum number of aircraft operations that the Airport can support over the course of a year.

VFR/IFR Hourly Capacities

Because characteristics of airports vary so widely, guidance in AC 150/5060-5 provides different types of airports, from large commercial service hubs, to small single runway facilities. According to AC 150/5060-5, VFR and IFR capacity calculations are based on certain assumptions such as the previously calculated Mix Index. These assumptions and their relevance to the Airport are described below:

- The Airport is currently used by approximately 86 percent Class A/B aircraft and 14 percent by Class C aircraft. In the future, it is anticipated use will change to include operations by approximately 85 percent Class A/B aircraft and 14 percent by Class C aircraft, which represents the twenty year forecast condition.
- The Airport currently has partial-length parallel taxiways for Runways 6-24 and 16-34. Both runways will have full-length parallel taxiways within the planning period.
- All runway ends are equipped with a GPS approach; Runway 6 has an ILS approach.
- Arrivals equal departures.
- There are no airspace limitations affecting runway use; aircraft flying southwest of the Airport may enter Philadelphia International Airport's Mode C veil, which requires functional Mode C transponders.
- Percentage of touch-and-go operations is less than 50 percent.

Guidance in FAA AC 150/5060-5 was used to determine the ASV. Table 4-3 summarizes the above airfield capacity calculations for the Airport showing the current and forecast level of activity. These figures indicate that the Airport is currently operating at 34 percent of capacity on an annual basis. The utilization of the airfield is expected to climb to approximately 41 percent of ASV by 2035. Because most of the Airport's operations are conducted during VFR conditions, the VFR hourly capacity figures are included for comparison purposes. Airfield capacity at the Airport does

not appear to be constrained at the present, and future capacity is also anticipated to be adequate. FAA guidance recommends that planning for capacity enhancement should begin when capacity reaches the 60 percent level. It is assumed that any runway improvements that are contemplated will be supplemented by taxiway improvements to maintain capacity.

4.2. AIRFIELD FACILITY REQUIREMENTS

Airside facility requirements address the items that are directly related to the arrival and departure of aircraft, primarily runways and taxiways and their associated safety areas. To assure that all runway and taxiway systems are correctly designed, the FAA has established criteria for use in planning and design of airfield facilities. The selection of appropriate FAA design standards for the development of airfield facilities is based on the characteristics of the most demanding aircraft expected to use the airport or that particular facility at the airport on a regular basis (500 operations per year). Correctly identifying the future aircraft types that will use the Airport is particularly important, because the design standards that are selected will establish the physical dimensions of facilities, and the separation distances between facilities that will impact airport development for years to come. While the forecast chapter identifies the Airbus 319 based on current usage, this chapter will consider the A320 NEO aircraft, which shares the same design code for FAA standards. Areas not based on FAA standard design codes will consider the larger A320 NEO to ensure future flexibility with airline scheduling needs. Use of appropriate standards will ensure that facilities can safely accommodate aircraft using the Airport today, as well as aircraft that are projected to use the Airport in the future.

Airfield facility requirements are covered in this section as follows:

- Runway Length
- Runway Width
- Runway Strength
- Runway Orientation
- Runway Safety Area
- Runway Object Free Area
- Runway Protection Zones
- Runway Visibility Zone
- Runway Pavement Markings
- Taxiways
- Potential Hot Spots and Geometry Issues
- Airfield Lighting and Signage
- Visual Approach Aids
- Airfield Facility Requirements Summary

4.2.1. Runway Length

A wide variety of aircraft use Trenton-Mercer on a daily basis. These aircraft, both large and small, have different runway requirements. In some cases, smaller or older aircraft may require more runway length than larger or more efficient aircraft. A significant number of factors go into determining the runway performance of an aircraft such as airport elevation, aircraft weight,

temperature, flap settings, payload or runway condition (wet/dry), which then dictate the runway requirements that must be met in order for an aircraft to utilize that runway.

The FAA has published Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design*, to assist in the determination of the required runway length for both the primary and crosswind runways. The requirements for both the primary and crosswind runways are based on the performance of a specific aircraft or a family of similar aircraft.

Existing services and operations at the Airport operate safely and efficiently from both Runways 6-24 (6,006 feet long) and 16-34 (4,800 feet long).

The existing and future design aircraft are the Airbus A319 and A320neo (new engine option) for the Airport and Runway 6-24. The existing and proposed design aircraft for Runway 16-34 is the Gulfstream V. Per AC 150/5325-4B, the A319 and A320neo should be reviewed on an individual basis, as they are greater than 60,000 pounds in their maximum takeoff configuration. The Gulfstream V is considered as part of the 100% of aircraft in the 12,500 to 60,000-pound range and will be reviewed accordingly. Both the Airbus 320 series and Gulfstream V are C-III aircraft.

Airbus A319 – Aircraft performance for an Airbus A319 varies depending on the weight variant used. The current approximately 6,000-foot runway accommodates takeoff weights of up to 158,000 pounds in the summer, which translates into ranges of approximately 1,100 nautical miles (nm) depending on weather conditions and direction of travel. Current operations from TTN to Florida are approximately 900 nm, which represents the longest-range flight. This range allows for additional operations to destinations as far east as Houston, depending on the season. The A319neo provides a minimum of 15% fuel savings, which translates into increased range.

Airbus A320 – Aircraft performance for an Airbus A320 varies depending on the weight variant used. The current approximately 6,000-foot runway accommodates takeoff weights of up to 158,000 pounds in the summer, which translates into ranges of approximately 900 nautical miles (nm) depending on weather conditions and direction of travel. Current operations from TTN to Florida are approximately 900 nm, which represents the longest-range flight. This range allows for additional operations to destinations as far as Minneapolis. The A320eo provides a minimum of 15% fuel savings, which translates into increased range.

Airbus A320neo – Aircraft performance for an Airbus A320neo varies depending on the weight variant used. The current approximately 6,000-foot runway accommodates takeoff weights of up to 162,000 pounds in the summer, which translates into ranges of approximately 1,200 nm depending on the direction of travel. Current operations from TTN to Florida are approximately 900 nm, meaning the A320neo can open up additional potential destination in the future.

Gulfstream IV/V - It is assumed that aircraft using Trenton will have maximum destinations east of the Mississippi River, which is approximately 1,300 nm (southern Louisiana). Instead of MTOW (which requires 5,910 feet of runway length in standard conditions), the Gulfstream V is anticipated to take off at approximately 64,000 pounds (operating weight plus the maximum payload weight plus one-hour reserve fuel). This results in an approximate takeoff distance of 4,320 feet a landing length of 4,815 feet and in wet and slippery conditions 6,230 feet (Gulfstream IV has a more critical landing length requirement).

Recommendation: The A319, A320, A320neo, and Gulfstream aircraft can safely takeoff and land at TTN. No runway extension is recommended.

4.2.2. Runway Width

Runways 6-24 and 16-34 are both 150 feet wide, which is meets FAA standards for C-III runways.

Recommendation: No changes are recommended for Runways 6-24 and 16-34.

4.2.3. Runway Strength

Pavement strength requirements are related to three primary factors: 1) the weight of aircraft anticipated to use the airport, 2) the landing gear type and geometry, and 3) the volume of aircraft operations. Airport pavement design, however, is not predicated on a particular weight that is not to be exceeded. The current methodology used in FAA's FAARFIELD airfield pavement design program analyzes the damage to the pavement for each airplane and determines a final thickness for the total cumulative damage per AC 150/5320-6E.

Design is based on the mix of aircraft that are expected to use the runway over the anticipated life of the pavement (usually 20 years). The methodology used to develop the runway pavement design considers the number of operations by both large and small aircraft, and reduces this data to a number of "equivalent annual operations" by a design aircraft, which is the most demanding in terms of pavement loading expected to use an airport. This may or may not be the design aircraft for planning purposes and its selection considers the type of landing gear and tire pressure in addition to weight. The outcome of the design process is a recommended pavement section that will accommodate operations by the forecast fleet mix, and withstand weather stresses without premature failure of the pavement.

The current pavement at the Airport is rated for 120,000 pounds single-wheel, 180,000 pounds dual wheel, and 320,000 pounds dual tandem for both runways according to the Airport's FAA 5010 Form *Airport Master Record*. Both runways are listed in good condition. The two critical aircraft, A320 NEO and Gulfstream V, have maximum takeoff weights of 172,000 and 91,000 pounds, respectively, the runways safely handle the design aircraft. The 2014 Pavement Condition Index (PCI) Report for the Airport showed Runway 16-34 in satisfactory condition and Runway 6-24 in fair condition.

Recommendation: Rehabilitation for Runway 6-24 is currently planned for 2017. Runway 6-24 will be subject to mill and overlay as the existing pavement is of sufficient thickness and strength to accommodate the future design aircraft.

4.2.4. Runway Orientation

A significant factor in evaluating a runway's orientation is the direction and velocity of the prevailing winds. Ideally, all aircraft takeoff and land in the direction of the wind. A runway alignment that does not allow an aircraft to go directly into the wind creates what is known as a crosswind component (i.e. winds at an angle to the runway in use), which makes it more difficult for a pilot to guide the airplane down the intended path. The commonly used measure of degree to which a runway is aligned with the prevailing wind conditions is the wind coverage percentage,

which is the percent of time crosswind components are below an acceptable velocity. Essentially, this measure indicates the percentage of time aircraft within a particular design group will be able to safely use the runway. Current FAA standards recommend that airfields provide 95 percent wind coverage.

Wind data for the Airport was obtained from the National Climatic Data Center (NCDC) in Asheville, North Carolina. The wind data was collected for a 10-year period from 2006 through 2015 at Trenton, and was compiled into all weather and IFR wind roses presented in **Figure 4-1** and **Figure 4-2**, respectively. The wind roses show the percentage of time winds at the Airport originated from different directions at various velocities. These percentages were then analyzed based on runway orientation and can be seen in **Table 4-4**. Ideally, the primary instrument runway at an airport should be the runway that has the highest percentage of wind coverage under IFR conditions, during which an approach procedure is needed.

According to the runway wind analysis, the current runway alignment at the Airport provides the recommended 95 percent coverage. The current RDC of C-III coverage is shown by the 16-knot coverage percentages as smaller aircraft cannot withstand as strong crosswinds. The 16-knot crosswind coverage allows operations at the Airport between 98 and 99 percent of the time. Crosswind coverage of 20 knots was not shown, as it does not apply at the Airport.

Table 4-4: Runway Wind Coverage Analysis

	All Weather Wind Coverage[1]			IFR Wind Coverage[2]		
	10.5 Knot	13 Knot	16 Knot	10.5 Knot	13 Knot	16 Knot
Runway 6-24	93.26%	96.35%	99.11%	94.50%	97.04%	99.14%
Runway 6	52.11%	53.38%	54.53%	69.89%	71.32%	72.31%
Runway 24	58.57%	60.41%	62.04%	42.94%	44.06%	45.18%
Runway 16-34	94.36%	97.04%	99.33%	90.87%	94.59%	98.44%
Runway 16	48.52%	49.59%	50.61%	58.18%	59.87%	61.71%
Runway 34	63.24%	64.85%	66.14%	51.09%	53.15%	55.18%
Both	99.14%	99.83%	99.98%	99.16%	99.79%	99.94%

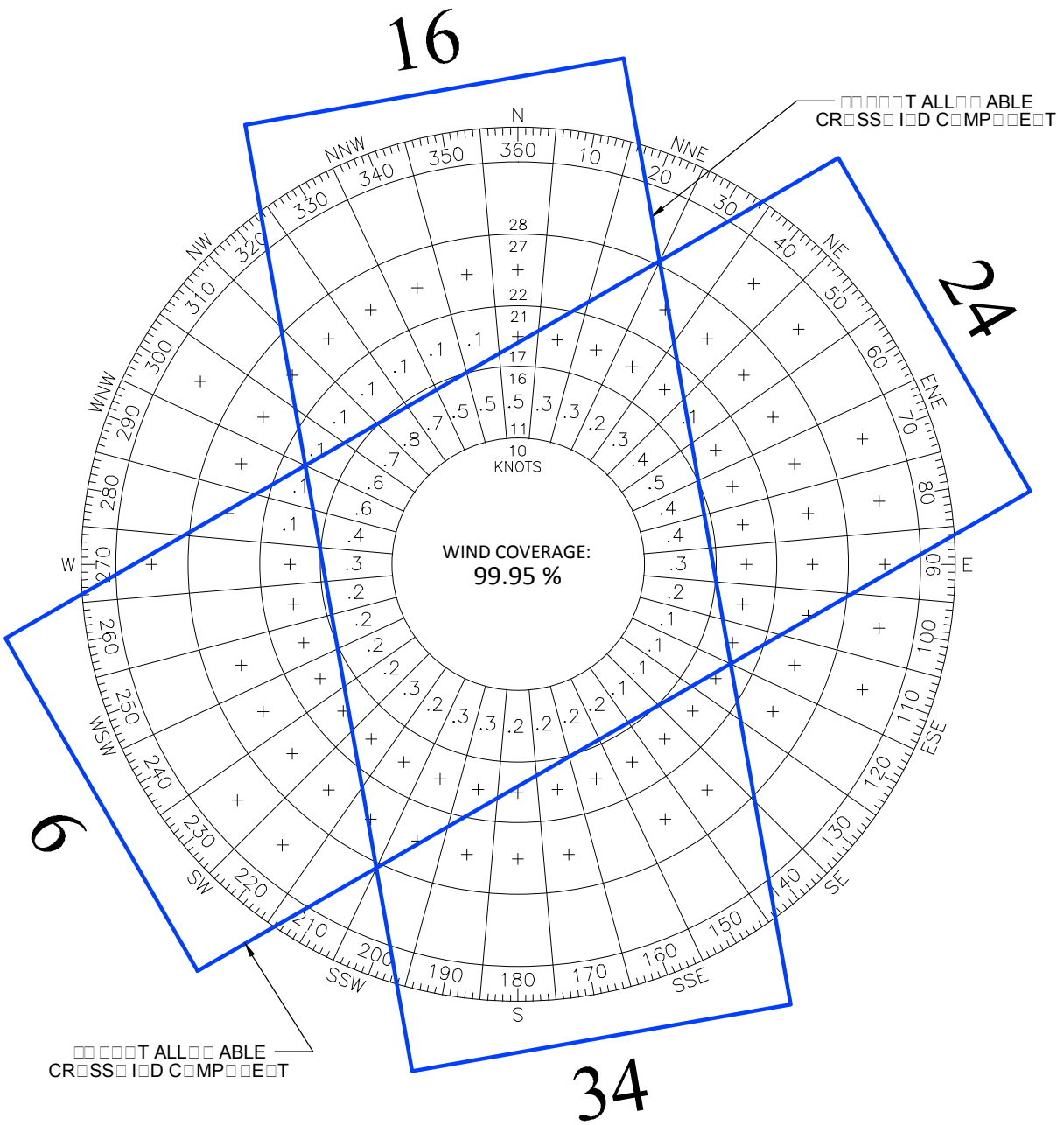
[1] All Weather Conditions: all ceiling and visibility conditions

[2] IFR Weather Conditions: ceiling less than 1,000 feet and below three statue miles but greater than or equal to 200 feet and one statute mile

Source: National Climactic Data Center – Trenton-Mercer Airport 2006-2015 (108,581).

Recommendation: Wind coverage meets 95% for both runways in both all-weather and IFR conditions. There is no recommendation for change.

Figure 4-1: All Weather Wind Rose



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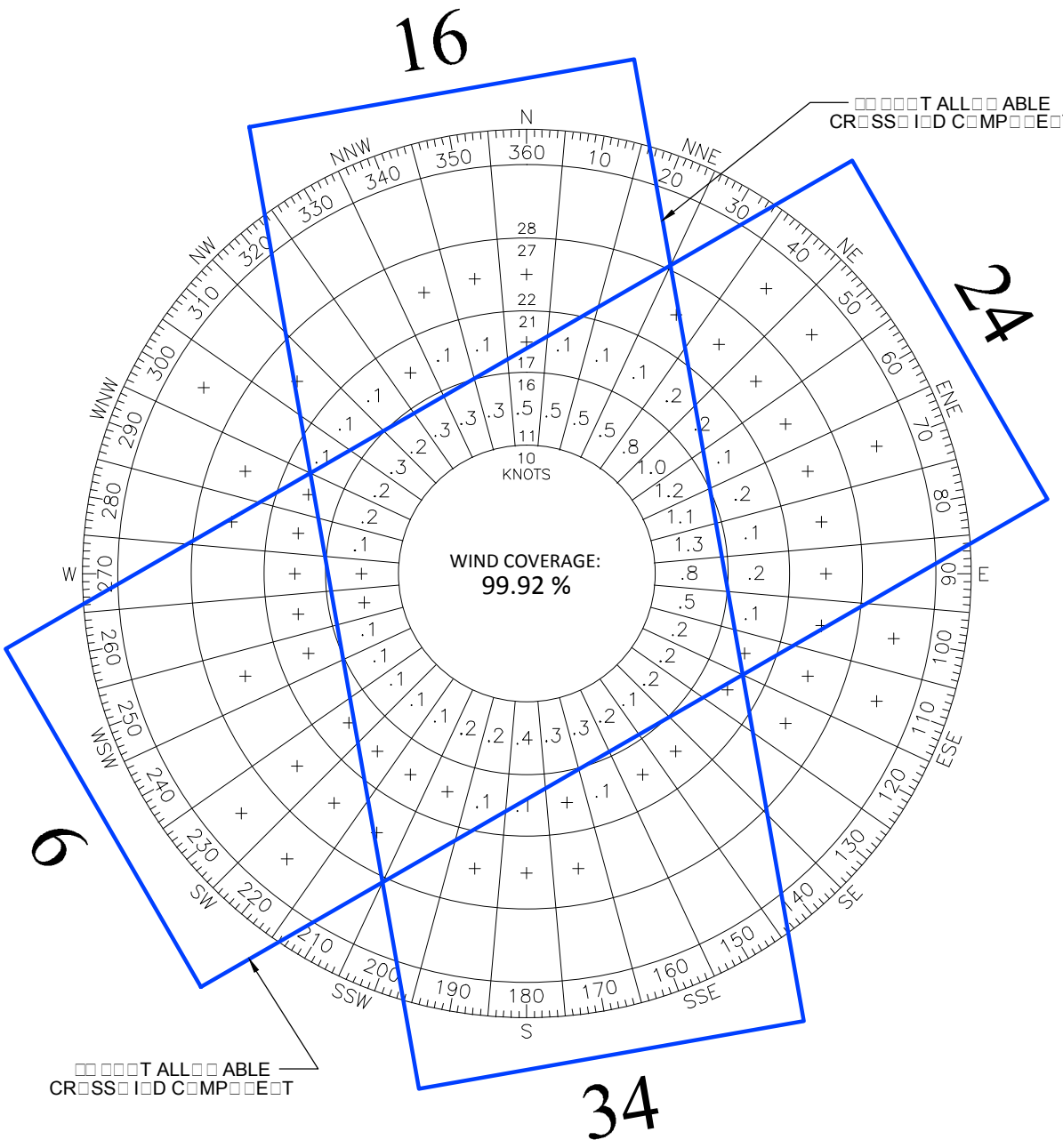
Source: National Climactic Data Center – Trenton-Mercer Airport 2006-2015 (108,581)

Figure 4-2: IFR Wind Rose



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Source: National Climactic Data Center – Trenton-Mercer Airport 2006-2015 (108,581)

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4.2.5. Runway Safety Areas

Runway safety areas (RSAs) are defined by the FAA as surfaces surrounding a runway that are prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway. RSAs consist of a relatively flat graded area free of objects and vegetation that could damage aircraft. According to FAA guidance, the RSA should be capable, under dry conditions, of supporting aircraft rescue and firefighting equipment, and the occasional passage of aircraft without causing structural damage to the aircraft. The FAA design standards for RSAs surrounding runways serving C-III aircraft is a width of 500 feet, a length that extends 600 feet prior to the landing threshold, and a length that extends 1,000 feet beyond the runway end. All four runway ends have engineering materials arresting system (EMAS), which is a bed of crushable concrete blocks designed specifically for the type of aircraft using the Airport. The purpose of an EMAS is to provide overrun protection by decelerating an aircraft and bringing it to a safe stop within the overrun area. The installation of the EMAS beds, means that the RSAs at the airport are now fully compliant with FAA RSA standards. An ongoing RSA project consists of moving the Runway 6 localizer to a point approximately 610 feet from the Runway 24 threshold.

Recommendation: No improvements to the existing RSAs are required.

4.2.6. Runway Object Free Areas

In addition to the RSA, a runway object free area (ROFA) is also defined around runways in order to enhance the safety of aircraft operations. The FAA defines ROFAs as an area cleared of all objects except those that are related to navigational aids and aircraft ground maneuvering. However, unlike the RSA, there is no physical component to the ROFA. Thus, there is no requirement to support an aircraft or emergency response vehicles.

Not unlike the RSA, FAA design standards for ROFAs surrounding runways serving RDC C-III aircraft are a width of 800 feet, a length of that extends 600 feet prior to the landing threshold, and a length that extends 1,000 feet beyond the runway end. Similarly, to the RSAs, the use of the four EMAS beds and declared distances that are the full length of each runway, is used to obtain additional ROFA and therefore meets design standards, except for a small corner of ROFA that extends beyond the Airport property near Runway 34.

Recommendation: ROFA extending beyond Airport property near Runway 34 should be acquired in fee.

4.2.7. Runway Protection Zones

RPZs are large trapezoidal areas on the ground off each runway end that are within aircraft approach and departure paths. The RPZ begins 200 feet beyond the end of the runway. The dimensions of the RPZ for each runway end are dependent on the type of aircraft and the approach visibility minimums associated with operations on that runway.

The RPZ is intended to enhance the protection of people and property on the ground. Many land uses (i.e. residential, places of public assembly, fuel storage) are prohibited by FAA guidelines within these areas. However, these limitations are only enforceable if the RPZ is owned or controlled by the airport sponsor. Airport control of these areas is strongly recommended and is

primarily achieved through airport property acquisition, but can also occur through easements or zoning to control development and land use activities.

The dimensions of the RPZ for each runway end are a function of the type of aircraft and the approach visibility minimums associated with operations on that runway. The RPZ begins 200 feet beyond the end of the area usable for takeoff and landing for all runways. The existing approach visibility minimums are shown in Table 4-5.

Table 4-5: RPZ Dimensions Per Runway End

Runway	Minimums	Length	Inner Width	Outer Width	Acreage
Runway 6	½ mile	2,500'	1,000'	1,750'	78.914
Runway 24	1 ¼ mile	1,700'	500'	1,010'	29.465
Runway 16	1 mile	1,700'	500'	1,010'	29.465
Runway 34	1 mile	1,700'	500'	1,010'	29.465

Source: FAA AC 150/5300-13A

The Airport currently owns land in fee off all runway ends to control portions of the Airport's RPZs as well as to prevent the construction of obstructions to the 14 Code of Federal Regulations (CFR) Part 77 approach surfaces. It is recommended that the Airport acquire interest for all areas within RPZs that are not currently under airport control. These areas include the southern portion of the Runway 6 RPZ. This area is comprised of several land uses considered non-compatible for an RPZ, including a portion of Bear Tavern Road and Sunset and Ridge Avenues. On the Runway 24 end the Airport owns in fee simple interest or easement nearly the entire RPZ, with the exception of Scotch Road and the northern and eastern corners. If a better approach to Runway 24 is considered, this would increase the RPZ size.

Only approximately half of the Runway 34 RPZ is on airport property. A rail line runs through the RPZ immediately beyond the EMAS bed. The entirety of the Runway 16 RPZ is on airport property. An easement is in place for the portion of Interstate 95 within the RPZ and Sam Weinroth Road is designated an internal road.

As previously noted, there are several public roads located within the RPZs. According to recently published guidance by the FAA, public roads are not considered compatible land uses within RPZs and are not recommended. The current FAA guidance does not require relocation of existing roadways within RPZs unless a change in geometry of the runway or a roadway occurs.

Recommendation: Acquire control of all land uses within existing and proposed RPZs (through fee simple acquisition or avigation easements) for those properties not currently under airport control or owned by a public entity.

