Killeen-Fort Hood

REGIONAL AIRPORT

AIRPORT MASTER PLAN

AIRPORT MASTER PLAN

For

KILLEEN-FORT HOOD REGIONAL AIRPORT
Killeen, Texas

Prepared for

The City of Killeen

By

December 2019

Killeen-Fort Hood
REGIONAL AIRPORT

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Killeen-Fort Hood
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INTRODUCTION

Killeen-Fort Hood
REGIONAL AIRPORT

INTRODUCTION

An Airport Master Plan is a visioning process that begins with an evaluation of the airport's aviation demand and concludes with targeted recommendations for development that will best meet those demands. The Master Plan establishes development objectives and provides for a 20-year planning period. The process entails development of rationale for various study elements, including airfield configuration, facility development, land use recommendations, and support facilities. It also serves as a strategic tool for establishing airport improvement priorities and obtaining federal and state funding assistance.

Killeen-Fort Hood Regional Airport (GRK or Airport) is the civilian portion of a large military airfield, Robert Gray Army Airfield (RGAAF) owned by the United States Army. The joint-use airport arrangement is somewhat unique as the facility serves both as an Army Air Field as well as a civilian airport accommodating itinerant corporate and commercial passenger aviation activity. The joint-use agreement has been established between the U.S. Army and the City of Killeen, Texas. This Airport Master Plan has been undertaken to evaluate the Airport's civilian capabilities and role, to forecast future aviation demand, and to plan for the timely development of new or expanded facilities that may be required to meet projected demand. The ultimate goal of the Master Plan is to provide guidelines for the Airport's maintenance, development, and operation in an environmentally and fiscally responsible manner while adhering to appropriate Federal Aviation Administration (FAA) safety design standards wherever applicable. It is intended specifically to evaluate and make recommendations only for civilian uses and needs; however, military use and activity will be an important part of the process.

The FAA recommends civilian airports update their long-term planning documents every seven to ten years, or as necessary, to address local changes at the airport. The preparation of this Master Plan is necessary as a timely reassessment of the development direction of GRK that will meet the needs of a dynamic local economy and robust aviation demand.

The City of Killeen (City) has contracted with a multidisciplinary consultant team to undertake the Master Plan which is prepared in accordance with FAA requirements, including Advisory Circular (AC) 150/5300-13A, *Airport Design*, and AC 150/5070-6B, *Airport Master Plans*. The scope of services, budget, and schedule has been approved by the City, following review by the FAA.

The City is responsible for funding civilian operations and capital improvements and obtaining FAA development grants at the Airport. In addition, the City oversees facility enhancements and infrastructure development conducted by private entities at GRK within the portion of the facility dedicated to civilian uses as outlined in the joint-use agreement. The Master Plan is intended to provide guidance for future development and justification for projects the Airport may receive funding participation through FAA airport improvement programs.

Following a systematic approach outlined by the FAA, the Master Plan identifies and plans for future facility needs well in advance of improvement needs. This is done to ensure the City can coordinate environmental reviews, project approvals, design, financing, and construction to minimize the detrimental effects of maintaining and operating inadequate or inefficient facilities. The output from the master planning process is a recommended development concept which outlines the proposed uses for all areas of airport property under control of the City, including areas which may be required for environmental mitigation/preservation.

The preparation of this Master Plan is evidence that the decision-makers of the City recognize the importance of air transportation to the community, as well as the unique challenges operating an airport presents. The investment in an airport yields many benefits to the community and the region. With a sound and realistic Master Plan, GRK will remain an important link to the national air transportation system for the community and maintain the existing public and private investments in its facilities.

MASTER PLAN GOALS AND OBJECTIVES

The overall objective of the Master Plan is to provide the City with guidance for future development of the Airport and meeting the needs of existing and future users, while also being compatible with area development, other transportation modes, and the environment. Accomplishing this objective requires an evaluation of the existing airport to make a determination of what actions should be taken to maintain a safe, adequate, and reliable airport facility. The completed Master Plan will produce a recommended long term development concept that will provide airport officials with a program for future capital needs to aid in planning, scheduling, and budgeting.

While a Master Plan must be developed according to FAA requirements, it can also be prepared in a manner which makes it useful in strategic planning for the City. The FAA requires specific elements within a Master Plan; however, these elements, to be detailed in the following section, are guidelines allowing for a systematic and technical approach to reach the final recommended plan.

This Master Plan will provide a vision for GRK covering the next 20 years. With this vision, the City will have the ability to adequately prepare for potential future airport funding needs so that appropriate steps can be taken to ensure that adequate local funds are budgeted and planned.
The specific goals to be considered in the Master Plan include:

- Research and evaluate socioeconomic factors likely to affect the air transportation demand in the Killeen, Fort Hood, and the surrounding region as a whole;
- Be reflective of the goals and visions of the surrounding area outlined by the City and Fort Hood, especially those related to quality of life, business and development, and land use;
- Definition of current and future aviation demand with primary focus on civilian users;
- Analysis of existing and future airfield design parameters to meet existing and forecasted demand wherever applicable to civilian uses and users;
- Determine the projected civilian facility needs of airport users, which are further supported by airport development alternatives;
- Recommend improvements that will enhance the Airport's safety capabilities to the maximum extent possible and practicable;
- Produce current and accurate airport base maps and updated airport layout plan (ALP) drawings to include a geographical information system (GIS) component to be uploaded into the FAA's Airport's GIS (AGIS);
- Establish a schedule of development priorities and a program for the improvements proposed in the Master Plan;
- Prioritize the Airport's capital improvement program (CIP) and develop a detailed financial plan;
- Develop the required level of environmental documentation for approval of the new Master Plan; and;
- Coordinate this Master Plan with local, state, and federal agencies as necessary and/or required.

BASELINE ASSUMPTIONS

The Master Plan typically requires baseline assumptions that will be used throughout the analysis. The baseline assumptions identified for this study include:

- The Airport will continue to operate under a joint-use agreement with the U.S. Army to provide commercial passenger services;
- The Airport will continue to serve general aviation users, primarily operators of aircraft over 12,500 pounds;
- The aviation industry on the national level will grow as forecast by the FAA in its annual *Aerospace Forecasts*;
- The socioeconomic characteristics of the region will grow as forecast by local and regional agencies; and;
- A federal and state airport improvement program will be in place through the planning period to assist in funding future capital development needs.

MASTER PLAN PROCESS

The GRK Master Plan was prepared in a systematic fashion following FAA guidelines and industry-accepted principles and practices as presented on **Exhibit IA**. The Master Plan has six chapters that are intended to assist in the evaluation of future facility needs and provide the supporting rationale for their implementation.

Chapter One – Inventory summarizes the inventory efforts. The inventory efforts are focused on collecting and assembling relevant data pertaining to the airport and the area it serves. Information is collected on existing airport facilities and operations. Local economic and demographic data is collected to define the local growth trends, and environmental information is gathered to identify potential environmental sensitivities that might affect future improvements. Planning studies which may have relevance to the Master Plan are also collected.

Chapter Two – Forecasts examines the potential aviation demand at the airport. The analysis utilizes local socioeconomic information, as well as national air transportation trends to quantify the levels of aviation activity which can reasonably be expected to occur at GRK through the year 2036. The results of this effort are used to determine the types and sizes of facilities required to meet the projected aviation demand at the airport through the planning period.

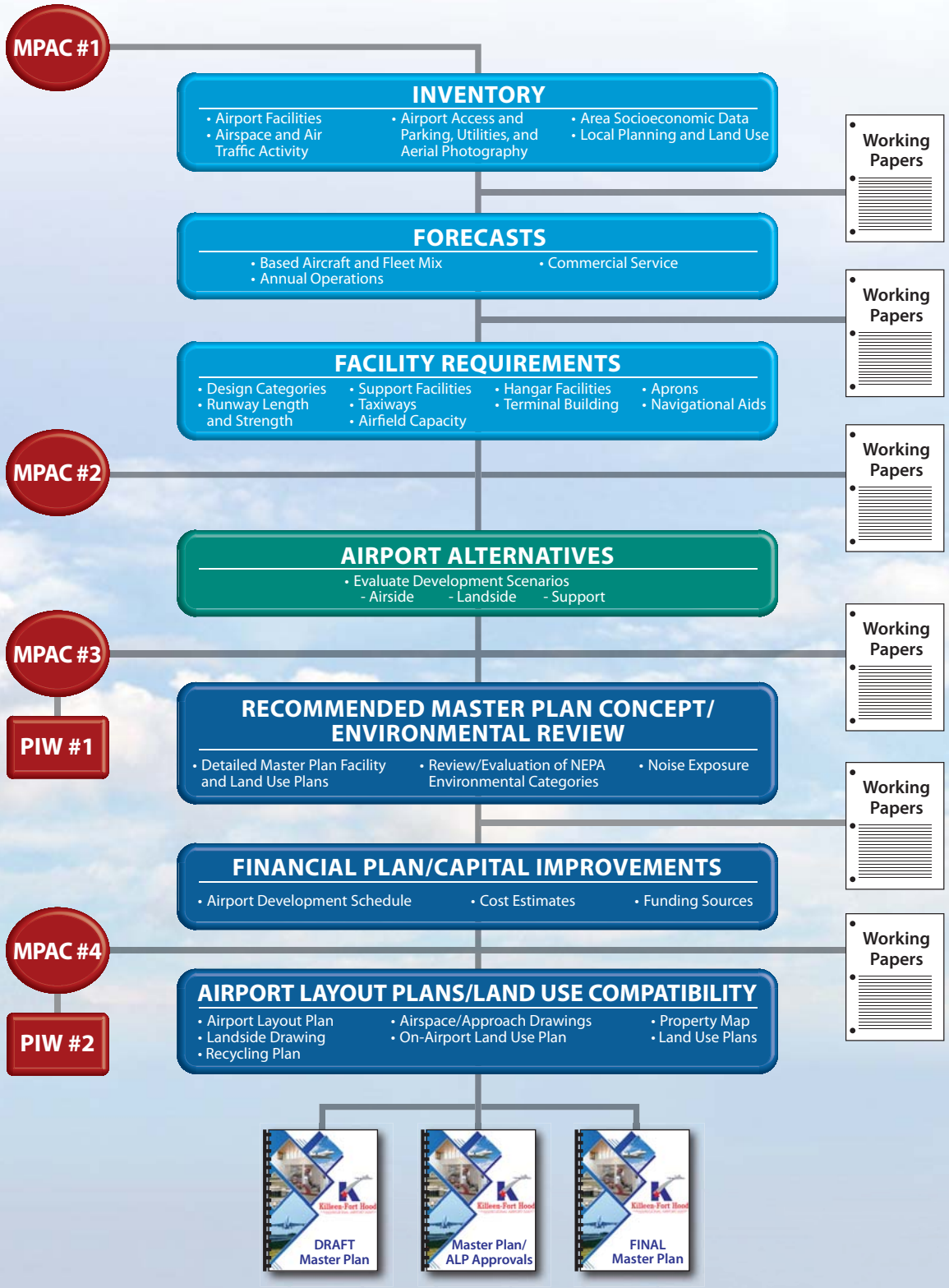
Chapter Three – Facility Requirements comprises the demand capacity and facility requirements analyses. The intent of this analysis is to compare the existing facility capacities to forecast aviation demand and determine where deficiencies in capacities (as well as excess capacities) may exist. Where deficiencies are identified, the size and type of new facilities to accommodate the demand are identified. The airfield analysis focuses on improvements needed to safely serve the type of aircraft expected to operate at the airport in the future, as well as navigational aids to increase the safety and efficiency of operations. This element also examines the general aviation terminal services, hangar, apron, and support needs.

Chapter Four – Airport Alternatives considers a variety of solutions to accommodate the projected facility needs. This element proposes various facility and site plan configurations which can meet the projected facility needs. An analysis is completed to identify the strengths and weaknesses of each proposed development alternative, with the intention of determining a single direction for development.

Chapter Five – Recommended Master Plan Concept provides both a graphic and narrative description of the recommended plan for the use, development, and operation of the airport. An environmental overview is provided at the end of this chapter to analyze potential environmental impacts of proposed airport development projects.

Chapter Six – Financial Management and Development Program provides a proposed capital needs program which defines the schedules, costs, and funding sources for the recommended development projects.

AIRPORT MASTER PLAN PROCESS



AIRPORT LAYOUT PLAN (ALP)

The official ALP drawings produced as a result of the recommended Master Plan Concept and used by the FAA in determining grant eligibility will be included as an appendix to the Master Plan at the completion of the project.

The planning process also includes capturing and utilizing very detailed survey data sets. GIS services included in the process involves the collection of data to comply with Table 2-1 of Advisory Circular 150/5300-18B, column Instrument Procedure Development. The dataset is a high precision, digital model of the safety critical features of the airport as defined in 18B, Table 4-1. The process includes collection of high-resolution aerial photography, high precision surveys of safety critical airport data (runway ends, NAVAIDS, airport elevation, airspace, obstructions and others), and compilation of collected data into a uniform GIS dataset. A GIS dataset that meets the airport's needs and is acceptable to the FAA is the deliverable.

STUDY COORDINATION

GRK is of interest to many stakeholders within the surrounding area, including local citizens, community organizations, airport users, airport tenants, area-wide planning agencies, and aviation organizations. As an important component of the regional, state, and national aviation systems, GRK is also important to the FAA, who are responsible for overseeing our national air transportation systems.

A cross-section of community members and aviation interest groups with a vested interest in GRK was identified to act in an advisory role during the development of the Master Plan. Members of this Master Planning Advisory Committee (MPAC) are assembled to review material and provide comments throughout the study to help ensure that a realistic, viable plan is developed that the goals and needs of the region.

The draft phase reports and other information related to the Master Plan were made available online via a website dedicated to the study at: www.killeenfthood.airportstudy.com

SWOT ANALYSIS

A SWOT analysis is a strategic business planning technique used to identify Strengths, Weaknesses, Opportunities, and Threats associated with an action or plan. The SWOT analysis involves identifying an action, objective, or element, and then identifying the internal and external forces that are positively and negatively impacting that action, objective, or element in a given environment. For this study, the SWOT analysis factors were applied to GRK within the confines of the Master Plan. As a result, the analysis provided a continuous vision and direction for the development of the Master Plan.

SWOT DEFINITIONS

This particular SWOT analysis groups information into two categories:

- Internal – attributes of the airport and market area that may be considered strengths or weaknesses to the action, objective, or element; and,
- External – attributes of the industry that may pose as opportunities or threats to the action, objective, or element.

The SWOT further categorizes information into one of the following:

- Strengths – internal attributes of the airport that are helpful to achieving the action, objective, or element;
- Weaknesses – internal attributes of the airport that are harmful to achieving the action, objective, or element;
- Opportunities – external attributes of the industry that are helpful to achieving the action, objective, or element; and,
- Threats – external attributes of the industry that are harmful to achieving the action, objective, or element.

The SWOT analysis for GRK was an interactive exercise conducted at the a kick-off MPAC meeting in August 2016 to identify key factors that might be addressed in the Master Plan. A summary of the results from the SWOT analysis is shown in **Table IA**. These results were utilized as a means to frame the subjective or judgmental processing of the data presented in the Master Plan.

TABLE IA
SWOT Analysis Results
Killeen-Fort Hood Regional Airport

	STRENGTHS	WEAKNESSES
INTERNAL (attributes of the airport market area)	• Markets: 3 airlines going to 3 hub airports – Atlanta, Dallas, and Houston – is a big bonus due to the far-reaching connectivity. • Built-in demand from military installations. • 10,000- foot long runway. • Partnership with Post/Military: shared costs of maintenance/rehabilitation. • Access: Getting into and out of airport; ease of parking automobiles. • Short lines through security. • Equipment and technology up to date with big airports: TSA equipment (AIT machines). • Technology top notch with cameras and badging. • Costs: Value and convenience versus overall costs and time (within $100 of AUS). • Reliability over competing airports (AUS, DFW, DAL). • Average wait time for TSA clearance: 15 minutes maximum. • Ease of parking and access; less costly for long stays. • Few noise complaints. • FAA 5-year inclusion in the Military Airport Program (MAP) program creates funding potential until 2022.	• Nearby Austin hub and HWY 130 causes loss of flights. • Competition in Waco and Austin. • Fort Hood restricted area limits airspace use north of field. • Military funding slow and cumbersome. • Parking costs. • Sound/noise. • Single runway. • Branding and marketing; people outside the immediate community are unaware; advertising is older. • Limited wait time limits retail sales within terminal building. • No marketing plan. • Land swap with Fort Hood hinged on FM 116 and City willingness. • Better concessions at other airports. • Better destinations - recreation and vacation types. • Passenger volume too low for many additional amenities. • Passenger types dominated by younger/lower ranked military personnel. • Higher airfare costs compared to DFW/DAL, ACT, AUS. • No low-cost airline or travel specials by current airlines. • Limited/lack of non-stops flights. • Rental car companies offer $50 one-way rental to AUS. • Missing north Austin market for passenger market. • Perception of aircraft sizes and types serving GRK are too small.

	OPPORTUNITIES	THREATS

EXTERNAL (attributes of the industry)	• New markets with different destinations similar to ATL and DFW potentially to west (DIA, ORD, or PHX).
	• Aviation fuel sales and additional services.
	• More non-stop legs.
	• Texas A&M Central Texas:
	  ○ Part of Texas A&M Engineering;
	  ○ University/EDC research park between airport and campus;
	  ○ NSF grant on solar research working with KEDC - looking at GRK and parking to install solar panels
	  ○ Cost-benefit analysis with local A&M Central graduate students
	• Cargo carrier and industrial package services (FedEx/UPS/DHL). COG Freight Advisory Committee to examine.
	• Skylark flights; Joint use agreement restricts GA aircraft to GRK; 2nd runway could move GA to GRK from ILE in future.
	• Economic diversification: property acquisition and development of a business park along HWY 201 and aeronautical development between it and airfield; Hotel near GRK; Walking paths between GRK and Texas A&M Central Campus.
	• International flights; phased in process.
	• Customs services for commercial side.
	• Diversified population within the greater Killeen area.
	• Consider renaming airport.
	• CTC pilot training A&M.
		• Security: lockdown of airfield by military.
		• Fort Hood downsizing; BRAC.
		• Austin Bergstrom competition; 130 Tollway promotes leakage.
		• Western markets or direct flights to western markets.
		• Costs of resources for flights into smaller airports like GRK versus AUS or DFW.
		• Possibility of major reduction in fossil fuels running out; 20-yr and beyond.
		• I-35 expansion allows for greater leakage as does the 130 Tollway.
		• Airline industry changes or further contraction/consolidation.
		• Losing an airline currently serving GRK
		• Availability of pilots (1500-hour pilot rule; military retaining pilots).
		• UAS airspace requirements.
		• High-speed rail – Texas T Rail line connections.

Killeen-Fort Hood
REGIONAL AIRPORT

CHAPTER ONE

INVENTORY

Killeen-Fort Hood
REGIONAL AIRPORT

CHAPTER ONE

INVENTORY

The initial step in the preparation of the master plan update for Killeen-Fort Hood Regional Airport (GRK or Airport) is the collection of information pertaining directly to or influencing the Airport and the area it serves. The information summarized in this chapter will be used in subsequent analyses within this study and includes:

- Background information related to the City of Killeen (City) and Fort Hood, including descriptions of the local geography, regional climate, and surface transportation systems;
- Physical inventories and descriptions of current aviation facilities and services offered at GRK. The analysis will include airfield and landside infrastructure and services as well as local and regional airspace, competing airport facilities, air traffic control, and aircraft operating procedures;
- GRK's role in regional, state, and national aviation systems. Development at the airport since the completion of the previous master plan will also be discussed;
- Socioeconomic data including population, employment, and income activity sectors will be analyzed. These sectors typically offer an indication of future trends that could influence commercial and general aviation (GA) activity at the airport;
- A review of existing local and regional plans and studies which will be utilized later in the process to determine their potential influence on the development and implementation of the Master Plan; and,
- Review of existing environmental conditions and sensitivities, on and near the Airport, to be factored into the recommended development plan.

The information outlined in this chapter provides a foundation for all subsequent chapters. Much of the information was obtained through on-site inspections of GRK and personal interviews with airport staff, commercial operators, and other tenants. Information was also obtained from outside resources including documents prepared by the Federal Aviation Administration (FAA), City of Killeen, Fort Hood, Bell County, and other pertinent regional planning and economic agencies.

REGIONAL SETTING

The City of Killeen is located in central Texas, approximately 60 miles to the north of Austin and 130 miles to the south-southwest of Dallas. The region offers an appealing mix of outdoor activities associated with nearby parks and lakes, including hiking and biking, as well as water sports utilizing local water bodies. The regional setting is ideal for supporting tourism as well as local resident lifestyles.

The City of Killeen originated as a railroad town named after railroad official Frank P. Killeen. Soon after its establishment in 1882, Killeen soon became a well-recognized shipping point for numerous agricultural products, most notably cotton. The City remained primarily an agricultural town until the development of Camp Hood in 1942. After the United States became actively involved in World War II, the U.S. military identified the need for a tank destroyer training post. Approximately 160,000 acres of land located north and west of Killeen was selected for the training post, which later became Camp Hood. In turn, this site selection significantly reduced the amount of quality farm land in the area and subsequently shifted the Killeen economy from primarily agricultural to military. Following World War II, the military presence and population at Camp Hood began to decline, which also resulted in the decline of Killeen's resident population and economic vitality. In 1950, the Department of the Army established Camp Hood as a permanent military installation and Camp Hood was declared Fort Hood.

Once Fort Hood was declared a permanent military installation, the City determined to create an outstanding community catering to both military families and local residents. With careful planning and consideration, the City of Killeen has been able to develop an attractive community for local military and civilian families.

The City contains a population of approximately 140,800 residents, ranking it as the county's most populated entity. Bell County boasts a population over two times that amount, with an estimated 334,941 residents. It should be noted that the Killeen-Temple-Fort Hood Metropolitan Statistical Area (MSA) possesses a resident population of approximately 431,032 people, according to the Killeen Chamber of Commerce. Larger regional population centers are situated relatively close and include Austin 70 miles to the south-southeast, Dallas, TX 153 miles to the north-northeast, and Houston, TX 168 miles southeast.

AIRPORT LOCATION

As depicted on **Exhibit 1A**, Killeen-Fort Hood Regional Airport is located in the western portion of Bell County, approximately seven miles from downtown Killeen. Although the entire airport and military installation is positioned on a much larger parcel of property, the civilian commercial service portion of the airport is situated on approximately 80 acres as allowed under a joint-use lease agreement and 4.75 acres owned by the City.

REGIONAL TRANSPORTATION NETWORK

Primary regional access to Killeen is provided by U.S. Interstate 35 (I-35) approximately 15 miles to the east of the city. I-35 routes through the entire Midwest of the United States, having a northern terminus in Duluth, Minnesota at Lake Superior, and a southern terminus in Laredo, Texas near the United States and Mexico Border. Access to Killeen from I-35 is provided by I-14, which is co-designated as U.S. Highway 190. I-35 and I-14 link Killeen with Dallas to the north and both Austin and San Antonio to the south.

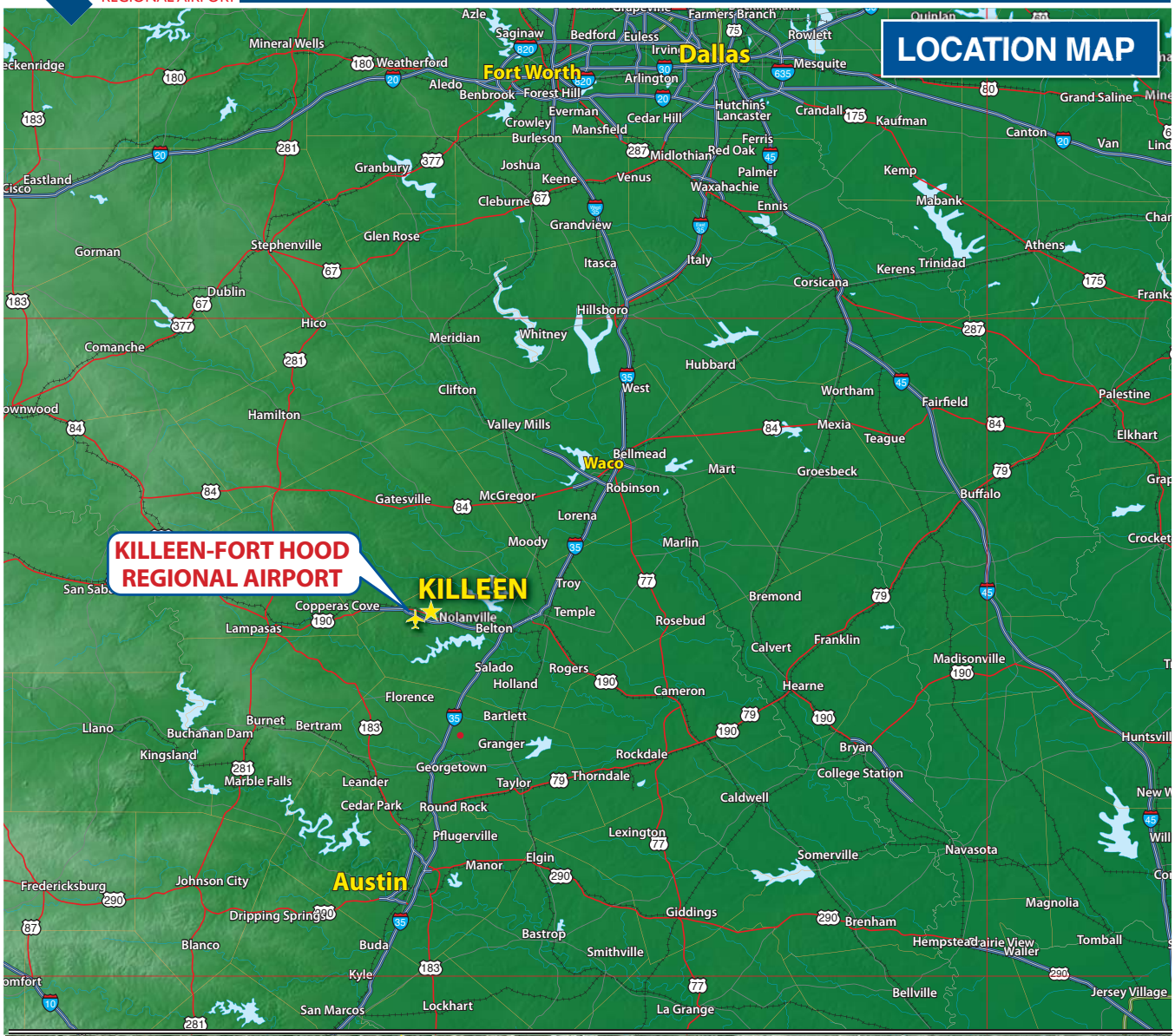
Primary access to the Airport is provided by State Highway 201, also known as Clear Creek Road, which spans between I-14 to the north and State Highway 195 to the east. Taxi and shuttle services are provided at the Airport.