4.2.8. Runway Visibility Zone

Standards have been developed for pilot visibility along runways, and between intersecting runways, which are known as the Runway Visibility Zone (RVZ). The RVZ is an area formed by imaginary lines connecting the two runway's visibility points, which are located half of the length between each runway end and the runway intersection. The current standard for intersecting runways recommends a clear line of sight between the ends of intersecting runways. According to

FAA AC 150/5300-13A, terrain needs to be graded and permanent objects need to be designed or sited so that there will be an unobstructed line of sight from any point five feet above one runway centerline to any point five feet above an intersecting centerline, within the RVZ. These standards are currently met at TTN.

Recommendation: No improvements to the existing RVZ are recommended.

4.2.9. Runway Pavement Markings

Both ends of primary Runway 6-24 have precision instrument approach runway markings. Both ends of Runway 16-34 have non-precision instrument runway markings. There are no plans for the establishment of a precision approach to either end of Runway 16-34, nor are they recommended. Consequently, the runway markings at the Airport are appropriate for their current and future approach requirements respectively.

Recommendation: No improvements to the existing runway pavement markings are required.

4.2.10. Taxiways

There are currently nine taxiways at the Airport. Runways 6-24 and 16-34 are served by partial parallel taxiways. All taxiways are discussed in more detail later on in this section. Planning standards for taxiways include taxiway width, taxiway safety areas, taxiway object free areas, taxiway shoulders, taxiway gradient, and for parallel taxiways, the distance between the runway and taxiway centerlines. The dimensions of each standard vary based on the identified airplane design group (ADG) and taxiway design group (TDG) for each taxiway. The ADG is based on the wingspan and tail height of an aircraft, while the TDG is based on the distance between an aircraft's cockpit to main gear, as well as the width of the main gear. There are six ADG groups, and seven TDG groups. Details regarding the various dimensions follow in **Table 4-6** and **Table 4-7**.

Table 4-6: Taxiway Requirements – Airplane Design Group

Design Standard	ADG I	ADG II	ADG III	ADG IV	ADG V	ADG VI
Taxiway Safety Area	49	79	118	171	214	262
Taxiway Object Free Area	89	131	186	259	320	386
Runway/Taxiway Separation	225 – 400*	240 – 400*	400	400	400	500*

Source: FAA AC 150/5300-13A

** Runway/Taxiway Separation vary based on approach visibility minimums*

Table 4-7: Taxiway Requirements – Taxiway Design Group

Design Standard	TDG 1	TDG 2	TDG 3	TDG 4	TDG 5	TDG 6	TDG 7
Taxiway Width	25	35	50	50	75	75	82
Taxiway Shoulder Width	10	10	20	20	25	35	40

Source: FAA AC 150/5300-13A

As taxiways are constructed or rehabilitated, design should carefully consider the recently updated guidance for taxiway design as published in FAA AC 150/5300-13A. The new requirements include

the design of taxiways for cockpit over centerline taxiing as opposed to judgmental oversteering. This change particularly impacts curves and intersections, which will require changes to accommodate the cockpit over centerline taxiing. The dimensions of intersection fillets and taxiway curves are based on the associated TDG for each taxiway.

The current and future design aircraft (A319 and A320neo) are both TDG 3 aircraft. Certain taxiways will only be used to a Gulfstream V or smaller aircraft; these taxiways will be designed to meet TDG 2 standards.

Taxiway A

Taxiway A is 75 feet wide and therefore meets and exceeds TDG 3 standards. It serves as both the access and crossover taxiway for both Runways 6-24 and 16-34. Both at the intersection of Runways 6-24 and 16-34, Taxiway A crosses in a non-perpendicular fashion, which does not meet geometry criteria. Additionally, at the intersection of Taxiways A and J with Runway 6-24, pilots could be confused which way to turn and may take up additional runway time before proceeding. Taxiway A provides direct access from the apron area to Runway 16-34. Taxiway A pavement was assessed as fair in 2014.

Taxiway B

Taxiway B is between 75 and 80 feet wide and has a runway separation of approximately 440 feet. It provides access to the Runway 24 threshold. The taxiway width meets and exceeds existing and proposed taxiway width and separation requirements. Taxiway B pavement was assessed as very poor in 2014.

Taxiway C

Taxiway C is 75 feet wide and meets TDG 3 standards. It serves as a crossover taxiway to Runway 16-34 and exit/entrance taxiway to Runway 6-24. This taxiway provides direct access from the ramp area to Runway 16-34 and intersects it in a non-perpendicular fashion, both of which do not meet FAA geometry requirements. Additionally, it intersects Runway 6-24 in a non-perpendicular fashion and could confuse pilots on the runway as the exits for Taxiways C and F are immediately adjacent to each other. Taxiway C pavement was assessed as satisfactory in 2014.

Taxiway D

Taxiway D is 50 feet wide which meets TDG 3 standards and has a runway separation of approximately 275 feet. The runway separation does not meet the ADG III 400-foot separation requirement. It serves as a partial parallel taxiway to Runway 16-34 and provides access to Runway 34, but not at the threshold, which does not meet FAA geometry requirements. Additionally, Taxiway D provides direct access from the apron via a taxilane to Runway 34, which does not meet FAA geometry requirements. Taxiway D pavement was assessed as serious in 2014.

Taxiway E

Taxiway E is 75 feet wide and has a runway separation of 400 feet. It serves as a partial parallel taxiway to Runway 16-34 and provides access to Runway 34, but in a non-perpendicular fashion, due to the adjacent non-airport property. Taxiway E pavement was assessed as poor in 2014.

Taxiway F

Taxiway F is between 50 and 60 feet wide and has a runway separation between 290 and 525 feet. It serves as a partial parallel taxiway to Runway 6-24 and a crossover taxiway to both runways. Taxiway F does not meet separation requirements. Additionally, it crosses both runways in a non-perpendicular fashion, which does not meet FAA geometry requirements. Taxiway F pavement was assessed as poor in 2014.

Taxiway G

Taxiway G is 75 feet wide and has a runway separation of 400 feet, which meets TDG 3 requirements. It serves as a partial parallel taxiway to Runway 16-34 and provides access to the Runway 16 threshold. Taxiway G pavement was assessed as poor in 2014.

Taxiway H

Taxiway H is 75 feet wide and is under construction to provide a separation of 400 feet. It serves as a partial parallel taxiway to Runway 16-34 and provides access to the Runway 16 threshold. Taxiway H pavement was assessed as very poor in 2014 but is being reconstructed in 2016.

Taxiway J

Taxiway J is 75 feet wide and has a runway separation of 400 feet. It serves as a partial parallel taxiway to Runway 6-24 and provides access to the Runway 6 threshold. The taxiway width and runway separation meet FAA design standards. Taxiway J pavement was assessed as satisfactory in 2014.

Recommendation: The following design and geometry issues were found and should be resolved:

- **Taxiway A**: direct access, non-perpendicular runway intersections, and confusing intersection between Taxiways A and J and Runway 6-24.
- **Taxiway C**: direct access, non-perpendicular runway intersections, and confusing intersection between Taxiways C and F and Runway 6-24.
- **Taxiway D**: direct access and runway separation do not meet design standards.
- **Taxiway E**: non-perpendicular runway intersection.
- **Taxiway F**: runway separation does not meet design standards and non-perpendicular runway intersection.

Additionally, any pavement condition in failed, serious, very poor, and poor condition should be rehabilitated in the short-term. Pavement assessed as fair should be rehabilitated within the planning period.

If any changes to the taxiways occur, Engineering Brief No. 89, *Taxiway Nomenclature Convention*, dated March 29, 2012 should be used to ensure clear taxiway nomenclature.

4.2.11. Potential Hot Spots and Geometry Requirements

Published Hot Spots

A hot spot is defined as "a location on an airport movement area with a history of potential risk of collision or runway incursion, and where heightened attention by pilots and drivers is necessary."[1] There are no published hot spots at the Airport.

Between 1990 and 2016 there were five accidents at the Airport. The Airport has had 20 runway incursions since 2003.[2] At three of these incursions, aircraft entered the runway from taxiways with direct access between the ramp and the runway. Two were Taxiway A to Runway 16-34 and one was at Taxiway C at Runway 16-34.

Geometry Requirements

FAA AC 150/5300-13A has multiple criteria in the design of taxiways. These geometry criteria are as follows:

- Three Node Concept: The three-node concept means that any taxiway intersection has no more than three choices – ideally left, straight, and right. Any more decision points make it potentially confusing to a pilot and does not allow for the proper placement of airfield markings, signage, and lighting. The three-node concept helps pilots maintain situational awareness.

- Taxiway Intersection Angles: Taxiway intersections are preferred to be 90-degrees whenever possible. Standard angles including 30, 45, 60, 90, 120, 135, and 150 degrees are preferred over other, non-standard, angles.

- Wide Expanse of Pavement: Wide pavements require placement of signs far from the pilot's eye which can be missed during low visibility conditions and should be avoided. This is especially critical at runway entrance points.

- Limit Runway Crossings: Limiting runway crossings reduces the opportunity for human error and reduces air traffic controller workload.

- Avoid "High Energy" Intersections: These intersections are located in the middle third of runways. This portion is where the pilot can least maneuver to avoid a collision.

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[1] Runway Safety – Hot Spot List, accessed Feb. 3, 2016 <http://www.faa.gov/airports/runway_safety/hotspots/hotspots_list/>.

[2] FAA Runway Incursion Database, accessed Feb. 18, 2016 <http://www.asias.faa.gov/pls/apex/f?p=100:28:0::NO:28::>.

- Runway Intersection Angles/Increase Visibility: Right (perpendicular) intersection angles between taxiways and taxiways and taxiways and runways provide the best visibility to the left and right for a pilot. A right angle at the end of a parallel taxiway is a clear indication of approaching a runway. Acute angle runway exits (high-speed taxiways) provide for greater efficiency in runway usage, but should not be used as a runway entrance or crossover point.

- Avoid "Dual Purpose" Pavement: Runways used as taxiways and taxiways used as runways can lead to confusion. A runway should always be clearly identified as a runway and only a runway.

- Indirect Access: Taxiways leading directly from an apron to a runway without requiring a turn can lead to confusion when a pilot typically expects to encounter a parallel taxiway but instead accidentally enters a runway.

- Multiple Taxiway Crossings Near Runway: A taxiway crossing a high-speed taxiway or multiple taxiways crossing each other between the hold line and the runway could cause confusion, additional time on the runway, and wrong turns/loss of pilot situational awareness.

- Taxiway Intersecting Multiple Runways: Taxiways must never coincide with the intersection of two runways. This creates a large expanse of pavement making it difficult to provide proper signage, marking and lighting. These could lead to pilot disorientation and potential wrong runway use.

- Aligned/Inline Taxiway: An aligned taxiway is one whose centerline coincides with a runway centerline. This places taxiing aircraft in direct line with aircraft landing or taking off therefore closing the runway for other traffic and potentially causing loss of situational awareness. Existing aligned taxiways should be removed as soon as practicable.

- "Y" Shaped Taxiway Crossing a Runway: Any runway crossing or runway exit that requires a pilot to make a decision prior to exiting the runway may cause a delay in the aircraft existing the runway and loss of situational awareness.

- Multiple Runway Thresholds in Close Proximity to One Another: If possible, safety areas of runway ends should not overlap, since work in the overlapping area would affect both runways. Configurations where runway thresholds are closer together should be avoided, as they can be confusing to pilots, resulting in wrong-runway takeoffs. The angle between extended runway centerlines should not be less than 30 degrees to minimize confusion.

- Short Taxi Distance: A short distance between the terminal and the runway requires flight crews to complete the same number of checklist items in a shorter timeframe and requires more heads-down time during taxi. Many of the event reports mentioned that the flight crew members were rushing to complete their checklists or to expedite their departures.

- **Taxiway Stubs**: Short taxiway stubs including overlapping holdlines or holdlines too close together to accommodate the length of an aircraft can create confusion and may cause runway incursions or accidents.

- **Unexpected Holdlines**: Holdlines located on a parallel taxiway or other unexpected location are more likely to be overlooked and cause a runway incursion or accident and should be avoided.

- **Intersection Departures**: Airports with a single runway layout were not immune to airplanes taking off on the wrong runway, especially when intersection departures were made. In these events, the flight crew taxied onto the runway and turned in the wrong direction, taking off 180 degrees from the intended direction.

The following elements or contributing factors are historically associated with wrong runway uses and should have the highest priority in resolving: [3][4]

- Multiple runway thresholds located in close proximity to one another.
- A short distance between the airport terminal and the runway.
- A complex airport design.
- The use of a runway as a taxiway.
- A single runway that uses intersection departures.
- A single taxiway leading to multiple runways.
- More than two taxiways intersecting in one area.
- A short runway (less than 5,000 feet).
- Joint use of a runway as a taxiway.

Table 4-8 shows geometry issues at TTN by geometry requirement.

Table 4-8: Geometry Issues at Trenton

Geometry Requirement	Taxiway/Taxiway Int.	Runway/Taxiway Int.
Three node concept	TWYs A, C, & G	RWY 6-24 with TWYs C & F
Taxiway intersection angle	TWYs A & J - 37° TWYs B & C - 53° TWYs D & F - 71° TWYs E & F - 71°	See Increase Visibility
Wide expanse of pavement	TWYs E & F	RWY 16-34 & TWY A RWY 6-24 & TWYs A & J
Runway crossings	N/A	RWY 6-24: 2 RWY 16-34: 5
High energy intersections	N/A	RWY 16-34 & TWY C

[3] Wrong Runway Departures, Aviation Safety Information Analysis and Sharing, July 2007.
[4] Wrong Runway Departures, FAA Runway Safety, September 2009, accessed Feb. 3, 2016 <https://www.faa.gov/airports/runway_safety/publications/media/wrong%20runway%20FINAL%20draft%20sept09.pdf>.

Geometry Requirement	Taxiway/Taxiway Int.	Runway/Taxiway Int.
Increase visibility	See Taxiway Intersection Angle	RWY 6-24 & TWY A RWY 6-24 & TWYs C & F RWY 16-34 & TWY A RWY 16-34 & TWY C RWY 34 & TWY E
Dual purpose pavement	None	RWY 34 via TWY D
Direct access	N/A	RWY 34 & TWY D RWY 16-34 via TWY A RWY 16-34 via TWY C
Multiple taxiways crossing	N/A	RWY 6-24 with TWYs A & J RWY 6-24 with TWYs C & F
Taxiway intersecting multiple runways	N/A	None
Aligned taxiway	N/A	None
Y-Shaped Runway Crossing	TWYs C & F	N/A
Multiple Runway Thresholds in Close Proximity	N/A	None
Short Taxi Distance	TWY A (north & south) to RWY 16-34 between Taxiways H and G TWYs A & F from the terminal ramp to RWY 6-24 TWY C from the GA apron (TWY B) to RWY 16-34 TWY F from the FBO terminal to Runway 6-24	N/A
Taxiway Stubs	None	N/A
Unexpected Holdline	TWY D TWY F	None
Intersection Departure	N/A	During operational need only: TWY A for RWY 16-34 TWY A for RWY 6-24 TWY F for RWY 24 TWY F for RWY 34

N/A – not applicable; RWY – runway; TWY – taxiway
Source: McFarland Johnson analysis, 2016

Recommendation: Geometry issues should be resolved as much as practicable. Priority should be set to resolve the following geometry requirements in **Table 4-8**: unexpected holdlines, direct access, runway crossings (Runway 16-34), and multiple taxiways crossing.

4.2.12. Airfield Lighting and Signage

Approach Lighting

The existing precision approach to Runway 6 end is equipped with a 2,400-foot medium intensity approach lighting system with runway alignment indicator lights (MALSR).

The current approach lighting system on Runway 6 meets the standards for ILS category (CAT) I approaches and meets existing needs at the Airport. Wind conditions predominantly favor Runway 6 during IFR conditions (over 70 percent).

Presently, no approach lighting systems are available, for Runways 16, 24, and 34. However, all three ends support non-precision GPS approaches and Runway End Indicator Lights (REILs). REILs assist pilots in identifying the runways and are useful in areas with a significant amount of other lighting sources or during times of reduced visibility.

Recommendation: There are no recommendations for approach lighting.

Runway and Taxiway Lighting

Runway and taxiway edge lights are provided on Runways 6-24 and 16-34 and all taxiways. High intensity runway edge lights (HIRLs) are provided on both Runway 6-24 and 16-34. All lighted taxiways are currently equipped with medium intensity taxiway edge lights (MITLs). Airfield lighting is controlled by the on-site airport electric vault. The airport's electrical vault is located adjacent to the ATCT. A 2015 inspection revealed some electrical code inconsistencies and unsafe conditions. The existing vault was installed several decades ago and needs to be updated or replacement.

Recommendation: Update or replace the electrical vault in the short-term.

Airfield Signage

There have been no complaints about missing or confusing airfield signage. Should the Federal Aviation Regulations (FAR) Part 139 inspections show up any non-standard conditions, these should be addressed.

Recommendation: Maintain current signage and fix any Part 139 inspection findings.

4.2.13. Visual Approach Aids

Presently, Runways 16, 24, and 34 have a four box Precision Approach Path Indicator (PAPI) system on the left side of each end with a standard 3-degree glide path. Runway 6 end has no visual approach aids. Installation of a PAPI system to Runway 6 could provide additional guidance to visual pilots utilizing the runway.

Recommendation: Installation of a PAPI for Runway 6 should be considered.

4.2.14. Airfield Facility Requirements Summary

Several requirements for airside facilities have been discussed throughout this section. A summary of the key requirements identified can be found in **Table 4-9**. Geometry issues are identified in **Table 4-8**.

Table 4-9: Summary of Airside Facility Requirements

Item/Facility	Existing Facility or Capacity	Ultimate Requirement	Deficit
Runway Length	Runway 6-24 – 6,006' Runway 16-34 – 4,800'	Runway 6-24 – 6,006' Runway 16-34 – 4,800'	None
Runway Width	Runway 6-24 – 150' Runway 16-34 – 150'	Runway 6-24 – 150' Runway 16-34 – 150'	None
Runway Safety Areas	Standard on Runway 6-24 through EMAS Standard on Runway 16-34 through EMAS	Provide Standard RSA on all Runways	None
Runway Object Free Area	Standard on Runway 6-24 through EMAS Standard on Runway 16-34 through EMAS, except road corner	Provide Standard on all Runways	Control of all ROFA through Ownership or Avigation Easements
Runway Protection Zone	Partially Under Airport Control through Ownership	Under Airport Control through Ownership or Avigation Easements	Control of all RPZs through Ownership or Avigation Easements
Runway Lighting	Runway 6-24 – HIRLs Runway 16-34 – HIRLs	Runway 6-24 – HIRLs Runway 16-34 – HIRLs	None
Runway Visual Aids	Runway 6 – MALSR Runway 24 – PAPI Runway 16 – PAPI Runway 34 – PAPI	Runway 6 – MALSR Runway 24 – PAPI Runway 16 – PAPI Runway 34 – PAPI	None
Instrument Approaches	Runway 6 – ILS Runway 24 – GPS Runway 16 – GPS Runway 34 – GPS	Runway 6 – ILS Runway 24 – GPS Runway 16 – GPS Runway 34 – GPS	Runway 24 – ¾ mile visibility minimums (GPS)
Taxiways	Runway 6-24 – Partial Parallel; 400 feet Runway 16-34 – Partial Parallel; 350 feet	Runway 6-24 –Full Parallel; 400 feet Runway 16-34 –Full Parallel; 400 feet	Address Airfield Geometry Concerns and Meet FAA Standards
Taxiway Width	50 – 80 feet	50 feet	None
Taxiway Lighting	All Taxiways – MITL	All Taxiways – MITL	None

Sources: FAA Form 5010-1; McFarland Johnson analysis

4.3. TERMINAL FACILITY REQUIREMENTS

This section analyzes the physical demands required of a terminal building to accommodate the immediate and short-term functional needs of Trenton-Mercer Airport (TTN) users/tenants. The overall goal is a tabulation of areas (SF) of all major components within a terminal structure, correctly sized to accommodate the traffic demand.

The facility requirements are identified through a quantitative evaluation of both building functional and support space related to the FAA approved forecast passenger demand (490 Peak Design Hour Enplaned). The following guides are utilized as reference:

- FAA Advisory Curricular 150/5360-13, *Planning and Design Guidelines for Airport Terminal Facilities*
- FAA Advisory Curricular 150/5360-9, *Planning and Design of Airport Terminal Facilities at Non-Hub Locations*
- TSA Checkpoint Design Guide
- Airport Cooperative Research Program (ACRP) Report 25, *Airport Passenger Terminal Planning and Design*

Note that the latter two references are most current and form the primary basis of calculations. Note too, that these guides are generic in nature, with actual demands dependent on the specific locale and its own unique requirements. Comments will be made regarding these possible variations throughout this chapter.

A summary of this tabulation is included as a conclusion.

4.3.1. Existing Facility

In summary, the existing terminal building is seriously deficient in many respects. The following items highlight these issues:

1. The terminal facility is composed of two separate structures with no physical connection. This includes the larger “outbound” ticketing/holdroom building and the modular inbound baggage claim facility. Arriving and departing passengers do not mix, resulting in passenger and meeter/greeter confusion.
2. Constructed in the 1970’s, the physical condition of the original structure (HVAC, plumbing, roofing, glazing, finishes, etc.) is in various stages of disrepair. Code compliance (ADA, fire egress, etc.) is deficient per current regulations, and many hazardous materials such as asbestos that were commonly used in construction of this era may be present.
3. The total area available within the two structures is approximately 25,000 square feet and is woefully deficient in terms of accommodating current traffic demands (refer to tabulations).
4. The main structure utilizes a split level configuration, adding to the inflexibility of non-overlapping spaces and the need for vertical circulation movements throughout.
5. Spaces for complimentary airport use have been added and deleted, modified and revised, and generally built with minimal functional planning over the Terminal’s useful life. Examples of this include the car rental counter and Mercer County Sherriff’s spaces, as well

as the office space in the upper levels currently used by Frontier Airlines. None of these spaces were planned; all are inadequate for current demands. In fact, the airport administration offices were relocated out of the Terminal in 2014 to provide the space that Frontier is currently occupying.

6. The recently constructed TSA checkpoint and hold room at the apron level were designed and built as a minimal facility to process Frontier passengers; there is no ability to add any capacity beyond these recently renovated spaces.

4.3.2. Facility Requirements

Ticketing and Check-In

The universal demand on manned ticket counters is in decline across the airline industry. Many passengers print their boarding passes prior to arrival and fewer are checking bags. With this, there is less demand for airline ticketing space. Furthermore, modifications to travel plans due to weather delays, operational situations, or changing travel plans can now be readily made via smart phone, lessening the demand even more. This trend is expected to continue.

Nine ticketing positions are currently utilized by the existing airline. This includes four counter positions and five kiosks. Fourteen (14) positions will be required in the new terminal design to satisfy the demand represented in the FAA approved forecast. Depending on specific requests of the respective airline(s), kiosks may be positioned within this counter zone or located in remote locations such as future parking garages. The final layout, with these considerations addressed, will dictate the actual dimensions of this public space.

The airline office space should be adjacent to the ticket counter zone for operational efficiency and customer support. Depending on the terminal layout, the ground operations area may be remote, possibly at ramp level and adjacent to aircraft operational areas.

Baggage make-up should also be positioned in close proximity to the ticket counter zone due to the required conveyor connections. However, as this space interfaces with the baggage screening area, the final layout of this area is subject to the overall terminal layout and TSA preferences. Further meetings with local and regional TSA representatives will clarify the preferred layout when designing the long-term solution.

Recommendation: Plan for a seven dual-position ticket counter zone with shared bag wells and related areas to accommodate the FAA approved forecast.

Hold Rooms

Four aircraft parking positions are currently in service at the existing TTN terminal. The largest aircraft utilized is the Airbus A320 with a seating capacity of 186 passengers.

To meet this demand and to provide redundancy and the ability to deal with irregular operations (delays), four holdroom areas consistent with the A320 operation are recommended for Terminal planning purposes. Overall, the assumption is that the aircraft boarded will include 50% regional aircraft (50-100 seats) and 50% narrow-body aircraft (100-186 seats). In accordance with industry standards for passenger terminals to accommodate 490 peak hour passengers, it is recommended

to provide for 1,360 SF for each commuter aircraft seating area and 2,460 SF for each narrow-body holdroom, assuming a contiguous layout of space with no fixed interruptions for ultimate flexibility. Additional space beyond these totals should be included to handle the higher than national average load factor, a lounge/play area for kids/parents, charging stations, and areas of larger, lounge-type furniture. The long term solution for proposed seating, airline counter space, queuing and necessary circulation space will lead to a more consistent passenger experience to similar, smaller commercial service airports.

Recommendation: Provide for 12,120 SF of holdroom space to accommodate the 490 peak hour passengers identified in the FAA approved forecast.

Baggage Claim

The public zone of the baggage claim area includes the bag conveying system equipment, space immediately adjacent for bag retrieval, and adequate circulation space within. Space must also be included for lost bag retrieval, information kiosks, hotel boards, seating, ground transportation wayfinding and/or kiosks, and other passenger-related conveniences. Providing additional space for meeters/greeters (beyond that required for arriving passengers) should also be a consideration.

The total area required for this public space depends primarily on the type of claim device utilized and its frontage configuration. Also, to be considered is the airline preferences for the handling of over-sized bags (skis, golf clubs, etc.). A minimum of two conveyers must be planned to both accommodate multiple aircraft arriving simultaneously, as well as for repair/maintenance redundancy.

The inbound baggage area is an enclosed area (partially heated/cooled) accommodating the tug movement for the dispersal of bags. Adequate length between the individual bag conveyers must be considered to allow for the safe and efficient maneuvering of multiple bag trains. Likewise, adequate width in this area is also necessary to accommodate secondary tug movement around the stationary vehicles and carts.

Recommendation: Provide for 340 LF of baggage claim frontage to accommodate the 490 peak hour passengers identified in the FAA approved forecast. The baggage claim devices should be able to accommodate simultaneous Airbus A320 arrivals and provide public-side recirculation consistent with security guidelines.

Rental Cars

Car rental facilities located within the terminal facility typically include an office area (with room for storage of car seats and similar amenities), a counter zone, and customer queuing areas. Located in close proximity to the baggage claim area for passenger convenience, the most flexible alignment is a single continuous zone of space.

A 10’ module per agency is assumed for planning purposes. This length will accommodate dual counter positions and a single access point for employees. While there is currently only one brand represented in the terminal due to space, other brands are currently operating off airport. A review of similar sized airports found most have between four and five rental car brands

represented in the terminal. Five counter positions for agencies should be planned (or four agencies and a limo/taxi operation).

Apart from the obvious passenger benefit of having multiple rental car options (as compared to the single operator in the existing facility), the adjacency to the bag claim area is a major benefit since passengers can complete their transaction while waiting for their baggage. The current situation of a completely separate baggage claim building, remote from the rental car operation, adds significant walking distance which translates directly to significant time delay, degrading the customer experience as compared to other airports.

Recommendation: Provide a contiguous 50-foot zone of rental car counter space (and related office and queuing areas) to satisfy the demand represented in the approved FAA forecast.

Concessions

Terminal concessions include all revenue-producing entities that serve the public (food, beverage and retail). The current concession arrangement at TTN includes a small snack bar within the sterile zone as well as a much larger non-sterile food/drink establishment on the upper level.

Concession opportunities within both the sterile and non-sterile zones must be accommodated. However, a single concessionaire offering a variety of services may be the most financially viable scenario for an airport of this size. Accommodations must be made to allow this operation to function in the most cost effective manner (staffing/space/efficiency) to ensure financial viability. Depending on the vendor and the planned service line, a "secure" kitchen serving both the non-sterile and sterile area may prove to be the optimum scenario when considering both vendor efficiency and passenger convenience.

Although further discussions with airport administration will clarify this initial direction in planning, concession needs over time will fluctuate significantly. Flexibility in accommodating changing needs, within both the sterile and non-sterile zones, is necessary.

Recommendation: Plan for a zone of in both sterile and non-sterile concession space that accommodates the demand represented in the approved forecast while allowing for ultimate flexibility.

Public Restrooms

The number and size (quantity of fixtures) of restrooms located in public buildings are determined by local building codes and assumed usage ("business", "assembly", etc.). Once areas of use are delineated, math calculations of assumed users within each space (per SF) will dictate the required plumbing fixture counts to satisfy the expected demand.

However, airport restrooms are typically larger than these established standards both in number of fixtures as well as stall size. Restrooms within both the non-sterile and sterile zones must accommodate passengers with baggage, dictating larger stalls and/or shelving for bag placement. Also, restrooms within the sterile zone must be planned to accommodate more than the minimum number of stalls due to the peak usage of deplaning passengers. All restroom configurations should include family rooms as well as baby changing areas, and be conveniently positioned

adjacent to the high public use areas (hold rooms, security check point, concessions and baggage claim).

Recommendation: Provide a variety of convenient/adequate restroom facilities within both the sterile and non-sterile terminal areas. The number of fixtures should be based on the computation of the square foot necessary of each specific terminal area to accommodate the FAA approved forecast of 490 peak hour passengers.

Public Lobby

The only public lobby seating within the existing terminal is located in the additional seating are on the upper level, adjacent to the non-sterile food/drink concession. Although only slightly inadequate in size to accommodate the current passenger demands, its location is hidden, remote, inconvenient, and it is not fully ADA accessible.

The optimum public lobby scenario positions the seating in areas most convenient for passengers and visitors, providing spacious/comfortable seating options within close and visual proximity of the major public activities. This includes seating adjacent to ticketing, baggage claim and food/beverage concessions (if not already included as part of the lease agreements).

Based on the projected activity levels, there is no need to have ticketing and baggage located on separate levels as at larger airports. This layout allows for common core functions for lobby and circulation to be shared, reducing the amount of overall public space required. As such, the bulk of non-sterile seating should be accommodated within this area. If the discharge pathway of deplaning passengers exists through this space, additional seating should be considered for meeter/greeters; otherwise, if remote, a small area should be planned in immediate proximity. Also included within this category could be an art/display area, a non-denominational chapel, and a business center, with the final size and location of these components to be determined.

Recommendation: Provide a variety of public seating areas convenient to the primary public spaces within the terminal. Each area should be sized to accommodate the FAA approved passenger demands at these specific locations.

Security

This general heading encompasses all of the components contained within the terminal complex that involves TSA control and utilization. As such, a thorough review of the planning directives for all activities with the local TSA staff is imperative.

Independent of such a meeting, an estimate of the requirements can be made based on the forecast and peak hour passenger totals: three screening lanes will be required based on an assumed throughput of approximately 180 passengers per lane per hour to accommodate the projected 490 peak hour passengers. Two will most likely suffice throughout the majority of the terminal's operating hours; however, a third for the busier times (and for redundancy in an emergency) is preferred. Regardless, considerations must be given to providing a space that is

easily expandable (and internally flexible) to accommodate quickly changing traffic patterns as well as equipment/template improvements and modifications.

The requirements for both the office/support space and the baggage screening space projected are unknown. Whereas the former tally is somewhat inconsequential in its relatively small required area (and its flexibility in terminal location), the latter is an extremely critical component both in potential size and its very specific location "between" the deposited bags at ticketing and the outbound baggage operation. The "stacking" of the terminal diagram (with either the ticketing and ramp movement on the same level or separate) will have a major input on the final configuration. Likewise, the particular type of screening equipment to be utilized, and manpower required will further define the appropriate design. Only a review of the proposed terminal layout and an in-depth discussion with the airport administration and TSA personnel, reviewing a series of options and scenarios, will lead to a sound planning direction. This will be a key early-action activity of any future Terminal programming exercise.

Recommendation: Provide three screening lanes (as well as necessary queuing and re-composure space) to accommodate the approved 490 design hour passenger load. The ultimate configuration is subject to the exact equipment and lane configuration desired by the TSA.

Administration

Although the amount of administration space varies widely from locale to locale, the specific types of space typically incorporated into a terminal facility are consistent. These types include an administration suite (staff offices, conference rooms, etc.) always located within the non-sterile area for public access - and typically with airside views and immediate ramp accessibility. This space, although accessible to both the traveling and non-traveling public, is often somewhat remote, allowing the more critical public spaces the more immediate and convenient access.

Other administration space to consider are training/lockers/support areas, security/police departments, and other county departments that would benefit by this more remote location.

Recommendation: Verify the specific airport administrative and support space requirements per the FAA approved forecast demands.

4.3.3. Terminal Facility Requirements Summary

The components discussed present a clear indication of the core deficiencies within the existing passenger terminal. Although final area adjustments for each functional component will be determined during the design process, Table 4-10 illustrates a starting point for the proposed terminal sizing.

Note that this tabulation does not include several non-departmental areas essential to the functioning of a terminal structure. The major square footage component is circulation, as it is a result of "connecting" each of the individual requirements noted. Circulation elements (both horizontal and vertical) will add substantial area to the mix of components outlined. Other support spaces (mechanical/electrical/housekeeping/data/etc.) will also be required, with each requiring further review and study by specific engineering consultants to determine the actual space needed. Actual wall thickness and structural elements will also need to be accommodated,

likewise increasing the building size. The actual cumulative tally of these areas will vary depending on the final layout and design intent, but can be assumed to compromise 40% or more of the total terminal gross square footage.

Table 4-10: Terminal Facility Requirements Summary

Terminal Facility Requirements	Existing			Proposed		
	Actual 2014 (1)	Required 2014 (2)	Deficit	Required 2014 (2)	Proposed (3)	Deficit
Annual Enplanements	377,554	377,554		377,554	476,507	
Peak Design Hour Enplaned	276	276		276	490	
Ticketing						
Counter Positions (#)	9	10	1	10	14	4
Counter (LF)	38	45	7	45	70	25
Counter Area (SF)	290	450	160	450	700	250
Check-in /Queuing Area (SF)	450	1,810	1,360	1,810	2,820	1,010
Airline Office (SF)	2,750	1,550	-425	1,550	2,415	865
Baggage Make Up (SF)	100	2,590	2,490	2,590	4,025	1,435
Airline Operations (SF)	0	1,295	1,295	1,295	2,010	715
Hold Rooms						
Gates (#)	4	4	0	4	4	0
Hold Room Waiting (SF)	3,420	8,420	5,000	8,420	12,120	3700
Baggage Claim						
Claim Lobby Frontage (LF)	45	235	190	235	(5) 340	105
Claim Lobby Area (SF)	1,655	6,755	5,555	6,755	9,775	3,020
Baggage Drop Off (SF)	1,200	5,405	4,205	5,405	7,820	2,415
Rental Cars						
Agencies (#)	1	3	2	3	5	2
Counter Frontage (LF)	10	30	20	30	50	20
Counter Area (SF)	80	240	160	240	400	160
Queuing Area (SF)	50	450	400	450	750	300
Office/Storage (SF)	0	450	450	450	750	300
Concessions						
Food/Gifts (SF)	1,750	4,600	2,850	4,600	7,475	2,875

Terminal Facility Requirements	Existing			Proposed		
	Actual 2014 (1)	Required 2014 (2)	Deficit	Required 2014 (2)	Proposed (3)	Deficit
Public Restrooms						
Total (SF)	1,030	2,380	1,350	2,380	3,880	1,500
Public Lobby (Seating)						
Total (SF)	1,550	2,875	1,325	2,875	7,530	4,655
Meeter/Greeter Waiting (SF)	0	830	830	830	1,550	720
Security						
Screening Lanes (#)	2	2	0	2	3	1
Passenger Screening (SF)	1,720	3,460	1,730	3,450	5,175	1,725
Security Queuing (SF)	630	600	-30	600	900	300
TSA Office Support (SF)	300	1,000	700	1,000	2,000	1,000
Baggage Screening (SF)	200	2,000	1,800	2,000	3,450	1,450
Administration						
Office/Conference/ Support (SF)	(4) 960	3,775	2,815	3,775	5,550	1,775
Circulation/Support/ Structural Etc. (SF)	6,645				34,000-44,000	
Gross Terminal Area (SF)	24,780				115,000 - 125,000	

Notes:

1. *2014 passenger totals and actual terminal areas.*
2. *Areas required (per planning tabulations) to accommodate 2014 passenger totals.*
3. *Areas required (per planning tabulations) to accommodate FAA-approved forecast of 490 peak design hour passengers.*
4. *Administration Suite not included – currently in remote location.*
5. *Total frontage for both conveyors.*

Source: Price Studios.

Table 4-11 summarizes these functional areas by a square footage per passenger metric. Areas not used by all passengers such as restrooms and rental cars have lower values, whereas areas that involve passengers and all their luggage such as baggage claim, have the highest values.

Table 4-11: Square Footage Per Passenger

Terminal Program Area	Area (SF)	SF/person
Ticketing	11,970	26.6
Hold Rooms	12,120	26.9
Baggage Claim	17,595	39.1
Rental Cars	1,900	4.2
Concessions	7,475	16.6
Public Restrooms	3,880	8.6
Public Lobby	9,080	20.2
Security	11,525	25.6
Administration	5,500	12.2
Circulation / Support	39,000	86.7

Source: Price Studios.

4.3.4. Airline Ground Support Equipment (GSE) Storage

The aircraft apron and terminal interface should support the hazard and obstacle-free servicing of an aircraft by all the vehicles necessary to support on aircraft loading/deplaning operation. When not used for the servicing of the aircraft, it is recommended that airline GSE equipment have covered storage to protect equipment from the elements, extend service life and also to prevent equipment from damaging aircraft during strong winds.

Recommendation: Future terminal and apron improvements should consider proper space for aircraft servicing and covered storage for GSE equipment.

4.3.5. Auto Parking

Auto parking facilities at an airport are a quintessential component to the overall operation of the airport. All airports strive to provide convenient and economical parking for passengers. In addition to the passenger convenience, auto parking has the potential to be a key revenue generator for an Airport. Undersized or inconvenient parking facilities result in fewer passengers and/or the creation of off–airport parking facilities which reduce revenues for the airport.

This section will discuss the following:

- Existing Parking Areas, Usage and Capacities
- Demand Calculation Methodology
- Summary of Parking Needs

Existing Parking Facilities

Demand for auto parking at the Airport was evaluated based on the use characteristics of the existing auto parking lots. A new parking area was constructed and includes two lots in short walking distance of the passenger terminal. These parking lots include 1,182 spaces. Parking fees are $2 per hour for four hours and long-term parking is $8 per day. All lots are patrolled by the Mercer County Sheriff's Office. In addition, there is a remote unpaved lot that serves as an

overflow lot which has approximately 600 additional spaces. The same parking rates apply and the Airport provides a shuttle service to this lot once the paved lots are full.

Traditionally, airports have offered both a short term and long term parking product, however the demand for a traditional short term lot has decreased at most airports, especially those where cell phone lots have been introduced. This analysis will focus on the overall passenger demand, assuming that short term demand can be accommodated via cell phone lots and the main lot, with congestion management during peak times (i.e. signage directing short term parkers to the cell phone lot at busy periods).

Demand Calculation Methodology

Demand calculations used a formula based on demand characteristics rather than limiting the analysis for forecast demand levels.

Enplanements/Load Factor – The formula contains enplanement levels ranging from 200,000 to 500,000 in 50,000 increments and assumes a 95 percent load factor for all flights. Displaying demand in a matrix as opposed to an annual progression will help the airport better plan for demand as service levels fluctuate over time.

Parking Factor – TTN is both an outbound and inbound passenger market and in addition, not all passengers are parking at the airport. It is assumed that approximately 60% of passengers are those who's itinerary originates in TTN (as opposed to inbound visitors/passengers); of that number it is assumed that approximately 70% of the leisure markets and 90% of the more business markets will park at the airport. These numbers will fluctuate over time as parking prices increase and the airline service patterns change. TTN originating passengers, not parking at the airport, arrive via bus, taxi, or are dropped off at the curb.

Occupants/Vehicle – Using historical data, a 70 percent parking factor was applied, and the average number of enplanements per vehicle was determined to use in the demand formula and subsequent parking calculations. The less people in each car, the greater the auto parking demand. Based on available data the range occupants per vehicle resulted is assumed to consist of between 2.25 (high) and 2.5 (low) for leisure routes and 1.25 (high) to 1.5 (low) for the business center markets. These factors are considered conservative but prudent for facility planning.

Duration –TTN parking data was reviewed to more accurately determine the average duration for which vehicles were parked in the parking lots, as the amount of days that a vehicle occupies a particular parking space can greatly affect the number of parking spaces required.

The demand formula contains an average of six (6) days for leisure oriented passengers and between three (3) and four (4) days (low and high) for the more business oriented destinations for auto parking. It is anticipated that as activity increases, so will the number of flight options creating more choices for passengers. The addition of flight options, especially with less than daily service, has the potential to slightly reduce (improve) the average duration over time.

Planning Thresholds

A planning threshold of 90 percent was applied to the forecast parking lot capacity. Parking lot occupancy can be higher when aircraft departure and arrival times overlap as there is a short time when both groups of passengers have their cars parked. Additionally, the winter months reduce spaces due to accumulation of snow and ice in some spaces.

Rental Car Parking Spaces

Presently there is only one on-site rental car provider that utilizes approximately 75 spaces at the airport. Other providers currently shuttle customers off-site. Airports of similar size typically accommodate between three and five rental car providers. While rental car spaces can be replenished throughout the day, it is important that the spaces be able to accommodate peak hour activity. Based on the forecast of 490 peak our deplanements, combined with the 40% inbound market and between 1.25 and 2.5 passengers per party, results in a planning demand of between 40 and 80 spaces, assuming half of the inbound passengers get rental cars, while half are picked up. Since this location will also likely support off airport business at the airport location as they do in many other cities, a total of 100-125 rental car spaces should be planned.

Total Spaces Required

The combination of the 90 percent planning threshold and peak season (busiest three-month average) was selected as the preferred method to determine the required number of vehicle parking spaces for NFIA. Table 4-12 displays the auto parking requirements for potential enplanement levels at TTN. Based on the enplanement levels identified in the forecast, additional auto parking spaces are likely to be required in the intermediate to long range planning period; however, demand should be monitored. Planning for additional parking lots should start as lots reach 90 percent of their capacity.

Table 4-12: Auto Parking Spaces

Enplanements	Low	Medium	High	Peak Periods	Rental
200,000	633	680	771	1,071	40
250,000	792	850	964	1,339	50
300,000	950	1,020	1,157	1,606	75
350,000	1,108	1,190	1,349	1,874	100
400,000	1,267	1,360	1,542	2,142	125
450,000	1,425	1,530	1,735	2,410	150
500,000	1,583	1,700	1,928	2,677	200

Source: McFarland Johnson, 2016.

Employee Parking (Passenger Terminal)

Employee parking can be accommodated with a dedicated lot for employees only or in some cases it is integrated into the long-term lot with passes provided. On a long-term basis, the required employee parking spaces will vary based on the number of airlines and vendors employing

personnel inside the passenger terminal and also the long term location of airport operations and administrative support staff. For the near term and similar operating conditions, an estimated 100 employee parking spaces should be planned for, with a more detailed review at the number of jobs located in the terminal building increases. Employee parking for airport businesses outside of the passenger terminal area is the responsibility of the business provider to meet their own specific needs.

Recommendation: Parking requirements will be evaluated at a future time and will be provided commensurate with the terminal space requirements. The alternatives analysis will evaluate the size and location of proposed parking lots. As previously noted, due to the volatile nature of smaller airports, it is recommended to plan for the out-year forecast levels sooner than anticipated when able, as short term spikes in demand are more common at airports like TTN.

4.3.6. Terminal Roadway System

The configuration of terminal roadway system is a function of both the terminal and auto parking lots with the recent expanded and additional auto parking lot connecting to the roadway. Much of the roadway system requirements and improvements are a result of changes to the auto parking lots which will be further discussed in the alternatives chapter; however, key requirements to be considered in the development of landside alternatives include:

- Protect or improve customer experience
- Provide for an internal vehicle circulation loop
- Limit the number of decision points
- Minimize areas of merging or converging traffic

The roadway system improvements are directly related to the configuration and expansion of auto parking lots which will be reflected in the alternatives. Should enplanements exceed forecasted levels, a traffic study should be conducted to determine if the existing access is sufficient. At this time, there are no anticipated access/intersection issues anticipated based on the levels identified in the forecast.

Recommendation: Provide internal circulation roadway that serves the ultimate auto parking demand needs and peak hour terminal traffic.

4.4. GENERAL AVIATION AND LANDSIDE REQUIREMENTS

The existing general aviation areas are located on both the north and the south side of the Airport.

This section discusses the requirements for each of the general aviation elements while the Alternatives chapter will explore the future location of the required facilities. Requirements for GA facilities at Trenton were calculated on the basis of data collected during the inventory, forecasts of aviation demand, consultation with Airport staff, as well as FAA standards. The following facilities were examined:

- Aircraft Hangars
- Aircraft Parking Apron
- Airport Administrative/Operations Offices

- Aviation Fuel Storage and Distribution
- General Aviation Auto Parking
- Non-Aviation Use Areas

4.4.1. Aircraft Hangars

General aviation hangars at an airport are planned for both based and itinerant aircraft. Requirements are calculated based on the size and quantity of aircraft based at the Airport. While each aircraft will vary in size, the following planning factors were used to calculate the approximate hangar space requirements for aircraft based at Trenton-Mercer Airport:

- 1,200 SF for Single Engine and Rotor Aircraft
- 1,600 SF for Multi Engine Aircraft
- 3,200 SF for Jet Aircraft

The forecast for based aircraft reflects a one percent growth of total based aircraft based on the market share or based aircraft in the area. The overall hangar requirements are displayed in Table 4-13. It should be noted that all hangars at Trenton-Mercer Airport are privately owned and operated.

Ideally, 100% of aircraft are stored in hangars. For planning purposes, it is assumed that 50% of single-engine aircraft will be stored in individual hangars and 50% on tie-downs. Additionally, 90% of rotor, multi-engine, and jet aircraft will be hangared in conventional hangars and 10% on tie-downs. There are approximately 48 individual box hangars and t-hangars at the Airport. Additionally, there are ten conventional hangars at Trenton, which have approximate square footages of 52,460; 61,908; 133,000; 37,124; 35,000; 15,000; 22,000; 16,500; 22,500; and 16,000 for a total conventional hangar space of approximately 411,500 square feet. Since portions of these hangars are being used for aircraft maintenance, terminal facilities, etc., it is estimated that approximately 205,700 square feet are used for aircraft storage.

All hangars are privately owned (corporations, FBO, or otherwise). Table 4-13 shows that within the planning period, current hangars are adequate to meet demand. Should demand exceed the forecast or the use of hangars change, private entities should coordinate with Airport Management to identify where additional hangars can be constructed. It should be noted that even if 100% of aircraft are hangared, including filling all 48 individual and t-hangars, there would only be a need for 188,400 SF of conventional hangar space in 2035, which is currently accommodated.

Table 4-13: Aircraft Hangar Demand

Year	Facility Demand	Current Provision	Shortage
2015			
Individual/T-Hangars	37	48	0
Conventional Hangars	96,400 SF	205,700 SF	0
2020			
Individual/T-Hangars	37	48	0
Conventional Hangars	109,600 SF	205,700 SF	0
2025			
Individual/T-Hangars	38	48	0
Conventional Hangars	124,800 SF	205,700 SF	0
2035			
Individual/T-Hangars	38	48	0
Conventional Hangars	138,400 SF	205,700 SF	0

SF – square feet

Source: McFarland-Johnson Analysis, 2015.

Recommendations: There are no recommendations for additional hangars. Should additional demand arise during the planning period, private parties should coordinate with Airport management to determine where to construct additional hangars.

4.4.2. Aircraft Parking Apron

There are four components that typically determine the required apron area for general aviation uses. They are: 1) based-aircraft parking, 2) itinerant aircraft parking (transient apron), 3) aircraft fueling apron, and 4) staging and maneuvering areas. The sum of these components determines the total area of apron required to meet the forecasted level of general aviation activity at the Airport.

Based Aircraft Parking

Based-aircraft apron tie-down requirements were developed in the *Aircraft Hangars* section because they are a factor in determining hangar requirements. All based aircraft (tie-downs and hangars) are located on the north side of the Airport. Pavement conditions on the tie-down apron are poor to very poor condition. Pavement should be rehabilitated during the planning period.

There are approximately 90 tie-downs available on the north apron. During the planning period, it is anticipated that 46 based aircraft will be stored on tie-downs. There is no based aircraft tie-down shortage anticipated for the planning period.

Recommendations: Pavement should be rehabilitated within the planning period. Should additional tie-downs be needed, which is not anticipated, they will be constructed by a private party with airport management coordination.