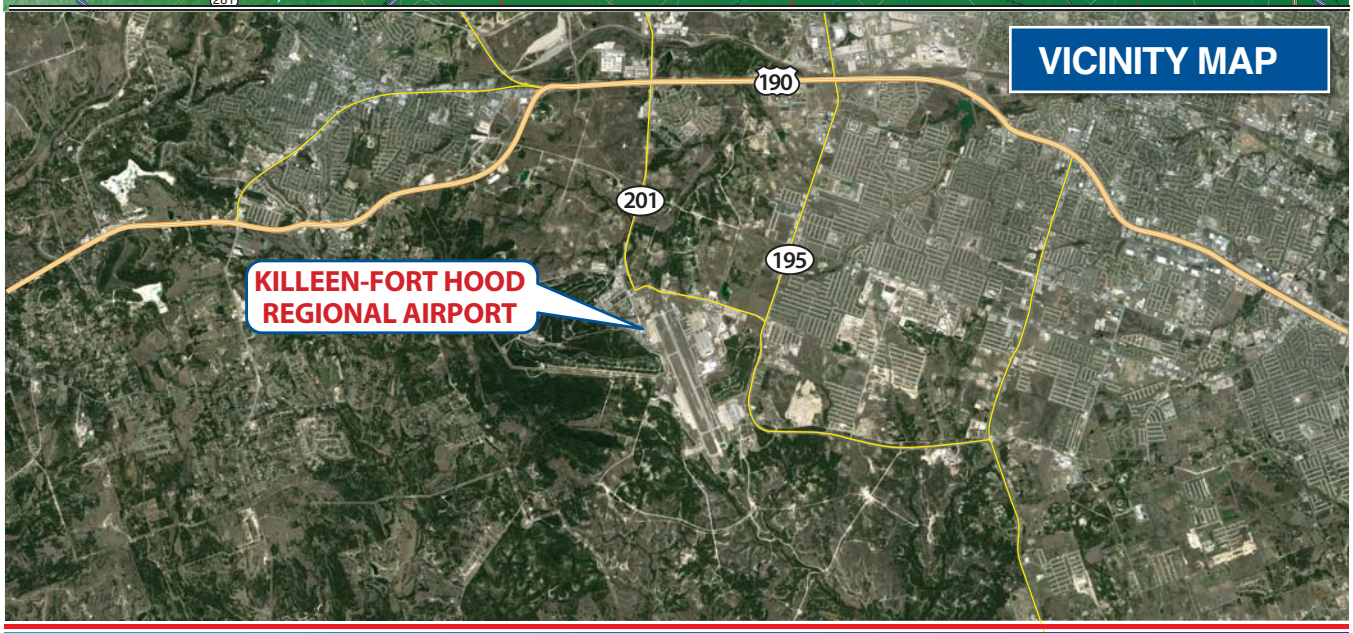
CLIMATE

Weather conditions are important to the planning and development of an airport. Temperature is an important factor in determining runway length requirements, while wind direction and speed are used to determine optimum runway orientation. The need for navigational aids and lighting is determined by the percentage of time that visibility is impaired due to cloud coverage or other conditions.

Killeen has very warm summers and falls, mild winters, and temperate springs. Summer and early autumn have the greatest number of sunny days. However, Killeen's central Texas location also presents rapidly changing weather conditions. The effects of converging frontal activity may create extremes in weather. These air masses consist of warm, moist air from the Gulf of Mexico, as well as westerly winds and northern cold fronts. With daytime summer temperatures well into the 90s and often surpassing 100 degrees, the average daily temperature (over 24 hours) for the hottest month (July and August) is 86 degrees Fahrenheit (F).

High surface temperatures create areas of vertical air movements, causing cumulus cloud buildups and afternoon thundershowers. Summer evenings are often punctuated by the thunder and high energy


LOCATION MAP
KILLEEN-FORT HOOD
REGIONAL AIRPORT
KILLEEN
Dallas
Fort Worth
Waco
Austin
Mineral Wells
Weatherford
Aledo
Benbrook
Forest Hill
Crowley
Everman
Burleson
Mansfield
Cedar Hill
Arlington
Irving
Euless
Bedford
Saginaw
Azle
Farmers Branch
Rowlett
Mesquite
Crandall
Kaufman
Grand Saline
Canton
Van
Hutchins
Lancaster
Ferris
Red Oak
Midlothian
Palmer
Waxahachie
Ennis
Kemp
Mabank
Athens
Trinidad
Kerens
Corsicana
Italy
Itasca
Grandview
Venus
Keene
Joshua
Cleburne
Granbury
Glen Rose
Stephenville
Gorman
Eastland
Cisco
Dublin
Hico
Comanche
Hillsboro
Whitney
Meridian
Hubbard
West
Clifton
Valley Mills
Hamilton
Wortham
Fairfield
Palestine
Mexia
Teague
Elkhart
Bellmead
Mart
Groesbeck
Robinson
McGregor
Gatesville
Buffalo
Lorena
Moody
Marlin
Troy
Temple
Rosebud
Bremond
Copperas Cove
Nolanville
Belton
Lampasas
Calvert
Franklin
Madisonville
Salado
Holland
Rogers
Cameron
Hearne
Florence
Bartlett
Burnet
Buchanan Dam
Bertram
Llano
Kingsland
Granger
Rockdale
Bryan
College Station
Marble Falls
Leander
Georgetown
Taylor
Thorndale
Caldwell
Cedar Park
Round Rock
Pflugerville
Lexington
Elgin
Manor
Somerville
Navasota
Fredericksburg
Johnson City
Dripping Springs
Giddings
Brenham
Magnolia
Blanco
Buda
Bastrop
Smithville
Hempstead
Waller
Tomball
Kyle
San Marcos
Lockhart
La Grange
Bellville
Jersey Village


VICINITY MAP
190
201
195
KILLEEN-FORT HOOD
REGIONAL AIRPORT

winds of thunderstorms driven eastward by westerly winds aloft and fueled by the moist Gulf air. This part of Texas is also known for the high number of days of sunshine.

Wind patterns for the central Texas area are typically from the south-southeast during the spring, summer, and fall months, and from the north-northwest in the winter months. Annual wind speeds for this area average 9.23 miles per hour (mph). On average, April is the windiest month in Killeen, with average wind speeds at 10.95 mph.

Table 1A lists common climate data for Killeen, Texas. Information pertaining to temperature and precipitation were obtained from the Southern Regional Climate Center (SRCC), while the wind speed, percent of time in instrument and visual flight rule conditions, and sky/cloud cover data were pulled from the GRK automated weather reporting station. Visual flight rules (VFR) conditions are those when the pilot is allowed to fly with visual reference having a minimum of three miles visibility and at least 1,000-foot cloud ceilings. Instrument flight rules (IFR) conditions are those times where either visibility or cloud heights fall below VFR conditions.

TABLE 1A
Historic Climate Data
Killeen, Texas

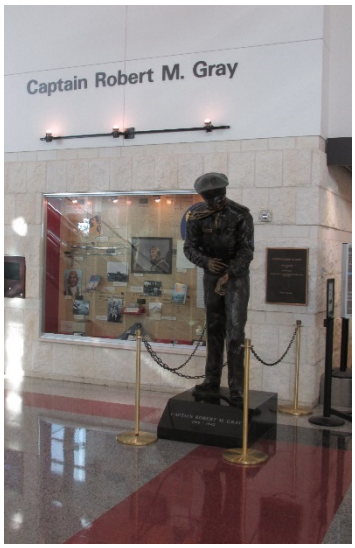
Period	Average Precipitation (in.)[1]	Average Daily Temp (F)[1]	Average Snowfall (in.)[1]	Average Wind Speed (mph)[2]	Percent IFR[2]	Percent VFR[2]	Sky Clear[2]
January	2.22	50	-	8.74	24.92	75.08	42.75
February	1.18	54	-	10.14	24.18	75.82	39.72
March	2.98	62	-	10.49	20.02	79.98	39.52
April	1.99	70	-	10.95	14.11	85.89	43.17
May	4.54	76	-	10.29	14.45	85.55	42.41
June	3.44	83	-	9.76	5.92	94.08	57.24
July	3.56	86	-	8.20	9.24	90.76	58.82
August	1.15	86	-	7.85	3.38	96.62	73.81
September	3.63	80	-	7.48	11.37	88.63	56.04
October	3.75	70	-	8.70	16.39	83.61	50.74
November	0.79	60	-	9.15	22.27	77.73	43.88
December	0.93	51	-	9.06	25.77	74.23	38.36
Average	***2.51***	***69***	***-***	***9.23***	***16.00***	***84.00***	***48.87***

[1] *Source: Southern Regional Climate Center (SRCC) for Killeen-Fort Hood, Texas; Data Range of 2000- April 2016*
[2] *Source: GRK Weather Reporting Station via 116,875 total observations; Data Range: 1/1/2006-12/31/2015*

KEY:
In. – Inches
MPH – Miles per hour
F – Degrees Fahrenheit
IFR – Instrument Flight Rules
VFR – Visual Flight Rules

AIRPORT HISTORY

The primary public use airport serving Killeen, Texas was originally known as Killeen Municipal Airport. Owned by the City of Killeen, the Airport was located on the eastern side of Killeen, near the western border of Harker Heights, and immediately to the north of then Highway 190 (now I-14). As Fort Hood and the Cities of Killeen and Harker Heights grew, airport development availabilities and options became constrained. This severely limited the Airport as many regional airlines began transitioning from propeller driven aircraft to regional jets. The constraints at the Airport were mainly due the length of runway required for jet aircraft and the close proximity of existing development surrounding the Airport.



Captain Robert Gray Statue

Opposed to purchasing land for expansion through eminent domain or choosing to build a new airport on another site, the City partnered with Fort Hood, the largest active duty armored post in the U.S. armed forces. Robert Gray Army Airfield (RGAAF), located on the southwestern side of the City of Killeen, had abundant space to accommodate civilian commercial service aircraft and associated activities, although the use of RGAAF for civilian commercial operation was federally prohibited at the time. City and Fort Hood leadership collaborated on how the joint-use of RGAAF would benefit both the community and the nation. In 1997, U.S. Representative Chet Edwards sponsored a bill repealing the prohibition of a joint-use facility at Fort Hood. In 1998, the bill passed and allowed the Army to begin formal negotiation with the City of Killeen regarding the joint-use facility that would become Killeen-Fort Hood Regional Airport (GRK).

Once GRK was established and providing commercial air service in August of 2004, the existing Killeen Municipal Airport was renamed Skylark Field (ILE) and made the primary general aviation (GA) airport serving the area. It should be noted that GRK does have GA provisions available at the airport; however, these services are primarily reserved for general aviation aircraft weighing over 12,500 pounds, and they must have prior permission before operating at GRK. GA aircraft weighing less than 12,500 pounds are typically directed to ILE.

In August of 2004, the civilian portion of Robert Gray Army Airfield was designated as Killeen-Fort Hood Regional Airport. As a means to support the joint-use facility, the Joint-Use Management Board (JMB) was created to generate plans for the joint operation of the Airport which sought to increase the overall financial feasibility of the project. One of the outcomes includes the City being responsible for various airfield maintenance and mowing services in lieu of rental payments for the 80 acres leased from the Army.

Table 1B presents a listing and brief description of major capital improvement projects completed since 2000. It should be noted that the airport also participated in the Military Airports Program (MAP). The MAP is a program designated by the FAA to encourage the conversion of closed military installations to civilian airports. The MAP also promotes joint-use facilities such as GRK. This program provides eligible airports with additional funding to achieve Airport Improvement Program (AIP) eligibility.

At any one time, a maximum of 15 airports can participate in the MAP simultaneously. Of the 15 participating airports, three airports can be designated as GA. An airport can participate up to five consecutive years and can receive up to seven million dollars on an annual basis. Once an airport's term has been fulfilled, it is possible to undergo evaluation for reapplication; however, an airport participating in the MAP for a second time may only receive limited funding as there are typically new entry airports in need of funding. Over the course of GRK's participation in the MAP, the airport received five million dollars on an annual basis for a period of five years.

Once a joint-use facility, GRK also became eligible for federal grants administered by the FAA from the AIP. Eligibility for these grants are for airport facilities used by commercial airlines for civilian purposes and cannot be used to improve facilities having exclusive military applications.

TABLE 1B
Major Capital Improvement Projects
Killeen-Fort Hood Regional Airport

Year	Grant Number	Project Description	Grant Amount
2000	AIP-001	Taxiway, apron, and terminal (planning and preliminary design for joint-use of Robert Gray Army Airfield); conduct miscellaneous studies (navigational aids and cost-benefit analysis).	$ 603,312.00
2001	AIP-003	Conduct airport master plan study (civilian area); Construct terminal building (design); construct apron (design); construct taxiway (design north connector); install miscellaneous (design navigational aids and grading).	$1,128,351.00
	AIP-004	Construct new airport (site grading, utilities, land acquire, terminal building, Phase I)	$10,383,603.00
2002	AIP-020	Security enhancements	$35,600.00
2003	AIP-008	Construct fuel farm [MAP]; construct apron, construct parking lot; construct access road; construct service road.	$4,984,762.00
	AIP-009	Construct terminal building.	$ 7,013,314.00
2004	AIP-010	Construct taxiway and terminal building; improve runway safety area.	$10,211,248.00
2005	AIP-011	Construct new airport, runway safety area (improve RSA phase II), expand apron.	$10,069,944.00
2006	AIP-012	Acquire equipment, expand apron, update airport master plan study.	$ 2,435,667.00
2007	AIP-013	Improve terminal building [procure and install two passenger boarding bridges].	$1,298,801.00
2008	AIP-016	Expand terminal building (phase I design); improve terminal building and enhance taxiway markings.	$1,440,566.00
2009	AIP-017	Improve airport drainage [Phase 1 - Design drainage flume along north edge of apron], improve airport erosion control [Phase I - Design blast pad, RW 15 approach end], rehabilitate runway [Phase 1 - Design] - 15/33.	$286,677.00
2010	AIP-021	Construct taxiway (phase II construction), rehabilitate taxiway (phase II reconstruction).	$311,308.00
2012	AIP-022	Modify terminal building (phase I construction). Modify terminal building (phase II construction)	$4,270,667.00
2014	AIP-023	Rehabilitate access road and taxiway.	$189,856.00
2015	AIP-025	Acquire equipment and improve terminal building.	$400,500.00

Source: FAA Grant History

HISTORICAL AERONAUTICAL ACTIVITY

At commercial service airports, the number of passenger boardings (enplanements) is a key indicator of operational strength as they are typically the basis for federal grants-in-aid. Enplanement activity is also a good barometer of operational conditions as they can be used to measure the strength of commercial passenger airline services. The Airport's based aircraft and annual operations (takeoffs and landings) in aggregate and type are also important aeronautical activity measures to factor. These indicators will be used in subsequent analyses in this Master Plan to project future aeronautical activity and determine future facility needs. Each of the activity segments is briefly described below.

PASSENGER ENPLANEMENTS

Commercial service airports provide local and regional access to the national and international aviation systems. As such, these airports are vital to interstate commerce as well as a key component to local and regional economic infrastructure. These facilities support and can even drive growth in all socioeconomic categories.

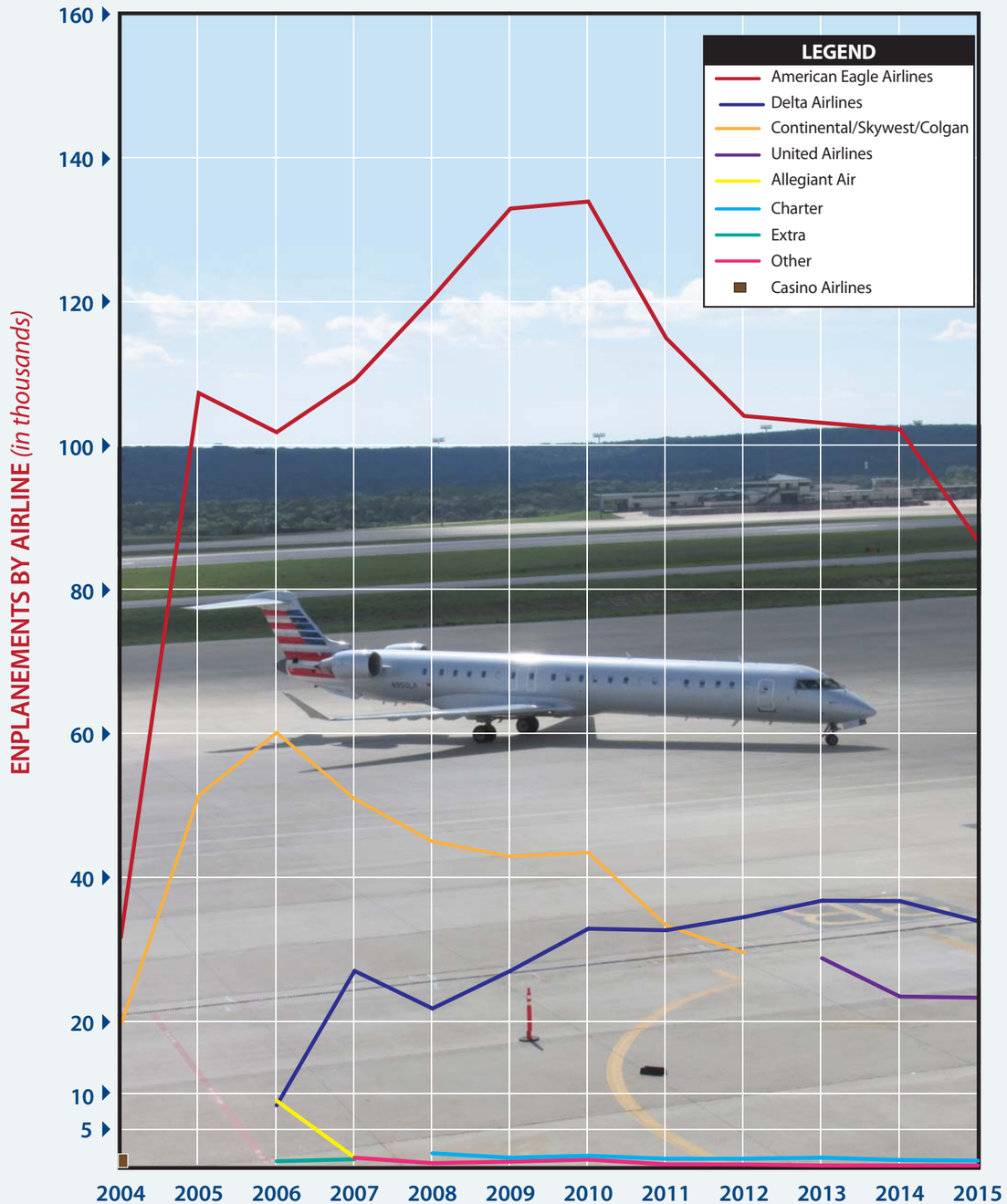
Commercial Service Aircraft

An enplanement includes any revenue passengers that board an aircraft for a fare at the airport. This statistic is important in that it is utilized by the FAA to determine the annual level of entitlement funding dedicated to the airport under the AIP grant system. An airport must reach 10,000 annual enplanements to be eligible for a minimum of one million dollars in annual entitlement funds via AIP. Historical enplanement data for GRK is provided on **Exhibit 1B**. Airline passenger enplanements will typically be influenced by many factors, including number of airlines serving the airport, frequency of daily departures, types of aircraft used, and diversity and number of non-stop destinations.

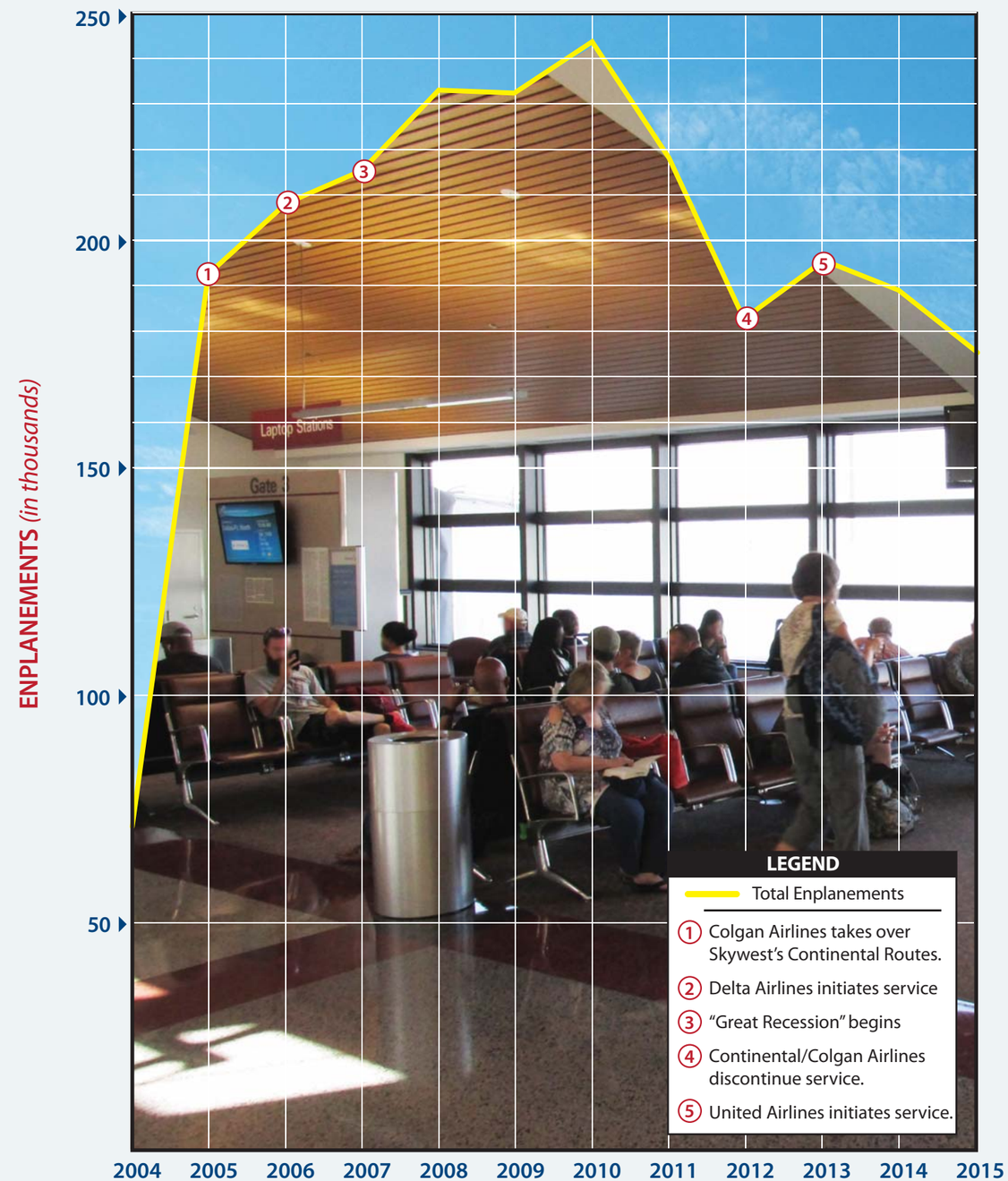
GRK is served by two regularly scheduled airlines offering an average of 10 daily departures at the time of this writing (2Q, 2019). The Airport also provides services for charter operations. The airlines currently providing daily flights at GRK include reginal airlines operating under a mainline carrier:

- American Airlines
- United Airlines

A third carrier, Delta Airlines, departed the market in 2Q, 2018.



NOTE: Enplanement counts from August 2004 - Sept 2016



ANNUAL AIRCRAFT OPERATIONS

Fiscal Year	ITINERANT OPERATIONS										LOCAL OPERATIONS			Total Operations
	AIR CARRIER			GENERAL AVIATION			MILITARY			Total Itinerant	General Aviation	Military	Total Local Operations	
	Air Carrier (AC)	Air Taxi (AT)	Total AC/AT	VFR	IFR	Total	VFR	IFR	Total					
2005	2,088	10,979	13,067	1,266	375	1,641	15,782	7,716	23,498	38,206	0	39,028	39028	77,234
2006	3,373	10,738	14,111	1,261	247	1,508	13,937	7,846	21,783	37,402	0	30,913	30913	68,315
2007	5,403	9,680	15,083	1,342	150	1,492	13,703	7,568	21,271	37,846	0	23,395	23395	61,241
2008	5,555	9,875	15,430	1,453	298	1,751	16,254	9,200	25,454	42,635	0	34,560	34560	77,195
2009	15,645	-	15,645	1,467	505	1,972	13,077	9,711	22,788	40,405	0	21,885	21885	62,290
2010	16,937	-	16,937	1,638	551	2,189	16,105	10,870	26,975	46,101	0	37,333	37333	83,434
2011	6,601	8,720	15,321	1,747	560	2,307	16,724	11,615	28,339	45,967	0	22,970	22970	68,937
2012	6,340	9,948	16,288	1,709	192	1,901	13,499	9,494	22,993	41,182	0	32,209	32209	73,391
2013	7,058	9,475	16,533	1,641	1,554	3,195	12,914	7,427	20,341	40,069	0	34,818	34818	74,887
2014	6,496	9,727	16,223	1,813	386	2,199	13,549	9,934	23,483	41,905	0	29,546	29546	71,451
2015	7,440	9,056	16,496	1,954	316	2,270	12,817	9,064	21,881	40,647	0	34,500	34500	75,147
2016*	5,559	5,566	11,125	1,327	211	1,538	11,129	7,534	18,663	31,326	0	26,654	26654	57,980

*2016 data thru September

MONTHLY AIRCRAFT OPERATIONS

Fiscal Year	ITINERANT OPERATIONS										LOCAL OPERATIONS			Total Operations
	AIR CARRIER			GENERAL AVIATION			MILITARY			Total Itinerant	General Aviation	Military	Total Local Operations	
	Air Carrier (AC)	Air Taxi (AT)	Total AC/AT	VFR	IFR	Total	VFR	IFR	Total					
Oct-15	746	733	1,479	184	29	213	1,845	1,080	2,925	4,617	0	2,828	2,828	7,445
Nov-15	620	651	1,271	165	45	210	1,396	1,119	2,515	3,996	0	2,642	2,642	6,638
Dec-15	617	740	1,357	83	5	88	766	758	1,524	2,969	0	2,399	2,399	5,368
Jan-16	528	568	1,096	133	18	151	1,335	744	2,079	3,326	0	3,528	3,528	6,854
Feb-16	693	513	1,206	119	18	137	1,385	880	2,265	3,608	0	2,134	2,134	5,742
Mar-16	665	559	1,224	112	19	131	656	500	1,156	2,511	0	2,719	2,719	5,230
Apr-16	698	588	1,286	103	9	112	654	631	1,285	2,683	0	2,560	2,560	5,243
May-16	594	632	1,226	108	16	124	790	641	1,431	2,781	0	2,707	2,707	5,488
Jun-16	649	616	1,265	168	16	184	2,086	1,085	3,171	4,620	0	3,900	3,900	8,520
Jul-16	590	621	1,211	238	44	282	1,508	1,199	2,707	4,200	0	3,250	3,250	7,450
Aug-16	605	745	1,350	178	45	223	1,026	947	1,973	3,546	0	3,024	3,024	6,570
Sep-16	537	724	1,261	168	26	194	1,689	907	2,596	4,051	0	2,832	2,832	6,883
Total	**7,542**	**7,690**	**15,232**	**2,049**	**290**	**2,339**	**15,136**	**10,491**	**25,627**	**43,198**	**0**	**34,523**	**34,523**	**77,721**

Currently, the regional passenger commercial service airlines operating at GRK utilize regional jets. Over the last few years, the three airlines operating at GRK have offered non-stop service to three major airline hubs:

- Dallas/Fort Worth, TX – Dallas/Fort Worth International Airport (DFW)
- Houston, TX – Houston George Bush Intercontinental Airport (IAH)
- Atlanta, GA – Hartsfield-Jackson Atlanta International Airport (ATL)

AIRCRAFT OPERATIONS

Aircraft operations, being a take-off or landing, are classified as either local or itinerant. Local operations consist mostly of aircraft training operations conducted within the airport traffic pattern and touch-and-go and stop-and-go operations. Itinerant operations are arriving or departing aircraft which have an origin or destination away from the airport.