Transient Aircraft Parking

The second major apron need is parking space for itinerant aircraft. FAA AC 150/5300-13A suggests one methodology for determining apron space requirements for transient aircraft. This methodology has been adjusted as outlined below to reflect current conditions at the Airport and is used to project future transient apron space requirements.

- Calculate the total design day operations for all itinerant GA operations
- Calculate itinerant arrivals on the design day assuming that half of the operations are arrivals.
- Assume that approximately 75 percent of these aircraft will require transient parking space during the course of the day. The other 25 percent of the itinerant arrivals are based aircraft that will return to their assigned spaces.
- Assume that up to 75 percent of these transient aircraft will be on the apron at the same time during peak events.
- Allow an area of 400 square yards per transient airplane, due to the need for taxiing space and aircraft of different sizes.

Table 4-14 presents the results of these computations. According to the above methodology, approximately 14,000 square feet of apron space is currently required for transient parking. By the end of the planning period this need is forecast to increase to 17,400 square feet.

Table 4-14: Transient GA Aircraft Apron Area Demand

Year	Design Day Itinerant GA Operations	Itinerant Arrivals per Design Day	Itinerant Aircraft on Apron	Peak Hour Transient Parking Demand	Required Transient Apron Space (SF)
2015	124	62	47	35	14,000
2020	131	66	49	37	14,800
2025	137	69	51	38	15,200
2035	154	77	58	44	17,400

Source: McFarland-Johnson Analysis, 2016.

Transient aircraft are parked on the tie-down apron. There are 90 tie-downs at the Airport for combined based and transient aircraft. The sum of based and transient aircraft anticipated to use tie-downs is 72 in 2015 and 82 in 2035, which can be accommodated on the current apron and therefore meets the planning period forecast.

Based and transient aircraft demands and current provisions are shown in Table 4-15.

Recommendations: Should additional tie-downs be needed, which is not anticipated, they will be constructed by a private party with airport management coordination.

Table 4-15: Tie-Down Demand

Year	Facility Demand	Current Provision	Shortage
2015			
Based and Transient	72	90	0
2020			
Based and Transient	74	90	0
2025			
Based and Transient	76	90	0
2035			
Based and Transient	82	90	0

Source: McFarland Johnson analysis, 2016.

Staging and Maneuvering Areas

Adequate space for the safe maneuvering of aircraft to and from aprons, hangars, and taxiways must also be included in any forecast of apron requirements. Staging and maneuvering is most closely associated with the provision of space in front of conventional hangars and between rows of box and t-hangars. Currently, the separation between the corporate hangars is 70 feet for the western rows and 178 feet for the eastern rows. The north t-hangars have a separation of 79 feet and tie-downs have a separation of approximately 45-63 feet. **Table 4-16** shows the taxiway and taxilane object free area requirements (TOFA and TLOFA, respectively).

Table 4-16: Taxiway/Taxilane Object Free Area Requirements by ADG

ADG	I	II	III
Taxiway OFA	89’	131’	186’
Taxilane OFA	79’	115’	162’

Source: FAA AC 150/5300-13A.

Even if the corporate hangars, t-hangars, and certain tie-downs are only used by ADG I aircraft, there is still not enough room to meet ADG I TLOFA requirements. If larger aircraft use these areas, it is recommended that ADG II or III (depending on the use) TLOFA be provided for.

Recommendations: Taxilanes serving ADG I aircraft should be widened to meet FAA AC 150/5300-13A 79-foot TLOFA requirements. Pavement rehabilitation is recommended within the planning period.

4.4.3. Airport Administrative/Operations Offices

There is no self-standing airport administrative/operations office at TTN. These offices are distributed throughout the airport and the passenger terminal building.

Recommendations: Airport administration offices should remain within the passenger terminal building.

4.4.4. Aviation Fuel Storage and Distribution

The County does not currently have any aviation fuel storage facilities. FBOs have their own fuel storage and distribution. Airlines contract with the FBO(s) for its fuel needs, which meets airline needs.

Recommendations: There is no recommendation for additional fuel facilities. Capacities, capabilities and services provided by the FBO's as a result of private investment should be continuously monitored to ensure facilities at TTN adequately meet demand.

4.4.5. General Aviation Auto Parking

There are several corporate hangar areas on-airport which individually provide vehicular parking for their users. With all of these being privately owned/operated facilities, the airport does not provide any vehicle parking for the private use facilities.

The methodology used below is based on a previously completed Aircraft Owners and Pilots Association (AOPA) survey that found an average of 2.5 persons aboard the average general aviation operation and automobile parking requirements for GA operations are displayed in **Table 4-17**:

- Determine the number of peak hour operations from the *Forecast* chapter.
- Determine the number of peak-hour pilots and passengers by multiplying the number of peak hour operations by 2.5.
- Estimate the number of parking spaces in use by assuming that parking demand will be half the number of pilots and passengers, since parking spaces will be utilized only by departing pilots and passengers.
- Multiply by a contingency factor of 1.10.

As shown, a need of 118 parking spaces are identified for based and transient GA operations at Trenton through 2035. The current parking lot has 231 spaces plus eight handicapped spots; during higher than average demand, cars can be stored next to the t-hangar buildings and inside conventional hangars.

Table 4-17: Automobile Parking Requirements

Year	Peak Hour Operations	Pilot and Passenger Parking Demand	Contingency	Total Parking Demand
2012	35	88	1.10	96
2017	37	93	1.10	102
2022	38	95	1.10	105
2032	43	108	1.10	118

Source: McFarland-Johnson Analysis, 2016.

Recommendations: There are no GA parking recommendations. Any parking requirements that may arise will be resolved by private parking construction as coordinated with airport management.

4.4.6. Non-Aviation Use Areas

Airport property without direct airside access was determined to be non-aviation use areas. This includes all land northwest of Interstate 95, residential parcels near the Runway 6 threshold, airport property east of Jack Stephan Way, and property east of the rail road tracks. Eight non-aeronautical use areas have previously been identified by the Airport. Existing and proposed non-aeronautical use areas will be further reviewed in a later portion of this Master Plan Update as part of the land use drawing.

4.5. SUPPORT FACILITY REQUIREMENTS

4.5.1. Air Traffic Control Tower (ATCT)

The current ATCT is located in the infield area near the terminal apron and near the Runway 6-24 and 16-34 intersection. It is operated from 6 AM to 10 PM local time. As noted in Chapter 1, *Inventory*, of this MPU, the building was constructed in 1961 and it contains asbestos. Equipment does not meet current standards.

ATCT employees currently have to cross active Taxiway A to get to their parking lot. Additionally, any aircraft on the southernmost portion of Taxiway J are not visible from the tower. This includes the Runway 6 approach area. The age of the facility combined with the outdated equipment, crossing Taxiway A to get there, and blind spots warrant further analysis for a new, taller ATCT with improved visibility to all airfield pavements. The alternatives analysis chapter will contain potential sites for a new ATCT.

Recommendation: The ATCT should be moved to provide full visibility of the airfield and all approach areas. Additionally, it should be accessible without crossing any active movement area.

4.5.2. Aircraft Rescue and Fire Fighting (ARFF)

As discussed in Chapter 1, *Inventory*, of this MPU, the ARFF station at the Airport is an Index B station under FAR Part 139. The ARFF station is located just south of the passenger terminal with access to Taxiway A and was dedicated in 1983. The station includes the following vehicles:

- One (1) 1,500-gallon ARFF vehicles
- Two (2) Rosenbauer vehicles (2014)
- One (1) Captain's utility vehicle

Recommendation: The ARFF facility may need to be relocated depending on the terminal area development alternatives. If so, a combined ARFF/SRE/maintenance/operations building should be considered.

4.5.3. Airfield Maintenance Facility and Snow Removal Equipment (SRE)

The Airport operations staff performs the day-to-day responsibilities of maintaining and inspecting the airfield facilities, including the removal of snow during winter months.

The Airport has the following maintenance equipment:

- M59 McCormick Mower with side arm cutter (2009)
- M63 McCormick Tri Mower (2009)
- M68 McCormick Mower (2008)
- M59 McCormick Tri Mower (2008)
- M58 John Deere Tri Mower (2006)
- M12 Ford Brush Hog Tractor (1991)
- M66 Zero Turn Mower (2007)
- M67 Zero Turn Mower (2007)
- M69 Zero Turn Mower (2012)
- M57 Johnson Street Sweeper (2008)
- Two Sweepster X Light Towers (2001)
- Two Honda X Light Towers (unknown)
- Two Whacker Light Towers (2015)
- Two Genie Light Towers (unknown)
- Two Yanmar X Light Towers (2013)
- Three Sign Boards (unknown)
- One Cracksealing Machine (unknown)

Additionally, the Airport has the following snow removal equipment:

- M51 Kodiak Multi with broom-plow-blower (2005)
- M56 Kodiak Multi with broom-plow-blower (2005)
- M52 Kodiak Plow truck (2005)
- M53 Kodiak Plow truck (2005)
- M54 Kodiak Plow truck (2006)
- M55 Kodiak Plow truck (2007)
- M7 Oshkosh Snow Blower (1987)
- M16 Oshkosh Sweepster (1993)
- M50 Toro Snow Sweeper (2014)
- M18 Volvo Loader (1997)
- M17 Case Backhoe (2016)
- M60 Ford Pick Up Truck with plow (unknown)
- M61 Ford Pick Up Truck with plow (unknown)
- M62 Ford Pick Up Truck with plow (unknown)
- M13 One-Ton Pick Up Truck with plow (unknown)
- M65 International Dump Truck-Plow (2014)
- M8 Ford Sand Truck 6-Ton (1991)
- M50 Sterling De-Ice Truck 1750 Gallons (2004)
- Two 10-foot Rubber Blade Snow Pushers (unknown)
- One 20-foot Ramp Plow (unknown)

- One 10-foot Snow Basket (unknown)
- One 27-inch Snow Blower (unknown)

The existing SRE/maintenance building was constructed in the 1940s and is located on the north portion of the Airport at the corner of Lockheed Avenue and East Piper Avenue.

Recommendation: Airfield maintenance and SRE equipment should be maintained or replaced, as needed, throughout the planning period. A combined ARFF/SRE/maintenance/operations building should be considered.

4.5.4. Land/Easement Acquisition

The existing airport property encompasses most safety areas on airport property. There are areas within the RPZs of Runways 6, 24, and 34 that extend beyond airport property, as discussed in the RPZ section of this chapter. These areas should be acquired either in full or by an easement.

Existing easements include road/highway easements and utility easements. The following easements are in place on airport property:

- Two utility easements in the Runway 16 approach area
- One utility easement in the Runway 24 approach area
- Easement to the USA in 1943 for civil aviation authority
- Easement to Mercer Highway in 1956
- Easement to the New Jersey Department of Transportation (NJDOT) in 1956 for Interstate 95
- Easement to Lutsky in 1956 for civil aviation authority
- Easement to Credit Union in 1977
- Easement to the State of New Jersey in 1975
- Easement to Ewing Township in 1990 for Scotch Road
- Easement to NJDOT in 2002

There is an ongoing obstruction removal study.

Recommendation: Acquire RPZ property in easement or in full and any recommendations that result from the obstruction removal study.

4.5.5. Utilities

Based on that information the Airport's utility services – electric/natural gas, water, telecommunications, storm drainage, and sewer – is adequate to meet the existing needs of the facility. In the event there are additional developments throughout the planning period, a review of the utilities and their respective capacities should be taken into account, including the potential development of hangar facilities related to the necessity of electricity, telephone, sanitary sewer, and cable.

The electrical vault for the airfield however has exceeded its useful life and is in need of replacement. Replacement should be considered with the next project that affects the airfield lighting circuits.

The ATCT is currently on a well. It is recommended to be connected to local water lines.

One thing to note is the water pressure on/near Scotch Road. This does not currently affect the Airport, but could be an issue for fire suppression of nearby buildings.

Recommendation: Replace airfield electrical vault. The ATCT should be connected to the local water line if it is to remain in its current location. Water pressure on/near Scotch Road should be reviewed/addressed if it impacts the Airport.

4.6. SUMMARY OF FACILITY REQUIREMENTS

The facility requirements recommended for TTN are summarized in **Table 4-18**. Although not all of the improvements recommended throughout this chapter are provided in **Table 4-18**, the table highlights the key improvements that are recommended for future development at TTN.

Table 4-18: Summary of Facility Requirements

Item/Facility	Existing	Ultimate Requirement	Deficit
Runway	6-24/16-34		
Length	6,006'/4,800’	6,006’/4,800’	None
Width	150' (both)	150' (both)	None
Safety Area	Standard (both)	Standard (both)	None
Object Free Area	Standard (both)	Standard (both)	None
Protection Zone	Partially Under Airport Control through Ownership or Avigation Easements	Under Airport Control through Ownership or Avigation Easements	Control of all RPZs through Ownership or Avigation Easements
Lighting	HIRL (both)	HIRL (both)	None
Visual Aids	Wind socks, PAPI (16, 24, and 34); MALSR (6)	Wind socks, PAPI (16, 24, and 34); MALSR (6)	None
Approaches	Runways 6 – ILS Runways 16, 24, and 34 - GPS	Runways 6 – ILS Runways 16, 24, and 34 - GPS	Runway 24 – ¾ mile visibility minimums (GPS)
Taxiways	A/B		
Width	75'/75’-80'	50’	None
Separation (if applicable)	NA/440’	NA/400'	None
Lighting	MITL	MITL	None
Taxiways	C/D		
Width	75'/50'	50'	None
Separation (if applicable)	NA/275’	NA/400’	Relocate Taxiway D

Item/Facility	Existing	Ultimate Requirement	Deficit
Lighting	MITL	MITL	None
Taxiways	E/F		
Width	75'/50'-60’	50'	None
Separation (if applicable)	400’/260-525’	400’/400’	Relocate Taxiway F
Lighting	MITL	MITL	None
Taxiways	G/H		
Width	75'/75'	50'	None
Separation (if applicable)	400'/400’	400’/400’	None
Lighting	MITL	MITL	None
Taxiways	J		
Width	75’	50’	None
Separation (if applicable)	400’	400’	None
Lighting	MITL	MITL	None
GA Terminal Facilities	Private Investment	Private Investment	N/A
Auto Parking	239 (8 handicapped)	118	None
Individual/T-Hangars	48	38	None
Conventional Hangars	205,700 SF	138,400 SF	None
Tie-Downs	90	82	None

LF – linear feet, SF – square feet, NA – not applicable
Source: McFarland Johnson analysis, 2016.

5. Alternatives

The Alternatives chapter assesses the recommended facility improvements identified in Chapter 5, *Facility Requirements,* against a number of evaluation factors to determine if the recommended improvements enhance the efficiency of the airport, while meeting future demand and minimizing environmental and community impacts. The evaluation factors used to compare development options were selected based on specific considerations associated with Trenton-Mercer Airport (TTN or the Airport).

Airside alternatives will be considered first, followed by an evaluation of landside components. The preferred alternatives for airside and landside are selected based on assessed criteria, as well as their compatibility with one another and the overall airport environment. These individual alternatives (airside and landside) combine to create an overall Preferred Airport Development alternative.

The identification and evaluation of the airport development alternatives are outlined as follows:

- Summary of Airport Facility Requirements
- Development Constraints
- Airside Alternatives
- Landside Alternatives
- Terminal Area Alternatives
- Preferred Airport Development Alternative

5.1. SUMMARY OF AIRPORT FACILITY REQUIREMENTS

The previous chapters identified and quantified the necessary improvements that should be addressed at the Airport over the 20-year planning period. The following is a summary of the key airport facility requirements as discussed in Chapter 5, *Facility Requirements.*

Airside Requirements:

- Rehabilitate Runway 6-24 within the planning period
- Improve Runway 24 approach minimums
- Acquire control of runway protection zones (RPZs) not currently under Airport control or owned by a public entity
- Resolve runway-taxiway centerline separations between:
    - Runway 16-34 and Taxiway D
    - Runway 6-24 and Taxiway F
    - Runway 16-34 and Taxiway H
- Fix Taxiway D and Taxiway F widths to meet requirements
- Rehabilitate any pavement in failed, serious, very poor, or poor condition in the short-term and fair within the planning period
- Resolve geometry issues noted in Table 5-1
- Update or replace the electrical vault in the short-term

Table 5-1: TTN Geometry Issues

Geometry Requirement	Taxiway/Taxiway Int.	Runway/Taxiway Int.
Three node concept	TWYs A, C, & G	RWY 6-24 with TWYs C & F
Taxiway intersection angle	TWYs A & J - 37° TWYs B & C - 53° TWYs D & F - 71° TWYs E & F - 71°	See Increase Visibility
Wide expanse of pavement	TWYs E & F	RWY 16-34 & TWY A RWY 6-24 & TWYs A & J
High energy intersections	N/A	RWY 16-34 & TWY C
Increase visibility	See Taxiway Intersection Angle	RWY 6-24 & TWY A RWY 6-24 & TWYs C & F RWY 16-34 & TWY A RWY 16-34 & TWY C RWY 34 & TWY E
Dual purpose pavement	None	RWY 34 via TWY D
Direct access	N/A	RWY 34 & TWY D RWY 16-34 via TWY A RWY 16-34 via TWY C
Multiple taxiways crossing	N/A	RWY 6-24 with TWYs A & J RWY 6-24 with TWYs C & F
Y-Shaped Runway Crossing	TWYs C & F	N/A
Short Taxi Distance	TWY A (north & south) to RWY 16-34 TWYs A & F to RWY 6-24 TWY C to RWY 16-34 TWY F to Runway 6-24	N/A
Unexpected Holdline	TWY D TWY F	None
Intersection Departure	N/A	During operational need only: TWY A for RWY 16-34 TWY A for RWY 6-24 TWY F for RWY 24 TWY F for RWY 34

N/A – not applicable; RWY – runway; TWY – taxiway
Source: McFarland Johnson analysis, 2016.

Taxiway E non-standard intersection angle with the runway will not be addressed as the current layout provides increased visibility of the runway approach area. The costs to modify this taxiway to a perpendicular taxiway far outweigh the safety benefits. This only applies to Taxiway E as it is located at the runway threshold.

Landside Requirements:

- Rehabilitate based aircraft parking within the planning period

- Widen taxilanes serving airplane design group (ADG) I aircraft to meet design standards, including taxilane object free area (TLOFA) dimensions
- Relocate the air traffic control tower (ATCT) to provide full visibility of the airfield and all approach areas and without employees needing to cross any movement area
- Consider a combined aircraft rescue and fire fighting (ARFF)/snow removal equipment (SRE)/operations building when relocating the ARFF building.

Potential alternatives that could meet the Airport's current and future needs were developed. The no-build alternative, which consists of maintaining the existing facilities as they are with no additions or expansions, was used as a baseline to compare development enhancements as well as potential environmental or community impacts. These alternatives were then evaluated based on a uniform set of criteria for the airside and landside elements. Not all of the alternatives are mutually exclusive. In fact, the final recommended plan could consist of several of the alternatives combined and refined to address the demands of the Airport within the constraints identified.

5.2. DEVELOPMENT CONSTRAINTS

There are several constraints associated with the potential development at the Airport. The constraints considered during the formulation of the development alternatives are described below:

- Bear Tavern Road runs behind Runway 6
- A railroad line runs behind Runway 34's engineered materials arresting system (EMAS)
- Sam Weinroth Road and Interstate 95 run behind Runway 16's EMAS
- Route 611/Scotch Road runs behind Runway 24

5.3. AIRSIDE ALTERNATIVES

In this section, various options to meet the airside needs of Trenton-Mercer were developed and evaluated. As noted in Chapter 4, *Facility Requirements,* airside facility alternatives include potential improvements to the runway, taxiways, instrumentation, and airfield lighting. Several alternatives were developed and are presented in the following sections.

5.3.1. Airside Alternative Evaluation Criteria

A set of evaluation criteria was developed to provide consistent assessments of each alternative throughout the review process. The criteria are defined as follows:

- Facility Requirements: Does the alternative meet the existing and future needs of the Airport and is the alternative feasible for implementation?

- Environmental Impact: What are the potential environmental impacts associated with implementation of the alternative? To what extent does this alternative further achievements of the Airport's environmental goals?

- **FAA Design Standards:** Does the alternative meet the design standards of Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5300-13A, *Airport Design*, and Code of Federal Regulations (CFR) Part 77, *Objects Affecting Navigable Airspace,* to the maximum extent feasible?

- **Development Costs:** Does the alternative have reasonable development costs in comparison to other alternatives that achieve the same goal?

- **Development Flexibility:** To what extent does this alternative leave flexibility for change and future surrounding development? Does this alternative allow flexibility from an operational standpoint?

Each of the evaluation factors above was given a scoring value as follows:

- **Facility Requirements:** No (0), Partial (1), Yes (2)
- **Environmental Impact:** Significant (0), Large (1), Minor (2), None (3)
- **FAA Standards:** No (0), Partial (1), Yes (2)
- **Development Costs:** Estimated Cost of Development
- **Development Flexibility:** Poor (0), Fair (1), Good (2), Excellent (3)

Alternatives were compared using both a qualitative and quantitative assessment and given a value based on the alternative's ability to meet the requirements of the evaluation factor. Selection of a recommended alternative is based on the alternative meeting demand needs, enhancing operations and safety, minimizing environmental and community effects, and providing future flexibility. While the assessment is created based on available information and design criteria, it should be noted that the completion of required environmental documentation, as well as preliminary and final design documents, could require modifications to the alternatives as depicted and result in additional impacts beyond those considered and contemplated as part of this Master Plan Update.

5.3.2. Airside Alternative Identification

The following airside alternatives have been developed to meet the facility requirements at TTN:

- **Airside Alternative 1: (No Build):** The existing airport layout would remain the same. There would be no change to the runway, taxiways, instrumentation, or approach lighting.

- **Airside Alternative 2:** This alternative resolves all geometry issues on the airfield and meets facility requirements.

- **Airside Alternative 3:** This alternative resolves all geometry issues on the airfield, meetings facility requirements, and protects for dual full parallel taxiways for both Runways 6-24 and 16-34.

The alternatives above are detailed in the next sections.

5.3.3. Airside Alternative 1 (No-Build)

The No-Build Alternative offers no changes to the existing layout at Trenton. The existing airport layout can be seen in **Figure 5-1**. Please note, the aerial does not show the following 2016 projects: Taxiway H relocation, Taxiway G narrowing, Taxiway D relocation, Taxiway B construction, and Taxiway F relocation.

Airside Alternative 1 was assessed against the five evaluation factors; the results are below:

- **Facility Requirements:** The No-Build Alternative would not satisfy Trenton's current or future facility requirements related to FAA design standards or geometry issues, which could lead to greater inefficiency, reduced capacity over time, and decreased safety. This evaluation factor was given a value of **No (0)** as it does not meet the suggested facility requirements.

- **Environmental Impact:** This alternative does not require additional construction, thus negating any environmental impacts. This evaluation factor was given a value of **None (3)** since the alternative has no environmental impacts.

- **FAA Standards:** Alternative 1 does not address the need for RPZ control or taxiway design. The evaluation factor was assigned a value of **No (0)** because it does not meet, or attempt to meet, FAA standards.

- **Development Costs:** There would be no design or construction costs associated with Airside Alternative 1. **None**

- **Development Flexibility:** While this selection allows great flexibility for surrounding development in the future, this choice could limit the operational flexibility of the airport in the future. This evaluation component was awarded assessments of **Excellent (3)** for Development Potential and **Poor (0)** for Operational Efficiency.