Aircraft operations are further sub-classified into four general categories: air carrier, air taxi, general aviation, and military. Air carrier operations are defined as those conducted commercially by aircraft having a seating capacity of 60 or more and/or a maximum payload capacity of 18,000 pounds. Air taxi operations can include small commercial service aircraft operations as well as general aviation type aircraft for the "on-demand" commercial transport of persons and property in accordance with 14 Code of Federal Regulations (CFR) Part 135 and Subchapter K of 14 CFR Part 91.

Exhibit 1B also presents the annual aircraft operations at GRK since 2005, obtained from counts conducted by the airport traffic control tower (ATCT). Operational traffic counts shown on **Exhibit 1B** were provided by the U.S. Army, which operates the ATCT at GRK. The exhibit includes the two most generalized categories of operations: itinerant and local. Local operations at GRK are conducted by military aircraft only due to the limitation of general aviation aircraft use under 12,500 pounds via the joint-use agreement.

Commercial passenger service operations at GRK fall under both air carrier and air taxi categories. Air carrier operations typically include mainline and regional passenger airlines. Air carrier operations are those carrying Ft. Hood troops, casino charters, or diversions from other airports due to weather. Commercial service operations counted as air taxi are represented by regional airlines utilizing regional jets or turboprop aircraft with fewer than 60 seats while hauling under the banner of the mainline carriers. General aviation operations include a wide array of aircraft weighing more than 12,500 pounds and having uses ranging from personal to business and corporate uses. Obviously, a wide variety of military aircraft also operate at GRK, as detailed on **Exhibit 1B**.

BASED AIRCRAFT

Aircraft are commonly based at nearly all federally supported airports across the country, even some large commercial service airports. According to the most recent FAA Airport Master Record—Form 5010,

there are currently 40 military aircraft and two commercial aircraft based at GRK. As previously noted, Skylark Field is the City's option for small and medium general aviation aircraft operations, including aircraft basing. GRK is designed primarily to facilitate commercial and large GA aircraft movements, those primarily being itinerant in nature at this time.

AIRPORT ADMINISTRATION

Robert Gray Army Airfield is owned and operated by the Department of the Army. The City leases approximately 80 acres on the southeast corner that operates as a commercial air carrier terminal as Killeen-Fort Hood Regional Airport. As previously outlined, GRK is operated as a joint-use facility by a Joint Management Board which facilitates the operation of the airport from a military and commercial service perspective. On the civilian side, the City has an elected mayor and city council form of government. An Executive Director of Aviation has responsibility of the day-to-day operations of KFHRA as well as ILE, and reports to the City Manager. The City Manager reports to the City Council, who ultimately have responsibility for all airport policy considerations including the compliance with all pertinent federal, state, and local regulation. Killeen-Fort Hood Regional Airport is staffed by 38 full-time employees.

AIRPORT SYSTEM PLANNING ROLE

Airport planning exists on many levels: national, state, and local. Each level has a different emphasis and purpose. On the national level, the Killeen-Fort Hood Regional Airport is included in the *National Plan of Integrated Airport Systems* (NPIAS); on the regional and state levels, the Airport is included in the *Texas Aviation Systems Plan* (2010). The most recent local planning document is the Airport Master Plan, last updated in 2004.

FEDERAL AIRPORT PLANNING

The role of the federal government in the development of airports cannot be overstated. Many of the nation's existing airports were either initially constructed by the federal government, or their development and maintenance was partially funded through various federal grant-in-aid programs to local communities. The system of airports existing today is due, in large part, to the existence of federal policy that promotes the development of civil aviation. As part of a continuing effort to develop a national airport system to meet the needs of civil aviation and promote air commerce, the United States Congress has continually maintained a national plan for the development and maintenance of airports.

On the national level, GRK is included in the NPIAS as a non-hub, primary commercial service airport. This designation includes 249 airports nationwide that provide regularly scheduled passenger commercial service and record less than 0.05 percent of total U.S. passenger enplanements, but more than 10,000 annually. Overall, the NPIAS identifies 3,332 existing airports which are considered significant to the national air transportation system. The NPIAS is published and used by the FAA in administering the AIP, which is the source of federal funds for airport improvement projects across the country. The AIP

program is funded exclusively by user fees and user taxes, such as those on fuel and airline tickets. The 2017-2021 NPIAS estimates that $32.5 billion worth of needed airport improvements are eligible for AIP funding across the country over the next five years. An airport must be included in the NPIAS to be eligible for federal funding assistance through the AIP.

The NPIAS supports the FAA's strategic goals for safety, system efficiency, and environmental compatibility by identifying specific airport improvements. The current issue of the NPIAS identifies approximately $9.89 million in development needs at GRK for the five-year planning horizon. This figure is not a guarantee of federal funding; instead, this figure represents development needs as presented to the FAA by the airport administration in the annual airport capital improvement program. Of the $32.5 billion in airport development needs identified by the NPIAS nationally, approximately 16 percent, or $5.3 billion, is proposed for the 249 non-hub commercial service airports, which includes GRK.

Airports that apply for and accept AIP grants must adhere to various grant assurances. These assurances include maintaining the airport facility safely and efficiently in accordance with specific conditions. The duration of the assurances depends on the type of airport, the useful life of the facility being developed, and other factors. Typically, the useful life for an airport development project is a minimum of 20 years. Thus, when an airport accepts AIP grants, they are obligated to maintain that facility in accordance with FAA standards for at least that long.

STATE AIRPORT PLANNING

The primary planning document for the State of Texas is the *Texas Aviation Systems Plan (TASP).* The TASP, last updated in 2010, was initiated in 1970 as the Texas Aeronautical Facilities Plan. The plan provides the TxDOT— Aviation Division with a tool to develop a statewide airport system to provide adequate access by air to the population and economic activity centers of the state, and to provide timely development and maintenance of the airport system. Other goals of the TASP include maximizing the economic benefit and return on investment to the state, counties, cities, and local communities from development of the airport system, and integrating the airport system effectively with other transportation modes.

The *TASP* identified seven types of airport service levels serving varying roles for the Texas airport system and are defined as follows:

Primary Commercial Service: These airports support scheduled passenger service by large and medium transport aircraft and enplane at least 10,000 passengers on an annual basis.

Non-Primary Commercial Service: Airports capable of accommodating scheduled passenger service by smaller transport aircraft and enplane fewer than 10,000, but more than 2,500 passengers annually.

Reliever: Airports designed primarily to relieve congestion at Commercial Service airports by providing alternative general aviation facilities.

General Aviation (Business/Corporate): These airports provide community access as they are capable of accommodating business jets.

General Aviation (Community Service): Airports that provide community access by single and light twin-engine aircraft, as well as a limited number of business jets.

General Aviation (Basic Service): Airports capable of providing air access for communities less than 30 minutes (drive time) from Commercial Service, Reliever, Business/Corporate, and Community Service airports; supports essential but low activity levels.

General Aviation (Heliport): A facility capable of accommodating helicopters used by individuals, corporations, and helicopter air taxi services. These facilities may support scheduled passenger service if demand exists.

Killeen-Fort Hood Regional Airport is classified as a Primary Commercial Service airport in the 2010 *TASP*. The minimum facility and service requirements are listed in **Table 1C**. The current airport layout and available services at GRK meet and/or exceed the minimum recommendations in the study for all criteria.

TABLE 1C
Facility and Service Criteria
TASP Primary Commercial Service Airports

Airport Criteria	Minimum Objective
Airport Reference Code	C-II Thru D-VI
Design Aircraft	Heavy Transport
Minimum Land Requirements	
--Runway Safety Area	As required by hub size
--Runway Protection Zone	As required by hub size
--Landside Development	As required by hub size
Runways	
--Length	As required by critical aircraft
--Width	As required by critical aircraft
--Strength	As required by critical aircraft
--Lighting	HIRL
Taxiways	
--Type	Full Parallel
Approach	
--Type	Precision
--Visibility Minimums (minimum decision altitude/ decision height and visibility minimums)	200'-1/2 mile
Services	
--Service Available	Full Range

HIRL: High Intensity Runway Lighting

Source: Texas Aviation Systems Plan (2010 TASP)

LOCAL AIRPORT PLANNING

The Airport Master Plan is the primary local planning document. The Master Plan is intended to provide a 20-year vision for airport development based on aviation demand forecasts. The most recent update

to the airport planning document is the 2004 Airport Master Plan. Over time, the forecast element of an Airport Master Plan typically becomes less reliable due to changes in aviation activity and/or the economy. As a result, the FAA recommends that airports update their Master Plans every five to ten years, or as necessary to address any significant changes. Therefore, this is an appropriate time to update the Airport Master Plan and revisit the development assumptions from the previous planning study.

14 CFR PART 139 CERTIFICATION

An airport must have an Airport Operating Certificate (AOC) if it is serving air carrier aircraft with more than nine seats or serving unscheduled air carrier aircraft with more than 30 passenger seats. 14 CFR Part 139 (Part 139) describes the requirements for obtaining and maintaining an AOC. This includes meeting various Federal Aviation Regulations (FARs) now codified under the CFR.

Airports are classified in the following categories based on the type of air carrier operations served:

- **Class I Airport** – an airport certificated to serve scheduled operations of large air carrier aircraft that can also serve unscheduled passenger operations of large air carrier aircraft and/or scheduled operations of small air carrier aircraft.

- **Class II Airport** – an airport certificated to serve scheduled operations of small air carrier aircraft and the unscheduled passenger operations of large air carrier aircraft. A Class II airport cannot serve scheduled large air carrier aircraft.

- **Class III Airport** – an airport certificated to serve scheduled operations of small air carrier aircraft. A Class III airport cannot serve scheduled or unscheduled large air carrier aircraft.

- **Class IV Airport** – an airport certificated to serve unscheduled passenger operations of large air carrier aircraft. A Class IV airport cannot serve scheduled air carrier aircraft regulated under CFR Part 121.

GRK is currently classified as a Class I CFR Part 139 commercial service airport. This designation supports the regularly (or irregularly) scheduled operations of large and/or small air carrier aircraft conducting commercial passenger services at the Airport.

Part 139 regulations (which implemented provisions of the *Airport and Airway Development Act of 1970*, as amended on November 27, 1971) set standards for: the marking and lighting of areas used for operations; firefighting and rescue equipment and services; the handling and storing of hazardous materials; the identification of obstructions; and safety inspection and reporting procedures. It also required airport operators to have an FAA-approved Airport Certification Manual (ACM).

The ACM is a required document that defines the procedures to be followed in the routine operation of the airport and for response to emergency situations. The ACM is a working document that is updated annually as necessary. It reflects the current condition and operation of the airport and establishes the responsibility, authority, and procedures as required. There are required sections for the ACM covering

administrative detail and procedural detail. Killeen-Fort Hood Regional Airport has a current, approved ACM. The ACM includes the following information:

- General Information
- Inspection Authority
- Deviation to Part 139 Requirements
- ACM Maintenance/Revisions
- Personnel Information
- Paved/Unpaved Areas
- Safety Areas
- Marking, Signs, and Lighting
- Snow and Ice Control
- ARFF Index, Equipment, Agents, and Operational Requirements
- Hazardous Materials
- Traffic and Wind Indicators
- Airport Emergency Plan
- Self-inspection Program
- Pedestrians and Ground Vehicles
- Obstructions
- Protection of navaids
- Public Protection
- Airport Condition Reporting
- Identifying, Marking, and Lighting Construction and Unserviceable Areas
- Letters of Agreement

AIRFIELD FACILITIES

Airfield facilities are those which facilitate aircraft movements between the air and ground. Generally, these facilities include runways, taxiways, airport lighting and markings, and navigational aids. **Exhibit 1C** summarizes and depicts airfield facility information atop an aerial photograph for visual reference. Given that GRK is designated as a joint-use airport for military and civilian users, it should be noted that civilian aircraft have access to the entire runway and taxiway system. Thus, all existing airfield facilities will be discussed.

RUNWAYS

GRK is served by a single runway configuration. Runway 15-33 is the Airport's only runway, which is capable and certified to accommodate air carrier aircraft operations.

Runway 15-33

Runway 15-33 is 10,000 feet long by 200 feet wide, oriented in a northwest-southeast manner. The Runway 33 landing threshold has been displaced by 194 feet. As such, the landing distance available (LDA) associated with Runway 33 is 9,806 feet. The pavement is constructed of asphalt with the initial 1,000 feet at each approach end constructed of concrete. The pavement has a grooved surface treatment and is reported as being in excellent condition by official FAA publications.

Runway 15-33 has a pavement strength of 135,000 pounds dual wheel loading (D), which refers to the design of certain aircraft landing gear that has two wheels on each main landing gear strut. The runway pavement has also been strength-rated at 345,000 pounds for dual tandem wheel (DT) aircraft.

RUNWAYS

	Runway 15	Runway 33
Runway Length (feet)	10,000	Same
Runway Width (feet)	200	Same
Threshold Displacement (feet)	None	194
Shoulder Width	None	Same
Blast Pad Dimensions (feet)	200 X 200	250 X 200
Runway Pavement Surface Material	Asphalt/Concrete	Same
Runway Pavement Surface Treatment	None	Same
Runway Pavement Condition (FAA Reported)	Excellent	Same
Runway Pavement Load Bearing Strength (lbs)		
Dual Wheel Loading (D)	135,000	Same
Double Tandem Wheel Loading (DT)	345,000	Same
Runway Pavement Markings	Precision	Same
Runway Lighting	HIRL	Same
Edge Lights	High Intensity	Same
Centerline Lights	None	Same
Touchdown Zone Lights	None	Same
Usable for Air Carrier Operations	Yes	Same
Traffic Pattern	Left	Same

TAXIWAYS

TAXIWAY DESIGNATIONS	SERVICE	WIDTH (feet)	TYPE
Taxiway A	Military	70	Parallel/Connector
Taxiway B	Commercial/Military	60-75	Parallel/Connector
Taxiway B1	Military	40	Connector
Taxiway B2	Military	40	Connector
Taxiway B3	Commercial	90	Connector
Taxiway C	Military	40-75	Connector/Exit
Taxiway C1	Military	50	Connector
Taxiway D	Commercial/Military	60	Connector/Exit
Taxiway E	Commercial/Military	75	Connector/Exit
Taxiway F	Military	75	Connector
Taxiway G	Commercial	80	Connector/Exit

WEATHER AND NAVIGATIONAL AIDS

Airport Beacon
Lighted Wind Cone
Airport Traffic Control Tower (ATCT): 120.75
Automated Terminal Information System (ATIS): 124.9
Common Traffic Advisory Frequency (CTAF): 120.75
Pilot to Metro Service (PMSV): 41.2

VISUAL AND INSTRUMENT APPROACH AIDS

	RUNWAY 15	RUNWAY 33
Instrument Landing System (ILS)		
Glideslope and Localizer	Yes (CAT I)	Yes (CAT I)
Global Positioning System (GPS)	Yes	Yes
Type(s)	LPV/LNAV	LPV/LNAV
Circling	Yes	Yes
Approach Lighting System (ALS)	MALSR	MALSR
Runway Visual Range Equipment (RVR)	No	No
Visual Glide Slope Indicator (VGSI)	Yes	Yes
Type	PAPI-4	PAPI-4
Visual Glide Angle	3.00	2.77
Runway End Identification Lights (REIL)	No	No

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TAXIWAYS

The taxiway system at GRK consists of parallel, connector, and entrance/exit taxiways. The width of each taxiway varies based on aircraft design and usage with each listed on **Exhibit 1C**.

Parallel taxiways are primarily designed to efficiently and quickly route aircraft between the runway and the originating/destination location. The Airport is served by two full-length parallel taxiways, Taxiways A and B. Taxiway A is positioned at a distance of approximately 785 feet from the runway (centerline to centerline), while Taxiway B is positioned at a distance of approximately 540 feet on the southern half and approximately 775 on the northern half. Both full length parallel taxiways are constructed of asphalt. Taxiway A is 70 feet wide for the entirety of the taxiway. Parallel Taxiway B is unique in that the northern half of the taxiway conforms to Department of Defense (DOD) standards, and the southern half conforms to FAA standards. Thus, the northern half of Taxiway B is approximately 75 feet wide, while the southern half is 60 feet wide. The differing DOD and FAA standards also explain the difference in centerline separation from runway to taxiway along Taxiway B, as previously discussed.

Taxiway G Connecting to Runway 15-33

Taxiway B

The Taxiway A and B designators are also given to the entrance/exit taxiways at the north and south ends of Runway 15-33. These taxiways simply connect the two runway ends with each parallel taxiway. There are six other entrance/exit taxiways connecting Runway 15-33 with parallel Taxiways A and B. These taxiways are designated C, D, E, and G moving from the north to the south, as depicted on **Exhibit 1C**. All of these entrance/exit taxiways are constructed of asphalt, with the exception of Taxiways E and G that connect parallel Taxiway B with Runway 15-33, which are constructed of concrete. Due to the use of both DOD and FAA standards on the airfield, taxiway widths vary depending upon the intended use of each taxiway. Taxiway widths are presented on **Exhibit 1C**. Each taxiway serving Runway 15-33 is aligned perpendicular to the runway. FAA standards suggest that all runway holding positions be aligned fully parallel with the runway centerline so that the pilot has full range of view in both runway directions.

In addition, Taxiways B1, B2, B3, C1, and F provide access to various military and commercial ramp and terminal areas.

Pavement Markings

Runway 15-33 has precision markings which identify the runway designation, edges, centerline, threshold, touchdown zone, and aiming point.

Taxiway and taxilane centerline markings are provided to assist pilots in maintaining proper clearance from pavement edges and objects near the taxiway/taxilane edges. Taxiway markings at GRK include the following:

- Centerline;
- Leadoff lines on normally used exits;
- Continuous type edge markings along paved shoulders; and
- Dashed type edge markings along the portion of Taxiway A which is contiguous to two different military ramps.

Enhanced Taxiway Centerline, Hold Position, and Directional Markings

Taxiway markings also include aircraft holding positions located on the entrance/exit and connecting taxiways. Enhanced taxiway centerline markings have been installed at all holding positions. All holding position markings are glass beaded, highlighted in black, and double sized. The hold-line positions function to keep aircraft from entering the runway environment without clearance. The location of hold-lines is established by the design aircraft for a runway. The hold-lines at GRK are set 250-260 feet from runway centerline for Runway 15-33. Furthermore, hold positions associated with connecting Taxiways A and B at each runway end contain a hold position at a distance greater than or equal to 400 feet from runway centerline to comply with precision obstacle free zone standards (POFZ). It should be noted that all hold positions complying with POFZ standards are located at a distance of 400 feet from runway centerline, with the exception of the northern connecting Taxiway A. This connecting taxiway includes a holding position located at 260 feet from runway centerline as well as a separate hold position complying with POFZ standards at approximately 570 feet from runway centerline.

Aircraft movement areas on various ramps are identified with centerline markings. Aircraft parking positions are also identified on various ramp surfaces.

AIRFIELD LIGHTING

Airfield lighting systems extend an airport's usefulness into periods of darkness and/or poor visibility. A variety of lighting systems are installed at the airport for this purpose. These lighting systems, categorized by function, are summarized as follows.

Identification Lighting: The location of the airport at night is universally identified by a rotating beacon. The rotating beacon projects three beams of light, two white and one green, which signifies GRK as lighted military airport. The rotating beacon at GRK is located on the east side of the Airport north of the commercial terminal building, as depicted on **Exhibit 1C**.

Runway and Taxiway Lighting and Signage: Runway and taxiway edge lighting utilize light fixtures placed near the edge of the pavement to define the lateral limits of the pavement. This lighting is essential for safe operations during night and/or times of low visibility to maintain safe and efficient access to and from the runways and aircraft parking areas.

Runway 15-33 is equipped with high intensity runway lights (HIRL). All taxiways associated with Runway 15-33 are equipped with light emitting diode (LED) medium intensity taxiway edge lighting (MITL).

The airport also has a runway/taxiway signage system. The presence of runway/taxiway signage is an essential component of a surface movement guidance control system necessary for the safe and efficient operation of the airport. The signage system installed at GRK includes runway and taxiway designations, holding positions, instrument landing system (ILS) critical areas, routing/directional, runway end and exits, and runway distance remaining.

Medium Intensity Taxiway Lighting

Visual Glide Slope Approach Aids: A four-box precision approach path indicator (PAPI-4) system is installed on both ends of Runway 15-33, as depicted on **Exhibit 1C**. The PAPI-4 is located on the left side of the approach ends to Runway 15-33. The system consists of four light box units that alert approaching pilots of their position relative to the desired three-degree glide slope. The visual glide angles set for the PAPI-4 systems at GRK are 3.0 degrees for Runway 15 and 2.77 degrees for Runway 33.

Approach Lighting Systems (ALS): Runways 15 and 33 are equipped with a medium intensity approach lighting system (MALS) which offer a lighted, visual grid for pilots to identify the runway end while on final approach. The MALS is supplemented with runway alignment indicator lights (RAIL). The combined MALS and RAIL is referred to as a MALSR. The RAIL portion of the MALSR is a linear progression of strobe lights which provides pilots with a rapid, visual cue of the runway centerline. The lights start 200 feet from the runway end and extend a total distance of 2,400 feet from the runway.

WEATHER AND COMMUNICATION AIDS

GRK is equipped with two windcones. The windcones provide information to pilots regarding wind conditions, such as direction and intensity.

Automated Weather Reporting Station

GRK is served by an automated Pilot to Metro Service (PMSV). PMSV is a military weather unit used at selected Air Force, Army, and Navy airfields to provide military aircrews a direct contact with weather forecasters or observers. The automated PMSV system available at GRK offers service with manual augmentation on a 24-hour basis, seven days per week. The primary purpose of PMSV is for communicating various types of weather information to military pilots. However, it can also be used to update Flight Weather Briefing Forms as well as to receive pilot weather reports (PIREPS) of significant or hazardous weather phenomena. Once reported, PIREPS are then entered into weather telecommunication networks for dissemination. Often times, PMSV information is transmitted to pilots in the airport vicinity via a very high frequency (VHF) ground-to-air radio transmitter. The PMSV service dedicated to GRK can be accessed via frequency 306.5 MHz. In addition, GRK is served by two automated weather reporting stations. Weather information from these stations is utilized by air traffic control and disseminated through military network as well as the civilian world-wide weather network. Pilots can receive weather-related information broadcast on the automated terminal information service (ATIS) frequency, where a computer-generated voice will present airport weather information. ATIS broadcasts are updated hourly and provide arriving and departing pilots the current surface weather conditions, communication frequencies, and other important airport-specific information. The ATIS frequency at GRK is 124.9 MHz.

It should be noted that GRK has a common traffic advisory frequency (CTAF) 120.75 MHz, which is the same frequency as the ATCT. Additionally, KFHRA maintains UNICOM frequency 128.925 MHz to handle ramp coordination, fuel requests, and the like.

AREA AIRSPACE AND AIR TRAFFIC CONTROL

The *Federal Aviation Administration Act of 1958* established the FAA as the responsible agency for the control and use of navigable airspace within the United States. The FAA has established the National Airspace System (NAS) to protect persons and property on the ground and to establish a safe and efficient airspace environment for civil, commercial, and military aviation. The NAS covers the common network of U.S. airspace, including: air navigation facilities; airports and landing areas; aeronautical charts; associated rules, regulations, and procedures; technical information; and personnel and material. The system also includes components shared jointly with the military.

AIRSPACE STRUCTURE

Airspace within the United States is broadly classified as either "controlled" or "uncontrolled." The difference between controlled and uncontrolled airspace relates primarily to requirements for pilot qualifications, ground-to-air communications, navigation and air traffic services, and weather conditions. Six classes of airspace have been designated in the United States, as shown on **Exhibit 1D**. Airspace designated as Class A, B, C, D, or E is considered controlled airspace. Aircraft operating within controlled airspace are subject to varying requirements for positive air traffic control.

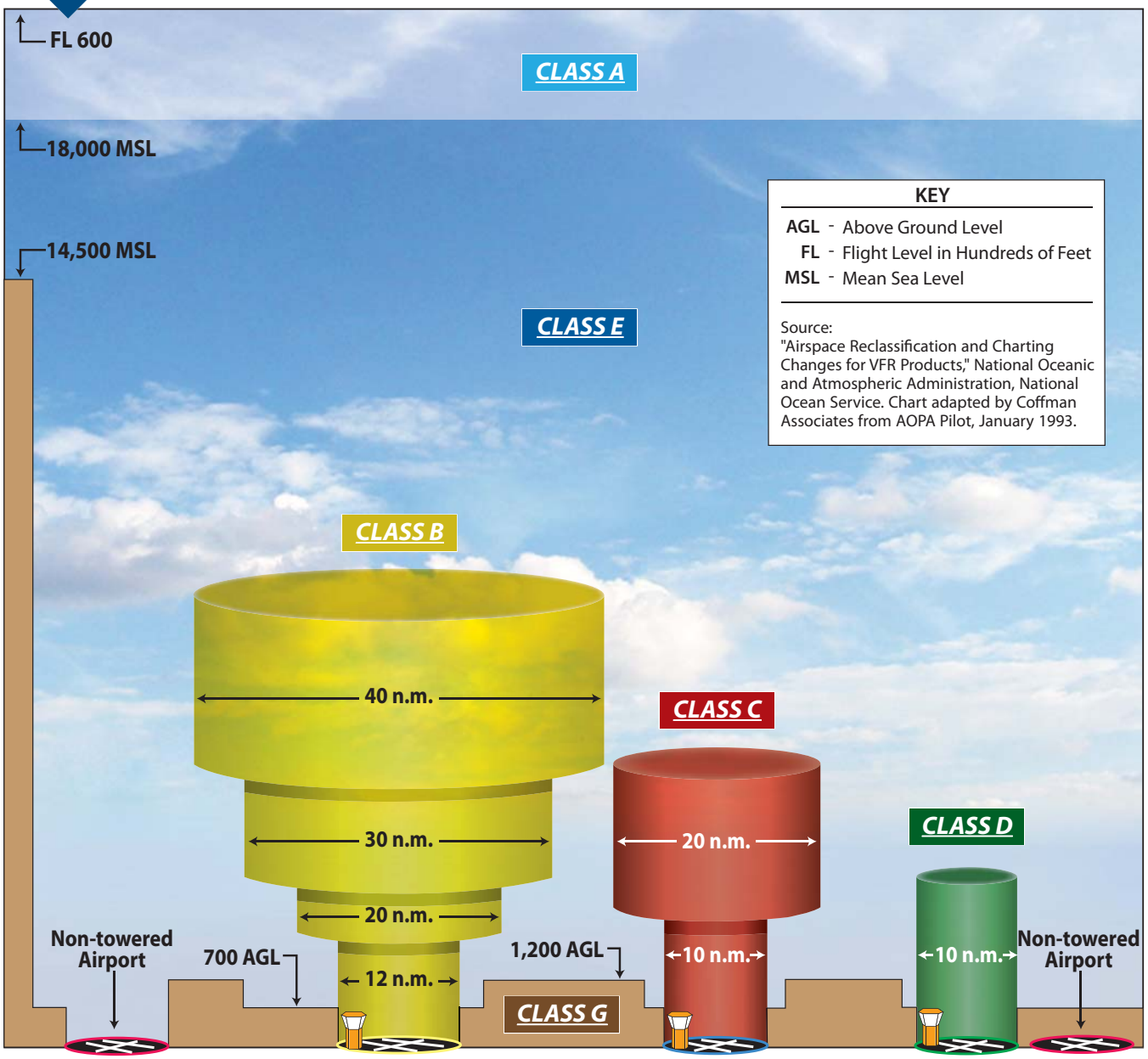
Class A Airspace: Class A airspace includes all airspace from 18,000 feet mean sea level (MSL) to flight level (FL) 600 (60,000 feet MSL). This airspace is designated in FAR Part 71.193 for positive control of aircraft. The Positive Control Area (PCA) allows flights governed only under IFR operations. The aircraft must have special radio and navigation equipment, and the pilot must obtain clearance from an ATC facility to enter Class A airspace. In addition, the pilot must possess an instrument rating.