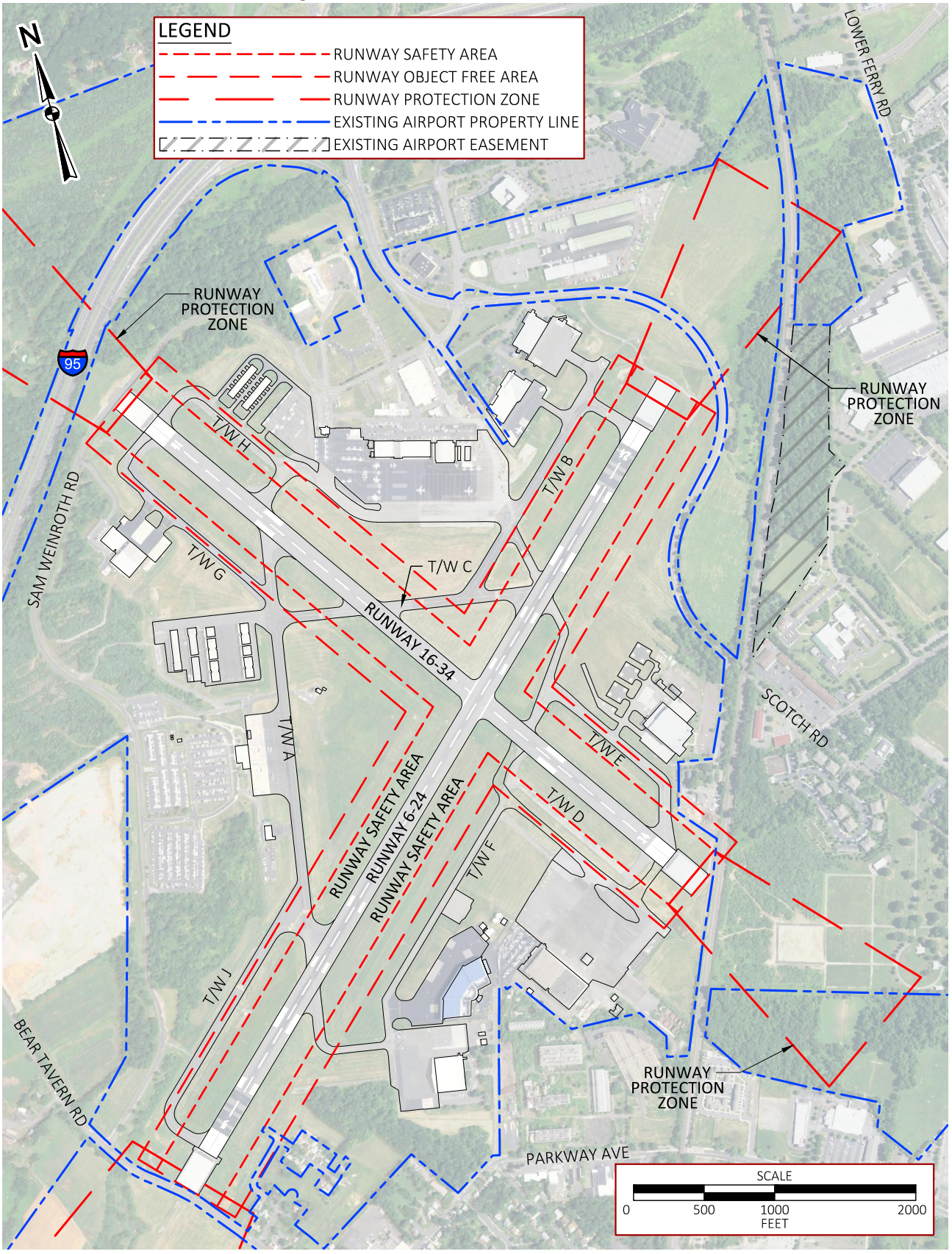
5.3.4. Airside Alternative 2

Airside Alternative 2 resolves all geometry issues at Trenton. This alternative is shown in **Figure 5-2**. The following projects are associated with Airside Alternative 2:

- Extend Taxiways B and J to create a full-length parallel taxiway for Runway 6-24. All taxiways associated with Runway 6-24 should meet Taxiway Design Group (TDG) 3 standards.

- Extend Taxiway G to provide a full-length parallel taxiway for Runway 16-34 to meet separation requirements. All taxiways associated with Runway 16-34 should meet a minimum TDG 2 standards, except for those crossing Runway 6-24, which should meet TDG 3 standards to allow for all aircraft to cross over. This means the portion of Runway 16-34 parallel taxiway between Taxiways B and F will meet TDG 3 standards.

Figure 5-1: Airside Alternative 1 - No Build



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- Reconstruct Taxiway A intersection with Runway 6-24 to provide a perpendicular TDG 3 runway crossing.
- Remove Taxiway C between Taxiways A and Runway 6-24.
- Taxiway H was reconstructed in 2016 and meets airplane design group C-II separation requirements and prevents direct access from the apron.
- Remove Taxiway A between Taxiways G and Runway 16-34.
- Improve Runway 24 GPS approach to ¾-mile visibility minimums. This allows pilots to use the primary runway (Runway 24) during weather conditions less than 1 ¼ mile and alleviates traffic and noise to the Runway 6 end in inclement weather.
- Acquire approximately 1.3 acres in easements and fee within the RSA, ROFA, and RPZ prior to Runways 24 and 34.

Airside Alternative 2 was assessed against the five evaluation factors; the results are below:

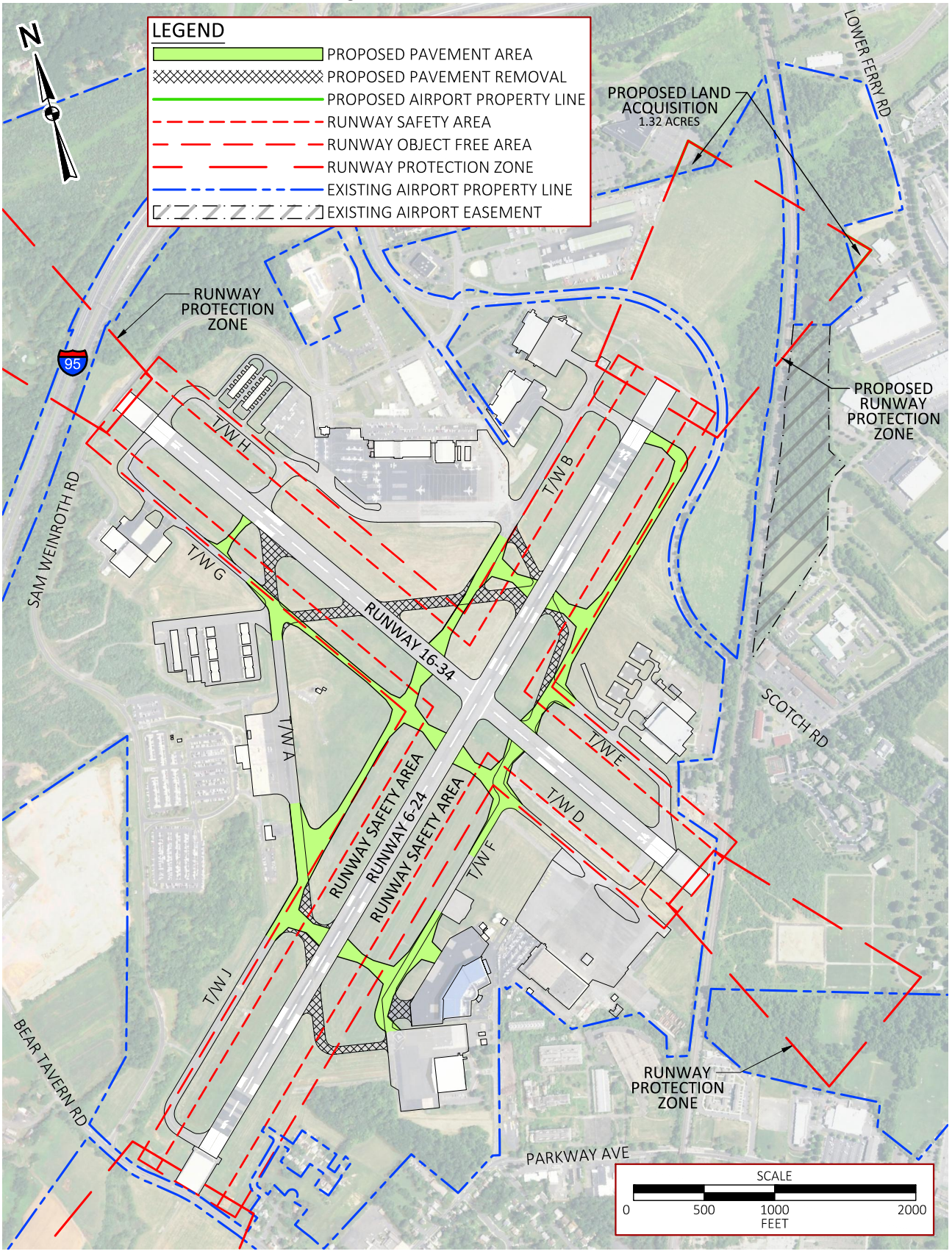
- **Facility Requirements:** Airside Alternative 2 would satisfy Trenton's current or future facility requirements related to FAA design standards or geometry issues and increase safety. This evaluation factor was given a value of **Yes (2)** as it meets the suggested facility requirements.
- **Environmental Impact:** This alternative requires construction within the existing airfield and does not disrupt any environmentally sensitive areas. This evaluation factor was given a value of **Minor (2)** since the alternative has no environmental impacts.
- **FAA Standards:** Alternative 2 addresses the need for RPZ control and geometry design. The evaluation factor was assigned a value of **Yes (2)** because it meets FAA standards.
- **Development Costs:** To be discussed in a later submission.
- **Development Flexibility:** Though the overall impacts are minimal, maintaining the existing excess runway-taxiway separation of 200 feet for Taxiway F, results in a slight reduction in the maximum overall apron space. This evaluation component was awarded assessments of **Good (2)** for Development Potential and **Good (2)** for Operational Efficiency.

5.3.5. Airside Alternative 3

Airside Alternative 3 resolves all geometry issues at Trenton and provides dual parallel taxiways for both runways and improves the Runway 24 approach minimums. This alternative is shown in **Figure 5-3**. The following projects are associated with Airside Alternative 3:

- Extend Taxiways B and J to create a full-length parallel taxiway for Runway 6-24. All taxiways associated with Runway 6-24 should meet TDG 3 standards.

Figure 5-2: Airside Alternative 2



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- Extend Taxiway G and relocate Taxiway D to provide a full-length parallel taxiway for Runway 16-34 to meet separation requirements. All taxiways associated with Runway 16-34 should meet a minimum TDG 2 standards, except for those crossing Runway 6-24, which should meet TDG 3 standards to allow for all aircraft to cross over. This means the portion of Runway 16-34 parallel taxiway between Taxiways B and F will meet TDG 3 standards.

- Reconstruct Taxiway A intersection with Runway 6-24 to provide a perpendicular TDG 3 runway crossing.

- Reconstruct and extend Taxiway F to meeting separation requirements and provide access to Runway 24. This taxiway should meet TDG 3 standards.

- Reconstruct the intersection between Taxiways C and F with Runway 6-24 to resolve geometry issues and remove direct access from the ramp. This taxiway should meet TDG 3 standards.

- Remove Taxiway C between Taxiways A and Runway 6-24.

- Taxiway H was reconstructed in 2016 and meets airplane design group C-II separation requirements and prevents direct access from the apron.

- Remove Taxiway A between Taxiways G and Runway 16-34.

- Improve Runway 24 GPS approach to ¾-mile visibility minimums. This allows pilots to use the primary runway (Runway 24) during weather conditions less than 1 ¼ mile and alleviates traffic and noise to the Runway 6 end in inclement weather.

- Acquire approximately 2.5 acres in easements and fee within the RSA, ROFA, and RPZ prior to Runways 24 and 34 and 1.2 acres for proposed taxiway object free area.

Airside Alternative 3 was assessed against the five evaluation factors; the results are below:

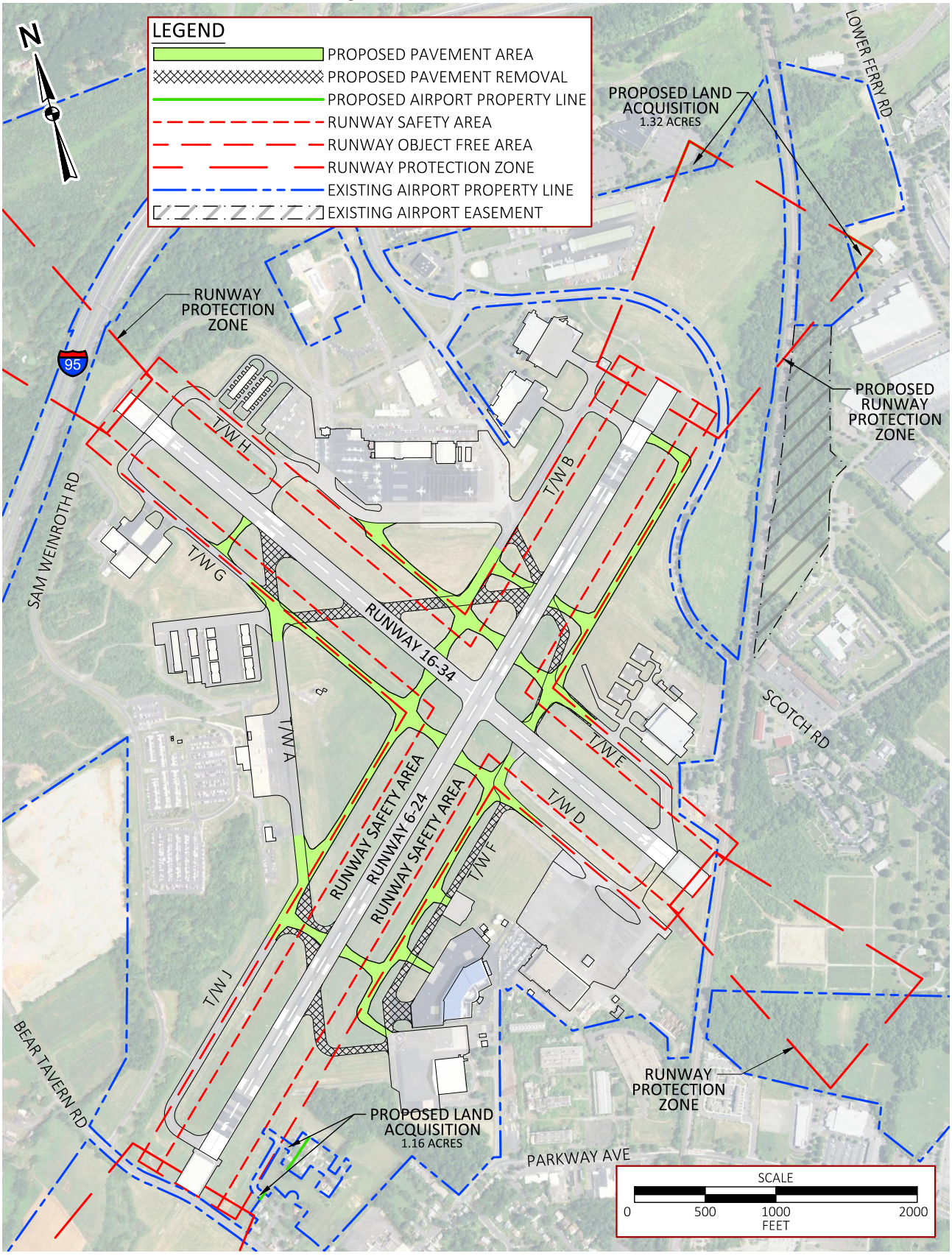
- **Facility Requirements:** Airside Alternative 3 would satisfy Trenton's current or future facility requirements related to FAA design standards or geometry issues and increase safety. This evaluation factor was given a value of **Yes (2)** as it meets the suggested facility requirements.

- **Environmental Impact:** This alternative requires construction within the existing airfield and does not disrupt any environmentally sensitive areas. This evaluation factor was given a value of **Minor (2)** since the alternative has no environmental impacts.

- **FAA Standards:** Alternative 3 addresses the need for RPZ control and geometry design. The evaluation factor was assigned a value of **Yes (2)** because it meets FAA standards.

- **Development Costs:** To be discussed in a later submission.

Figure 5-3: Airside Alternative 3



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- **Development Flexibility:** This alternative provides an airfield consistent with all FAA separation standards and allows for the maximum development potential adjacent to the new infrastructure. This evaluation component was awarded assessments of **Excellent (3)** for Development Potential and **Excellent (3)** for Operational Efficiency.

5.3.6. Airside Alternative Comparison

The previous airside alternatives were evaluated based on five criteria as shown in **Table 5-2** below:

Table 5-2: Airside Alternatives Summary

Alternative	Meets Facility Needs	Environmental Impacts	Meets FAA Standards	Cost	Flexibility	Score
Airside Alt. 1 (No Build)	No (0)	None (3)	No (0)	None	Development: Excellent (3) Operational: Poor (0)	6
Airside Alt. 2 (Resolve Geometry Issues)	Yes (2)	Minor (2)	Yes (2)	$17 Million	Development: Excellent (3) Operational: Good (2)	11
Airside Alt. 3 (Resolve Geometry and Build-Out)	Yes (2)	Minor (2)	Yes (2)	$41 Million	Development: Excellent (3) Operational: Excellent (3)	12

Source: McFarland Johnson, 2016.

The recommended airside alternative for TTN is Alternative 3. Airside Alternative 3 best meets the airport's facility requirements long-term and minimizes costs. A parallel taxiway program is the most efficient layout and offers excellent operational flexibility while resolving geometry issues increases safety. The southern portion of the full parallel Taxiway F may occur in a later phase near the end of the planning period or later as required to minimize land acquisition impacts. Airside Alternative 3 is the Preferred Airside Alternative.

5.4. LANDSIDE ALTERNATIVES

The landside alternatives will be compatible with the preferred airside alternative identified in the previous section. TTN has several areas available for landside development. This portion of the report examines the future placement of, and relationships between, existing and future landside facilities at the Airport. In planning for landside facilities, an important consideration is the relationship between the activity centers of an Airport. An activity center is an area in which a certain type of activity occurs, such as aircraft fueling or equipment maintenance. As an airport grows and activity increases, the smooth functioning of these activity centers and the relationships between them become increasingly important. With this in mind, three landside alternatives were developed. Elements that were considered in each alternative are as follows:

5.4.1. Landside Alternative Evaluation Criteria

A set of evaluation criteria was developed to provide consistent assessments of each landside alternative throughout the review process. The criteria are defined below:

- **Land Use Compatibility:** Is the alternative compatible with on-Airport and off-Airport patterns of land use? This criterion will evaluate such things as access to the airside movement areas and the local road network, as well as the degree to which the alternative is compatible with activities occurring in surrounding on and off-Airport lands.

- **Environmental Impact:** What are the potential environmental impacts associated with implementation of the alternative? Does the alternative avoid or minimize and mitigate environmental impacts?

- **Potential for Expansion:** Does this alternative have the ability to accommodate future unanticipated expansion? This criterion recognizes the fact that site decisions made today will influence future Airport development for many years to come. Planning shall consider future development needs beyond the Facility Requirements of the current planning period.

- **Revenue Generation Capability:** Does the alternative afford opportunities for Airport Management to increase revenue generation thereby improving the financial sustainability and cost effectiveness of the Airport?

Each of the evaluation factors above was given a scoring value as follows:

- **Land Use Compatibility:** Poor (0), Fair (1), Good (2), Excellent (3)
- **Environmental Impact:** Significant (0), Large (1), Minor (2), None (3)
- **Potential for Expansion:** Poor (0), Fair (1), Good (2), Excellent (3)
- **Revenue Generation Capability:** Poor (0), Fair (1), Good (2), Excellent (3)

Alternatives were compared using both a qualitative and quantitative comparison between the alternatives and given a value based on the alternative's ability to meet the requirements of the evaluation factor. Selection of a recommended alternative was based on an alternative that was compatible with surrounding land uses, enhanced safety, minimized environmental and community effects, and provides flexibility for expansion. While the assessment is created based on available information and design criteria, it should be noted that the completion of required environmental documentation, as well as preliminary and final design documents, could require modifications to the alternatives as depicted and result in additional impacts beyond those considered and contemplated as part of this Master Plan Update.

All airport property both aeronautical and non-aeronautical must be leased at fair market value and land identified for non-aeronautical use clearly identified on the ALP. An overview of current airport land use actions for FAA compliance is outlined in Section 5.8.1, *Non-Aeronautical Parcels and FAA Compliance* and Chapter 6 Section 6.3.

5.4.2. Landside Alternative 1 (No Build)

Landside Alternative 1 represents the No-Build option. This alternative maintains the existing landside facilities in their current configuration. The No-Build option is presented in **Figure 5-1**.

The evaluation of this alternative is as follows:

- **Land Use Compatibility:** This option would allow airport activity to remain generally compatible with adjacent and nearby patterns of land use, as there would be no changes. This evaluation factor received an assessment of **Excellent (3)** since it maintains balanced land use compatibility.

- **Environmental Impact:** Alternative 1 would require no additional construction, and therefore would have no added environmental impacts. This evaluation factor was given a value of **None (3)**.

- **Potential for Expansion:** This alternative would possess maximum potential for future airport expansion, as nothing would be constructed. This component was awarded a score of **Excellent (3)** as it provides for future airport expansion.

- **Revenue Generation Capability:** Landside Alternative 1 does not significantly improve the overall competitiveness of the Airport, nor does it provide additional opportunities for increased revenue generation without added development. This component received an assessment of **Poor (0)** due to its inability to improve existing facility revenues.

5.4.3. Landside Alternative 2

Landside Alternative 2 is shown in **Figure 5-4**. It shows general areas in which general aviation development could be constructed. It should be noted that all general aviation development is anticipated to be constructed by private developers in coordination with Airport management. The following areas are available for general aviation development:

- An area spanning approximately 26 acres is located between Taxiways D and F south of Runway 34 provides existing pavement and buildings. This area could be modified or reconstructed for general aviation use.

- South of Taxiway G and between the corporate aviation hangars and conventional hangars is an area spanning approximately 17 acres available for general aviation development.

- North of Runway 16 and east of the t-hangars is an area of approximately 7 acres available for general aviation development.

- In the long-term (10-20 years), an area between Runways 24 and 34 spanning 16 acres could be reviewed for development.

- The ultimate development (20+ years) includes an area of approximately 23 acres for development, which includes property acquisition of approximately 7 acres. This area protects for a full-length parallel taxiway south of Runway 6-24 and associated taxiway object free areas.

The evaluation of this alternative is as follows:

- **Land Use Compatibility:** This option would allow Airport activity to remain generally compatible with adjacent and nearby patterns of land use, as they are currently not in use, but located adjacent to existing general aviation areas and are on Airport property. This evaluation factor received an assessment of **Excellent (3)** since it maintains balanced land use compatibility.

- **Environmental Impact:** Development areas identified have the general goal of avoiding environmentally sensitive areas, though all impacts cannot be completely avoided. The specific development details are not currently known and it is recommended that the airport consider ways to minimize impacts with each new development. This evaluation factor was given a value of **Minor (2)**.

- **Potential for Expansion:** This alternative would possess potential for future Airport expansion, as the areas shown could be protected for general aviation development only. This component was awarded a score of **Excellent (3)** as it provides for future Airport expansion.

- **Revenue Generation Capability:** Landside Alternative 3 improves the overall competitiveness of the Airport as it provides additional opportunities for increased revenue generation by allowing private developers the opportunity to construct additional tie-downs, hangars, or on-airport businesses. This component received an assessment of **Excellent (3)** due to its ability to improve existing facility revenues.