Class B Airspace: Class B airspace has been designated around some of the country's busiest commercial service airports, such as the Dallas/Fort Worth International Airport. Class B airspace is designed to regulate the flow of uncontrolled traffic, above, around, and below the arrival and departure airspace required for high-performance, passenger-carrying aircraft at busy commercial service airports. This airspace is the most restrictive controlled airspace encountered by pilots operating under VFR.

To fly within Class B airspace, an aircraft must be equipped with special radio and navigation equipment and must obtain clearance from air traffic control. Moreover, a pilot must have at least a private pilot's certificate or be a student pilot who has met the requirements of F.A.R. Part 61.95, which requires special ground and flight training for Class B airspace. Helicopters do not need special navigation equipment or a transponder if they operate at or below 1,000 feet and have made prior arrangements in the form of a Letter of Agreement with the FAA controlling agency. Aircraft are also required to have and utilize a Mode C transponder within a 30-nautical mile (NM) range of the center of Class B airspace. A Mode C transponder allows the ATCT to track the altitude of the aircraft.

Class C Airspace: The FAA has established Class C airspace at 120 airports around the country as a means of regulating air traffic in these areas. Class C airspace is designed to regulate the flow of uncontrolled traffic above, around, and below the arrival and departure airspace required for high-performance, passenger-carrying aircraft at some commercial service airports. To fly inside Class C airspace, the aircraft must have a two-way radio, an encoding transponder, and have established communication with the ATC. Aircraft may fly below the floor of the Class C airspace, or above the Class C airspace ceiling without establishing communication with ATC.

Class D Airspace: Class D airspace is controlled airspace surrounding airports with an ATCT. GRK is surrounded by Class D Airspace. The Class D airspace typically constitutes a cylinder with a horizontal radius of five miles from the airport, extending from the surface up to a designated vertical limit, typically set at approximately 2,500 feet above the airport elevation. If an airport has an instrument approach or



DEFINITION OF AIRSPACE CLASSIFICATIONS

CLASS A	Generally airspace above 18,000 feet MSL up to and including FL 600.
CLASS B	Generally multi-layered airspace from the surface up to 10,000 feet MSL surrounding the nation's busiest airports.
CLASS C	Generally airspace from the surface to 4,000 feet AGL surrounding towered airports with service by radar approach control.
CLASS D	Generally airspace from the surface to 2,500 feet AGL surrounding towered airports.
CLASS E	Generally controlled airspace that is not Class A, Class B, Class C, or Class D.
CLASS G	Generally uncontrolled airspace that is not Class A, Class B, Class C, Class D, or Class E.

departure, the Class D airspace sometimes extends along the approach or departure path. During periods when the airport's ATCT is closed, Class D airspace typically reverts to Class E airspace. However, the airspace surrounding GRK is continuously Class D airspace.

Class E Airspace: Class E airspace consists of controlled airspace designed to contain IFR operations near an airport, and while aircraft are transitioning between the airport and en route environments. Unless otherwise specified, Class E airspace terminates at the base of the overlying airspace. Only aircraft operating under IFR are required to be in contact with air traffic control when operating in Class E airspace. While aircraft conducting visual flights in Class E airspace are not required to be in radio communications with air traffic control facilities, visual flight can only be conducted if minimum visibility and cloud ceilings exist. There are several airports supported by Class E airspace near GRK.

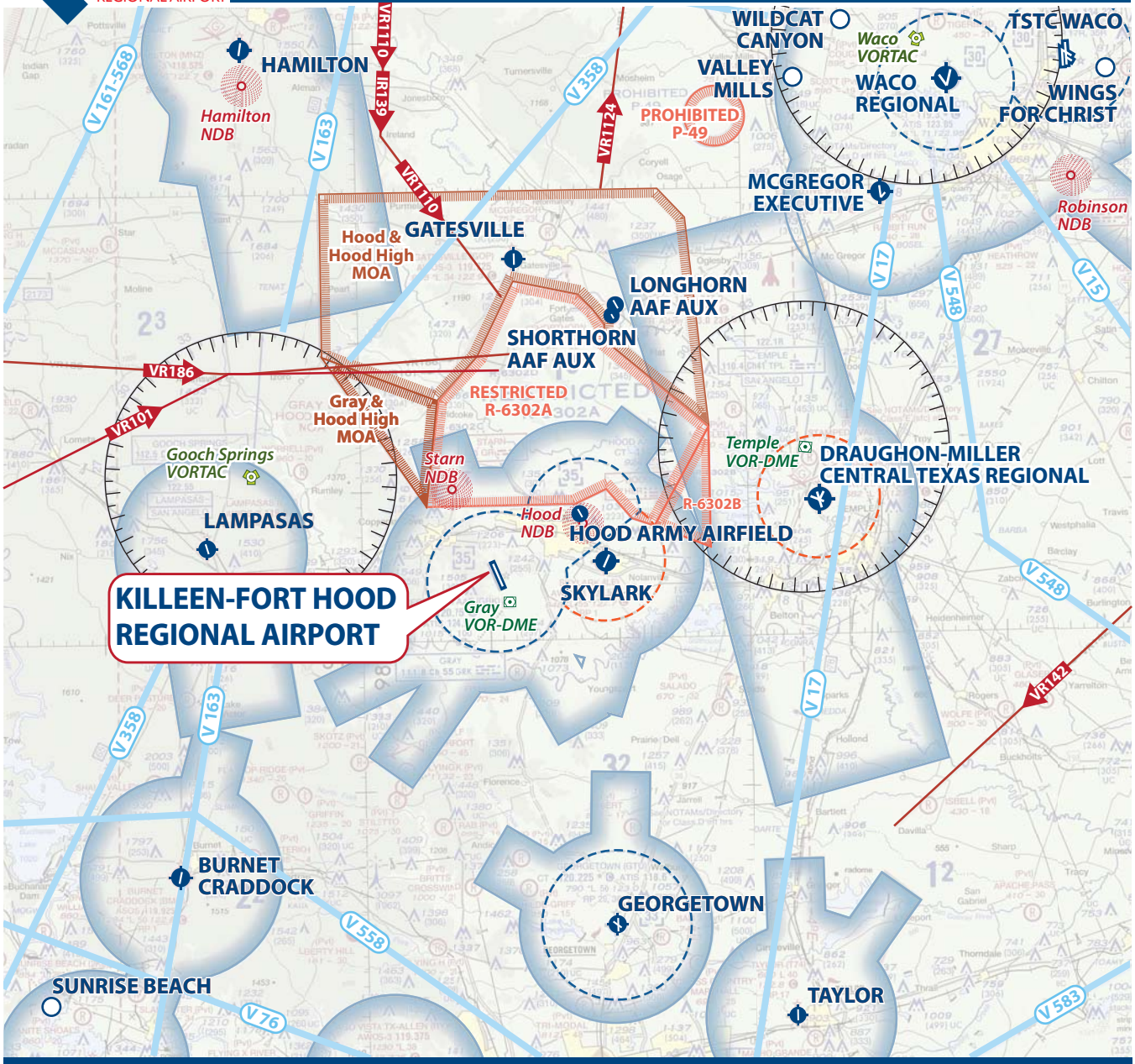
Class G Airspace: Airspace not designated as Class A, B, C, D, or E is considered uncontrolled, or Class G, airspace. Air traffic control does not have the authority or responsibility to exercise control over air traffic within this airspace. Class G airspace lies between the surface and the overlaying Class E airspace (700 to 1,200 feet above ground level [AGL]).

Exhibit 1E shows the Class D airspace surrounding GRK. The Class D airspace consists of controlled airspace extending upward from the surface to and including 3,500 feet MSL within a five-mile radius of GRK, which overlaps with the Class D airspace serving Hood Army Airfield to the northeast and the Class E airspace serving Skylark Field to the east. In addition, GRK, Hood Army Airfield, and Skylark Field are all surrounded by Class E airspace beginning 700 feet AGL above the surface that laterally abuts Class E airspace of 1,200 feet AGL or higher. The Class E airspace extends out from the airport with a radius of 8.5 nautical miles and overlaps with the Hood Army Airfield and Skylark Field Class E airspace to the northeast and east. To allow for instrument approaches, several corridors of Class E airspace extend out to create a transition from en route to the terminal environment or vice versa.

SPECIAL USE AIRSPACE

Special use airspace is defined as airspace where activities must be confined because of their nature or where limitations are imposed on aircraft not taking part in those activities. The designation of special use airspace identifies for other users the areas where military activity occurs, provides for segregation of that activity from other fliers, and allows charting to keep airspace users informed. These areas are depicted on **Exhibit 1E**.

Victor Airways: For aircraft arriving or departing the regional area using very high frequency omni-directional range (VOR) facilities, a system of Federal Airways, referred to as Victor Airways, has been established. Victor Airways are corridors of airspace eight miles wide that extend upward from 1,200 feet AGL to 18,000 feet MSL and extend between VOR navigational facilities. Victor Airways are shown with solid blue lines on **Exhibit 1E**.



LEGEND

- Airport with other than hard-surfaced runway
- Airport with hard-surfaced runways 1,500' to 8,069' in length
- Airports with hard-surfaced runways greater than 8,069' or some multiple runways less than 8,069'
- Non-directional Radio Beacon (NDB)
- VORTAC
- VOR-DME
- Victor Airways
- Class D Airspace
- Class E Airspace
- Class E (sfc) Airspace with floor 700 ft. above surface that laterally abuts 1200 ft. or higher Class E airspace
- Military Training Route
- Alert Area and MOA
- Prohibited, Restricted, and Warning Area
- Compass Rose

N

Source: San Antonio Sectional Chart, US Department of Commerce, National Oceanic and Atmospheric Administration, 4/28/16

Military Operating Areas: Military Operating Areas (MOAs) are designated areas of airspace established outside of Class A airspace to separate or segregate certain military activities and IFR traffic, and to identify for VFR traffic where these activities are conducted. While the FAA does not prohibit civilian VFR traffic from transiting an active MOA, it is strongly discouraged. Two MOAs, depicted on **Exhibit 1E**, are near GRK, including the Hood and Hood High MOA and the Gray and Hood High MOA both located to the north.

Military Training Routes: Military Training Routes (MTRs) are designated military flight paths that allow flight in excess of 250 knots at low altitude, typically below 10,000 feet MSL. MTRs can be designated for either VFR or IFR flight at altitudes below 1,500 feet or above 1,500 feet. Non-participating pilots are not restricted from utilizing MTRs; however, extreme caution and vigilance is recommended due to the nature of the participant aircraft using the MTRs. The FAA recommends contacting the nearest Flight Service Station to obtain information regarding the activity status of the MTR. MTRs within the vicinity of GRK are located primarily north and northwest of the airport and include VR101, VR186, VR1110, VR1124, VR142, and IR139.

Restricted Airspace: Restricted areas contain airspace in which the flight of aircraft, while not wholly prohibitive, is subject to restrictions. Activities within these areas must be confined because of their nature, and limitations to aircraft operations may be imposed on those aircraft that are not a part of these activities. Restricted airspace is off-limits for public use unless granted permission from the controlling agency. The restricted areas in the vicinity of GRK are used by the military.

The Air Route Traffic Control Center (ARTCC) facility having jurisdiction over the restricted airspace needs to authorize clearances to aircraft that cannot avoid the restricted area, unless the aircraft is on a previously approved altitude reservation mission or is part of the activity within the restricted area. If the restricted area is not active, the ARTCC facility will allow aircraft to transition through the airspace without issuing special clearances. Two restricted areas are located within the vicinity of GRK. **Table 1D** presents these restricted areas and their pertinent information as it relates to time of designation, designated altitudes, controlling agency, and using agency.

TABLE 1D
Restricted Airspace
Killeen-Fort Hood Regional Airport

Airspace Name	Time of Designation (Local)*	Designated Altitude	Controlling Agency	Using Agency
R-6302A	Continuous	Surface to 30,000 feet MSL	FAA, Houston ARTCC	U.S. Army, Commander, III Corps, Fort Hood, TX
R-6302B	6:00 p.m. - 6:00 a.m. Monday - Saturday	Surface to 11,000 feet MSL	FAA, Houston ARTCC	U.S. Army, Commander, III Corps, Fort Hood, TX

*Other times by NOTAM at least 24 hours in advance
Source: FAA Order JO 7400.8Y, *Special Use Airspace* (February 2016).

Prohibited Area: Prohibited Airspace P-49 is a circular area with a diameter of two nautical miles and extends from the surface to 2,000 feet AGL located in Crawford, Texas, as depicted on **Exhibit 1E**. The United States Secret Service is the imposing agency of Airspace P-49. Penetrations into prohibited airspace are strictly forbidden at all times.

AIRSPACE CONTROL

The GRK ATCT is a Department of Defense (DOD) facility located on the northwestern side of the airfield, operates on a continuous basis. Tower controllers provide services to aircraft operating on the airport and generally within a five-mile radius of GRK. Primary air traffic services for the airport are provided within the airport's Class D airspace via radio frequency 120.75. GRK ATC also provides terminal radar coverage on a continuous basis.

GRK Airport Traffic Control Tower

NAVIGATIONAL AIDS

Navigational aids are electronic devices that transmit radio frequencies which pilots of properly equipped aircraft can translate into point-to-point guidance and position information. The types of electronic navigational aids available for aircraft flying to or from GRK include a very high frequency omnidirectional range combined with distance measuring equipment (VOR-DME) facility and the global positioning system (GPS).

The VOR, in general, provides azimuth readings to pilots of properly equipped aircraft transmitting a radio signal at every degree to provide 360 individual navigational courses. Frequently, distance measuring equipment (DME) is combined with a VOR facility (VOR-DME) to provide distance as well as direction information to the pilot. Military tactical air navigation aids (TACANs) and civil VORs are commonly combined to form a VORTAC. The VORTAC provides distance and direction information to both civil and military pilots. The Gray VOR-DME is located approximately 2 miles to the southeast, while the Temple VOR-DME is located approximately 22 miles to the northeast of GRK. In addition, the Gooch Springs VORTAC is located approximately 18 miles to the northwest. Although the Gray VOR-DME is owned and operated by the U.S. Army, it is frequently used and designated for public use.

GPS is an additional navigational aid for pilots. GPS was initially developed by the United States Department of Defense for military navigation around the world. GPS differs from a VOR in that pilots are not required to navigate using a specific facility. GPS uses satellites placed in orbit around the earth to transmit electronic radio signals which pilots of properly equipped aircraft use to determine altitude, speed, and other navigational information. With GPS, pilots can directly navigate to any airport in the country and are not required to navigate to a specific ground-based navigation facility.

Many commercial service airports are equipped with an Instrument Landing System (ILS). The ILS at each end of Runway 15-33 at GRK is comprised of dual transmitter localizer equipment and dual transmitter glideslope equipment. The localizers provide an instrument approach course for horizontal alignment with runway centerline and transmit on a 14 element antenna array. The glideslopes provide vertical guidance for landing aircraft and transmit on a 3-element capture effect antenna. Additionally, the Runway 15 and 33 MALSR visually align the aircraft with the extended runway centerline.

Localizer Antenna (south of Runway 33)

INSTRUMENT APPROACH PROCEDURES

Instrument approach procedures are a series of predetermined maneuvers established by the FAA using electronic navigational aids that assist pilots in locating and landing at an airport, especially during instrument flight conditions. There are currently eight published instrument approach procedures at GRK, including two ILS instrument approaches one for each runway. Precision instrument approaches provide vertical descent information and course guidance information to the pilot. Non-precision approaches only provide course guidance to the pilot; however, the relatively new GPS localizer performance with vertical guidance (LPV) approaches are currently categorized by the FAA as a non-precision approach even though it provides vertical guidance.

It should be noted that Runways 15 and 33 are also equipped with precision approach radar (PAR) capabilities. PAR is a system in which a controller provides highly accurate navigational guidance in azimuth and elevation to pilots using the system. Pilots are given headings to fly to direct them to and keep their aircraft aligned with the extended centerline of the landing runway. PAR equipment may be used as a primary landing aid, or it may be used to monitor other types of approaches.

The capability of an instrument approach procedure is defined by the visibility and cloud ceiling minimums associated with the approach. Visibility minimums define the horizontal distance the pilot must be able to see to complete the approach. Cloud ceilings define the lowest level a cloud layer (defined in feet above the ground) can be situated for the pilot to complete the approach. If the observed visibility or cloud ceilings are below the minimums prescribed for the approach, the pilot may not be able to complete the instrument approach. **Exhibit 1F** summarizes FAA approved and published instrument approach procedures, including associated weather minimums for GRK.

The most sophisticated instrument approach procedures at GRK are associated with the ILS to Runways 15 and 33. The ILS or LOC Runway 15 and 33 approaches provide visibility minimums as low as ½-mile (2,400 feet RVR) and cloud ceilings of 200 feet AGL (referred to as a Category I approach). Generally,

	WEATHER MINIMUMS BY AIRCRAFT TYPE									
	Category A		Category B		Category C		Category D		Category E	
	CH	VIS	CH	VIS	CH	VIS	CH	VIS	CH	VIS
Runway 15 ILS Approaches										
Straight-In ILS	1,217	2,400	1,217	2,400	1,217	2,400	1,217	2,400	1,217	2,400
Straight-In LOC	1,520	2,400	1,520	2,400	1,520	5,000	1,520	5,000	1,520	6,000
Circling	1,540	1	1,540	1	1,560	1.5	1,580	2	1,740	2.5
Runway 33 ILS Approaches										
Straight-In ILS	1,195	2,640	1,195	2,640	1,195	2,640	1,195	2,640	1,195	2,640
Straight-In LOC	1,360	2,640	1,360	2,640	1,360	2,640	1,360	3,960	1,360	3,960
Circling	1,540	1	1,540	1	1,560	1.5	1,580	2	1,740	2.5
RNAV (GPS) 15										
LPV DA	1,271	2,400	1,271	2,400	1,271	2,400	1,271	2,400	1,271	2,400
LNAV/VNAV DA	1,547	6,000	1,547	6,000	1,547	6,000	1,547	6,000	1,547	2
LNAV MDA	1,540	2,400	1,540	2,400	1,540	5,000	1,540	6,000	1,540	6,000
Circling	1,540	1	1,540	1	1,560	1.5	1,580	2	1,740	2.5
RNAV (GPS) 33										
LPV DA	1,195	2,640	1,195	2,640	1,195	2,640	1,195	2,640	1,195	2,640
LNAV/VNAV DA	1,552	1.5	1,552	1.5	1,552	1.5	1,552	1.5	1,552	1.5
LNAV MDA	1,460	2,640	1,460	2,640	1,460	1	1,460	1	1,460	1
Circling	1,540	1	1,540	1	1,560	1.5	1,580	2	1,740	2.5
VOR/DME 15										
Straight-In 15	1,520	2,400	1,520	2,400	1,520	5,000	1,520	5,000	1,520	6,000
Circling	1,540	1	1,540	1	1,560	1.5	1,580	2	1,740	2.5
NDB 15										
Straight-In 15	1,740	4,000	1,740	4,000	1,740	1.5	1,740	2	1,740	2.25
Circling	1,740	1	1,740	1	1,740	2	1,740	2.25	1,740	2.5
VOR-A										
Circling	1,540	1	1,540	1	1,560	1.5	1,580	2	-	-
PAR 15										
Straight-In	1,215	2,400	1,215	2,400	1,215	2,400	1,215	2,400	1,215	2,400
PAR 33										
Straight-In	1,187	2,640	1,187	2,640	1,187	2,640	1,187	2,640	1,187	2,640
Copter VOR 33	***Copter***									
H-33	CH: 1,460						VIS: 1,320			

Aircraft categories are based on the approach speed of aircraft, which is determined as 1.3 times the stall speed in landing configuration. The approach categories are as follows:

Category A 0-90 knots (ex: Cessna 172)
Category B 91-120 knots (ex: Beechcraft King Air)
Category C 121-140 knots (ex: Boeing 737, Airbus 319, Regional Jets, Canadair Challenger)
Category D 141-165 knots (ex: Gulfstream IV)
Category E 166 knots or more (limited to certain military aircraft)

Abbreviations:

CH - Cloud Height as reported in feet Above Ground Level (AGL)
VIS - Visibility as Reported in Runway Visual Range (typical as hundreds or thousands of feet) or Statute Miles (typical as decimal)
LPV - Localizer Performance with Vertical Guidance (GPS approach providing vertical guidance)
DA - Decision Altitude (Used for vertically-guided approaches)
MDA - Minimum Descent Altitude (Used for non-precision approaches)
ILS - Instrument Landing System
LOC - Localizer
GPS - Global Positioning System
LNAV - Lateral Navigation
VNAV - Vertical Navigation
RNAV - Area Navigation
PAR - Precision Approach Radar

Source: U.S. Terminal Procedures, South Central-3, 31 March to 29 April 2016

this type of approach is considered the minimum for a commercial service airport. Larger hub airports will typically have instrument approaches offering lower visibility minimums (Categories II and III).

Instrument approaches based on the global positioning system (GPS) have become very common across the country. GPS is inexpensive, as it does not require a significant investment in ground based systems by the airport or FAA. Both runway ends at GRK are served by GPS approaches with associated minima presented on **Exhibit 1F**. GPS LPV approaches provide both horizontal and vertical guidance information to pilots. Advancements in GPS technology have allowed for instrument approach procedures to provide minimums nearly as low as more traditional ILS systems. Currently, the GPS approaches to Runways 15 and 33 include an LPV component.

REGIONAL AIRPORTS

A review of public-use airports within the vicinity of GRK has been made to identify and distinguish the type of air service provided in the area surrounding the airport. The location and services offered at these facilities will influence the aviation demand for GRK. Information pertaining to each airport was obtained from FAA records, with a summary provided on **Exhibit 1G**. Typically, airports within a 30-mile radius can influence aviation demand at the airport.

There are seven public-use airports within a 30-mile radius, as presented on the exhibit. Although some of these airports offer similar facilities and/or aviation services as GRK, Killeen-Fort Hood Regional Airport is the only airport served by commercial passenger service in the 30-mile radius. There are several commercial passenger service options at more distant locations in Waco and Dallas to the north, and Austin, College Station, San Antonio, and Houston to the south.

LANDSIDE FACILITIES

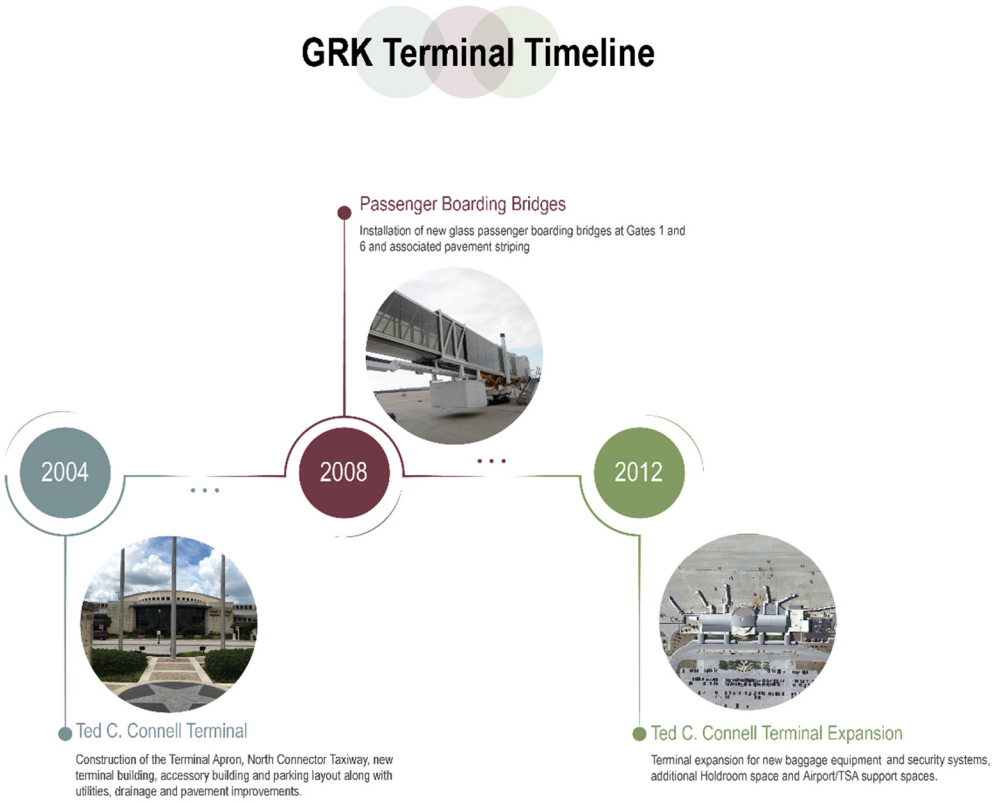
Landside facilities support the aircraft and pilot/passenger transition between air and ground. Typical landside facilities include the passenger terminal complex, general aviation facilities, and support facilities such as fuel storage, automobile parking, roadway access, snow removal facilities, and aircraft rescue and firefighting. The landside facilities at Killeen-Fort Hood Regional Airport are depicted on **Exhibit 1H**.

TERMINAL HISTORY

The city of Killeen opened their new airport facility in 2004 after a five-year period of construction beginning with the extension of Taxiway B in 1999. The terminal complex opened with six gate positions, four being serviced with passenger boarding bridges. The new terminal's aesthetics reflected the airport's history and connection to the city's military heritage.

Subsequent to the construction of the new facility, the Airport built the terminal apron, north taxiway, utilities and drainage systems. Acknowledging the need for additional boarding bridges, the Airport purchased and installed the first glass passenger boarding bridges in the country in 2008, increasing their total gates from four to six. In 2012, the Airport initiated a modernization project which included an upgraded baggage handling system (BHS) with new EDS machines and improved baggage conveyor system to increase throughput. On the first level, the project included additional support spaces for Airport and TSA back of house operations at the north end of the Airport. On the second level, the Airport also expanded holdrooms located at the north and south end of the concourse. ***Figure 1A – GRK Terminal Timeline*** is a timeline graphic showing major milestones and Airport improvements.

Figure 1A: GRK Terminal Timeline



CITY OF KILLEEN CODES AND STANDARDS

A cursory building code and regulatory review is included in the master plan to identify the potential limitations and/or capital requirements necessitated as a result of code deficiencies. During the production of this master plan the following codes and standards were in effect:

- 2015 International Construction Codes (ICC).
- International Building Code 2015 Edition as amended.
- International Fire Code, 2015 Edition as amended in Chapter 11, Killeen Code of Ordinances

SKYLARK FIELD AIRPORT (ILE)

Airport NPIAS Classification	GA
FAA Asset Study Classification	Local
Location from BVU	7.4 nm E
Elevation	847.5 ft.
Weather Reporting	AWOS
ATCT	None
Annual Operations	28,470
Based Aircraft	59
Enplaned Passengers	None

Runways	1-19
Length	5,495 ft.
Width	100 ft.
Pavement Strength	
SWL	17,000 lbs.
DWL	50,000 lbs.
Lighting	MIRL
Marking	Precision (1), Basic (19)
Approach Aids	PAPI-4
Instrument Approach Procedures	ILS (1)

Services Provided: Aircraft tiedowns, 100LL and Jet A fuel, minor airframe and power plant maintenance.

SALADO AIRPORT (2TX)

Airport NPIAS Classification	NA
FAA Asset Study Classification	NA
Location from BVU	17.2 nm ESE
Elevation	685 ft.
Weather Reporting	None
ATCT	None
Annual Operations	1,508
Based Aircraft	2
Enplaned Passengers	None

Runways	1-19
Length	3,190 ft.
Width	100 ft.
Pavement Strength	
SWL	NA (turf/dirt)
DWL	NA (turf/dirt)
Lighting	Reflectors
Marking	Non-Standard
Approach Aids	None
Instrument Approach Procedures	None

Services Provided: Aircraft tiedowns.

LAMPASAS AIRPORT (LZZ)

Airport NPIAS Classification	NA
FAA Asset Study Classification	NA
Location from BVU	19 nm W
Elevation	1,214.4 ft.
Weather Reporting	AWOS
ATCT	None
Annual Operations	10,950
Based Aircraft	13
Enplaned Passengers	None

Runways	16-34
Length	4,202 ft.
Width	75 ft.
Pavement Strength	
SWL	12,500 lbs.
DWL	NA
Lighting	MIRL
Marking	Non-Precision
Approach Aids	VASI
Instrument Approach Procedures	GPS(34)/VOR

Services Provided: Aircraft tiedowns, 100LL and Jet A fuel

GATESVILLE MUNICIPAL AIRPORT (GOP)

Airport NPIAS Classification	GA
FAA Asset Study Classification	Basic
Location from BVU	21.3 nm N
Elevation	905 ft.
Weather Reporting	AWOS
ATCT	None
Annual Operations	4,472
Based Aircraft	10
Enplaned Passengers	None

Runways	17-35
Length	3,400 ft.
Width	60 ft.
Pavement Strength	
SWL	12,500 lbs.
DWL	NA
Lighting	MIRL
Marking	Non-Precision
Approach Aids	PAPI-2
Instrument Approach Procedures	None

Services Provided: Aircraft hangars and tiedowns, major airframe and power plant maintenance, bulk and bottled oxygen.

DRAUGHTON-MILLER CENTRAL TEXAS REGIONAL AIRPORT (TPL)

Airport NPIAS Classification	GA
FAA Asset Study Classification	Regional
Location from BVU	22.2 nm ENE
Elevation	682.3 ft.
Weather Reporting	AWOS
ATCT	None
Annual Operations	53,290
Based Aircraft	194
Enplaned Passengers	None

Runways	15-33	2-20
Length	7,000 ft.	4,740 ft.
Width	150 ft.	100 ft.
Pavement Strength		
SWL	55,000 lbs.	31,000 lbs.
DWL	70,000 lbs.	37,000 lbs.
Lighting	MIRL	MIRL
Marking	Precision	Basic
Approach Aids	MALSR/PAPI-4	PAPI-4
Instrument Approach Procedures	ILS/DME	GPS(20)

Services Provided: Aircraft hangars and tiedowns, Jet A, Jet A1+, and 100LL fuel, major airframe and power plant maintenance.

GEORGETOWN MUNICIPAL AIRPORT (GTU)

Airport NPIAS Classification	Reliever
FAA Asset Study Classification	Regional
Location from BVU	24.5 nm SSE
Elevation	785.7 ft.
Weather Reporting	AWOS
ATCT	Yes
Annual Operations	73,365
Based Aircraft	291
Enplaned Passengers	None

Runways	18-36	11-29
Length	5,004 ft.	4,099 ft.
Width	100 ft.	75 ft.
Pavement Strength		
SWL	30,000 lbs	12,500 lbs.
DWL	NA	NA
Lighting	MIRL	MIRL
Marking	Non-Precision	Non-Precision
Approach Aids	PAPI-4/REIL	PAPI-2
Instrument Approach Procedures	GPS	GPS

Services Provided: Aircraft tiedowns, 100LL and Jet A1+ fuel, major airframe and power plant maintenance, bottled and bulk oxygen.

BURNET MUNICIPAL KATE CRADDOCK FIELD AIRPORT (BMQ)

Airport NPIAS Classification	GA
FAA Asset Study Classification	Local
Location from BVU	28.9 nm SW
Elevation	1,284.1 ft.
Weather Reporting	AWOS
ATCT	None
Annual Operations	16,060
Based Aircraft	45
Enplaned Passengers	None

Runways	1-19
Length	5,000 ft.
Width	75 ft.
Pavement Strength	
SWL	30,000 lbs.
DWL	NA
Lighting	MIRL
Marking	Non-Precision
Approach Aids	PAPI-4/REIL
Instrument Approach Procedures	GPS

Services Provided: Aircraft tiedowns, Jet A and 100LL fuel, major airframe and power plant maintenance.

ABBREVIATION KEY

ATCT	-	Airport Traffic Control Tower
AWOS	-	Automated Weather Observation System
DME	-	Distance Measuring Equipment
DWL	-	Dual Wheel Loading
GA	-	General Aviation
GPS	-	Global Positioning System
ILS	-	Instrument Landing System
MALSR	-	Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
MIRL	-	Medium Intensity Runway Lighting
NA	-	Not Applicable
nm	-	Nautical Miles
NPIAS	-	National Plan of Integrated Airport Systems
PAPI	-	Precision Approach Path Indicator
REIL	-	Runway End Identification Lights
SWL	-	Single Wheel Loading
VASI	-	Visual Approach Slope Indicator
VOR	-	Very High Frequency Omni-Directional Range

Source: Airport Master Record (Form 5010) and FAA National Plan of Integrated Airport Systems (NPIAS)

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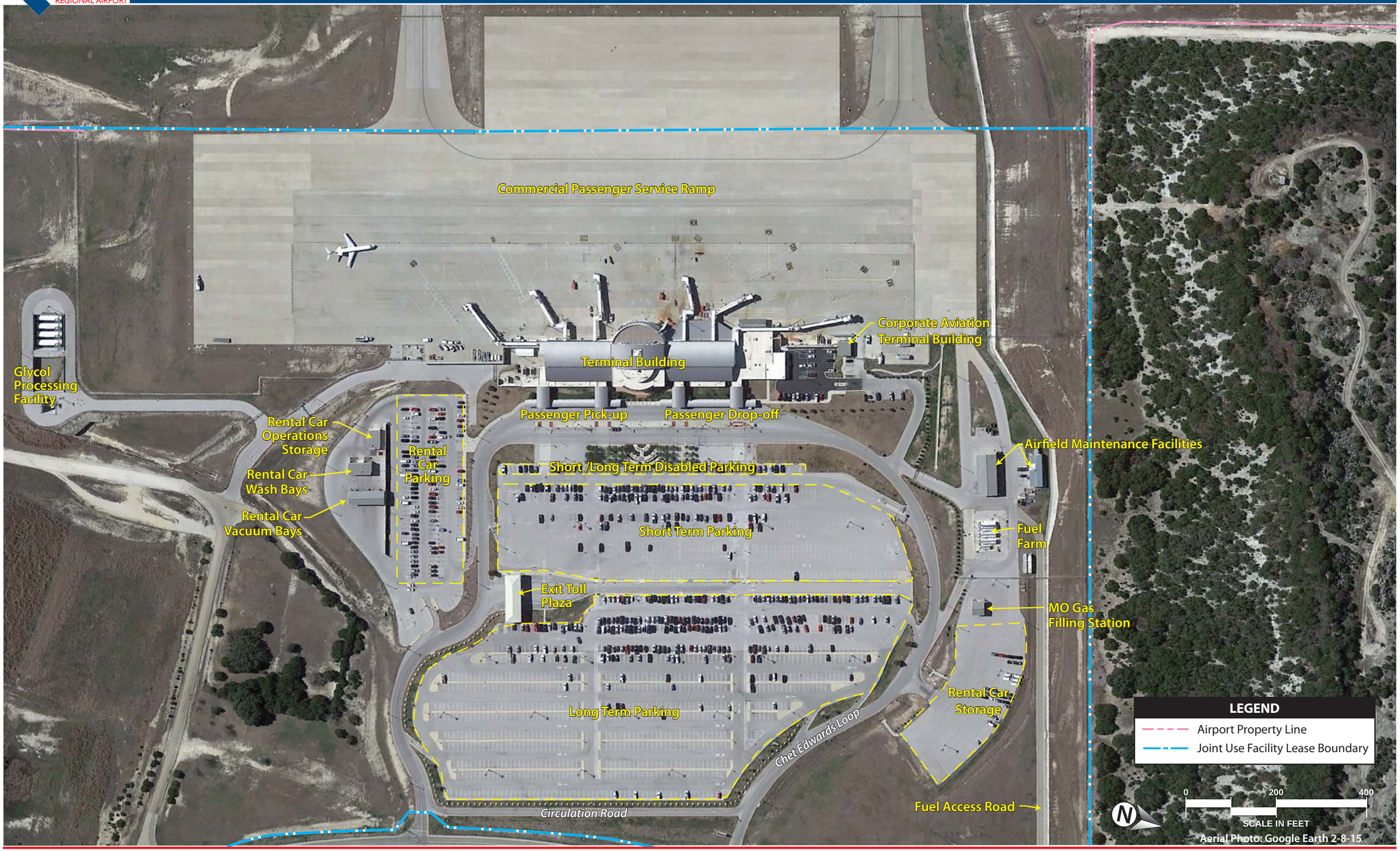

Exhibit 1H
LANDSIDE FACILITIES

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- International Residential Code, 2015 Edition as amended.
- International Plumbing Code, 2015 Edition as amended.
- International Fuel Gas Code, 2015 Edition as amended.
- International Mechanical Code, 2015 Edition as amended.
- International Energy Code, 2015 Edition as amended.
- International Property Maintenance Code, 2015 Edition as amended.
- International Electrical Code, 2015 Edition as amended (administrative regulations).
- National Electrical Code, 2016 Edition as amended.

All facilities were reviewed and designed in compliance with the Architectural Barriers Texas Accessibility Standards (TAS) 2012 to the extent required by regulations issued by the Texas Department of Licensing and Regulations under the Architectural Barrier Act, Texas Civil Statutes.

PASSENGER TERMINAL

Upon approaching the Airport, the passenger experiences the regional identity of Killeen, Texas represented by the rustic limestone façade symbolic of the nearby hills, the canopy cladded in warm rigid materials of steel and stone extending to the passenger drop off/ pick up lane and an expansive curved curtain wall bringing natural light throughout the main terminal area. Inside the terminal, the departing passenger experience begins in the double height ticketing hall proceeded by circulating up the stairs/escalators into the center of the Concourse located on the second level providing access to concessions overlooking the airfield. Next, the passenger enters one of the two security check points flanking the food court to gain access to their designated north or south holdrooms.

With regards to aesthetics, the arriving passenger's visual experience it is similar to the departing passenger experience with a continuity of exterior finishes reinforcing the regional identity. Arriving passengers deplane into the boarding bridge, fixed walkway and holdroom and continue exit through a corridor adjacent to the security check point into the center of the concourse. The passenger is then transported down to the baggage claim lobby and rental car services. Long-term and short-term parking is located east of the terminal and rental car parking is located to the south. It should be noted that **Appendix B: Airport Terminal and Parking Layout Package** contains multiple exhibits detailing varying aspects of the Airport terminal building and parking layout. **Exhibits i and ii**, located in **Appendix B**, indicate passenger flows throughout the Airport.

Table 1E depicts existing square footage for the Airport. The spaces are designated as follows: Airline & Airport Support, Airside Circulation, Baggage Claim, Baggage Screening, Concessions, Holdroom, Landside Circulation, Mechanical/Electrical/Comm, Public Restrooms, Security Screening Checkpoint and Ticket Counter/Queuing.

TABLE 1E
Existing Terminal Building Function Area Square Footage
Killeen-Fort Hood Regional Airport

Description	Existing Terminal	Percentage of Terminal SF
Airline Functions		
Ticket Counter Area	1,719	1.81%
Ticket Counter Length	*143*	0.15%
Ticket Counter Queuing	2,335	2.46%
Self Service Kiosk	2	
Curbside Baggage Check	0	0.00%
Baggage Claim Area / Oddsize Area	4,769	5.02%
Baggage Claim Frontage	*190*	0.20%
Oversized Bag Claim	*8*	
Baggage Service Office	0	0.00%
Outbound Baggage	8,643	9.10%
Inbound Baggage	2,419	2.55%
Airline Operations / Airline Ticket Office	3,400	3.58%
Departures Lounges (Holdrooms)	10,604	11.17%
Jet Gates	*6*	
Subtotal Airline Functions	**33,889**	**35.68%**
Concessions		
Concessions (Food / Beverage)	1,545	1.63%
Concessions (News / Gifts / Sundry)	1,847	1.94%
Concessions (Concession Storage)	89	0.09%
Concessions (Open Seating)	3,452	3.63%
Ground Transportation	0	0.00%
Information	73	0.08%
Rental Car Counters	2,656	2.80%
Subtotal Concessions	**9,662**	**10.17%**
Secure Public Area		
Security	3,359	3.54%
Secure Circulation	2,455	2.58%
TSA Restrooms	116	0.12%
Bag Screen Room	4,494	4.73%
TSA Offices	1,860	1.96%
TSA Break	309	0.33%
Airport Administration	7,368	7.76%
Secure Other	139	0.15%
Subtotal Secure Public Area	**20,100**	**21.16%**
Non-Secure Public Area		
Circulation - Ticketing	0	0.00%
Circulation - Baggage Claim	0	0.00%
Circulation - General	19,373	20.40%
Restrooms	2,513	2.65%
Other	0	0.00%
Subtotal Non-Secure Public Area	**21,886**	**23.04%**
Non-Public Area		
Loading Dock	0	0.00%
Storage	924	0.97%
Maintenance	279	0.29%
Mech. / Elec. / Bldg. Systems	7,950	8.37%
Restrooms	282	0.30%
Miscellaneous	0	0.00%
Subtotal Non-Public Area	**9,435**	**9.93%**
Grand Total	**94,972**	**100.00%**

The following sections describe the designated spaces in more detail. Refer to Exhibits iii, iv, and v – Existing Floor Plans located in **Appendix B** for terminal layouts.

Ticketing Lobby

The ticketing lobby on the first floor located on the north end of the Airport provides (143) linear feet of ticket counter for airline use. Ticketing is separated from the baggage lobby on the south end of the terminal building on the first floor. The ticketing lobby accommodates (10) two position tickets. American Airlines currently occupies Ticket Office #2, Delta Air Lines occupies Ticket Office #1 and United Airlines occupies Ticket Office #4 with each airline occupying the ticket counters adjacent to their leased space. Two airline specific check-in kiosks are also provided for passengers in the lobby.

Concessions

The non- secure concessions are located in the center of the concourse on the second level and include two retail locations, two food and beverage locations and open seating. Unique to the airport is the non-secure food court located within a curved curtain wall which mirrors the curved front facade and overlooks the airfield. The retail spaces are located near the central vertical circulation from the main lobby leading into the food court with open seating at a balcony overlooking the ticketing and baggage lobbies.

Located in the baggage lobby, the Airport has six (6) designated rental car offices. One of the offices is currently vacant. Offices are occupied as follows:

	Office 1	**Office 2**	**Office 3**	**Office 4**	**Office 5**
Lease Holder	Checker Leasing, Inc.	Clearwater Transportation Ltd.	The Hertz Corporation	EAN Holdings, LLC	EAN Holdings, LLC
Brand	Avis & Budget	Thrifty & Dollar	Hertz	Enterprise	National & Alamo

See rental car parking lot for a list of rental car amenities. Two counters and offices that border the rental counters are also designated for retail.

Security Screening Check Point

Two security screening checkpoints (SSCP) are located on the second level of the terminal concourse. The checkpoint at each entrance to the North and South Holdrooms is a 1-lane module standard as indicated in the Transportation Security Administration (TSA) Checkpoint Design Guide. Each checkpoint consists of queuing, an X-ray machine, a walk-through metal detector, passenger containment and a secondary screening area. In January/February 2017 AIT body scanners are planned to be installed. According to TSA, the existing checkpoints provide throughput rates ranging from (300) to (600) passengers

daily. After passing through security screening, departing passengers enter directly into the secure holdroom area located in either the north or south end of the Concourse.

Secure Holdroom

The secure holdrooms are on the north and south side of the Concourse and comprise approximately eleven percent of the terminal building when combined.

Located at the south end of the Concourse is the South Holdroom with 5,215 square feet. Restrooms for the south end total of 358 square feet located adjacent to the SSCP.

Located at the north end of the Concourse is North Holdroom with 5,389 square feet. Restrooms for the north end total of 352 square feet located adjacent to the SSCP.

Departing passengers utilize three gates within each of the second floor holdrooms. Passengers access the aircraft by walking through fixed walkways to passenger boarding bridges located on the west side of the terminal. The bridges and gate counters are owned by GRK allowing flexibility to relocate airlines as needed due to Airport peak loads, charter operations, or flight diversions.

Airport Administrative Offices

Airport administrative offices amount to approximately eight percent of the terminal building space and are located on the third level of the terminal above the Concourse. Visitors to the Airport gain access to the third level by activating an internal communications system located in interior of the elevator adjacent to the elevator control panel. The elevator is located in the main lobby opposite the Airport's central vertical circulation. The administrative offices include a reception/waiting area, breakroom, restrooms, conference rooms, and Airport employee offices.

Baggage Lobby & Outbound Baggage

The existing inbound baggage system is located on the south side of the terminal. The system consists of a baggage slide for oversized luggage, a T-shape flatbed carousel, and a C-shape flatbed carousel. The combined presentation length for both carousels equals 190 linear feet for passengers to pick up baggage. Inbound bags are fed by hand from the ramp side of the terminal building. The inbound baggage, baggage claim and lobby total approximately eight percent of the terminal.

The existing outbound baggage system consists of linear baggage conveyors originating at the ticket counters leading to a back-of-house in-line checked baggage inspection system (CBIS). The CBIS includes explosive detection system (EDS) and a checked baggage resolution area that terminates at outbound baggage make up units. The outbound baggage system also includes an On-Screen Resolution (OSR) room managed by the TSA. The existing outbound baggage areas and screening areas amount to approximately fourteen percent of the terminal.

AIRPORT ROADWAYS AND GROUND ACCESS

Vehicular Access

The airport's main entrance is accessible via SH 201/Clear Creek Road and provides access to the Airport passenger terminal area, which includes the passenger parking areas and ground. **Exhibit vi** provides a high level overview of the passenger and vehicle access to and from the terminal.

Terminal Curb Roadways

The terminal building is located with a 510-linear-foot roadway curb which serves arriving and departing passengers. The roadway consists of a six-lane road in front of the terminal building that is also used for shuttle, cab, bus, and commercial vehicle parking. The road uses a median to separate the traffic flows of passenger and commercial vehicles.

Parking Lots

Killeen – Fort Hood Regional Airport has four parking lots that provide parking for Airport employees, passengers and rental cars.

Airport Auto Parking Area (as viewed from terminal)

Employee Parking

The employee parking lot is located north of the terminal building outside of the TSA/airline support spaces and is accessed by vehicle from Terminal Loop Road via the main entrance.

Passenger Parking

Passenger parking for both short-term and long-term are combined in the same area. The parking lots are located directly east of the terminal building and accessed from Terminal Loop Road. Departing passengers are prompted to receive a ticket upon entry which will be assessed according to time spent while exiting.

Rental Car

The rental car ready/return lot is located directly south of the passenger parking lot, southeast of the terminal building. The parking lot currently contains approximately 190 spaces for rental vehicles. It is co-located with the rental car vehicle prep/service area consisting of vacuums and car wash facilities.

Terminal Ramp

The main terminal ramp abuts the commercial terminal building and provides approximately 90,000 square yards of ramp space. The ramp provides six numbered gates, with Gates 1-4 offering up to three separate boarding positions (ex. 1a, 1b, and 1c). As such, the ramp supports a total of 13 total boarding positions.

GENERAL AVIATION

GRK offers GA services; however, those services are catered toward the corporate and charter sectors. This is a direct result of the joint-use agreement between the City and the U.S. Army. As such, prior permission must be granted to all aircraft that are not regularly scheduled commercial service aircraft before operating at the airport. Furthermore, all general aviation aircraft under 12,500 pounds are typically directed to ILE unless given special consideration.

The Corporate Aviation building is located on the north end of the commercial terminal apron immediately north of the air carrier terminal building and is accessible by the airport terminal road. Airside access to the corporate aviation facilities are provided via Taxiway B3. The GA services offered at GRK include:

- Jet A fuel (including AvFuel corporate contract);
- Ground power unit (GPU);
- Air stairs (up to B-737 or A-320);
- Lavatory service;
- Towing and pushback (up to B-757);
- De-icing services; and
- Overnight parking.

SUPPORT FACILITIES

The previous sections addressed airside and landside facilities. This section discusses other related facilities that support airport operations.

Airport Rescue and Firefighting (ARFF)

14 CFR Part 139 airports are required to provide aircraft rescue and firefighting (ARFF) services during air carrier operations that require a Part 139 certificate. Each certificated airport maintains equipment and personnel based on an ARFF index established according to the length of aircraft and scheduled daily flight frequency. However, as previously noted, GRK is unique in that all ARFF services

Military Aircraft Rescue and Firefighting Facility

for civilian and military operations are provided by the Army. There are five indices, A through E, with A applicable to the smallest aircraft and E the largest (based on aircraft length). GRK falls within ARFF Index E as a result of the military aircraft in operation at RGAAF. As such, RGAAF is required to maintain a fleet of equipment and properly trained personnel consistent with this standard.

The RGAAF ARFF facility is located to the west of Taxiway A, situated between connector Taxiways C and E. **Table 1F** is an itemized list of the airfield's ARFF equipment, including firefighting agent capacities.

TABLE 1F
ARFF Equipment Inventory
Killeen-Fort Hood Regional Airport

Year-Make-Model	Dry Chemical (lbs.)	Water (gal.)	AFFF (gal.)	Turret Gun Speed (GPM)	Roof Turret Dry Chemical Discharge (lb/min.)
2008 Oshkosh 3000	500	3,000	420	Roof: 1,250 HF/625 LF Bumper: 300	12-17
2011 Oshkosh 3000	500	3,000	420	Roof: 1,250 HF/625 LF Bumper: 300	12-17
2014 Oshkosh 3000	500	3,000	420	Roof: 1,250 HF/625 LF Bumper: 300	12-17
Support Apparatus					
1999 Water Tender	NA	2,100	NA	NA	NA
2009 Ferrara Engine	NA	700	25	NA	NA
2011 Attack Truck	NA	400	NA	NA	NA
2013 Type III Wildland Engine	NA	400	NA	NA	NA

HF: High Flow
LF: Low Flow
NA: Not Applicable
Source: Airport Management

Airport Maintenance

The airport maintenance facility encompasses approximately 4,000 square feet and is currently located north of the commercial service terminal. **Table 1G** provides a list of Airport-owned maintenance equipment as well as equipment owned by DGS Aviation and Envoy.

TABLE 1G
Maintenance Equipment Inventory
Killeen-Fort Hood Regional Airport

Airport Owned Equipment		Equipment Owned by Separate Entity		
Vehicle Type	Fuel Type	Vehicle Type	Fuel Type	Owner
Ranger: 4 Pax	Gas	Baggage Tug	Diesel	DGS
Ranger: 6 Pax	Gas	Baggage Tug	Diesel	DGS
De-Ice Truck	Diesel	Baggage Tug	Diesel	DGS
Fuel Truck	Diesel	Belt Loader	Diesel	DGS
Fuel Truck	Diesel	Belt Loader	Diesel	DGS
Belt Loader	Diesel	Lac. Cart	Gas	DGS
Lav. Cart	Electric	GPU	Gas	DGS
Disabled Lift	Electric	GPU	Gas	DGS
GPU	Diesel	Airstart	Gas	DGS
Pushback Tug	Diesel	De-Ice Truck	Gas	DGS
Pushback Tug	Diesel	Pushback Tractor	Diesel	DGS
Gator	Gas	Pushback Tractor	Diesel	DGS
Pickup Truck	Gas	De-Ice Truck	Diesel	Envoy
Pickup Truck	Gas	Airstart	Diesel	Envoy
Pickup Truck	Gas	Airstart	Diesel	Envoy
Jeep	Gas	A/C Unit	Diesel	Envoy
Jeep	Gas	A/C Unit	Diesel	Envoy
Pickup Truck	Gas	GPU	Diesel	Envoy
Emergency	Diesel	Pushback Tug	Diesel	Envoy
JLG Lift	Electric	Belt Loader	Gas	Envoy
JLG Hydraulic Lift	Electric	Baggage Tractor	Electric	Envoy
JD Tractor	Diesel	Baggage Tractor	Electric	Envoy
ZTR Mower	Gas	Baggage Tractor	Electric	Envoy
Gator	Gas	Pushback Tug	Electric	Envoy
Paint Equipment	Gas	Belt Loader	Electric	Envoy
Paint Equipment	Gas	Air Bottle	Electric	Envoy
Lift Truck	Diesel			
ZTR Mower	Diesel			
ZTR Mower	Diesel			
JD Tractor	Diesel			
Street Sweeper	Diesel			

Source: Airport Certification Manual

Aircraft De-Icing Fluid Recycling Facility

Aircraft Deicing Fluid Recycling Facility

The deicing fluid recycling facility was constructed immediately south of the commercial service ramp, just outside of the security fence. The facility's primary role is to reclaim and recycle the deicing fluid from the ramp spent from operations at GRK as well as prevent contaminants from running into Gray Lake. The complex is supported by a 33,500-square foot treatment infrastructure with associated tank inventory, presented in **Table 1H**.

TABLE 1H
Inventory of Storage Tanks Associated with Aircraft Deicing and Fluid Recycling Activities
Killeen-Fort Hood Regional Airport

Qty of Tanks	Tank Size (gallons)	Purpose	Location
1	7,500	Waste oil tank	South of commercial service ramp
1	550	Oil-water separator	South of commercial service ramp
4	46,000	Glycol storage tanks	South of commercial service ramp
1	500,000	Retention pond	South of commercial service ramp

Source: Airport Management

Fuel Storage

Under revised 14 CFR Part 139.321, *Handling and Storing of Hazardous Substances and Materials*, the FAA has clarified the airport operator's responsibility for fuel storage areas owned or operated by tenant air carriers. Specifically, the FAA has deleted paragraph (h), which exempted the airport operator from overseeing Part 121 or 135 air carrier fueling operations to ensure compliance with Part 139 fuel fire safety requirements. Accordingly, the FAA holds airport operators responsible for protecting against fire and explosion in air carrier fuel storage facilities. This will ensure that all fuel storage facilities at Part 139 airports are inspected in the same manner and held to the same fuel fire safety standards.

A wide range of fuel is stored on the airport in bulk storage tanks. The significant facilities are listed in **Table 1J**.

TABLE 1J
Fuel Storage
Killeen-Fort Hood Regional Airport

Location	Installed	Type Containment	Fuel Type	Capacity (gallons)	Ownership
Fuel farm located east of the airport maintenance facility	2004	Double-walled steel tank in concrete containment tub	Auto Gas	3,000	City of Killeen
Fuel farm located east of the airport maintenance facility	2004	Double-walled steel tank in concrete containment tub	Jet A	12,000	City of Killeen
Fuel farm located east of the airport maintenance facility	2004	Double-walled steel tank in concrete containment tub	Jet A	12,000	City of Killeen
Fuel farm located east of the airport maintenance facility	2004	Double-walled steel tank in concrete containment tub	Jet A	12,000	City of Killeen
Fuel farm located east of the airport maintenance facility	2009	Double-walled steel tank in concrete containment tub	Jet A	12,000	City of Killeen
Apron area north of corporate aviation facility	2004	Double-walled steel tank	Diesel	500	City of Killeen
Apron area north of corporate aviation facility	2004	Fuel truck/double-walled steel tank	Jet A	5,000	City of Killeen
Apron area north of corporate aviation facility	2004	Fuel Truck/double-walled steel tank	Jet A	5,000	City of Killeen
Fuel tank mounted under emergency generator	2004	Double-walled steel tank	Diesel	780	City of Killeen

Source: Airport Management

Rental Car Service and Storage

Five car rental companies conduct business at GRK for the following brands: Avis, Alamo, Budget, Enterprise, and National. All have counter space in the terminal building and share a wash rack and cleaning facilities located southeast of the terminal building.