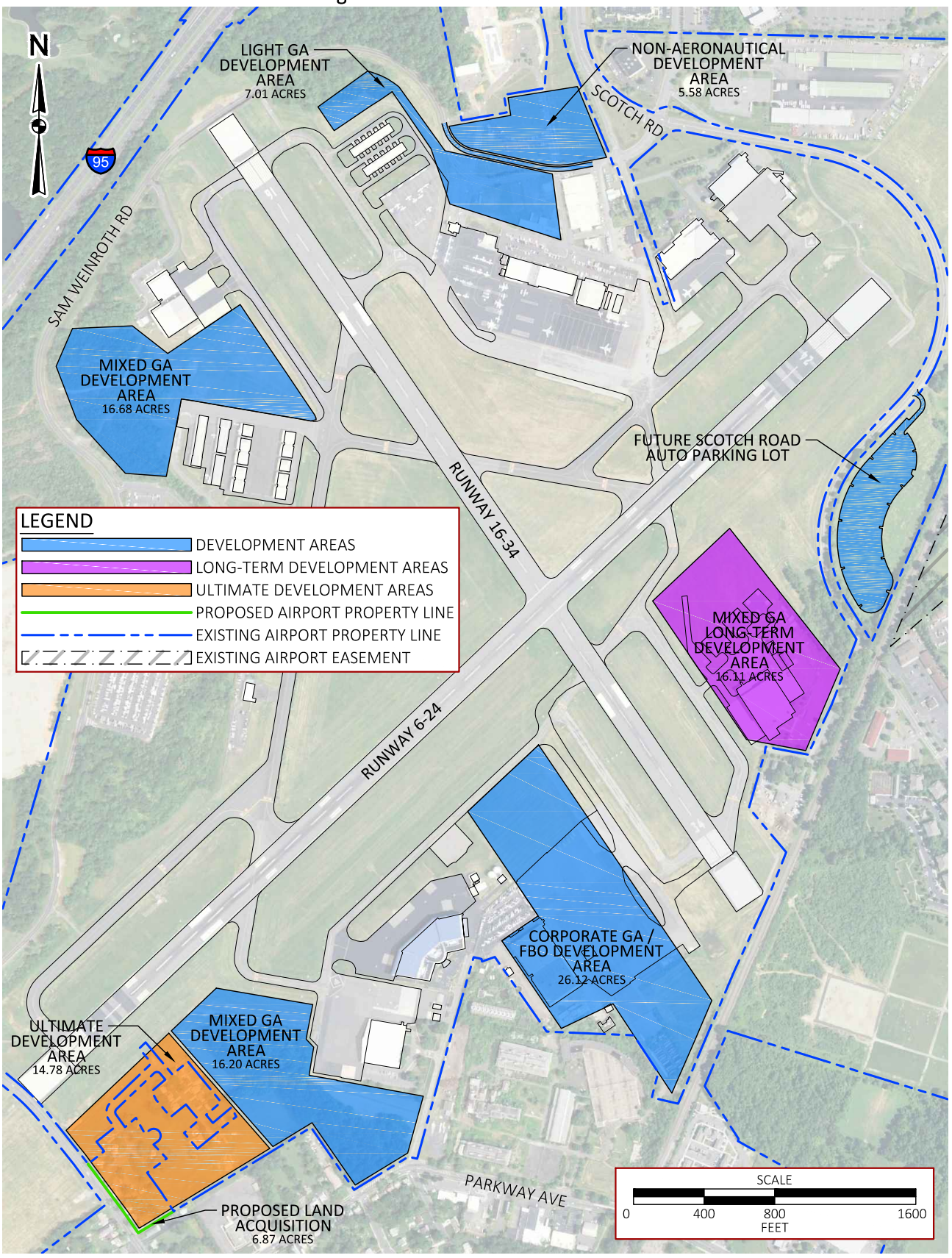
5.4.4. Landside Alternative 3

Landside Alternative 3 is shown in **Figure 5-4**. It shows general areas in which general aviation development could be constructed. It should be noted that all general aviation development is anticipated to be constructed by private developers in coordination with airport management. The following areas are available for general aviation development:

- An area spanning approximately 26 acres is located between Taxiways D and F south of Runway 34 provides existing pavement and buildings. This area could be modified or reconstructed for general aviation use.

- South of Taxiway G and between the corporate aviation hangars and conventional hangars is an area spanning approximately 20 acres available for general aviation development.

Figure 5-4: Landside Alternative 2



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- North of Runway 16 and east of the t-hangars is an area of approximately 1.6 acres available for general aviation development.

- In the long-term (10-20 years), an area between Runways 24 and 34 spanning 16 acres could be reviewed for development.

The evaluation of this alternative is as follows:

- **Land Use Compatibility:** This option would allow Airport activity to remain generally compatible with adjacent and nearby patterns of land use, as they are currently not in use, but located adjacent to existing general aviation areas and are on Airport property. This evaluation factor received an assessment of **Excellent (3)** since it maintains balanced land use compatibility.

- **Environmental Impact:** Development areas identified have the general goal of avoiding environmentally sensitive areas, though all impacts cannot be completely avoided. The specific development details are not currently known and it is recommended that the airport consider ways to minimize impacts with each new development. This evaluation factor was given a value of **Minor (2)**.

- **Potential for Expansion:** This alternative would possess potential for future Airport expansion, as the areas shown could be protected for general aviation development only. This component was awarded a score of **Excellent (3)** as it provides for future Airport expansion.

- **Revenue Generation Capability:** Landside Alternative 2 improves the overall competitiveness of the Airport as it provides additional opportunities for increased revenue generation by allowing private developers the opportunity to construct additional tie-downs, hangars, or on-Airport businesses. This component received an assessment of **Good (2)** due to its ability to improve existing facility revenues.

5.4.5. Landside Alternative Comparison

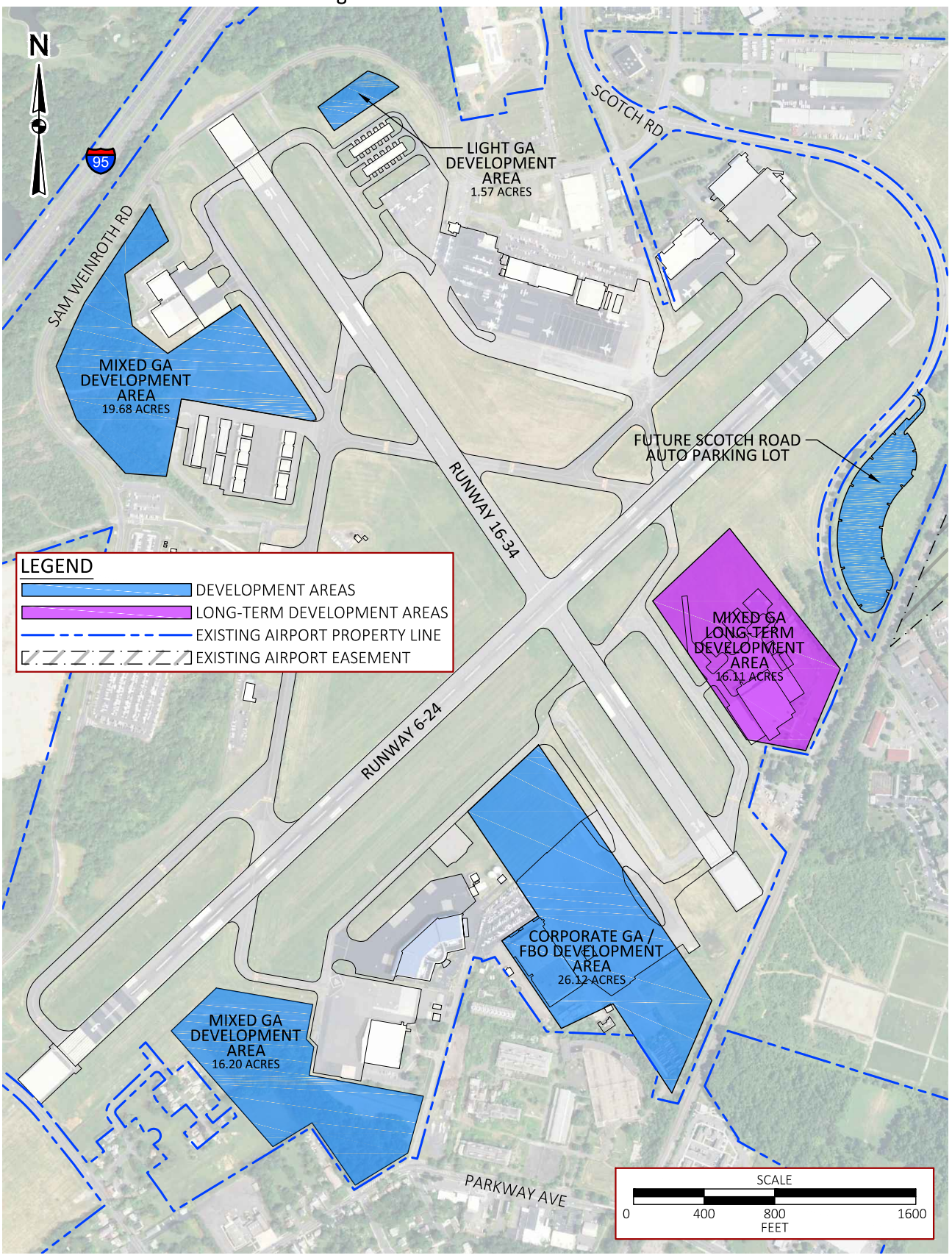
The previous landside alternatives were evaluated based on four criteria as shown in **Table 5-3** below:

Table 5-3: Landside Alternatives Summary

Alternative	Land Use Compatibility	Environmental Impacts	Potential for Expansion	Revenue Generation Capability	Score
Landside Alt. 1 (No Build)	Excellent (3)	None (3)	Excellent (3)	None (0)	9
Landside Alt. 2	Excellent (3)	Minor (2)	Excellent (3)	Excellent (3)	11
Landside Alt. 3	Excellent (3)	Minor (2)	Excellent (3)	Good (2)	10

Source: McFarland Johnson analysis.

Figure 5-5: Landside Alternative 3



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The recommended landside alternative for TTN is Landside Alternative 2, as this option best provides use for the airport's 20-year planning needs. Additional land acquisition as shown in Landside Alternative 3 would be considered when demand requires it.

5.5. PASSENGER TERMINAL ALTERNATIVES

To accommodate the space/program needs developed in the previous "Facilities Requirements" chapter, various alternatives were reviewed to determine the best direction in which to accommodate. A description of these alternatives follows.

After review an analysis of the existing airport property and surrounding land uses, it was determined that the current location of the terminal area is the optimum location. Other potential suitable locations such as the east side contain less available land than the existing terminal area complex and there would be little room for future growth. In addition, access to/from I-95 is efficient and the existing infrastructure (access roadway, landside and airside development, etc.) is in good condition and overall layout. Adequate land beyond that already utilized is also available for easy expansion.

5.5.1. Terminal Area Alternative Evaluation Criteria

A set of evaluation criteria was developed to provide consistent assessments of each alternative throughout the review process. The criteria are defined as follows:

- Facility Requirements: Does the alternative meet the existing and future needs of the Airport and is the alternative feasible for implementation?

- Land Use Compatibility: Is the alternative compatible with on-Airport and off-Airport patterns of land use? This criterion will evaluate such things as access to the airside movement areas and the local road network, as well as the degree to which the alternative is compatible with activities occurring in surrounding on and off-Airport lands.

- Environmental Impact: What are the potential environmental impacts associated with implementation of the alternative? To what extent does this alternative further achievement of the Airport's environmental goals?

- Potential for Expansion: Does this alternative have the ability to accommodate future unanticipated expansion? This criterion recognizes the fact that site decisions made today will influence future Airport development for many years to come. Planning shall consider future development needs beyond the Facility Requirements of the current planning period.

- Operational Efficiency: Does this alternative facilitate operational efficiency to accommodate current and forecast levels of operations?

- Revenue Generation Capability: Does the alternative afford opportunities for Airport Management to increase revenue generation from within the terminal area and terminal concourse as a means to improve financial sustainability

- **Development Costs:** Does the alternative have reasonable development costs in comparison to other alternatives that achieve the same goal?

Each of the evaluation factors above was given a scoring value as follows:

- **Facility Requirements:** No (0), Partial (1), Yes (2)
- **Land Use Compatibility:** Poor (0), Fair (1), Good (2), Excellent (3)
- **Environmental Impact:** Significant (0), Large (1), Minor (2), None (3)
- **Potential for Expansion:** Poor (0), Fair (1), Good (2), Excellent (3)
- **Operational Efficiency:** Poor (0), Fair (1), Good (2), Excellent (3)
- **Revenue Generation:** Poor (0), Fair (1), Good (2), Excellent (3)
- **Development Costs:** Estimated Cost of Development

5.5.2. Passenger Terminal Alternatives Identification

The following alternatives have been developed to accommodate the current and future space/requirements at TTN:

- **Terminal Area Alternative 1: (No Build)** - The existing structures (terminal and bag claim building) would remain as is. No changes would be made to the interior layout or any expansion would be addressed.

- **Terminal Area Alternative 2: (Expansion/Renovation)** -The current structure would be expanded to accommodate the substantial increased space demands (however, the remote bag claim structure would be demolished). The existing interior layout would be renovated as well, resulting in a cohesive whole. Aircraft parking would require relocation and loading bridges would be added. Phasing of construction to accommodate continuous terminal operations would require much review. Totals would include: +/- 25,000 SF renovation space and 90,000-100,000 SF new space.

- **Terminal Area Alternative 3: (Replacement)** -The terminal would be completely new (115,000-125,000 SF) with no reuse of the existing. Phasing would be much simpler as the issue of continued terminal operation during construction would be eliminated. Aircraft parking would require relocation and loading bridges would be added.

5.5.3. Passenger Terminal Alternative 1 – No Build

This initial terminal option is the no-build direction. Per this concept all interior and exterior conditions will remain intact with no alternation. See **Figure 5-6** for the current existing conditions (note: this diagram includes the bag claim addition project currently in the early phases in construction).

- **Meets Facility Needs:** This concept would not provide any of the space requirements listed in the "Facility Requirements" chapter. As both the current and future needs of the terminal are not met, this component receives a score of **No (0)** as it relates to facility requirements.

- **Land Use Capability**: As there will be no changes, this concept would allow airport activity to remain compatible with adjacent and nearby patterns of use. This component, therefore, receives a score of **Excellent (3)** as it maintains land use compatibility.

- **Environmental Impact**: There is no environmental impact with this alternative as there is no additional construction. Therefore, this component receives a score of **Excellent (3)**.

- **Potential for Expansion**: Although not impossible; the existing terminal, due to its small size, tight structural bays, and split-level layout, will be difficult to expand. Therefore, this component receives a score of **Fair (1)**.

- **Operational Efficiency**: The No-Build option does not facilitate operational efficiency to accommodate even its current level of operations. As traffic increases, its deficiencies will prove to be even more extreme. This component receives a score of **Poor (0)** for its deficiencies.

- **Revenue Generation Capability**: The existing revenue space within the current terminal building is severely limited, and no additional space is available for such use. This No-Build option, therefore, rates a **Poor (0)** as it does not improve its existing revenue opportunities.

5.5.4. Passenger Terminal Alternative 2 - Renovate/Expand

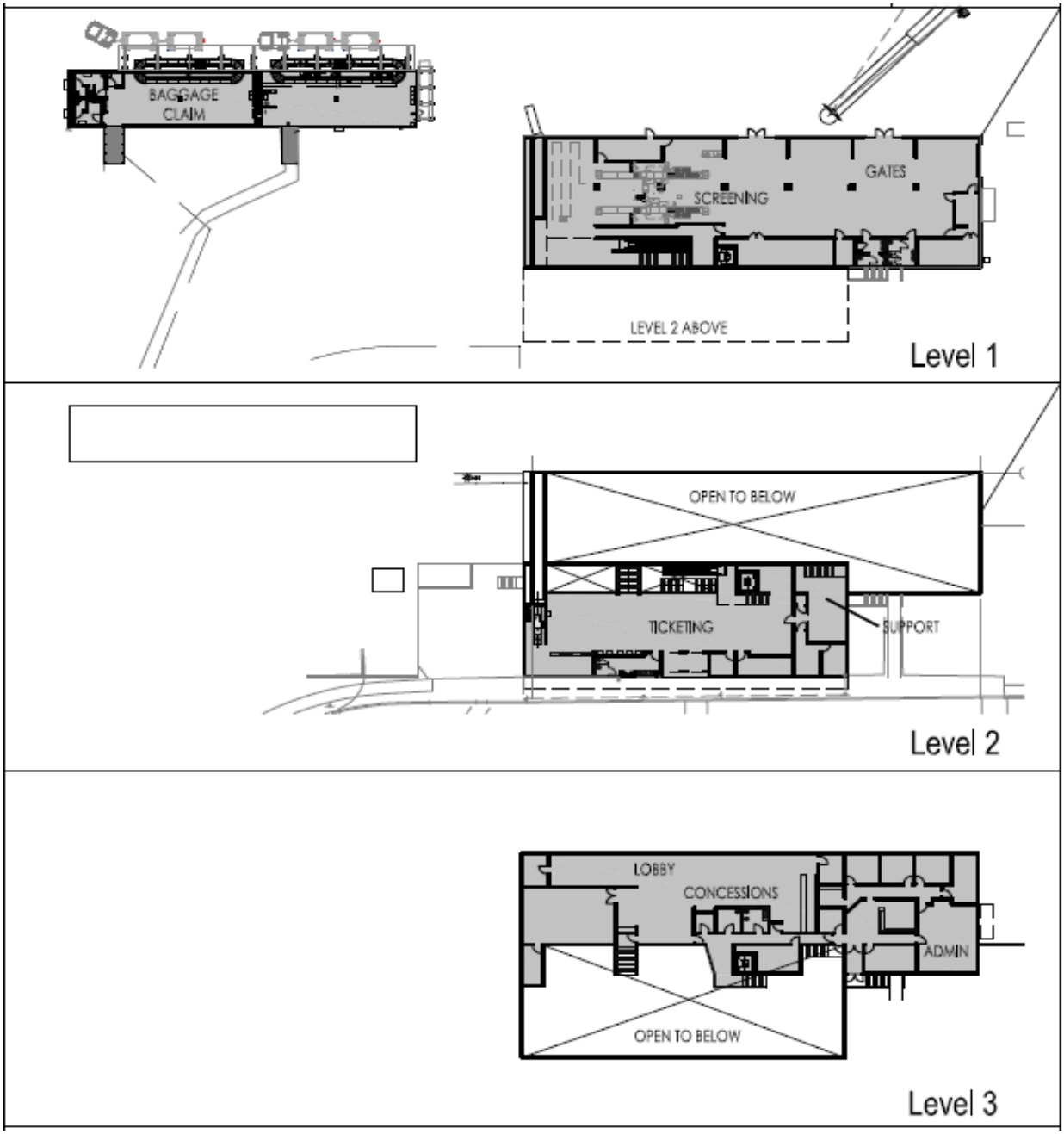
Terminal Area Alternative 2, illustrated in **Figure 5-7** represents the modifications required to expand/renovate the existing terminal structure to accommodate the space requirements documented in the "Facility Requirements" section. In summary, the amount of renovation space is minimal when compared with the additional space required (all components within the terminal building require a substantial increase in program area.) This discrepancy is even more extreme when that the remote bag claim structure will require demolition. There are several other major concerns with this direction including the difficulty in maintaining constant terminal operations during construction, the impact to the final design of the existing split level layout, and the ultimate high construction cost of this complicated phased construction.

- **Meets Facility Needs**: The final plan diagram does accommodate the appropriate program areas to meet current traffic demands. However, the compromises in the physical layout due to the impact of the existing structure reuse (section/structure etc.) results in a less than ideal design direction. Therefore, this factor receives a score of **Fair (1)**.

- **Land Use Compatibility**: As this concept maintains the current land use pattern of the reuse of the existing terminal structure, and landside/airside components with no impact to adjacent land uses, this alternative receives a score of **Excellent (3)**.

- **Environmental Impact**: Some environmental impact is expected with this alternative. As the existing structure is expanded both the landside and airside areas will require some modification. Therefore, this direction receives a score of **Minor (2)**.

Figure 5-6 Passenger Terminal Alternative 1 – No Build



- **Potential for Expansion**: Alternative 2 allows for future terminal expansion to all major building components. However, some interior inflexibility, due to the reuse of the existing structure (split-level section, structural bays, etc.) is limiting. Therefore, this alternate receives a score of **Good (2)**.

- **Operational Efficiency**: Similar to the above criteria, this proposed direction results in a positive functional flow for all terminal users. However, due primarily to adapting to the split-level layout and fixed floor plate elevations of the existing terminal building, some circulation disadvantages will arise. Therefore, this concept receives a score of **Good (2)**.

- **Revenue Generation Capability**: This alternative allows for increased opportunities for revenue generation in the form of added concession space. This added space would benefit the traveling public in terms of positive amenity offerings as well as add financial revenue opportunities for the airport. This concept receives as score of **Excellent (3)**.

5.5.5. Passenger Terminal Alternative 3- Replace

Terminal Area Alternate 3 (**Figure 5-8**) represents a total replacement of the terminal structure. As compared to the previous alternative, the design direction is not compromised by the split-level section and other physical realities dictated by the reuse of the existing structure. The lack of complicated construction phasing will lead to a shorter construction duration and less overall costs. Likewise, the ease of transition from the use of the existing terminal to new for both the traveling public and airport operators will be much more advantageous.

- **Meets Facility Requirements**: The proposed plan layout accommodates all appropriate program areas to meet expected demands. As construction is new, all physical realities (structural grid/floor plates, etc.) can be designed to custom fit the expected uses. Therefore, this factor receives a score of **Yes (2)**.

- **Land Use Compatibility**: As this alternative is planned to be positioned adjacent to the existing terminal structure, the existing landside and airside components are able to be reused with no impact to adjacent land uses. This factor scores **Excellent (3)**.

- **Environmental Impact**: As with Alternative 2, some environmental impact is expected although minimal. It is assumed that, although the site disturbance required of the existing totally new structure is more, the effect on the existing landside and airside components are minimized. Therefore, this factor scores **Excellent (3)**.

- **Potential for Expansion**: As a totally new facility, internal flexibility is able to be accommodated, unlike Alternative 2. Exterior expansion will be easily available for all major terminal components as well (with the existing ARFF facility possibly requiring relocation at some point). This criteria scores **Excellent (3)**.

Figure 5-7: Passenger Terminal Alternative 2 – Renovate/Expand

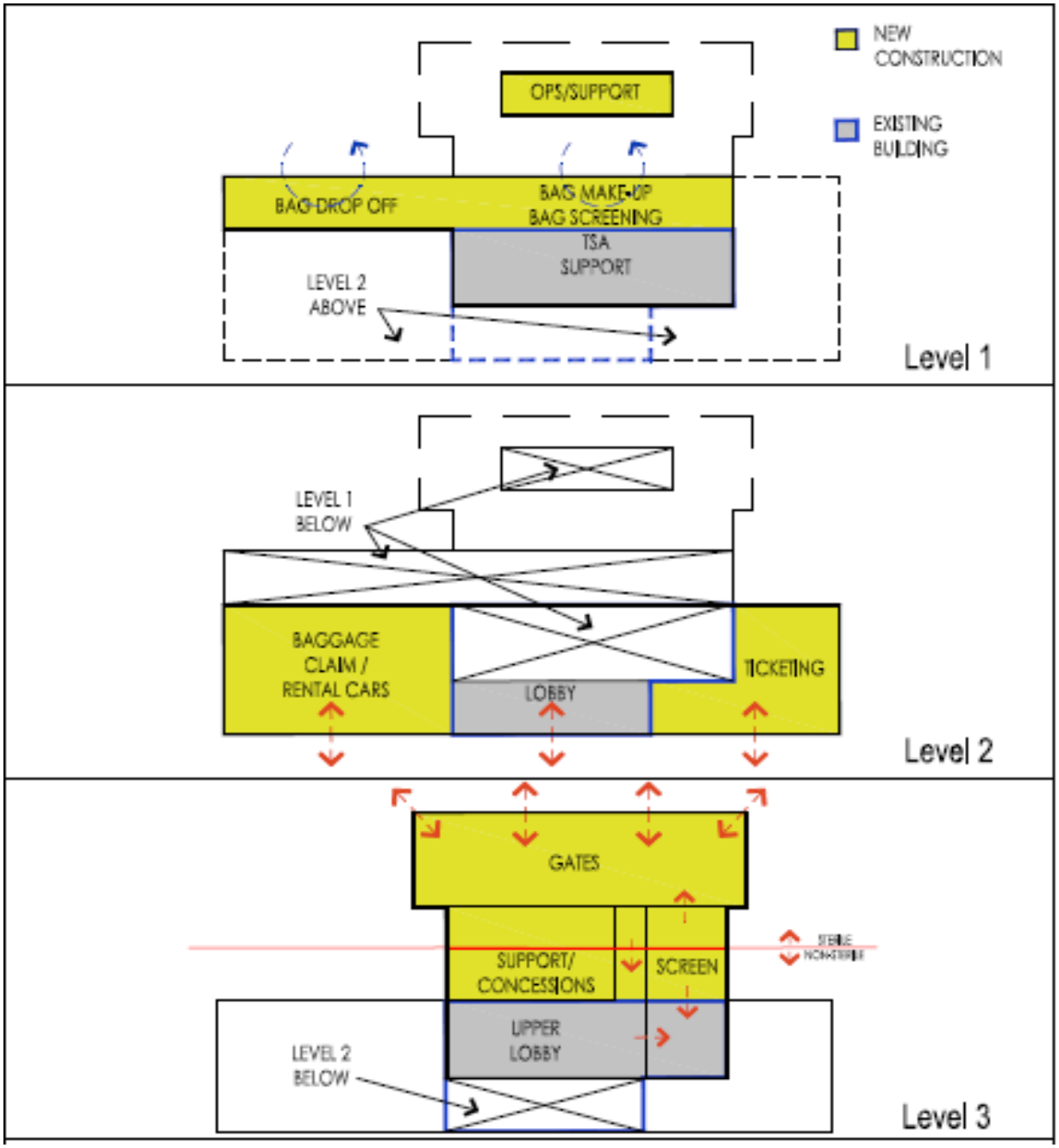
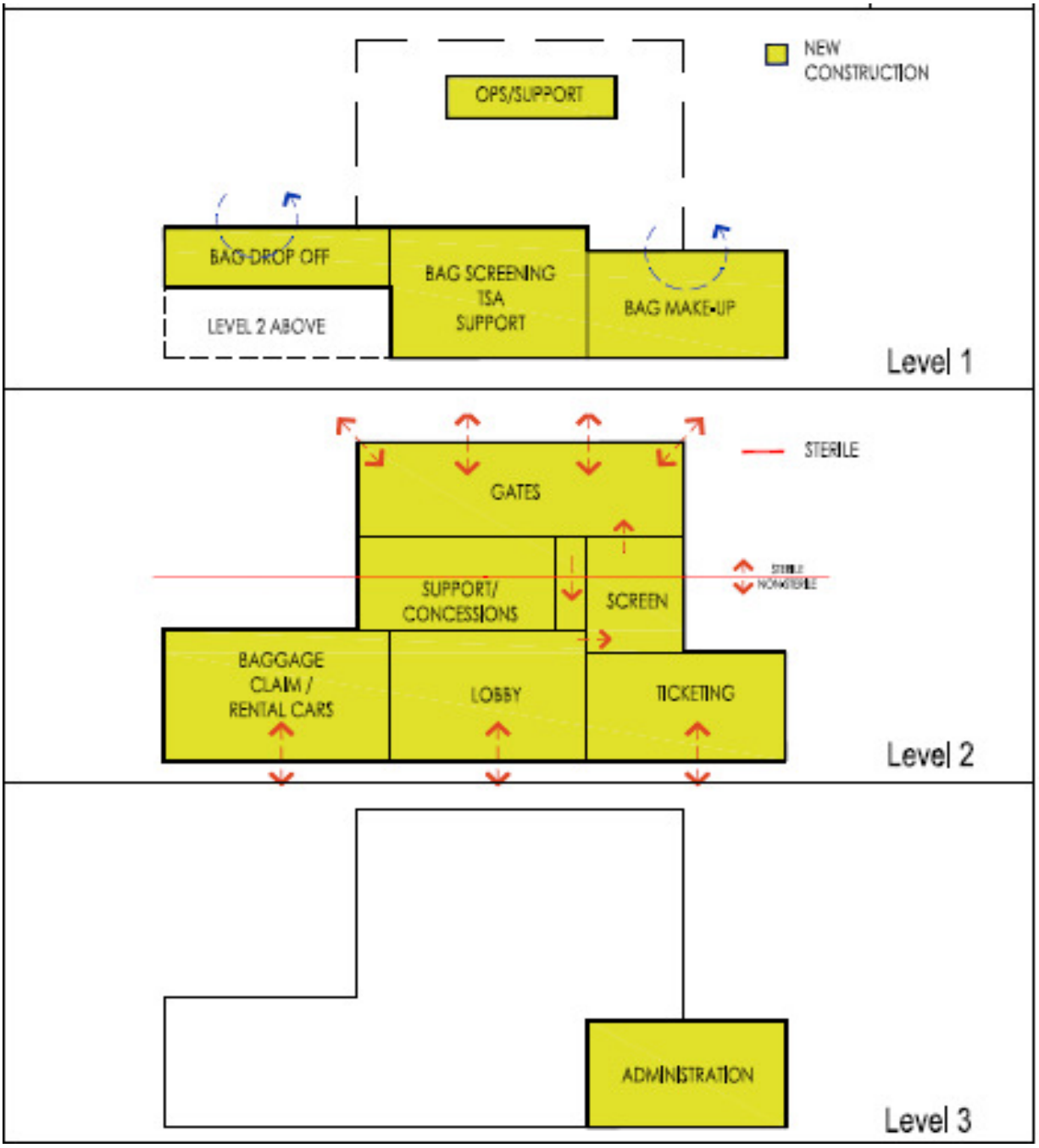


Figure 5-8: Passenger Alternative 3 Replace



- **Operational Efficiency**: This alternative offers optimum functional flow for all primary terminal components with no compromises whatsoever. The layout efficiency applies to the passenger as well as all terminal users. This factor scores **Excellent (3).**

- **Revenue Generation Capability**: As with Alternative 2, this option allows for increased opportunities for revenue generation, enhancing the travelling public's choices of amenities and increasing the financial revenue to the airport. This alternative receives a score of **Excellent (3).**

5.6. TERMINAL AREA ALTERNATIVES

In this section, the various options to support the previously mentioned passenger terminal alternatives and need for improved terminal support infrastructure outlined in the preceding chapter, Chapter 4, *Facility Requirements*, were developed and evaluated.. The terminal area alternatives correspond to their respective terminal building alternatives presented in the previous section. As such, terminal area alternatives include potential improvements to the terminal building, terminal access roadway system and terminal parking lots/structures. Several alternatives were developed and are presented in the following sections.

5.6.1. Terminal Area Alternative Evaluation Criteria

A set of evaluation criteria was developed to provide consistent assessments of each alternative throughout the review process. The criteria are defined as follows:

- **Facility Requirements:** Does the alternative meet the existing and future needs of the Airport and is the alternative feasible for implementation?

- **Land Use Compatibility:** Is the alternative compatible with on-Airport and off-Airport patterns of land use? This criterion will evaluate such things as access to the airside movement areas and the local road network, as well as the degree to which the alternative is compatible with activities occurring in surrounding on and off-Airport lands.

- **Environmental Impact:** What are the potential environmental impacts associated with implementation of the alternative? To what extent does this alternative further achievement of the Airport's environmental goals?

- **Potential for Expansion:** Does this alternative have the ability to accommodate future unanticipated expansion? This criterion recognizes the fact that site decisions made today will influence future Airport development for many years to come. Planning shall consider future development needs beyond the Facility Requirements of the current planning period.

- **Operational Efficiency:** Does this alternative facilitate operational efficiency to accommodate current and forecast levels of operations?

- **Revenue Generation Capability:** Does the alternative afford opportunities for Airport Management to increase revenue generation from within the terminal area and terminal concourse as a means to improve financial sustainability

- **Development Costs:** Does the alternative have reasonable development costs in comparison to other alternatives that achieve the same goal?

Each of the evaluation factors above was given a scoring value as follows:

- **Facility Requirements:** No (0), Partial (1), Yes (2)
- **Land Use Compatibility:** Poor (0), Fair (1), Good (2), Excellent (3)
- **Environmental Impact:** Significant (0), Large (1), Minor (2), None (3)
- **Potential for Expansion:** Poor (0), Fair (1), Good (2), Excellent (3)
- **Operational Efficiency:** Poor (0), Fair (1), Good (2), Excellent (3)
- **Revenue Generation:** Poor (0), Fair (1), Good (2), Excellent (3)
- **Development Costs:** Estimated Cost of Development

Alternatives were compared using both a qualitative and quantitative assessment and given a value based on the alternative's ability to meet the requirements of the evaluation factor. Selection of a recommended alternative is based on the alternative meeting demand needs, enhancing operations and safety, minimizing environmental and community effects, and providing future flexibility. While the assessment is created based on available information and design criteria, it should be noted that the completion of required environmental documentation, as well as preliminary and final design documents, could require modifications to the alternatives as depicted and result in additional impacts beyond those considered and contemplated as part of this Master Plan Update.

5.6.2. Terminal Area Alternative Identification

The following alternatives for terminal area development have been prepared to address the facility requirements at TTN:

- **Airside Alternative 1: (No Build):** The existing commercial terminal building, parking facilities and access route would remain the unchanged. The existing terminal area facilities would be maintained through the planning period and service demand as best able.

- **Airside Alternative 2:** In terminal area alternative 2 the current structure would be expanded to accommodate the substantial increased space demands. Auto parking is expanded along with the provision for a multi-level parking structure. The terminal roadway entrance is relocated to encompass all auto parking lots and includes an internal recirculation road.

- **Airside Alternative 3:** In terminal area alternative 3 the terminal would be completely new (115,000-125,000 SF) with no reuse of the existing.

5.6.3. Terminal Area Alternative 1 (No-Build)

This initial terminal option is the no-build direction. Per this concept all interior and exterior conditions will remain intact with no alternation. See **Figure 5-9** for the current existing conditions (note: this diagram includes the bag claim addition project currently in the early phases in construction).

- **Meets Facility Needs:** This concept would not provide any of the space requirements listed in the "Facility Requirements" chapter. As both the current and future needs of the terminal are not met, this component receives a score of **No (0)** as it relates to facility requirements.

- **Land Use Capability:** As there will be no changes, this concept would allow airport activity to remain compatible with adjacent and nearby patterns of use. This component, therefore, receives a score of **Excellent (3)** as it maintains land use compatibility.

- **Environmental Impact:** There is no environmental impact with this alternative as there is no additional construction. Therefore, this component receives a score of **None (3)**.

- **Potential for Expansion**: Although not impossible; the existing terminal, due to its small size, tight structural bays, and split-level layout, will be difficult to expand. Therefore, this component receives a score of **Fair (1)**.

- **Operational Efficiency**: The No-Build option does not facilitate operational efficiency to accommodate even its current level of operations. As traffic increases, its deficiencies will prove to be even more extreme. This component receives a score of **Poor (0)** for its deficiencies.

- **Revenue Generation Capability**: The existing revenue space within the current terminal building is severely limited, and no additional space is available for such use. This No-Build option, therefore, rates a **Poor (0)** as it does not improve its existing revenue opportunities.

5.6.4. Terminal Area Alternative 2

Terminal Area Alternative 2, illustrated in **Figure 5-10,** represents the modifications required to expand/renovate the existing terminal structure to accommodate the space requirements documented in the "Facility Requirements" section. In summary, the amount of renovation space is minimal when compared with the additional space required (all components within the terminal building require a substantial increase in program area.) This discrepancy is even more extreme when that the remote bag claim structure will require demolition. There are several other major concerns with this direction including the difficulty in maintaining constant terminal operations during construction, the impact to the final design of the existing split level layout, and the ultimate high construction cost of this complicated phased construction.

- **Meets Facility Needs**: Passenger terminal Alternative 2 does accommodate the appropriate program areas to meet current traffic demands. Auto parking and roadway

networks shown are capable of supporting forecast activity levels Therefore, this alternative receives a score of **Yes (2)**.

- **Land Use Compatibility**: As this concept maintains the current land use pattern of the reuse of the existing terminal structure, and landside/airside components with no impact to adjacent land uses, this alternative receives a score of **Excellent (3)**.

- **Environmental Impact:** Some environmental impact is expected with this alternative. As the existing structure is expanded both the landside and airside areas will require some modification. Therefore, this alternative receives a score of **Minor (2)**.

- **Potential for Expansion**: Alternative 2 allows for future terminal expansion to all major building components and supporting parking and roadway infrastructure. However, some interior inflexibility, due to the reuse of the existing structure (split-level section, structural bays, etc.) is limiting. Therefore, this alternative receives a score of **Good (2)**.

- **Operational Efficiency:** Similar to the above criteria, this proposed direction results in a positive functional flow for all terminal users. While the roadway network and parking meeting requirements, it could become congested at peak times or at activity levels beyond what is identified in the forecast. Therefore, this alternative receives a score of **Good (2)**.

- **Revenue Generation Capability:** This alternative allows for increased opportunities for revenue generation in the form of added concession space in the terminal and additional auto parking spaces and products (i.e. covered parking). These added amenities would benefit the traveling public in terms of a positive passenger experience as well as add financial revenue opportunities for the airport. This alternative receives as score of **Excellent (3)**.

5.6.5. Terminal Area Alternative 3

Terminal Area Alternate 3 **Figure 5-11** represents a total replacement of the terminal structure. As compared to the previous alternative, the design direction is not compromised by the split-level section and other physical realities dictated by the reuse of the existing structure. The lack of complicated construction phasing will lead to a shorter construction duration and less overall costs. Likewise, the ease of transition from the use of the existing terminal to new for both the traveling public and airport operators will be much more advantageous.

- **Meets Facility Requirements:** The proposed plan layout accommodates all appropriate program areas to meet expected demands. Auto parking and roadway infrastructure are planned to meet forecasted activity levels, even during peak times. Therefore, this factor receives a score of **Yes (2)**.

- **Land Use Compatibility:** As this alternative is planned to be positioned adjacent to the existing terminal structure, the existing landside and airside components are able to be reused with no impact to adjacent land uses. This factor scores **Excellent (3)**.

Figure 5-9: Terminal Area Alternative 1 - No Build

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- **Environmental Impact:** As with Alternative 2, there are no major environmental impacts to the surrounding area. some environmental impact is expected to wetland areas south and west of the existing terminal area. It is recommended that the design phase look to minimize these impacts to the greatest extent possible. This factor scores **Large (1)** primarily on a comparative basis with Alternative 2.

- **Potential for Expansion:** As a totally new facility, internal flexibility is able to be accommodated, unlike Alternative 2. Additional space for the roadway and parking allows for future flexibility for development within the terminal area. This alternative scores **Excellent (3)**.

- **Operational Efficiency:** This alternative offers optimum functional flow for all primary terminal components with no compromises. The roadway layout and auto parking options support additional growth beyond the forecast and planning horizon. The layout efficiency applies to the passenger as well as tenants and operational staff. This factor scores **Excellent (3)**.

- **Revenue Generation Capability:** As with Alternative 2, this option allows for increased opportunities for revenue generation, enhancing the travelling public's choices of amenities and increasing the financial revenue to the airport. This alternative receives a score of **Excellent (3)**

5.6.6. Terminal Area Alternative Comparison

Each of the three terminal area alternatives were evaluated based on the criteria outlined above, and expressed in **Table 5-4**.

Table 5-4: Terminal Area Alternatives Summary

Alternative	Meets Facility Needs	Land Comp.	Enviro Impact	Expansion Potential	Operational Efficiency	Rev. Gen.	Cost	Score
Terminal Area Alt. 1 (No Build)	No (0)	Excellent (3)	None (3)	Fair (1)	Poor (0)	Poor (0)	TBD	6
Terminal Area Alt. 2 (Expansion)	Yes (2)	Excellent (3)	Minor (2)	Good (2)	Good (2)	Excellent (3)	TBD	14
Terminal Area Alt. 3 (New Cons)	Yes (2)	Excellent (3)	Large (1)	Excellent (3)	Excellent (3)	Excellent (3)	TBD	14

Source: McFarland Johnson, 2016.

The preferred Terminal Area Alternative is Alternative 3. While both scores are equal, this option meets all of the building's facility requirements as well as expansion, operational and revenue generation goals. As opposed to Alternative 2, when factored beyond the planning period, the

Figure 5-10: Terminal Area Alternative 2

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Figure 5-11: Terminal Area Alternative 3

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better operational efficiency score will help yield greater dividends to the airport as well as eliminating serious phasing complications during construction.

Near term auto parking requirements may require additional auto parking facilities before the long term solution identified in the preferred alternatives can be constructed. In particular, a more durable long-term / overflow parking area has been identified which will provide a higher level of customer service over the existing grass overflow lot. A location for this auto parking lot has been identified along Scotch Road, between RW 24 and the railway tracks. This lot will be able to accommodate approximately 400 parked vehicles along with room for existing rental car operations. Once the permanent terminal area parking facilities are constructed, it is anticipated the lot could continue to be used for rental car support.

5.7. SUPPORT FACILITIES

Chapter 4, *Facility Requirements*, identifies the following needs for support facilities at the Airport:

- ATCT should have full visibility of the airfield and all approach areas. It should be accessible without crossing any movement area.
- ARFF facility may need to be relocated. A combined ARFF/SRE/maintenance/operations building should be considered.
- Airfield electrical vault should be replaced.

Figure 5-12 shows potential support facility locations.

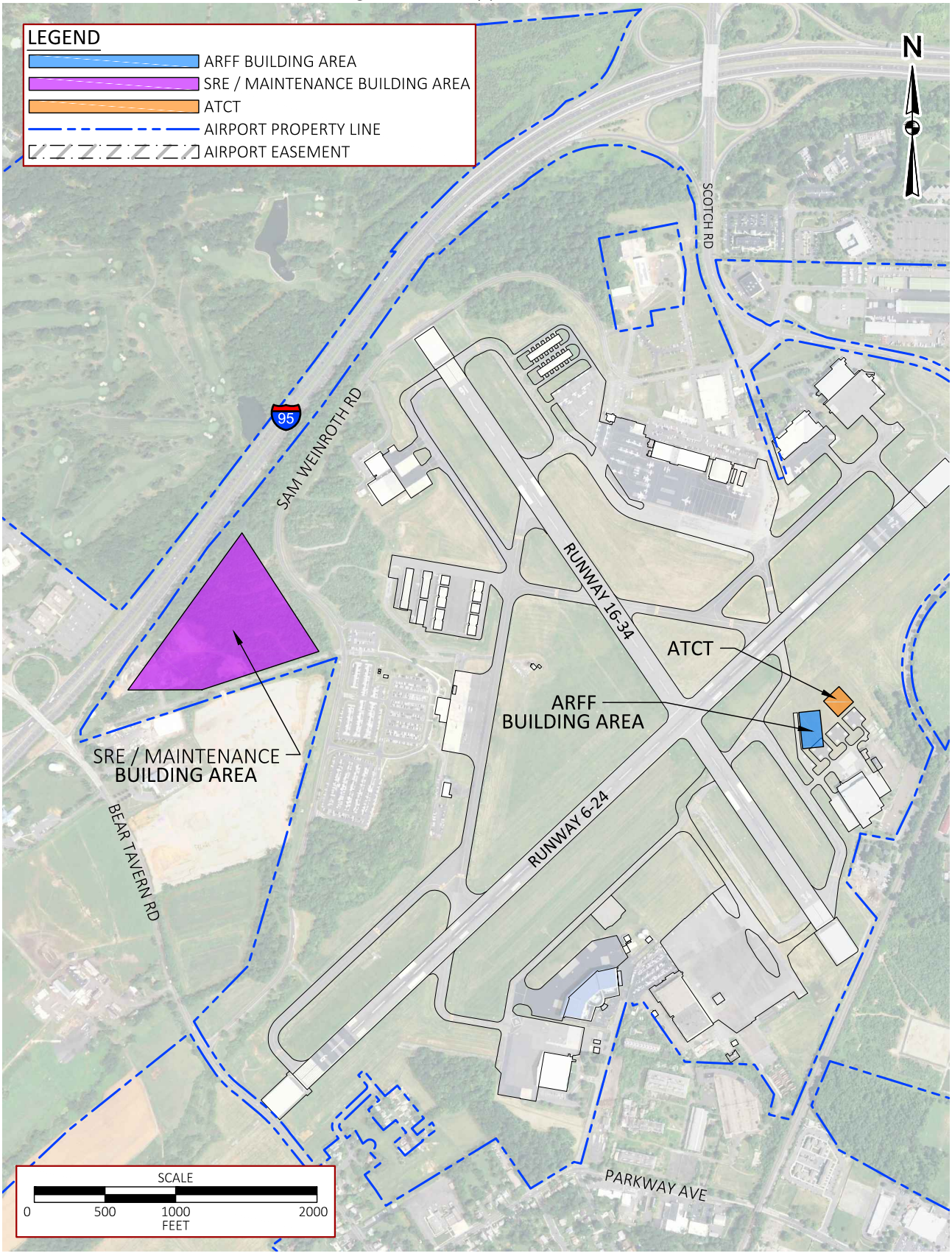
5.8. PREFERRED AIRPORT DEVELOPMENT ALTERNATIVE

The preferred airside and landside, and terminal area alternatives were combined into one figure, which represents the overall proposed development for the Trenton-Mercer Municipal Airport. In review, the following alternatives were the preferred selections for their category:

- Airside Alternative 3
- Landside Alternative 2
- Terminal Alternative 3

Figure 5-13 presents the Preferred Airport Development Alternative.

Figure 5-12: Support Facilities



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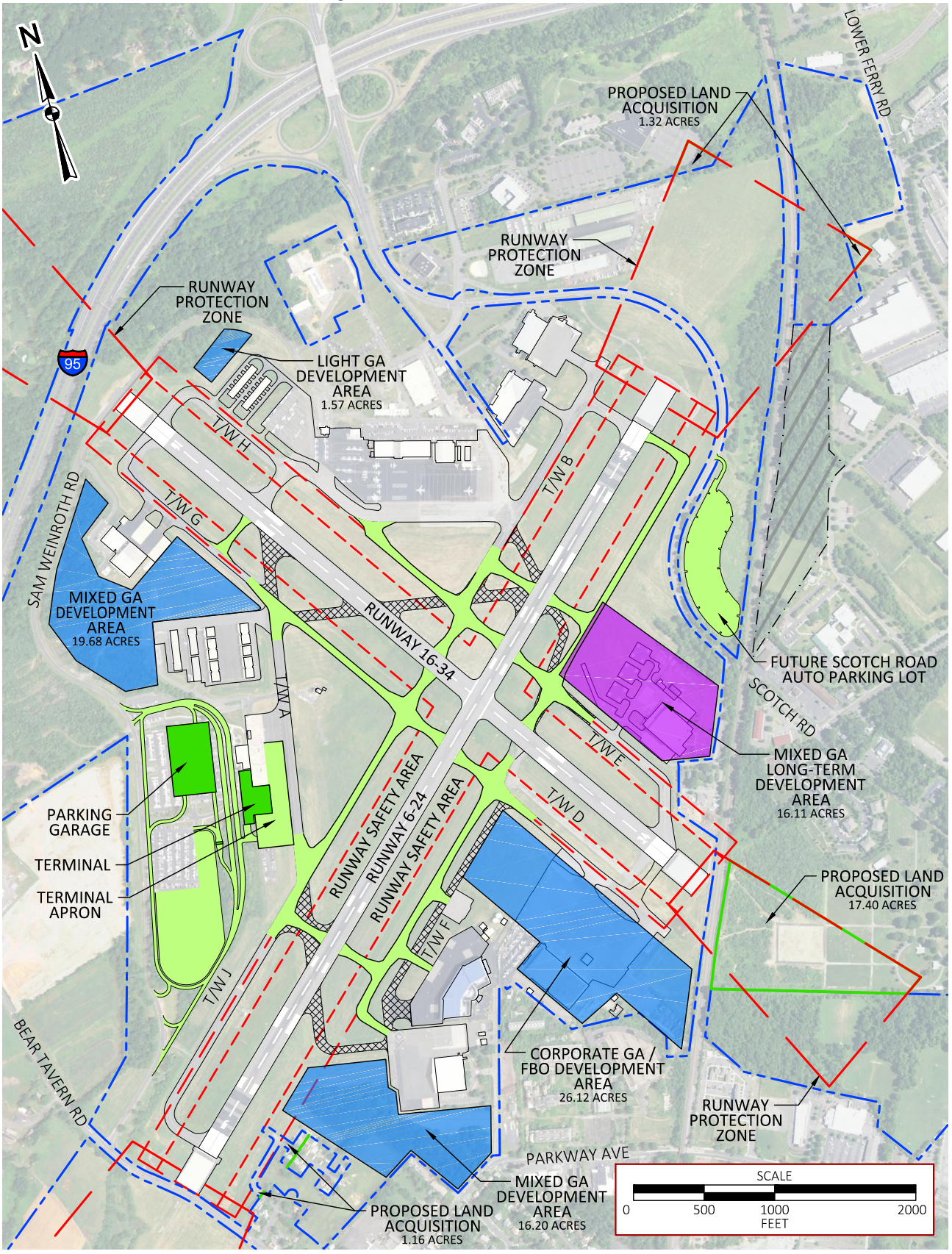
5.8.1. Non-Aeronautical Parcels and FAA Compliance

Several parcels identified for non-aeronautical use on the previous ALP have been considered non-compliant with the FAA Airport Compliance Manual, Order 5190.6B. The new ALP included in this MPU, Exhibit A identifies theses parcels and Mercer County's proposed actions to comply with the FAA Airport Compliance Manual, which are described below:

- Mercer County Library Branch: TTN intends to seek to release this property from the ALP.
- Mountainview Golf Course: TTN intends to maintain this property within the ALP. In connection therewith, an agreement will be reached in which the fair allocation of services and personnel provided by the County will be credited by TTN to the County, and the fair rental value of the property will be credited to TTN. The County is working with the state and FAA to craft the proper mechanism to comply with both the state's accounting rules and the FAA Compliance Manual.
- Department of Transportation Facility: TTN intends to maintain this property within its ALP. The fair rental value will be credited to TTN.
- County Morgue: Mercer County is pursuing the merger of this facility with an off-Airport facility, and will convert the combined facility to aeronautical use. Once finalized, the property will be leased at fair market value.
- County Impound Lot: TTN intends to convert the use of this property to aeronautical use. Once finalized, the property will be leased for fair market value.
- County Soccer Fields: TTN intends to maintain this property within its ALP. The fair rental value will be credited to TTN.
- Salt Dome: TTN intends to maintain this property within its ALP. The fair rental value will be credited to TTN.
- Civil Air Patrol: TTN intends to convert the use of this property to an aeronautical use. Once finalized, the property will be leased for fair market value.