Rental Car Storage and Service Facility and Security Fence

Security Fencing

Ground vehicles authorized by the Airport to operate on movement and safety areas are limited to those vehicles necessary for airport operations. These include airport maintenance vehicles, police patrols, fire and rescue vehicles, aircraft fuel and service vehicles, and others authorized by the airport such as airline vehicles, construction vehicles, FAA, and airport staff. A service road provides access to the perimeter of the airfield to authorized ground vehicles.

Seven miles of the perimeter of the RGAAF is fenced with seven-foot chain-link fencing with barbed-wire outriggers at the top. Airport staff is responsible for the maintenance and upkeep of the security fencing system in the Airport leased area. The Airport fencing complies with TSA security requirements in 49 CFR Part 1542. Signs prohibiting unauthorized entry are displayed on gates, fences, buildings and other prominent locations to control inadvertent entry to the airfield. Four security gates are located at various locations around the perimeter fence, three of which are controlled with keypads requiring a pin number access code as well as proximity technology card readers. The fourth gate is secured utilizing a chain and lock system.

SOCIOECONOMIC CHARACTERISTICS

For an airport planning study, socioeconomic characteristics are collected and examined to derive an understanding of the dynamics of growth within the study area. Socioeconomic information related to the approximate airport service area is an important consideration in the master planning process. The primary service area for GRK has been and will continue to be the entirety of Bell County and the Killeen-Temple-Fort Hood MSA. The MSA is defined as Bell County, as well as Lampasas to the northwest and Coryell County to the north-northwest. Other nearby counties and communities influence aviation demand at GRK, but serve as a secondary service area.

The historic trend in elements such as population, employment, income, and earnings provides insight into the long term socioeconomic condition of the region. This information is essential in determining

aviation service level requirements, as well as forecasting aviation demand elements for airports. Aviation forecasts are typically related to the population base, economic strength of the region, and the ability of the region to sustain a strong economic base over an extended period of time.

Historical and forecast socioeconomic data for Bell County was obtained from Woods & Poole Economics - *Complete Economic and Demographic Data Source*, 2016. Woods & Poole utilizes information from the U.S. Census Bureau, as well as other national and state organizations for historic data to project future conditions. The information is presented on **Exhibit 1J**.

AREA LAND USE

GRK is located in a primarily rural area on the southwestern side of the City of Killeen. Not unlike other airports in the United States, area land uses surrounding GRK can have a significant impact on airport operations and growth. **Exhibit 1K** illustrates the planned land uses near the Airport as well as the City of Killeen. By understanding the land use issues surrounding the Airport, more appropriate recommendations can be made for the future of the Airport.

Land surrounding GRK falls primarily under two jurisdictions: Killeen and Fort Hood. A large majority of existing land use adjacent to the north, west, and south of the Airport is owned by Fort Hood. This is advantageous to the Airport as there are minimal noise conflicts associated with the Airport and its surrounding land use. Although the Airport is zoned within a rural land use designation, immediately to the east, land use is primarily zoned as suburban commercial and suburban residential. Given the proximity of potentially noise-sensitive land uses on the eastern side of the Airport, expansion of both airport and suburban commercial/residential areas should be carefully planned.

ENVIRONMENTAL INVENTORY

The purpose of the following environmental inventory is to identify potential environmental sensitivities that should be considered when planning future improvements at GRK.

Research was done for each of the 14 environmental impact categories described within the FAA's Order 1050.1F *Environmental Impacts: Policies and Procedures*. These categories are:

- Air Quality
- Biological Resources (including fish, wildlife, and plants)
- Climate
- Coastal Resources
- Department of Transportation Act, Section 4(f)
- Farmlands
- Hazardous Materials, Solid Waste, and Pollution Prevention
- Historical, Architectural, Archeological, and Cultural Resources
- Land Use
- Natural Resources and Energy Supply
- Noise and Compatible Land Use

- Socioeconomics, Environmental Justice, and Children's Environmental Health and Safety Risks
- Visual Effects (including light emissions)
- Water Resources (wetlands, floodplains, surface waters, groundwater, and wild and scenic rivers)

Coastal Resources is not a resource that impacts the Airport and was therefore not inventoried. Resource categories which are part of the developed environment of the Airport, such as lighting and utilities, are discussed in previous sections of this chapter. The following sections provide a discussion of the remaining resource categories.

AIR QUALITY

Air quality is described by the concentrations of various pollutants in the atmosphere. The significance of a pollution concentration is determined by comparing it to state and federal air quality standards. In 1971, the U.S. Environmental Protection Agency (EPA) established standards that specify the maximum permissible short term and long term concentrations of various air contaminants. The National Ambient Air Quality Standards (NAAQS) consist of primary and secondary standards for six criteria pollutants which include: Ozone (O_3), Carbon Monoxide (CO), Sulfur Dioxide (SO_2), Nitrogen Oxide (NO_x), Particulate matter (PM_{10} and $PM_{2.5}$), and Lead (Pb).

Based on both federal and state air quality standards, a specific geographic area can be classified as either an "attainment," "maintenance," or "non-attainment" area for each pollutant. The threshold for non-attainment designation varies by pollutant. Killeen-Fort Hood Regional Airport is in Bell County, Texas, which is designated as an attainment area for all federal criteria pollutants[1].

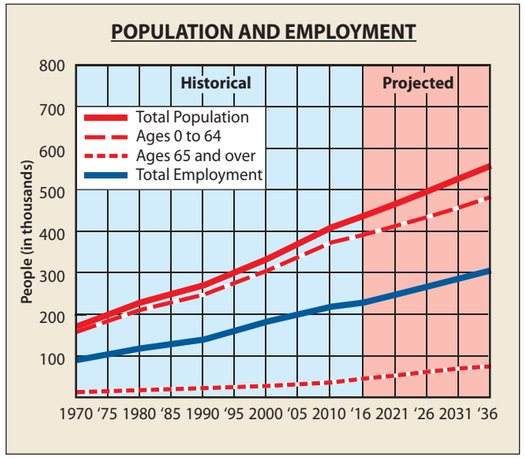
BIOLOGICAL RESOURCES

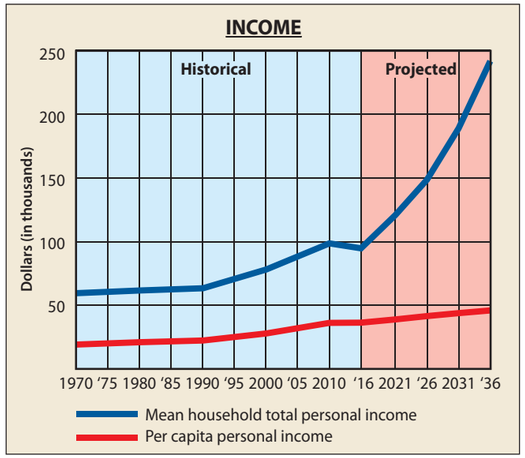
Biotic resources include the various types of plants and animals that are present in an area. The term also applies to rivers, lakes, wetlands, forests, and other habitat types that support plants, birds, animals/reptiles, and/or fish.

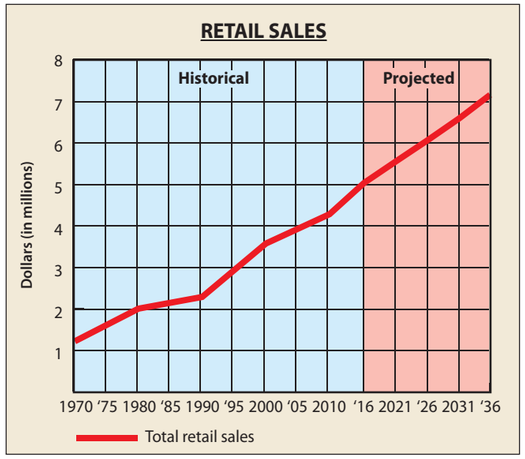
The U.S. Fish and Wildlife Service (USFWS) is charged with overseeing the requirements contained within Section 7 of the *Endangered Species Act* (ESA). This Act was put into place to protect animal or plant species whose populations are threatened by human activities. Along with the FAA, the USFWS reviews projects to determine if a significant impact to these protected species will result with implementation of a proposed project. Significant impacts occur when the proposed action could jeopardize the continued existence of a protected species or would result in the destruction or adverse modification of federally designated critical habitat in the area.

[1] https://www3.epa.gov/airquality/greenbook/ancl.html#TEXAS

	HISTORICAL							PROJECTED				
	1970	1980	1990	2000	2010	2016	CAGR	2021	2026	2031	2036	CAGR (2016-2036)
POPULATION												
Total Population	170,154	227,860	269,515	332,989	408,217	435,551	2.06%	464,242	494,404	525,470	556,078	1.23%
Median Age (years)	22.74	24.41	27.18	29.13	30.03	31.25	0.69%	32.23	32.74	32.6	32.72	0.23%
Ages 0-64	157,365	210,233	247,037	305,165	372,198	390,266	1.99%	411,557	432,846	455,811	481,168	1.05%
Ages 65 and over	12,789	17,627	22,478	27,824	36,019	45,325	2.79%	52,685	61,558	69,659	74,910	2.54%
Male	96,113	122,390	140,426	167,718	201,862	217,039	1.79%	230,597	245,161	260,268	275,302	1.20%
Female	74,041	105,470	129,089	165,271	206,355	218,512	2.38%	233,645	249,243	265,202	280,776	1.26%
Total Households	47,415	71,922	89,496	112,548	145,201	162,422	2.71%	175,345	186,209	196,277	205,553	1.18%
Persons Per Household	2.91	2.82	2.74	2.72	2.67	2.56	-0.28%	2.54	2.55	2.58	2.62	0.12%
EMPLOYMENT												
Total Employment	89,828	117,725	139,119	182,513	217,957	227,768	2.04%	246,661	265,960	285,421	304,907	1.47%
Farm	4,347	3,980	4,125	4,682	4,720	4,839	0.23%	5,019	5,176	5,307	5,414	0.56%
Forestry,Fishing, Related Activities and Other	79	166	284	410	427	370	3.41%	393	417	440	464	1.14%
Mining	183	302	381	393	1,122	1,707	4.97%	1,841	1,984	2,136	2,296	1.49%
Utilities	216	244	219	326	443	368	1.17%	373	375	375	373	0.07%
Construction	2,794	5,284	4,817	8,784	9,346	11,381	3.10%	12,575	13,574	14,235	14,732	1.30%
Manufacturing	4,657	7,917	9,014	9,953	7,973	8,475	1.31%	8,786	8,931	9,000	9,028	0.32%
Wholesale Trade	1,228	1,653	2,412	4,369	4,485	5,352	3.25%	5,788	6,176	6,558	6,916	1.29%
Retail Trade	6,446	10,037	12,653	17,899	19,085	21,644	2.67%	23,631	25,467	27,415	29,472	1.56%
Transportation and Warehousing	2,444	2,918	2,465	3,863	5,585	5,688	1.85%	6,140	6,695	7,284	7,873	1.64%
Information	513	789	1,138	1,704	2,686	2,372	3.38%	2,490	2,607	2,724	2,841	0.91%
Finance and Insurance	1,612	3,134	3,668	5,636	7,403	9,775	4.00%	11,607	13,493	15,393	17,282	2.89%
Real Estate and Rental and Lease	1,296	2,501	2,917	4,509	6,751	7,309	3.83%	8,175	9,127	10,161	11,279	2.19%
Professional and Technical Services	1,157	1,797	3,150	4,943	7,818	7,255	4.07%	7,846	8,497	9,203	9,969	1.60%
Management of Companies and Enterprises	40	63	112	157	336	880	6.95%	979	1,079	1,180	1,282	1.90%
Administrative and Waste Services	1,966	2,887	4,456	7,263	7,624	7,559	2.97%	8,021	8,527	9,023	9,469	1.13%
Educational Services	287	439	771	1,291	2,314	3,290	5.45%	3,953	4,724	5,584	6,511	3.47%
Health Care and Social Assistance	3,819	5,875	10,217	15,380	19,006	22,276	3.91%	25,150	28,364	31,852	35,468	2.35%
Arts, Entertainment, and Recreation	431	670	1,016	1,567	1,874	2,399	3.80%	2,664	2,963	3,275	3,585	2.03%
Accommodation and Food Services	2,676	4,151	6,273	9,453	12,543	14,448	3.73%	16,336	18,367	20,369	22,306	2.20%
Other Services, Except Public Administration	2,146	3,371	5,859	8,512	10,542	11,877	3.79%	13,204	14,676	16,287	18,029	2.11%
Federal Civilian Government	6,508	7,566	8,721	7,911	11,448	10,660	1.08%	11,179	11,710	12,252	12,806	0.92%
Federal Military	39,430	42,423	38,315	42,604	48,486	40,330	0.05%	40,449	40,568	40,688	40,810	0.06%
State and Local Government	5,553	9,558	16,136	20,904	25,940	27,514	3.54%	30,062	32,463	34,680	36,702	1.45%
INCOME AND SPENDING												
Total Earnings (2009 Dollars)	2,708,743	3,682,627	4,562,929	6,841,690	10,968,326	11,144,657	3.12%	12,492,567	13,948,617	15,511,276	17,185,799	2.19%
Per Capita Personal Income (2009 Dollars)	19,655	21,470	22,822	28,352	36,659	36,828	1.37%	39,372	41,984	44,311	46,413	1.16%
Mean Household Total Personal Income (2009 Dollars)	59,882	62,088	63,842	78,559	99,074	95,192	1.01%	121,338	149,112	189,416	242,159	4.78%
Gross Regional Product (2009 Dollars)	4,093,008	6,027,389	7,481,564	10,613,990	18,295,297	19,176,955	3.41%	21,531,022	24,072,225	26,794,538	29,705,480	2.21%
Total Retail Sales (2009 Dollars)	1,198,045	1,986,017	2,268,006	3,556,359	4,265,007	5,022,461	3.16%	5,541,998	6,054,680	6,585,724	7,145,801	1.78%
Total Retail Sales Per Household (in 2009 Dollars)	25,267	27,613	25,342	31,599	29,373	30,922	0.44%	31,606	32,516	33,553	34,764	0.59%







Source: Woods & Poole Complete Economic and Demographic Data Source (CEEDS) 2016

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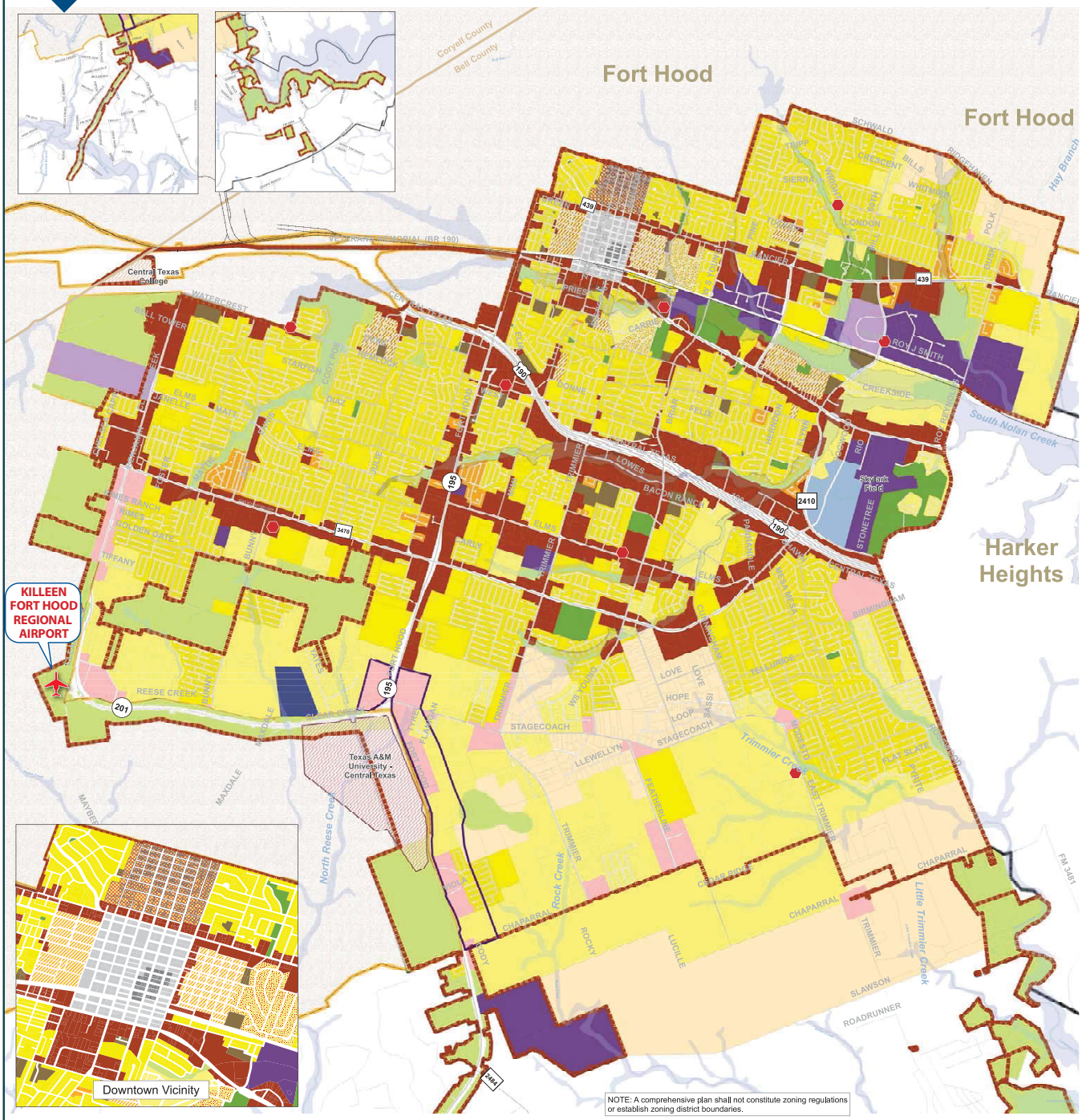


LEGEND

- Urban Center (UC)
- Urban (U)
- University Village (UV)
- Planned Development (PD)
- Multi-Family Residential (MFR)
- Industrial (I)
- Neighborhood Conservation (NC)
- General Residential (GR)
- Residential Mix (R-MIX)
- Four-Plex Residential (RQ)
- Residential-Commercial Mix (RC-MIX)
- General Commercial (GC)
- Suburban Residential (SR)
- Suburban Commercial (SC)
- Business Park (BP)
- Estate (E)
- Parks-Recreation (P-R)
- Rural (R)
- City Limits
- ETJ
- 195 Overlay District
- Texas A&M-Central Texas
- Central Texas College
- Fort Hood
- 100-year Floodplain
- 500-year Floodplain
- Fire Stations
- Railroad

0 1,750 3,500 7,000 10,500

Per the USFWS Information for Planning and Conservation (IPaC) report, there are seven threatened or endangered species listed for the vicinity of the airport: Salado Salamander (threatened, amphibian), Black-capped Vireo (endangered, bird), Golden-cheeked Warbler (endangered, bird), Least Tern (endangered, bird), Piping Plover (threatened, bird), Red Knot (threatened, bird), and Whopping Crane (endangered, bird). The Salado Salamander is found in freshwater springs. The Black-capped Vireo resides in scattered clumps of shrubs separated by open grassland. The Golden-cheeked Warbler prefers woodlands with tall, hardwood trees. The Least Tern occupies bare or sparsely vegetated sand, shell and gravel beaches, often along rivers and reservoirs. The Piping Plover lives on sandy beaches and lakeshores. The Red Knot typically occurs in tidal flats, shorelines, and sometimes on open sandy beaches. The Whopping Crane prefers salt flats and marshes[2]. The nearest critical habitat is for the Salado Salamander, found 14.7 miles southeast of the Airport.

In addition to the ESA, the *Migratory Bird Treaty Act* (MBTA) is also applicable at the Airport as much of the study area constitutes habitat for birds protected under the MBTA. The IPaC report for the airport lists 22 bird species that may be affected by projects at the Airport.

Birds protected under the MBTA may nest, winter, or migrate throughout the area, including those protected by the ESA. Under the requirements of the MBTA, all project proponents are responsible for complying with the appropriate regulations protecting birds when planning and developing a project. Migratory birds known to occur in the study area are listed in **Table 1K**.

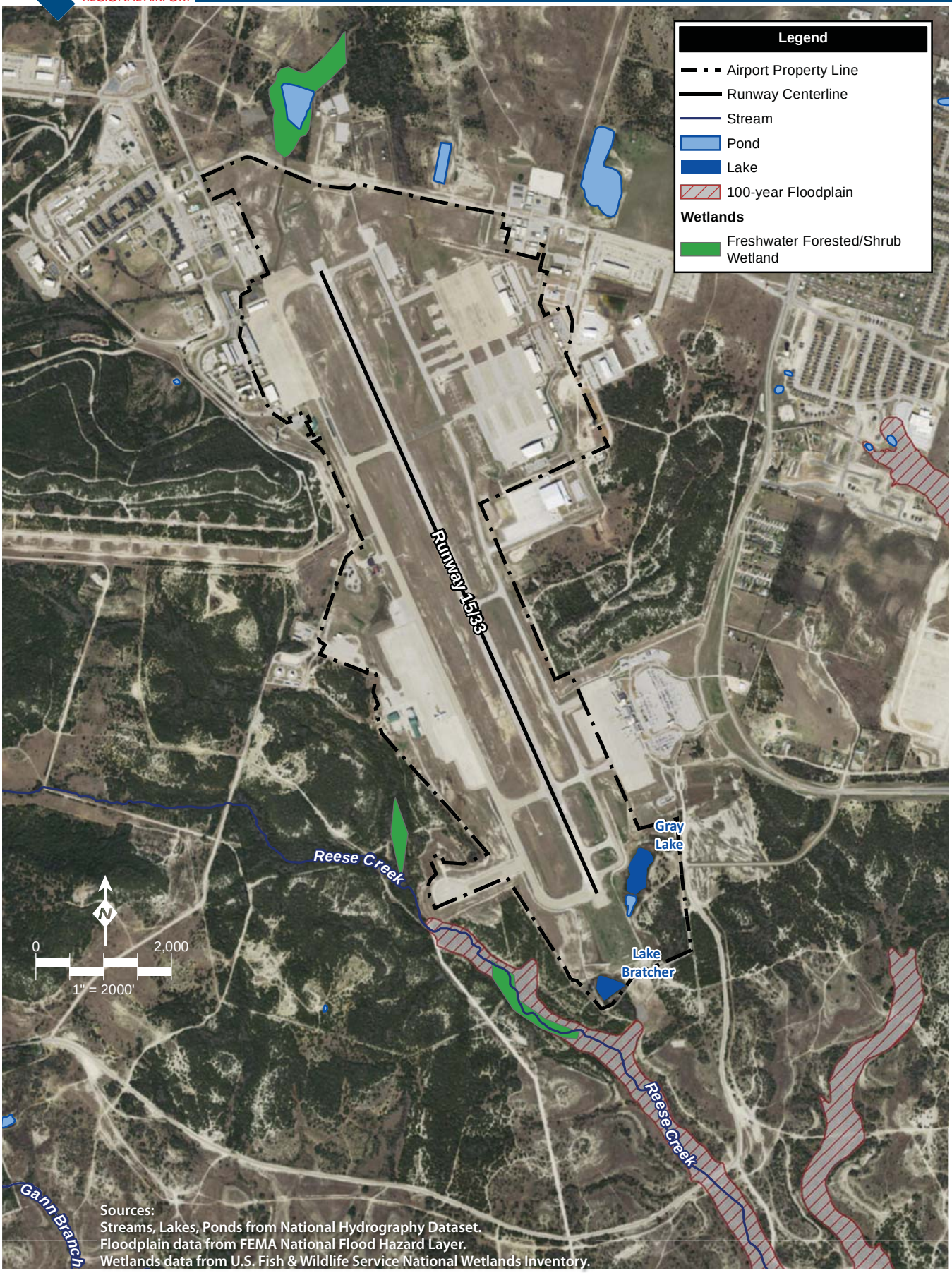
TABLE 1K
Birds Protected Under the *Migratory Bird Treaty Act*
Bell County, Texas

Bald Eagle	Lewis's Woodpecker
Bell's Vireo	Loggerhead Shrike
Burrowing Owl	Mississippi Kite
Chestnut-collared Longspur	Orchard Oriole
Dickcissel	Painted Bunting
Fox Sparrow	Prothonotary Warbler
Harris's Sparrow	Red-headed Woodpecker
Hudsonian Godwit	Rufus-crowned Sparrow
Lark Bunting	Rusty Blackbird
Le Conte's Sparrow	Short-eared Owl
Least Bittern	Sprague's Pipit

Source: USFWS IPaC Report, April 2016

A review of the National Hydrography Dataset[3], published by the United States Geological Survey, and the Texas Watershed Viewer[4], was conducted to determine the presence of perennial streams, rivers, sand and gravel pits, lakes and reservoirs within the study area. There are several types of waterbodies around the Airport. These are displayed on **Exhibit 1L**.

[2] https://tpwd.texas.gov/huntwild/wild/species/
[3] http://viewer.nationalmap.gov/basic/
[4] https://tpwd.texas.gov/education/water-education/Watershed%20Viewer


Legend
Airport Property Line
Runway Centerline
Stream
Pond
Lake
100-year Floodplain
Wetlands
Freshwater Forested/Shrub Wetland
Runway 15/33
Reese Creek
Gray Lake
Lake Bratcher
Reese Creek
Gann Branch
N
0
2,000
1" = 2000'
Sources:
Streams, Lakes, Ponds from National Hydrography Dataset.
Floodplain data from FEMA National Flood Hazard Layer.
Wetlands data from U.S. Fish & Wildlife Service National Wetlands Inventory.

- Gann Branch
- Gray Lake
- Lake Bratcher
- Reese Creek
- Un-named ponds

HISTORICAL, ARCHITECTURAL, ARCHEOLOGICAL, AND CULTURAL RESOURCES

Determination of a project's environmental impact to historic and cultural resources is made under guidance in the *National Historic Preservation Act* (NHPA) *of 1966* as amended, the *Archaeological and Historic Preservation Act* (AHPA) *of 1974*, the *Archaeological Resources Protection Act* (ARPA), and the *Native American Graves Protection and Repatriation Act* (NAGPRA) *of 1990*. In addition, the *Antiquities Act of 1906*, the *Historic Sites Act of 1935*, and the *American Indian Religious Freedom Act of 1978* also protect historical, architectural, archaeological, and cultural resources. Impacts may occur when the proposed project causes an adverse effect on a property which has been identified (or is unearthed during construction) as having historical, architectural, archaeological, or cultural significance.

There is one place listed on the National Register of Historic Places within five miles of the airport.

- Copperas Cove Stagestop and Post Office, 5.0 miles west of the Airport

DEPARTMENT OF TRANSPORTATION ACT, SECTION 4(f)

Section 4(f) of the DOT Act, which was recodified and renumbered as Section 303(c) of 49 USC, provides that the Secretary of Transportation will not approve any program or project that requires the use of any publicly owned land from a historic site, public parks, recreation areas, or waterfowl and wildlife refuges of national, state, regional, or local importance unless there is no feasible and prudent alternative to the use of such land, and the project includes all possible planning to minimize harm resulting from the use.