Mercer County provided this information via correspondence to the FAA ADO in June 2016.

Figure 5-13: Preferred Alternative



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6. Airport Layout Plan (ALP) Drawing Set and Implementation Plan

This chapter presents the project phasing plan, estimates of construction costs and funding sources, and Airport Capital Improvement Plan (ACIP). These components represent the final recommendations of the Master Plan Update (MPU) for Trenton-Mercer Airport (TTN).

The proposed development depicted on the ALP Drawing Set is derived from the Preferred Airport Development Alternative presented in Chapter 5, *Alternatives*. The Project Phasing Plan presents a recommended phasing schedule for implementing the proposed improvements shown on the ALP over the twenty-year planning period, while the ACIP details the potential funding mechanisms and costs for implementing those projects. The ALP, Project Phasing Plan, and ACIP are all subject to review and comment by the Federal Aviation Administration (FAA), New Jersey State Department of Transportation (NJDOT), and Mercer County. Subsequent to final review and approval by the FAA, NJDOT, and Mercer County, these documents will become the final recommendations of the MPU.

The major components of this chapter are listed below:

- Public Participation Process
- Airport Layout Plan Drawing Set
- Project Phasing
- Funding Sources
- Airport Capital Improvement Plan

6.1. PUBLIC PARTICIPATION PROCESS

The ALP Drawing Set, Project Phasing Plan, and ACIP are the culmination of a planning process that was designed to permit comment from interested parties. The planning process included Project Review Committee meetings and public information meetings held at key stages in the planning process. A series of interim reports, documenting the various stages of the planning process, were presented to the Project Review Committee for their review/comment.

Two Public Workshops were held during the planning process. The first workshop presented general information about the Airport to the public, and detailed the aviation forecasts, environmental overview, and facility requirements. The second workshop provided an overview on the information presented in the first workshop, but also presented the draft airport alternatives and the final recommendations of the Master Plan Update.

6.2. AIRPORT LAYOUT PLAN DRAWING SET

The ALP Drawing Set has been prepared in accordance with generally accepted planning practices and with the following FAA guidance materials:

- FAA Advisory Circular 150/5300-13A (Change 1), *Airport Design*
- FAA Advisory Circular 150/5070-6B (Change 2), *Airport Master Plans*
- Federal Aviation Regulations, Part 77, *Objects Affecting Navigable Airspace*
- FAA Standard Operating Procedures (SOP) 2.00, *Standard Procedure for Review and Approval of Airport Layout Plans (ALPs)*
- FAA SOP 3.00, *Standard Operating Procedure for FAA Review of Exhibit 'A' Airport Property Inventory Maps*

The ALP Drawing Set for TTN consists of 30 drawing sheets as follows:

Sheet	Title
1	Title Sheet
2	Airport Data Sheet
3	Airport Layout Plan Drawing
4	Airport Airspace Drawing
5	Airport Airspace Drawing
6	Airport Airspace Drawing Data Table
7*	Inner Approach Drawings Set (1-17)
8*	Runway Departure Surface Drawings Set (1-4)
9	Terminal Area Drawing
10	Property Map/Exhibit A
11	Property Map/Exhibit A Tables

The ALP Drawing Set is provided at the end of this Master Plan Report in Appendix C. Narrative descriptions of the drawings prepared for TTN are provided below.

6.2.1. Title Sheet

The Cover Sheet provides a listing of the sheets comprising the ALP set. It also provides both a location map showing TTN's central New Jersey setting and a vicinity map that shows the Airport and surrounding towns. Included on this sheet is information including the Mercer County project number.

6.2.2. Airport Layout Plan

The Airport Layout Plan illustrates the recommended development at TTN over the 20-year planning period. The ALP serves as the officially approved planning document for the Airport and is used by the FAA to allocate federal grant funding for projects. As a result, this sheet is a key deliverable as part of the MPU. The major recommended airside and landside improvements depicted on the Airport Layout Plan are discussed in further detail below.

6.2.3. Terminal Area Plan

The Terminal Area Plan illustrates the recommended development for the terminal area at TTN over the 20-year planning period. The Terminal Area Plan includes a total replacement of the terminal structure adjacent and south of the existing terminal building. The primary terminal area development components are summarized in **Table 6-1** below:

Table 6-1: Passenger Terminal and Terminal Area

Passenger Terminal and Terminal Area
Construction of New Passenger Terminal Building
Construction of New Parking Structure
Expansion of Existing Surface Automobile Parking
Reconfiguration of Terminal Area Ingress/Egress Roadway Intersections and Internal Circulatory Roadway(s)

As stated in Chapter 5, *Alternatives*, the general aviation development described here and shown on the ALP is anticipated to be constructed by private interests in coordination with Airport management.

6.2.4. Airport Airspace Plan

Title 14 of the Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of the Navigable Airspace*, regulates the airspace surrounding airports through the establishment of "Imaginary Surfaces," which include the Primary, Approach, Transitional, Horizontal and Conical Surfaces. These surfaces are defined and discussed in Chapter 4, *Facility Requirements*.

The intent of the Airport Airspace Plan is to identify obstructions to all of the 14 CFR Part 77 surfaces outside of the inner approach surfaces. The 14 CFR Part 77 surfaces are shown over the United States Geological Survey (USGS) map to orient the surfaces over the Airport and surrounding community. USGS quadrangles that make up this area are shown on the plan. Additionally, an isometric view of the 14 CFR Part 77 surfaces are shown to provide an understanding of what is being depicted in a three dimensional view.

6.3. NON-AERONAUTICAL PARCELS AND FAA COMPLIANCE

Parcels identified for non-aeronautical use on the previous ALP have been considered non-compliant with the FAA Airport Compliance Manual, Order 5190.6B. The new ALP included in this MPU, Exhibit A identifies theses parcels and Mercer County's proposed actions to comply with the FAA Airport Compliance Manual, which are described below:

- **Mercer County Library Branch:** TTN intends to seek to release this property from the ALP.
- **Mountainview Golf Course:** TTN intends to maintain this property within the ALP. In connection therewith, an agreement will be reached in which the fair allocation of services and personnel provided by the County will be credited by TTN to the County, and the fair rental value of the property will be credited to TTN. The County is working with the state and FAA to craft the proper mechanism to comply with both the state's accounting rules

and the FAA Compliance Manual. The golf course has been annotated on the ALP as a continuing non-aeronautical use.

- **Department of Transportation Facility:** TTN intends to maintain this property within its ALP. The fair rental value will be credited to TTN. It has been annotated on the ALP as a continuing non-aeronautical use.
- **County Morgue**: Mercer County is pursuing the conversion of this facility to aeronautical use. It is tentatively slated to be used by airport maintenance crews.
- **County Impound Lot:** TTN intends to convert the use of this property to aeronautical use. Once finalized, the property will be leased for fair market value.
- **County Soccer Fields:** TTN intends to maintain this property within its ALP. The fair rental value will be credited to TTN.
- **Salt Dome:** TTN intends to convert this property to aeronautical use and maintain it within its ALP. The fair rental value will be credited to TTN.
- **Civil Air Patrol:** TTN intends to convert the use of this property to an aeronautical use. Once finalized, the property will be leased for fair market value.

Mercer County provided this information via correspondence to the FAA ADO in June 2016 and continues to work towards resolution of these transfers.

6.4. PROJECT PHASE

The phasing plan is an annual implementation for the 2017-2023 period for projects identified on the ALP as well as other major projects such as design and environmental projects. Projects that are not included in the phasing plan are projects such as basic airfield maintenance and long term pavement rehabilitation projects.

The phasing recommendations have been developed to coordinate with the aviation forecasts presented in Chapter 2, *Aviation Forecasts*. The forecasts project aviation demand through 2035 and used a base year of 2015.

Table 6-2 presents the proposed phasing of 50 projects over the 2017-2023 period. Projects were phased such that those addressing immediate needs were prioritized. Key projects include taxiway improvements, obstruction removal, Runway Protection Zone (RPZ) acquisitions, and construction of snow removal equipment (SRE) and maintenance building.

Table 6-2: Project Phasing Summary

Short Term Period (2017-2023)
2017
Relocation of T/W D (Design) - Phase I, Rehab T/W G (Design) - Phase II, and connect D to G (Design) - Phase III
Relocation of T/W D (Construction) - Phase I
Relocation of T/W F (NJDOT Construction Grant) - Phase I
Rehabilitate T/W G (Construction) - Phase II
Runway 24 Localizer Modification Study
Obstruction Removal (Appraisal for Easement - Up Front County Funding)
RPZ Acquisition (Appraisal for Relocation Costs - Up Front County

Short Term Period (2017-2023)
Construct SRE/Maintenance Building (Environmental)
Relocate T/W F (Environmental)
Construct Connecting T/W D & G (Environmental)
Construct Scotch Road Remote Parking Lot (Environmental and Design)
RPZ Acquisition and Obstruction Removal (Acquisition/Easements) - Phase I (Up Front County Funding)
Terminal Repairs & Upgrade (Temporary Holdroom, Maintenance Projects)
2018
Relocate T/W F (AIP Design Grant)
Relocate T/W F (AIP Construction Grant)
Obstruction Removal (On-Airport Design – Part 77) Phase I
Obstruction Removal (Construction) – Phase II
Obstruction Removal (Off-Airport Design and Permitting)
Construct SRE/Maintenance Building (Design)
Construct Connecting T/W D & G (Environmental)
Construct Connecting T/W B & J (Environmental)
Rehabilitate T/W E (Environmental)
Electrical Vault Upgrade (Local Funded Environ & Design)
Electrical Vault Upgrade (NJDOT Construction Grant))
Terminal NEPA (Environmental)
RPZ Acquisition and Obstruction Removal (Acquisition/Easements) - Phase II (Up Front County Funding)
Replace SRE - Broom/Blower (M7 and M16)
Replace SRE - Broom/Blower (M51 and M56)
Construct Scotch Road Remote Parking Lot (Construction)
2019
Construct Connecting T/W B & J (Design)
Construct Connecting Taxiway D to G (Construction) - Phase III
Rehabilitate T/W E (Design)
Rehabilitate T/W E (Lighting Design)
RPZ Acquisition (Appraisal for Relocation Costs) – County Reimbursement
Obstruction Removal (Appraisal for Easement) – County Reimbursement
Construct Deicing Containment Facility (Environmental)
Construct SRE/Maintenance Building (Construction)
Construct ARFF (Design)
2020
Construct Connecting T/W B & J (Construction)
Rehabilitate T/W E (Construction)
Construct Deicing Containment Facility (Design)
Extension of T/W H (Environmental)
RPZ Acquisition (Acquisition Costs) – County Reimbursement
2021
Construct Deicing Containment Facility (Construction)
Extension of T/W H (Design)

Short Term Period (2017-2023)
Obstruction Removal (Easement Acquisition - County Reimbursement)
2022
Extension of T/W H (Construction)
Obstruction Removal (Off-Airport Construction)
2023
Acquire Friction Measuring Equipment
Security Improvements Phase II (Design & Construction)

Source: Airport Capital Improvement Program, 2/22/2017.

6.5. FUNDING SOURCES

The breakdown of funding as shown in **Table 6-3** represents the following breakdown for projects eligible for funding through the FAA Airport Improvement Program (AIP) for TTN:

- FAA Share - 90%
- State Share - 5%
- Mercer County Share - 5%

To cover project costs as well as the local share, TTN has several ways in which to fund projects. They are summarized in the following sections.

6.5.1. Federal Funding

For public-use facilities like TTN, the FAA Airport Improvement Program (AIP) provides up to 90 percent funding for public, non-revenue generating elements of the airport such as runways, taxiways, aprons, and lighting, as well as necessary planning and environmental studies. The remaining 10 percent is typically split between Mercer County and the New Jersey State Department of Transportation (NJDOT). FAA funding available for the TTN capital program is:

- **Entitlement Funds:** The Airport receives entitlement funding from the FAA based on the number of passengers that are enplaned at the airport annually. Current entitlement levels are anticipated to be approximately $2.74 million in the near term with the projected rise in enplanements. Entitlement funding is applied to projects eligible for federal funding.

- **Discretionary Funds:** Funding above the entitlement amount is then obtained from the FAA through discretionary funding. It should be noted that discretionary funding is competitive. Therefore, TTN competes for these funds nationally as well as with regional airports.

6.5.2. State Funding

NJDOT funding for airports is through the Aviation Capital Improvement Program Grant program.

- **Aviation Capital Improvement Program Grants**: Funding from this grant program is available for construction or reconstruction of facilities, pavement maintenance, the purchase of

airport equipment, the purchase of navigational aids, and are typically for projects that may not be eligible for AIP funds (i.e., hangars, revenue parking facilities, etc.).

Additionally, NJDOT typically provides a grant for half of the local match required by the FAA (50 percent of the non-FAA share) for AIP projects.

6.5.3. Local Share

TTN has options to fund their local share, which is 5 percent for federally-funded projects:

- **Passenger Facility Charges (PFC):** With approval from the FAA, TTN has the authority to charge a fee of up to $4.50 to each passenger enplaning at TTN. PFCs are collected by the air carriers on behalf of the airport and are remitted monthly. PFCs can be utilized on projects that are considered AIP eligible, as well as for additional improvements to the passenger terminal. PFC funds can be utilized to provide the local match to eligible AIP and Aviation Capital Grants, or can provide 100 percent funding for projects. All uses of PFCs must be approved by the FAA, with coordination required through a public comment period and notifications to the air carriers serving TTN. The Airport's current PFC program is approved to collect a fee of $4.50 for each passenger through June 1, 2018 for a projected total of $9,645,113.

- **Mercer County Funds:** Funds collected through Airport revenue or other Mercer County general funds could be utilized to complete airport improvements, particularly for improvements that are not eligible for AIP or Aviation Capital Grants, or for the use of PFCs.

- **Bonding:** If projects are ineligible for federal funding they can be funded through Mercer County's Bonding authority. Bonding is typically used when projects are high cost and cannot be funded through other Mercer County funding sources.

- **Private Investment:** Projects within the ACIP can also be privately funded, such as hangar development. For privately-funded projects, TTN's involvement is limited to lease agreements and providing specific design requirements for pavements or buildings. Tenant development typically leads to increases in operations, utilization of other on-airport maintenance providers, and fuel sales. Other examples of tenant development include buildings for fixed based operators, specialty aviation businesses, fuel facilities, and non-aviation commercial development.

Table 6-3 summarizes TTN Capital Improvement Program funding by year and source.

Table 6-3: Trenton-Mercer Airport Capital Improvement Program Summary by Year

Year	Federal		State	Local	Total
	NPE	Discretionary			
2017	$2,745,397	$2,960,785	$2,421,200	$6,280,820	$14,408,202
2018	$2,600,000	$1,203,400	$2,265,000	$9,852,600	$15,921,000
2019	$2,600,000	$1,197,100	$2,304,850	$3,215,050	$9,317,000
2020	$2,600,000	$8,658,100	$605,450	$670,450	$12,534,000
2021	$2,745,397	$3,217,103	$300,000	$362,500	$6,625,000

2022	$2,745,397	$4,885,803	$375,000	$445,000	$8,451,200
2023	$1,800,000	$180,000	$0	$220,000	$2,200,000
Total	**$17,836,191**	**$22,302,291**	**$8,271,500**	**$21,046,420**	**$69,456,402**

Source: Airport Capital Improvement Program, 2/22/2017.

6.6. AIRPORT CAPITAL IMPROVEMENT PLAN (ACIP)

The ACIP for the 2017-2023 period is presented in **Table 6-4**. The ACIP lists all projects and identifies the estimated overall project costs and potential funding sources for each project.

Presently, projects eligible for funding through the FAA's Airport Improvement Program (AIP) can receive up to 90 percent funding from the FAA. The remaining 10 percent is split evenly between the airport sponsor (Mercer County) and the New Jersey State Department of Transportation (NJDOT). Grant funding for airport development projects is also available through NJDOT's Aviation Capital Grant program. Projects eligible for a NJDOT Aviation Capital Grant at TTN can receive up to 90 percent of total project cost.

Project eligibility for FAA's AIP funds, as well as for the use of PFC funds, are generally restricted to projects that are for public use and are not revenue generating. Examples include, but are not limited to, runways, taxiways, obstruction removal, easement and land acquisition, snow removal equipment, snow removal equipment buildings, and public areas of the passenger terminal, as well as associated planning studies and environmental assessments. Projects that are not eligible, or that have a very low funding priority for the FAA, include fuel facilities, revenue-producing parking lots, hangars, and airfield maintenance equipment (other than snow removal equipment and aircraft rescue and fire fighting vehicles). For projects that are not deemed eligible for AIP or PFC funding, the NJDOT Aviation Capital Grant program is a source of funding. These grants vary from year to year, but are generally geared toward projects that would not typically qualify for AIP or PFC funding.

Table 6-4: Trenton-Mercer Airport Capital Improvement Program Short Term 2017-2021

Project[1/]	Federal		State	Local	Total
	NPE	Disc.			
2017					
Design - Relocation of T/W D, Rehab T/W G, Connect D	$680,582	$0	$0	$75,620	$756,202
Construct - Relocation of T/W D	$2,064,815	$790,885	$158,650	$158,650	$3,173,000
NJDOT Construction Grant - Relocation of T/W F	$0	$0	$2,125,000	$375,000	$2,500,000
Contruct - Rehabilitate T/W G	$0	$2,151,900	$119,550	$119,550	$2,391,000
Study - Runway 24 Localizer Modification	$0	$18,000	$18,000	$2,000	$38,000
Appraisal - Obstruction Removal	$0	$0	$0	$100,000	$100,000

Project[1/]	Federal		State	Local	Total
	NPE	Disc.			
Appraisal - RPZ Acquisition	$0	$0	$0	$200,000	$200,000
Environmental - SRE/Maintenance Building	$0	$0	$0	$20,000	$20,000
Environmental - Relocate T/W F	$0	$0	$0	$15,000	$15,000
Environmental - Connecting T/W D & G	$0	$0	$0	$15,000	$15,000
Environmental & Design - Scotch Road Remote Parking	$0	$0	$0	$200,000	$200,000
Acquisition & Easements - RPZ Obstruction Removal	$0	$0	$0	$2,000,000	$2,000,000
Terminal Repairs & Upgrade - Temporary Holdroom,	$0	$0	$0	$3,000,000	$3,000,000
Total	**$2,745,397**	**$2,960,785**	**$2,421,200**	**$6,280,820**	**$14,408,202**
2018					
AIP Design Grant - Relocate T/W F	$342,000	$0	$0	$38,000	$380,000
AIP Construction Grant - Relocate T/W F	$1,170,000	$0	$65,000	$65,000	$1,300,000
Design - Obstruction Removal - On-Airport	$0	$144,000	$0	$16,000	$160,000
Construct - Obstruction Removal	$1,088,000	$262,000	$75,000	$75,000	$1,500,000
Design & Permitting - Obstruction Removal - Off-	$0	$234,000	$0	$26,000	$260,000
Design - SRE/Maintenance Building	$0	$563,400	$0	$62,600	$626,000
Environmental - Connecting T/W D & G	$0	$0	$0	$15,000	$15,000
Environmental - Connecting T/W B & J	$0	$0	$0	$15,000	$15,000
Environmental - Rehabilitate T/W E	$0	$0	$0	$15,000	$15,000
Environmental & Design - Electrical Vault Upgrade	*$0*	*$0*	*$0*	*$250,000*	$250,000
NJDOT Construction Grant - Electrical Vault Upgrade	$0	$0	$2,125,000	$375,000	$2,500,000
Environmental - Terminal NEPA	$0	$0	$0	$500,000	$500,000

Project[1/]	Federal		State	Local	Total
	NPE	Disc.			
Acquisition & Easements - RPZ Obstruction Removal	$0	$0	$0	$2,700,000	$2,700,000
Replace SRE - Broom/Blower (M7 and M16)	$0	$0	$0	$1,600,000	$1,600,000
Replace SRE - Broom/Blower (M51 and M56)	$0	$0	$0	$1,600,000	$1,600,000
Construct - Scotch Road Remote Parking Lot	$0	$0	$0	$2,500,000	$2,500,000
Total	**$2,600,000**	**$1,203,400**	**$2,265,000**	**$9,852,600**	**$15,921,000**
2019					
Design - Connecting T/W B & J	$585,000	$0	$32,500	$32,500	$650,000
Construct - Connecting Taxiway D to G	$1,725,200	$927,100	$147,350	$147,350	$2,947,000
Design - Rehabilitate T/W E	$231,840	$0	$0	$25,760	$257,600
Design - Lighting Rehabilitate T/W E	$57,960	$0	$0	$6,440	$64,400
Acquisition & Easements - RPZ Acquisition	$0	$180,000	$0	$20,000	$200,000
Appraisal & Easement - Obstruction Removal	$0	$90,000	$0	$10,000	$100,000
Environmental - Deicing Containment Facility	$0	$0	$0	$25,000	$25,000
Construct - SRE/Maintenance Building	$0	$0	$2,125,000	$2,548,000	$4,673,000
Design - ARFF	$0	$0	$0	$400,000	$400,000
Total	**$2,600,000**	**$1,197,100**	**$2,304,850**	**$3,215,050**	**$9,317,000**
2020					
Construct - Connecting T/W B & J	$431,900	$5,418,100	$325,000	$325,000	$6,500,000
Construct - Rehabilitate T/W E	$2,168,100	$0	$120,450	$120,450	$2,409,000
Design - Deicing Containment Facility	$0	$360,000	$0	$40,000	$400,000
Environmental - Extension of T/W H	$0	$0	$0	$25,000	$25,000

Project[1/]	Federal		State	Local	Total
	NPE	Disc.			
Acquisition - RPZ	$0	$2,880,000	$160,000	$160,000	$3,200,000
Total	**$2,600,000**	**$8,658,100**	**$605,450**	**$670,450**	**$12,534,000**
2021					
Construct - Deicing Containment Facility	$2,745,397	$1,304,603	$225,000	$225,000	$4,500,000
Design - Extension of T/W H	$0	$562,500	$0	$62,500	$625,000
Acquisition & Easements - Obstruction Removal	$0	$1,350,000	$75,000	$75,000	$1,500,000
Total	**$2,745,397**	**$3,217,103**	**$300,000**	**$362,500**	**$6,625,000**
2022					
Construct - Extension of T/W H	$2,745,397	$4,004,603	$375,000	$375,000	$7,500,000
Construct - Obstruction Removal Off-Airport	$0	$881,200	$0	$70,000	$951,200
Total	**$2,745,397**	**$4,885,803**	**$375,000**	**$445,000**	**$8,451,200**
2023					
Acquire Friction Measuring Equipment	$0	$180,000	$0	$20,000	$200,000
Design & Construction - Security Improvements	$1,800,000	$0	$0	$200,000	$2,000,000
Total	**$1,800,000**	**$180,000**	**$0**	**$220,000**	**$2,200,000**
Total (2017-2023 Period)	**$17,836,191**	**$22,302,291**	**$8,271,500**	**$21,046,420**	**$69,456,402**

Source: Airport Management, 2/22/2017.

[1/] Project names/descriptions abridged to fit.