The following list summarizes the nearest properties of each type that may be protected under Section 4(f) of the DOT Act:

- Historic site listed on the National Register of Historic Places – Waco Suspension Bridge, 52.3 miles northeast of the Airport
- Nearest locally owned park – Iduma Park, 3.0 miles northeast of the Airport
- Recreation Area – Amistad National Recreation Area, 207.4 miles west of the Airport
- Wilderness Area – Little Lake Creek Wilderness, 127.8 miles east of the Airport
- Wildlife Refuge – Balcones Canyonlands National Refuge, 28.2 miles south of the Airport

FARMLANDS

Under the *Farmland Protection Policy Act* (FPPA), federal agencies are directed to identify and consider the adverse effects of federal programs on the preservation of farmland, to consider appropriate alternative actions which could lessen adverse effects, and to assure that such federal programs are, to the extent practicable, compatible with state or local government programs and policies to protect farmland. The FPPA guidelines developed by the U.S. Department of Agriculture (USDA) apply to farmland classified as prime or unique, or of state or local importance as determined by the appropriate government agency, with concurrence by the Secretary of Agriculture.

Information obtained from the Natural Resource Conservation Service's (NRCS) Web Soil Survey indicates that approximately 34.0% of the airport property is classified as farmland of statewide importance.

HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

Federal, state, and local laws regulate hazardous materials use, storage, transport, and disposal. These laws may extend to past and future landowners of properties containing these materials. In addition, disrupting sites containing hazardous materials or contaminates may cause significant impacts to soil, surface water, groundwater, air quality, and the organisms using these resources. According to the EPA's *EJSCREEN*, there are no Superfund sites within five miles of the Airport[5].

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

Executive Order 12898, *Federal Action to Address Environmental Justice in Minority Populations and Low-Income Populations,* the accompanying Presidential Memorandum, and Order DOT 5610.2, *Environmental Justice* require FAA to provide for meaningful public involvement by minority and low-income populations, as well as analysis that identifies and addresses potential impacts on these populations that may be disproportionately high and adverse. The EPA's *EJSCREEN* online tool was consulted regarding the presence of environmental justice areas within the airport environs. According to the tool, 43 percent of the population within the five-mile radius around the airport is considered low-income. Fifty-six percent of the people living in this area are considered minorities.

WATER RESOURCES

Wetlands. The U.S. Army Corps of Engineers regulates the discharge of dredged and/or fill material into waters of the United States, including adjacent wetlands, under Section 404 of the *Clean Water Act*. Wetlands are defined in Executive Order 11990, *Protection of Wetlands*, as "those areas that are inundated by surface or groundwater with a frequency sufficient to support and under normal circumstances

[5] https://ejscreen.epa.gov/mapper/

does or would support a prevalence of vegetation or aquatic life that requires saturated or seasonably saturated soil conditions for growth and reproduction." Wetlands can include swamps, marshes, bogs, sloughs, potholes, wet meadows, river overflows, mud flats, natural ponds, estuarine areas, tidal overflows, and shallow lakes and ponds with emergent vegetation. Wetlands exhibit three characteristics: the soil is inundated or saturated to the surface at some time during the growing season (hydrology), has a population of plants able to tolerate various degrees of flooding or frequent saturation (hydrophytes), and soils that are saturated enough to develop anaerobic conditions during the growing season (hydric).

According to the U.S. Fish and Wildlife Service, which manages the National Wetlands Inventory on behalf of all federal agencies, there are three freshwater forested/shrub wetlands present near the airport[6] (shown on **Exhibit 1L**). Additionally, based on information from the NRCS Web Soil Survey, the soils present at the airport do not have any hydric components.

Floodplains. Executive Order 11988 directs federal agencies to take action to reduce the risk of flood loss, minimize the impact of floods on human safety, health, and welfare, and restore and preserve the natural and beneficial values served by the floodplains. Based on a review of Federal Emergency Management Agency (FEMA) maps dated September 26, 2008, there are two floodplains south and east of the airport that have a one percent annual chance flood (100-year flood). These are displayed on **Exhibit 1L**.

Surface Waters. The *Clean Water Act* provides the authority to establish water quality standards, control discharges, develop waste treatment management plans and practices, prevent or minimize the loss of wetlands, and regulate other issues concerning water quality. Water quality concerns related to airport development most often relate to the potential for surface runoff and soil erosion, as well as the storage and handling of fuel, petroleum products, solvents, etc. Additionally, Congress has mandated (under the *Clean Water Act*) the National Pollutant Discharge Elimination System (NPDES). Using permits, certain procedures are required to prevent contamination of water bodies from storm water runoff. The EPA can delegate this permit authority to individual states. In Texas, the Texas Commission on Environmental Quality (TCEQ) administers the TPDES program. This program addresses non-agricultural storm water discharges. With TPDES permits, certain procedures are required to prevent contamination of water bodies from storm water runoff.

Examples of direct impacts to surface waters include any in-water work resulting from expansion of an existing FAA facility adjacent to surface waters, or a withdrawal of water from a surface water for construction or operations. There are no impaired waters (under section 303(d) of the *Clean Water Act*) within five miles of the airport for which Total Maximum Daily Loads (TMDLs) have been exceeded[7].

National Wild and Scenic Rivers. The National Wild and Scenic Rivers System was created in 1968 to preserve certain rivers with outstanding natural, cultural, and recreational values[8]. There are no Wild and Scenic Rivers in the region of the airport.

[6] http://www.fws.gov/wetlands/Data/Mapper.html
[7] https://www.tceq.texas.gov/assets/public/waterquality/swqm/assess/14txir/2014_303d.pdf
[8] http://www.rivers.gov/wsr-act.php

National Marine Sanctuary. The Office of National Marine Sanctuaries oversees National Marine Sanctuaries to preserve the natural beauty, biodiversity, history and economic productivity of these underwater areas[9]. There are no Marine Sanctuaries in the region of the airport.

National River Inventory. The Nationwide Rivers Inventory (NRI) is managed by the U.S. Department of the Interior's National Park Service. The NRI contains more than 3,400 rivers in the U.S. that are believed to have one or more natural or cultural characteristics deemed to be of more than local or regional importance[10].There are no rivers on the NRI near the airport.

Groundwater. Groundwater is subsurface water that occupies the space between sand, clay, and rock formations. The term aquifer is used to describe the geologic layers that store or transmit groundwater, such as to wells, springs, and other water sources. Examples of direct impacts to groundwater could include withdrawal of groundwater for operational purposes or reduction of infiltration or recharge area due to new impervious surfaces. The Edwards Aquifer II is a sole source aquifer 55.7 miles south of the airport. The airport property is underlain by a non-yielding base rock aquifer.

[9] http://sanctuaries.noaa.gov/about/
[10] http://www.nps.gov/ncrc/programs/rtca/nri/index.html

DOCUMENT SOURCES

A variety of sources were used during the inventory process. The following listing reflects a partial compilation of these sources. In addition, considerable information was provided directly to the consultant by Killeen-Fort Hood Regional Airport.

Airport/Facility Directory Northeast U.S., U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office. Effective May 26, 2016 – June 22, 2016.

U.S. Terminal Procedures, South Central U.S., U.S. Department of Transportation, Federal Aviation Administration, National Aeronautical Charting Office. Effective May 26, 2016 - June 23, 2016.

National Plan of Integrated Airport Systems (NPIAS), U.S. Department of Transportation, Federal Aviation Administration, 2015-2019.

Killeen Municipal Airport and Killeen Joint Use Airport at Robert Gray Army Airfield Planning Program—Final Report, 2002. Completed by Bernard Dunkelberg and Company.

A number of internet websites were also used to collect information for the inventory chapter. These include the following:

Killeen-Fort Hood Regional Airport:
http://www.flykilleen.net/

TxDOT- Aviation Division:
https://www.txdot.gov/

Texas Airport System Plan (TASP):
http://ftp.dot.state.tx.us/pub/txdot-info/avn/tasp_2010.pdf

Various FAA Websites:
Historical FAA Grants:
http://www.faa.gov/airports/aip/grant_histories/
Terminal Area Forecast:
http://aspm.faa.gov/main/taf.asp
TFMSC:
https://aspm.faa.gov/tfms/sys/main.asp
FAA 5010 Data:
http://www.airnav.com and http://www.gcr1.com/5010Web

U.S. Census Bureau:
http://www.census.gov

City of Killeen:
http://www.killeentexas.gov/

Bell County:
http://www.bellcountytx.com/

Killeen-Fort Hood
REGIONAL AIRPORT

CHAPTER TWO

FORECASTS

Killeen-Fort Hood
REGIONAL AIRPORT

CHAPTER TWO

FORECASTS

The definition of demand that may reasonably be expected to occur during the useful life of an airport's key components (e.g., runways, taxiways, terminal buildings, etc.) is an important factor in facility planning. In airport master planning, this involves projecting potential aviation activity for at least a 20-year timeframe. Aviation demand forecasting for Killeen-Fort Hood Regional Airport (GRK) will focus on demand indicators, including commercial airline passenger enplanements and operations, general aviation based aircraft and operations, as well as military operations and overall operational peaking periods.

GRK opened to civilian operations in August 2004 as a joint-use facility at Robert Gray Army Airfield with limitations on general aviation activity. The most basic assumption of this evaluation will be that the Airport will continue to operate as is, thereby requiring continued investments for the operation and maintenance of existing facilities. The goal of this effort will be to focus on the aviation demand segments that will influence future capital and operational outlays for new and/or improved civilian, commercial and general aviation facilities.

The Federal Aviation Administration (FAA) has oversight responsibility to review and approve aviation forecasts developed in conjunction with airport planning studies. In addition, aviation activity forecasts may be an important input to future benefit-cost analyses associated with airport development, and FAA reviews these analyses when federal funding requests are submitted.

The FAA will review individual airport forecasts with the objective of comparing them to its *Terminal Area Forecasts* (TAF) and the *National Plan of Integrated Airport Systems* (NPIAS). Even though the TAF is updated annually, it is developed by FAA personnel in Washington D.C., and it is very common to have a disparity between the TAF and more localized master planning forecast efforts. Historically, the disparity was primarily due to the TAF forecasters' lack of consideration of local conditions or recent trends. In recent years, however, the FAA has improved its forecast model to be a demand-driven forecast for

aviation services based upon local and national economic conditions, as well as conditions within the aviation industry.

As stated in FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems* (NPIAS), forecasts should be:

- Realistic;
- Based on the latest available data;
- Reflective of current conditions at the airport (as a baseline);
- Supported by information in the study; and
- Able to provide adequate justification for airport planning and development.

The forecast process for an airport master plan consists of a series of basic steps that vary in complexity depending upon the issues to be addressed and the level of effort required. The steps include a review of previous forecasts, determination of data needs, identification of data sources, collection of data, selection of forecast methods, preparation of the forecasts, and evaluation and documentation of the results. FAA Advisory Circular (AC) 150/5070-6B (Change 2), *Airport Master Plans*, outlines seven standard steps involved in the forecast process, including:

1) **Identify Aviation Activity Measures**: The level and type of aviation activities likely to impact facility needs. For GRK, which has both commercial service and limited general aviation activities, this typically includes enplaned passengers, based aircraft, and operations.

2) **Review Previous Airport Forecasts**: May include the FAA *Terminal Area Forecast*, state or regional system plans, and previous master plans.

3) **Gather Data**: Determine what data are required to prepare the forecasts, identify data sources, and collect historical and forecast data.

4) **Select Forecast Methods**: There are several appropriate methodologies and techniques available, including regression analysis, trend analysis, market share or ratio analysis, exponential smoothing, econometric modeling, comparison with other airports, survey techniques, cohort analysis, choice and distribution models, range projections, and professional judgment.

5) **Apply Forecast Methods and Evaluate Results**: Prepare the actual forecasts and evaluate for reasonableness.

6) **Summarize and Document Results**: Provide supporting text and tables as necessary.

7) **Compare Forecast Results with FAA's TAF**: Follow guidance in FAA Order 5090.3C, *Field Formulation of the National Plan of Integrated Airport Systems*. In part, the Order indicates that forecasts should not vary significantly (more than 10 percent) from the TAF. When there is a greater than 10 percent variance, supporting documentation should be supplied to the FAA.

Aviation activity can be affected by many influences on the local, regional, and national levels, making it virtually impossible to predict year-to-year fluctuations of activity over 20 years with any certainty. Therefore, it is important to remember that forecasts are to serve only as guidelines, and planning must remain flexible enough to respond to a range of unforeseen developments.

The forecast analysis for GRK was produced following these basic guidelines: (1) Existing forecasts are examined and compared against current and historic activity; (2) the historical aviation activity is then examined along with other factors and trends that can affect demand; and (3) the outcome will provide an updated set of aviation demand projections for GRK that will permit airport management to make planning adjustments as necessary to maintain a viable, efficient, and cost-effective facility.

PASSENGER COMMERCIAL AIRLINE SERVICE AREA

The initial step in determining the aviation demand for an airport is to define its generalized service area for various segments of aviation operators. The service area is determined by numerous factors, with one important factor being the location of competing airports, their capabilities, their services, and their relative attraction and convenience. In determining the aviation demand for an airport, it is necessary to first identify the role of the airport, as well as the specific areas of aviation demand the airport is intended to serve. For GRK, the primary role is to accommodate regularly scheduled commercial passenger airline service, with a secondary role to serve limited general aviation demand, specifically aircraft weighing more than 12,500 pounds, in the region. The general aviation components are presented later in this chapter. The service area for military has and will continue to be serving the aviation functions and activities in support of all military roles at Fort Hood. Obviously, Fort Hood and all of its associated functions and activities offer a very large demand component for passenger commercial service at GRK.

Generally stated, an airport service area is a geographic region from which an airport can be expected to attract the largest share of its activity. The definition of the service area can then be used to identify other factors, such as socioeconomic and demographic trends, which influence aviation demand at an airport. Aviation demand will be impacted by the proximity of competing airports, the surface transportation network, and the strength of commercial airline and/or general aviation services provided at the airport and at the competing airports.

As in any business enterprise, the more attractive the facility is in terms of service and capabilities, the more competitive it will be in the market. If an airport's attractiveness increases in relation to nearby airports, so will the size of its service area. If facilities and services are adequate and/or competitive, some level of aviation activity might be attracted to an airport from more distant locales.

The size of an airport's service area will vary depending on numerous factors, but is primarily limited by the proximity of other airports providing similar services. This is especially true for commercial services as competition for passengers often shapes an airline's decision to operate in a specific community. As such, an examination of other nearby and regional commercial service airport competitors can provide an understanding of the service area limits at GRK. Currently, there are 24 primary commercial service airports in the state of Texas. **Table 2A** presents passenger enplanement rankings for each of the 24

primary commercial service airports based upon the FAA documented 2015 enplanement, or passenger boarding, levels. The table also provides the state and national rank for each airport, hub size, enplanement change from 2014, and the airport's enplanement percentage of total statewide enplanements.

TABLE 2A
Primary Commercial Service Airport Enplanements in Texas

State/U.S. Rank		Airport Name	Hub	CY 14 Enplanements	CY 15 Enplanements	% Change	% of State
1	4	Dallas-Fort Worth International	L	30,804,567	31,589,839	2.55%	39.7%
2	12	George Bush Intercontinental/Houston	L	19,772,087	20,595,881	4.17%	25.9%
3	31	Dallas Love Field	M	4,522,341	7,040,950	55.69%	8.8%
4	33	William P Hobby	M	5,800,726	5,937,990	2.37%	7.5%
5	34	Austin-Bergstrom International	M	5,219,982	5,797,562	11.06%	7.3%
6	45	San Antonio International	M	4,046,856	4,091,434	1.10%	5.1%
7	76	El Paso International	S	1,395,363	1,381,392	-1.00%	1.7%
8	117	Midland International	S	547,355	518,509	-5.27%	0.7%
9	126	Lubbock Preston Smith International	S	451,238	443,239	-1.77%	0.56%
10	135	McAllen Miller International	N	385,631	391,687	1.57%	0.49%
11	146	Rick Husband Amarillo International	N	362,412	341,132	-5.87%	0.43%
12	147	Corpus Christi International	N	347,977	338,312	-2.78%	0.42%
13	167	Valley International	N	293,306	259,864	-11.40%	0.33%
14	**191**	**Killeen-Fort Hood Regional**	**N**	**189,529**	**176,895**	**-6.67%**	**0.22%**
15	205	Brownsville International	N	183,604	143,353	-21.92%	0.18%
16	219	Laredo International	N	116,565	110,368	-5.32%	0.14%
17	235	Easterwood Field	N	91,127	89,844	-1.41%	0.11%
18	239	Abilene Regional	N	93,656	86,000	-8.17%	0.11%
19	251	Tyler Pounds Regional	N	86,625	72,294	-16.54%	0.09%
20	266	San Angelo Regional	N	65,973	63,842	-3.23%	0.08%
21	268	Waco Regional	N	66,631	62,882	-5.63%	0.08%
22	286	Sheppard AFB/Wichita Falls	N	46,906	44,262	-5.64%	0.06%
23	307	Jack Brooks Regional	N	38,213	33,747	-11.69%	0.04%
24	343	East Texas Regional	N	21,867	20,968	-4.11%	0.03%

Source: Federal Aviation Administration
Hub: (L) Large; (M) Medium; (S) Small; (N) Non-hub primary

The 24 primary commercial service airports in the State of Texas output 79,632,246 enplanements in calendar year 2015. The state's two large hub airports, Dallas-Fort Worth International and George Bush Intercontinental Airports, tallied 65.6 percent of that total. The most impressive change was for Dallas Love Field, which had a 55.6 percent increase in enplanements as the newly constructed terminal building opened in 2015 and the repeal of the Wright Amendment, offering the ability to serve more markets and daily departures. Only seven Texas airports had a positive enplanement growth between 2014 and 2015, including all large and medium hub airports. McAllen Miller International Airport was the only small or non-hub airport to experience enplanement growth between 2014 and 2015.

As presented in the table, GRK 2015 enplanements rank 14th in the State of Texas and 191st in the nation. The 2015 enplanement level was 6.67 percent lower than 2014, having dropped by approximately 13,000 enplanements. The enplanement decrease at GRK is much less than that experienced at Valley International (Harlingen) and Brownsville International Airports, which are ranked just above and below GRK, respectively.

COMPETING COMMERCIAL SERVICE AIRPORTS

The most common criteria in a commercial airline passenger's selection of an airport are the proximity (convenience) and airfare (ticket price); however, several other factors can influence the passenger's decision. Business travelers often prefer expedient travel and may pay higher airfares for that convenience. The business traveler also desires reliable service with the most options possible, such as diverse destinations, frequency of flights, favorable departure, or arrival times, etc. Leisure travelers usually make airfare the most important factor for choosing an airline as there are typically more travelers in the party. As such, the leisure traveler will commonly evaluate a more distant airport when selecting flights. Discount airlines have proven nationwide that leisure passengers, and even some business travelers, will choose airports outside their local area due to low fares.

An important factor is the level of service offered from an airport. Level of service factors that can affect the secondary service area include frequency of service, number of airlines, size and/or type of aircraft, and nonstop destinations available. Reliability is also very important, especially for business travelers who will have little patience for service problems forcing them to miss business meetings. The biggest factor, however, tends to be airfare for all travelers. Competition on routes and low-fare airlines are major factors that can draw vacation and some business travelers to drive as much as three hours to a larger airport.

The surface transportation network provides options for local travelers to use other commercial service airports in the region. Regional competing airports include Waco Regional (ACT), Austin Bergstrom International Airport (AUS), Easterwood Field in College Station (CLL), San Antonio International Airport (SAT), and Dallas and Houston area airports including Dallas-Fort Worth International Airport (DFW), Dallas Love Field Airport (DAL), George Bush Intercontinental (IAH) and Hobby (HOU) Airports. Each of these airports are within a 3 ½ hour drive time or less from Killeen. Airline service factors for these airports will contribute greatly to whether a passenger will elect to use one of these airports instead of GRK. The following is a brief discussion of the primary competing commercial service airports. A summary of these competing airports and current service at GRK is provided in **Table 2B**.

GRK's most proximate competitor is Waco Regional Airport (ACT), approximately one hour drive time to the north. Waco Regional is served by one carrier, American Eagle, with only four daily departures to DFW utilizing 50-seat regional aircraft models. Airline service at ACT primarily serves to accommodate Baylor University associated activities as well as the growing Waco populace and expanding economy. ACT offers little to no competition for passengers within the GRK service area; however, GRK may offer competition for Waco market travelers, as Waco only offers non-stop service to DFW with just one airline. GRK offers three markets and three airlines. Thus, GRK is a much greater competitor for ACT than

the converse, although Waco area passengers only need to travel 1¾ hours to reach DFW or Dallas Love Field via automobile. This does make Dallas a more likely choice to drive than Killeen.

TABLE 2B
Competing Commercial Service Airport Summary

Airport	CY 2015 Enplanements	Airlines	Daily Departures	Non-Stop Destinations	Drive Time from GRK (hrs)
Waco Regional	66,631	1	4	1	1
Austin-Bergstrom International	5,797,562	7	130	50	1.25
Easterwood Field	89,844	2	6	2	1.75
San Antonio International	4,091,434	10	122	37	2.5
George Bush Intercontinental	20,595,881	17	800	146	3.1
Hobby	5,937,990	4	175	47	3.5
Killeen-Fort Hood Regional	**44,340**	**2**	**10**	**2**	**--**

[a] Daily departures range from 8-10.

Sources: US DOT - Bureau of Transportation Statistics (enplanements); Airport websites (airlines/departures)

Austin Bergstrom International Airport (AUS), approximately 75 miles south-southeast and 1¼ hour drive from Killeen, offers the most significant competition. As detailed in **Table 2B**, AUS is a medium hub airport with just under six million enplanements, ranking as the fifth busiest in the state, AUS is served by seven commercial passenger airlines with 130 daily departures to 50 non-stop destinations.

Easterwood Field Airport (CLL) is located in College Station. CLL supports two airlines, American Eagle and United Express, with six daily departures – three each to DFW and IAH. CLL is similar to ACT as its primary passenger demand is tied to a major university, Texas A&M. It is located approximately 1¾ hour drive time from Killeen and represents minimal competition to GRK.

Dallas-Fort Worth International Airport, Dallas Love Field Airport, San Antonio International Airport, Houston Hobby, and IAH are located 2½ to 3½ hours from Killeen. Each of these airports offer significant airline services with hundreds of daily non-stops to most domestic and many international destinations. These airports offer limited competition for Killeen passengers, and most leakage is comprised of leisure travelers with specific destination or cost concerns.

The final competitive mode is surface transportation. The I-35 corridor links to other major east-west interstates to the south in San Antonio and to the north in Dallas. Killeen passengers, primarily leisure travelers, have the option to drive to their intrastate and even regional interstate destinations, which is much more affordable than flying, especially for groups such as families. As a result, I-35 is and will continue to be a competitor creating passenger leakage. Future transportation modes, such as the potential high speed rail option, would further reduce passenger demand at GRK; however, high speed rail is not a certainty at this point and cannot be fully factored in a reasonable forecast model at this time.

PASSENGER COMMERCIAL SERVICE AREA SUMMARY

GRK's proximity to Austin, San Antonio, Dallas, and Houston area airports that offer the nation's largest airlines, including low-cost carriers, leads to a certain level of passenger leakage from the local market. These airports are large and medium hubs that currently offer significantly better commercial passenger service than GRK; however, the two most significant factors for choosing an airport, convenience and airfare, place GRK in a strong position to continue to attract passengers, especially those within the City of Killeen and the Fort Hood military installation. GRK also serves regional demand extending out to the entirety of the Killeen-Fort Hood Metropolitan Statistical Area (MSA), which is comprised of Bell, Coryell, and Lampasas Counties. **Exhibit 2A** illustrates the MSA boundary as well as a computer modeled drive time map with an estimated drive time to GRK from points within the region. The areas highlighted within the 0-45 minute drive time will be those containing airline passengers that will most often utilize GRK as long as airfare, flight frequency, and reliability remain strongly competitive with AUS.

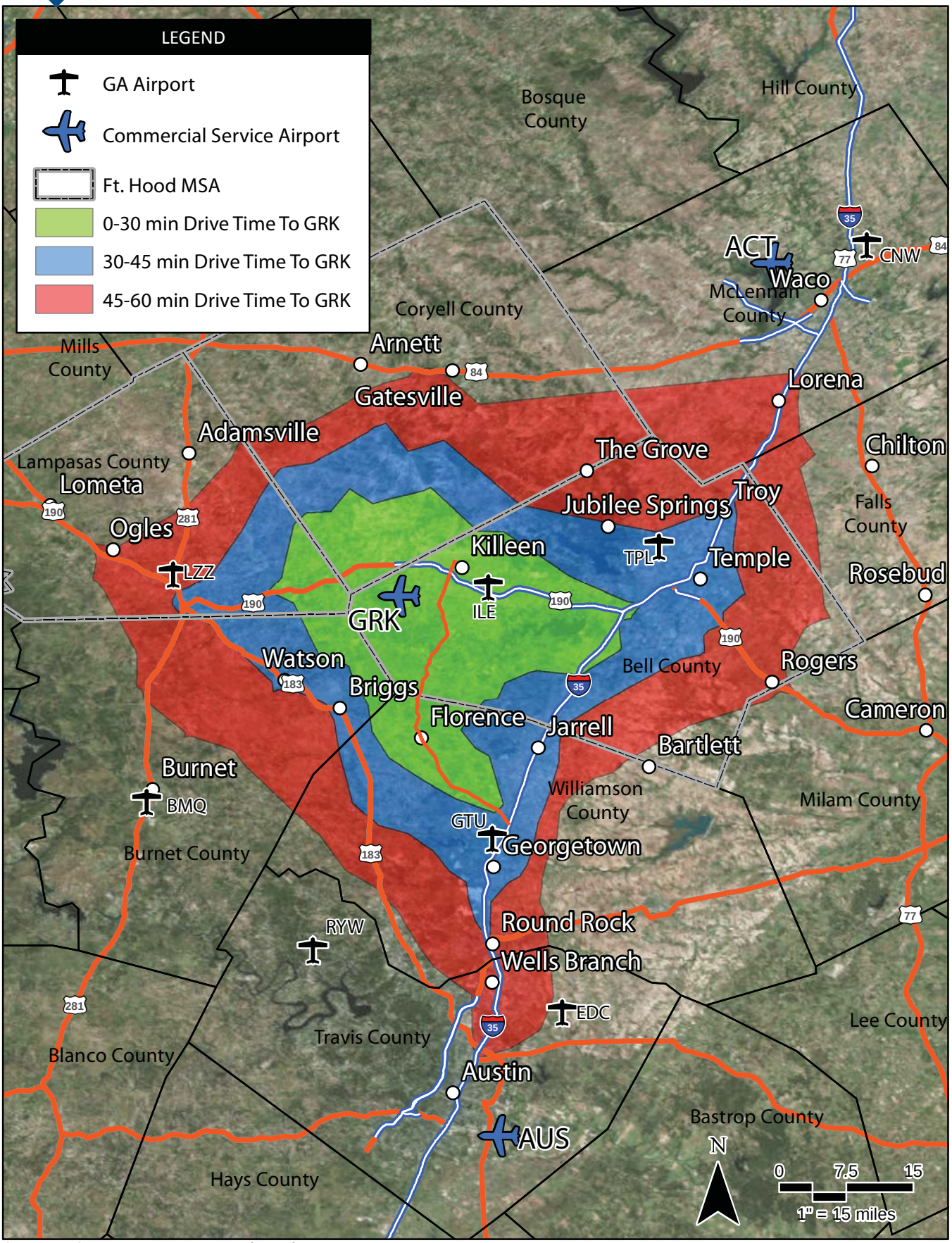
Due to the proximity of AUS and the more distant SAT, DFW, DAL, IAH, and HOU that provide a wider range of carrier options and non-stop destinations, many people within the local area can choose to drive to another airport for commercial flights. In a very real sense, the surface roadway network provides the greatest competition for airline passengers in Killeen and the entirety of the region. It also offers an inexpensive transportation mode for leisure travelers. In a highly competitive regional market such as the central Texas I-35 corridor region, it is unlikely that GRK will attract a significant number of airline passengers from outside the City of Killeen and Fort Hood, which provide the greatest concentration of users. Therefore, the planning analysis will consider the City of Killeen and Fort Hood as the primary service area for GRK. Secondary service areas will extend beyond to include the entire MSA and the areas within the 30-45-minute drive time; however, these areas will not offer reliable or consistent passenger demand.

SOCIOECONOMIC TRENDS

The socioeconomic conditions provide an important baseline for preparing aviation demand forecasts. Local socioeconomic variables, such as population, employment, and income, are indicators for understanding the dynamics of the community and can relate to local trends in aviation activity. Analysis of the demographics of the airport service area will give a more comprehensive understanding of the socioeconomic situations affecting the region which supports GRK. The following is a summary of historical demographic trends as well as forecasts of those socioeconomic characteristics.

Exhibit 1J in the previous chapter summarized historical and forecast socioeconomic conditions for the Killeen-Fort Hood MSA. Typically, population, employment, and income conditions will impact passenger demand at a local airport. Based on the information presented in Exhibit 1J, the Killeen-Fort Hood MSA has experienced strong growth since 1970 in all socioeconomic categories, with most exceeding 2.0 percent compounded annual growth rates (CAGR).

Over the next 21 years, the MSA population is projected to grow at a slower 1.23 percent CAGR rate, reaching 556,078 residents by 2036. Employment is forecasted to grow at a faster pace of 1.47 percent



Source: ESRI Basemap Imagery (2014).

CAGR, reaching 304,907 by 2036. These growth rates exceed levels projected nationally. Projected per capita personal income (PCPI) levels remain above national levels and are forecast to grow at 1.16 percent CAGR through 2036. Details for each socioeconomic condition are presented on Exhibit 1J and were obtained from Woods & Poole Economics.

FORECASTING APPROACH

The development of aviation forecasts proceeds through both analytical and judgmental processes. A series of mathematical relationships is tested to establish statistical logic and rationale for projected growth. However, the judgment of the forecast analyst, based upon professional experience, knowledge of the aviation industry, and assessment of the local situation, is important in the final determination of the preferred forecast. The most reliable approach to estimating aviation demand is through the utilization of more than one analytical technique. Methodologies frequently considered include trend line/time-series projections, correlation/regression analysis, and market share analysis.

Trend line/time-series projections are probably the simplest and most familiar of the forecasting techniques. By fitting growth curves to historical data, then extending them into the future, a basic trend line projection is produced. A basic assumption of this technique is that outside factors will continue to affect aviation demand in much the same manner as in the past. As broad as this assumption may be, the trend line projection does serve as a reliable benchmark for comparing other projections.

Correlation analysis provides a measure of direct relationship between two separate sets of historic data. Should there be a reasonable correlation between the data sets, further evaluation using regression analysis may be employed.

Regression analysis measures statistical relationships between dependent and independent variables, yielding a "correlation coefficient." The correlation coefficient (Pearson's "r") measures association between the changes in the dependent variable and the independent variable(s). If the "r^2" value (coefficient determination) is greater than 0.95, it indicates good predictive reliability. A value less than 0.95 may be used, but with the understanding that the predictive reliability is lower.

Market share analysis involves a historical review of the airport activity as a percentage, or share, of a larger regional, state, or national aviation market. A historical market share trend is determined, providing an expected market share for the future. These shares are then multiplied by the forecasts of the larger geographical area to produce a market share projection. This method has the same limitations as trend line projections, but can provide a useful check on the validity of other forecasting techniques.

It is important to note that one should not assume a high level of confidence in forecasts that extend beyond five years. Facility and financial planning usually require at least a 10-year purview since it often takes more than five years to complete a major facility development program. However, it is important to use forecasts which do not overestimate revenue-generating capabilities or understate demand for facilities needed to meet public (user) needs.

NATIONAL AVIATION TRENDS

Each year, the FAA updates and publishes a national aviation forecast. Included in this publication are forecasts for the large air carriers, regional/commuter air carriers, general aviation, and FAA workload measures. The forecasts are prepared to meet the budget and planning needs of the FAA and to provide information that can be used by state and local authorities, the aviation industry, and the general public. The current edition when this chapter was prepared was FAA *Aerospace Forecasts – Fiscal Years 2016-2036*, published in March 2016. The FAA primarily uses the economic performance of the United States as an indicator of future aviation industry growth. Similar economic analyses are applied to the outlook for aviation growth in international markets. The following discussion is summarized from the FAA Aerospace Forecasts.

Since its deregulation in 1978, the U.S. commercial air carrier industry has been characterized by boom-to-bust cycles. The volatility that was associated with these cycles was thought by many to be a structural feature of an industry that was capital intensive but cash poor. However, the great recession of 2007-09 marked a fundamental change in the operations and finances of U.S. airlines. Air carriers fine-tuned their business models to minimize losses by lowering operating costs, eliminating unprofitable routes, and grounding older, less fuel-efficient aircraft. To increase operating revenues, carriers initiated new services that customers were willing to purchase and started charging separately for services that were historically bundled in the price of a ticket. The industry experienced an unprecedented period of consolidation with four major mergers in five years. These changes, along with capacity discipline exhibited by carriers, have resulted in a fifth consecutive year of profitability for the industry in 2015. Looking ahead, there is optimism that the industry has been transformed from that of a boom-to-bust cycle to one of sustainable profits.

ECONOMIC ENVIRONMENT

Per the FAA forecast report, as the economy recovers from the most serious economic downturn and slow recovery since the Great Depression, aviation will continue to grow over the long run. Fundamentally, demand for aviation is driven by economic activity. As economic growth picks up, so will growth in aviation activity. The FAA forecast calls for passenger growth over the next 20 years to average 2.1 percent annually. The steep decline in the price of oil in 2015 was a catalyst for a short-lived uptick in passenger growth; however, growth is anticipated to be somewhat muted, primarily due to the uncertainty that surrounds the U.S. and global economies.

Employee wages in 2015 continued to stagnate, household income growth was weak, the housing market's recovery was patchy across the country, and government spending at the federal and local levels remained stagnant and are projected to remain so for the next few years. Despite these dire statistics, the unemployment rate fell, consumer spending was up, and many urban housing markets have been revived strongly. U.S. economic performance in 2015 is estimated to have grown in real GDP to 16.3 trillion (inflation adjusted to 2009 dollars) and is forecast to grow at an average annual growth rate of 2.3 percent through 2036. Oil prices should remain below $50 per barrel through 2016, but are projected to grow at an annual average growth rate of 4.8 percent, reaching over $150 per barrel by 2036. Al-

though the U.S. economy has managed to avoid a recession, a prolonged period of faster economic growth (e.g., > 3.0 percent) may not be forthcoming.

U.S. TRAVEL DEMAND

Mainline and regional carriers offer domestic and international passenger service between the U.S. and foreign destinations, although regional carrier international service is confined to the border markets in Canada, Mexico, and the Caribbean. Twenty-nine all-cargo carriers were providing domestic and/or international air cargo service at the end of 2015.

According to the FAA, three distinct trends are shaping today's commercial air carrier industry: (1) continuing industry consolidation and restructuring; (2) continued capacity discipline in response to external shocks; and (3) the proliferation of ancillary revenues.

The restructuring and consolidation of the U.S. airline industry that began in the aftermath of the terror attacks of September 11, 2001 continued in 2015. American Airlines and US Airways combined their networks and reservations systems to form the world's largest airline, with the last US Airways flight occurring in October 2015. Consequently, there are now only four dominant airlines in the U.S. – American, Delta, Southwest, and United – controlling approximately 76 percent of the domestic market. It is highly unlikely the U.S. Government will approve any further mergers among these four due to anti-trust regulations. In 2005, there were twelve major mainline airlines.

The mergers and increasing market presence of low cost carriers like Frontier, JetBlue, and Southwest have had clear implications on the fares, size of the aircraft being used, and the load factors.

One of the most striking outcomes of industry restructuring has been the unprecedented period of capacity discipline (achieving higher passenger loads through scheduled flight and fleet mix consolidation primarily), especially in domestic markets. Between 1978 and 2000, available seat miles (ASMs) in domestic markets increased at an average annual rate of 4.0 percent per year, recording only two years of decline. Even though domestic ASMs shrank by 6.9 percent in FY 2002 following the events of September 11, 2001, growth resumed and by FY 2007, domestic ASMs were 3.6 percent above the FY 2000 level. However, U.S. domestic ASMs are still down 1.2 percent when compared to 2007 as the industry responded first to the sharp rise in oil prices (up 155 percent between 2004 and 2008) and then the global recession that followed (2009 to the present). 2015 is the first year showing strong growth in ASMs (4.6 percent) since 2004.

The reduction in domestic capacity since 2007 has not been shared equally between the mainline carriers and their regional counterparts. To better match demand to capacity, the mainline carriers contracted out "thin" routes to their regional counterparts because they could provide lift at a lower cost, or simply removed the capacity altogether. In 2015, the mainline carrier group provided 0.9 percent less capacity than it did in 2007 (but carried 2.1 percent more passengers). Capacity flown by the regional group has shrunk by 3.0 percent over the same period (with passengers carried decreasing by 2.1 percent).

The regional market has continued to shrink as the regionals compete for even fewer contracts with the remaining dominant carriers; this has meant slow growth in enplanements and yields. The regionals have less leverage with the mainline carriers than they have had in the past and are facing large pilot shortages and tighter regulations regarding pilot training. Their capital costs have increased in the short-term as they continue to replace their 50-seat regional jets with more fuel efficient 70-seat jets. This move to the larger aircraft will prove beneficial in the future, however, since their unit costs are lower.

Another continuing trend is that of ancillary revenues. Carriers generate ancillary revenues by selling products and services beyond that of an airplane ticket to customers. This includes the un-bundling of services previously included in the ticket price, such as checked bags and on-board meals, and by adding new services, such as boarding priority. As a result of very low oil prices and ancillary revenue sources, U.S. passenger carriers posted net profits for the sixth consecutive year in 2015.

PREVIOUS AVIATION FORECASTS

For a non-hub, primary commercial service airport such as GRK, forecasts of commercial airline passenger enplanements and operations, general aviation based aircraft and operations, and peak activity levels are the most basic indicators of future demand. GRK is unique, however, as it is primarily a military installation, Robert Gray Army Airfield, to which most activity centers. The purpose of this analysis and study is to focus on civilian activities with attention also provided in aggregate to military operations. Military functions are not within the jurisdiction of FAA planning/guidance and as such are not eligible for full scale evaluation here.

The primary purpose of forecast activity in a master plan is to set the bar for evaluating existing and future facility needs. Future facility requirements, such as airline terminal complex component spaces and general aviation hangars and apron areas, are derived from these projections. The first step in forecasting demand at an airport is to review and analyze historical aviation forecasts for the facility.

FAA *TERMINAL AREA FORECAST*

On an annual basis, the FAA publishes the *Terminal Area Forecast* (TAF) for each airport included in the National Plan of Integrated Airport Systems (NPIAS). The TAF is a generalized forecast of airport activity used by FAA for internal planning purposes. It is available to airports and consultants to use as a baseline projection and important point of comparison while developing local forecasts. **Table 2C** presents the 2016 *Terminal Area Forecast* for GRK.

As presented in the table, the TAF projects enplanements to grow at a CAGR of 0.66 percent through 2036, reaching approximately 174,094 annual passenger enplanements. Total itinerant operations are projected to grow by only 3,592 at a CAGR of 0.66 percent. Itinerant general aviation operations are projected to remain constant at 92 annually over the next 20 years. The TAF does not present a current or projected operational count for military or local general aviation aircraft operations.

TABLE 2C
2016 FAA Terminal Area Forecast
Killeen-Fort Hood Regional Airport

	2015	2021	2026	2036	CAGR 2015-2036
ENPLANEMENTS					
Air Carrier	872	929	962	1,081	1.03%
Commuter	150,843	146,401	154,915	173,013	0.66%
Total	151,715	147,330	155,877	174,094	0.66%
ANNUAL OPERATIONS					
Itinerant					
Air Carrier	1,380	3,184	4,436	4,972	6.29%
Air Taxi	92	2,661	0	0	-100.00%
General Aviation	92	92	92	92	0.00%
Military	0	0	0	0	0.00%
Total Itinerant	*1,564*	*5,937*	*4,528*	*5,064*	*5.75%*
Local					
General Aviation	0	0	0	0	0.00%
Military	0	0	0	0	0.00%
Total Local	*0*	*0*	*0*	*0*	*0.00%*
Total Operations	***1,564***	***5,937***	***4,528***	***5,064***	***5.75%***
Based Aircraft	***0***	***0***	***0***	***0***	***0.00%***

Source: FAA TAF 2016

Being a military installation, the military has based aircraft with current estimates by the FAA at approximately 40. There are no general aviation aircraft currently based at the airport. Future general aviation aircraft basing could occur if those aircraft weigh more than 12,500 pounds per the joint-use operational agreement with Gray Army Airfield. There are currently no general aviation hangar facilities which could support full-time storage of aircraft at GRK.

It is important to note that the TAF figures are unsupported by real counts. For example, the official FAA 2015 enplanement figure for GRK is 176,895, much higher than the 150,843 reported in the TAF. The official FAA enplanement breakdown for 2015 includes 144,044 commuter airline, 669 air carrier charter (casino junkets), and 32,182 air carrier military charter enplanements.

Operationally, the TAF figures are even more disparate from reality. The TAF presents 1,564 itinerant operations. Based on actual operational counts reported by the airport traffic control tower (ATCT), itinerant operations for 2015 were 40,647, far exceeding the TAF reported 1,564. The disparity among actual ATCT counts and TAF estimates is striking for all components, with actual ATCT counts of 7,440 for air carrier, 9,056 for air taxi, 2,270 for general aviation, and 21,881 for military. As such, the TAF will be utilized only as a reference, with actual counts used as the basis for forecasting.

PREVIOUS MASTER PLAN FORECASTS

Forecasts of passenger demand were developed as a part of the previous master plan study, *Killen Municipal Airport and the Joint Use Facility at Robert Gray Airfield*, completed in October 2002. At that time, passenger commercial services were still being offered at Killeen Municipal (ILE), but the joint use agreement was already in place. As such, the plan presented updated forecasts for both airports with the understanding that all commercial passenger service was shifting to Robert Gray Army Airfield and only large general aviation aircraft activity could be accommodated at Gray Army Airfield with smaller general aviation activity purposed to ILE. The study presented the aggregated projections (base year 2001) as presented in **Table 2D**.

Table 2D
Previous Master Plan Projections

	2006	2011	2016	2021
OPERATIONS				
Commercial Service	11,020	14,550	19,600	25,200
Corporate Aviation	230	600	780	960
Military	24,059	26,563	29,328	32,281
Total Operations	35,309	41,713	49,708	58,441
Passenger Enplanements	131,920	178,980	240,620	313,441
Civilian Based Aircraft	0	0	1	1

Source: *Killeen Joint Use Airport at Robert Gray Army Airfield* Summary of Aviation Activity Forecasts 2001-2021

GRK COMMERCIAL AIRLINE PASSENGER FORECASTS

As previously mentioned, GRK is a primary commercial service airport categorized as a non-hub airport by the FAA. Non-hub primary commercial service airports account for less than 0.05 percent of domestic enplanements and have more than 10,000 enplanements.

To evaluate commercial service potential at GRK and the facilities necessary to properly accommodate present and future airline activity, two basic elements must be forecast: annual enplaned passengers and annual airline operations. Annual enplaned passengers serve as the most basic indicator of demand for commercial passenger service activity. The combination of enplanements and deplanements generally equals the total passengers using an airport. The annual number of enplanements is the figure utilized by the FAA to determine various entitlement funding levels for commercial service airports.

The term “enplanement” refers to a passenger boarding an airline flight. Enplaning passengers are then described in terms of either “originating” or “connecting/transferring.” Originating passengers depart a specific airport for a destination or hub airport to connect/transfer to another flight. Connecting/transferring passengers are those who have departed from another location and are using the airport as an intermediate stop. These passengers may disembark their originating flight to wait in the terminal for their next flight, or they could simply remain on the aircraft at an intermediary stop as a “through” passenger. GRK and airports similar to it have almost exclusively originating passengers, while larger hubs

like those in Dallas or Houston have a more significant percentage of passengers who are connecting/transferring.

As presented earlier, a resource utilized in aviation demand forecasting is the annual FAA aerospace forecasts. The most recent available version is the FAA *Aerospace Forecasts – Fiscal Years 2016-2036*, published in March 2016. The FAA forecasts a variety of aviation demand indicators on an annual basis. In the most current edition, fiscal year 2014 is presented as the baseline, with 2015 showing as an estimate, and years 2016 through 2036 as projections. Many forecasting elements utilized in this analysis will consider the history and projections presented by the FAA in its annual forecast.

FAA COMMERCIAL PASSENGER AIRLINE FORECASTS

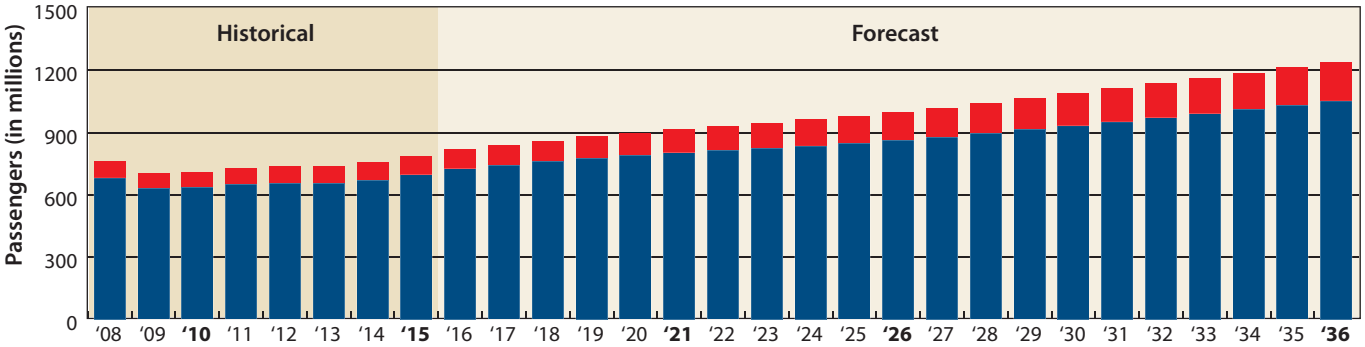
U.S. commercial air carriers' total number of domestic departures continued the downward trend that started in 2008, while ASMs, revenue passenger miles (RPMs), and enplanements all showed a rebound; these trends underlie the expanding size of aircraft and higher load factors. In 2015, the domestic load factor reached a historic high of 84.5 for commercial air carriers. In such an uncertain but slowly improving economic environment, industry capacity growth was somewhat restrained (up 3.9 percent in 2015), after only a 2.3 percent increase in 2014. U.S. mainline carrier capacity is projected to grow 3.8 percent in 2016, while capacity for regional carriers is forecast to remain static through 2016. Passenger demand growth is in line with capacity growth in 2016, with system RPMs forecast to grow 3.8 percent. Supported by a growing U.S. and world economy, year over year RPM growth is forecast to be 2.7 percent on average over the period from 2015-2036. Over the same time period, system capacity growth averages 2.1 percent per year. System passengers are projected to increase an average of 2.0 percent a year, with mainline carriers growing at 2.0 percent a year, slightly higher than their regional counterparts (up 1.8 percent). By 2036, U.S. commercial air carriers are projected to fly 1.81 trillion ASMs and transport 1.24 billion enplaned passengers, for a total of 1.53 trillion passenger miles.

Planes will remain crowded, with load factors projected to grow moderately during the early years of the forecast period, then tapering off during the mid-to-latter years to 84.7 percent in 2036 (up 1.3 points compared to the beginning of the forecast period in 2015). The FAA forecasts indicate that enplanements are forecast to grow (up 4.2 percent) in 2016, following a 3.8 percent increase in 2015. Over the forecast period, domestic enplanements are projected to grow at an average annual rate of 2.0 percent, with mainline and regional carriers growing at the same rate. **Exhibit 2B** presents the annual historical and forecast enplanement totals for both large air carriers and commuter airlines in the U.S., as forecast by the FAA.

FAA COMMERCIAL PASSENGER AIRLINE AIRCRAFT FLEET FORECAST

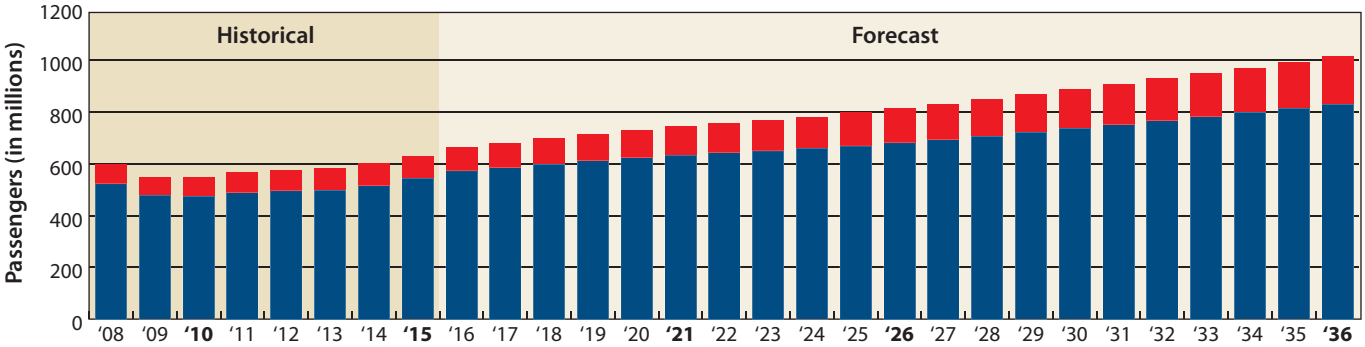
The commercial passenger carrier fleet is undergoing transformation. The mainline carriers are retiring older, less fuel-efficient aircraft (e.g., 737-300/400/500, 757/767, and MD-80) and replacing them with more technologically advanced A319/320 and 737-700/800/900 aircraft. The regional carriers are growing their fleet of 70-90 seat regional jet aircraft and reducing their fleet of 50-seat jet aircraft. Between

U.S. AIR CARRIER PASSENGER ENPLANEMENTS[1]



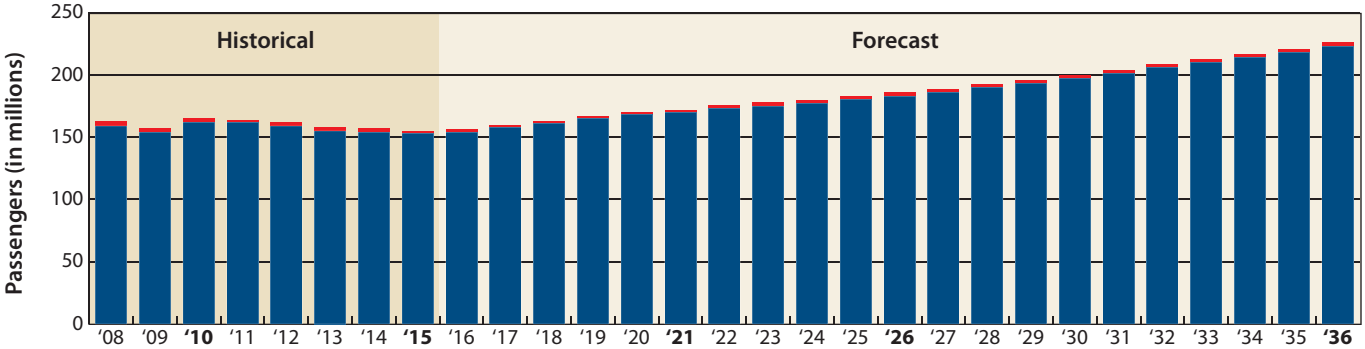
SOURCE	2015	2021	2026	2036	AAGR 2015-2036
Domestic Revenue Enplanements	696	803	863	1,052	2.0%
International Revenue Enplanements	89	113	135	188	3.6%
TOTAL	786	916	998	1,240	2.2%

U.S. MAINLINE AIR CARRIER PASSENGER ENPLANEMENTS



SOURCE	2015	2021	2026	2036	AAGR 2015-2036
Domestic Revenue Enplanements	543	633	680	829	2.0%
International Revenue Enplanements	87	111	132	185	3.6%
TOTAL	631	743	812	1,014	2.3%

U.S. REGIONAL AIR CARRIER PASSENGER ENPLANEMENTS



SOURCE	2015	2021	2026	2036	AAGR 2015-2036
Domestic Revenue Enplanements	153	170	183	223	1.8%
International Revenue Enplanements	2	2	3	3	1.8%
TOTAL	155	173	185	226	1.8%

Source: FAA Aerospace Forecast - Fiscal Years 2016-2036 Note: All figures measured in millions

2015 and 2036, the number of jets in the U.S. mainline carrier fleet is forecast to grow from 3,946 to 5,339, at an average of 66 aircraft a year.

The regional carrier fleet is forecast to decline from 2,144 aircraft in 2015 to 1,961 in 2036 as the fleet shrinks by 21 percent (448 aircraft) between 2015 and 2022. The loss of aircraft is due to the aging and likely retirement of aircraft models with fewer than 40 seats, including the Beechcraft 1900, EMB120, and Saab 340 turboprops. **Exhibit 2C** presents the FAA commercial aircraft fleet forecast through 2036.

HISTORICAL GRK AIRLINE PASSENGER ACTIVITY

Exhibit 2D provides a history of passenger enplanements at GRK since civilian activity began at the airport in August 2004. Over the past 12 years, GRK has experienced passenger activity ranging from a period high of 243,861 in 2010, to a low of 176,895 in 2015. As depicted on the exhibit, total airport enplanements grew between 2004 and 2010, then turned negative through 2015 and into the third quarter of 2016.

GRK enplanements can be categorized into three distinct segments. First, regularly scheduled airline service conducted currently by American, Delta, and United comprise the vast majority of total airport enplanements. The next highest annual enplanement total are civilian commercial airline charters carrying military personnel for wartime or other reasons. Since 2004, military passenger charters have fluctuated, ranging between a low of 14,304 in 2012 to a high of 42,948 in 2008. It is important to note that these enplanements are captive to the military but are conducted on civilian airlines, thus counting towards the airport's official enplanement tally. The third and final enplanement category for GRK is public charter operations. The public charters have been for casino junkets as well as regional college team sports flights and are relatively few on an annual basis. Each of these segments offer differing forecast opportunities and will be forecast individually before being combined to provide an overall aggregate airport enplanement figure for facility planning purposes later in this study process.

REGULARLY SCHEDULED COMMERCIAL PASSENGER AIRLINE ENPLANEMENT FORECASTS

Enplanements on regularly scheduled commercial passenger airlines comprise the clear majority of total airline enplanements at GRK. These enplanements generally have factors which allow forecast models to more accurately predict future movements. The analysis will begin by developing forecasts for future regularly scheduled airline enplanements.

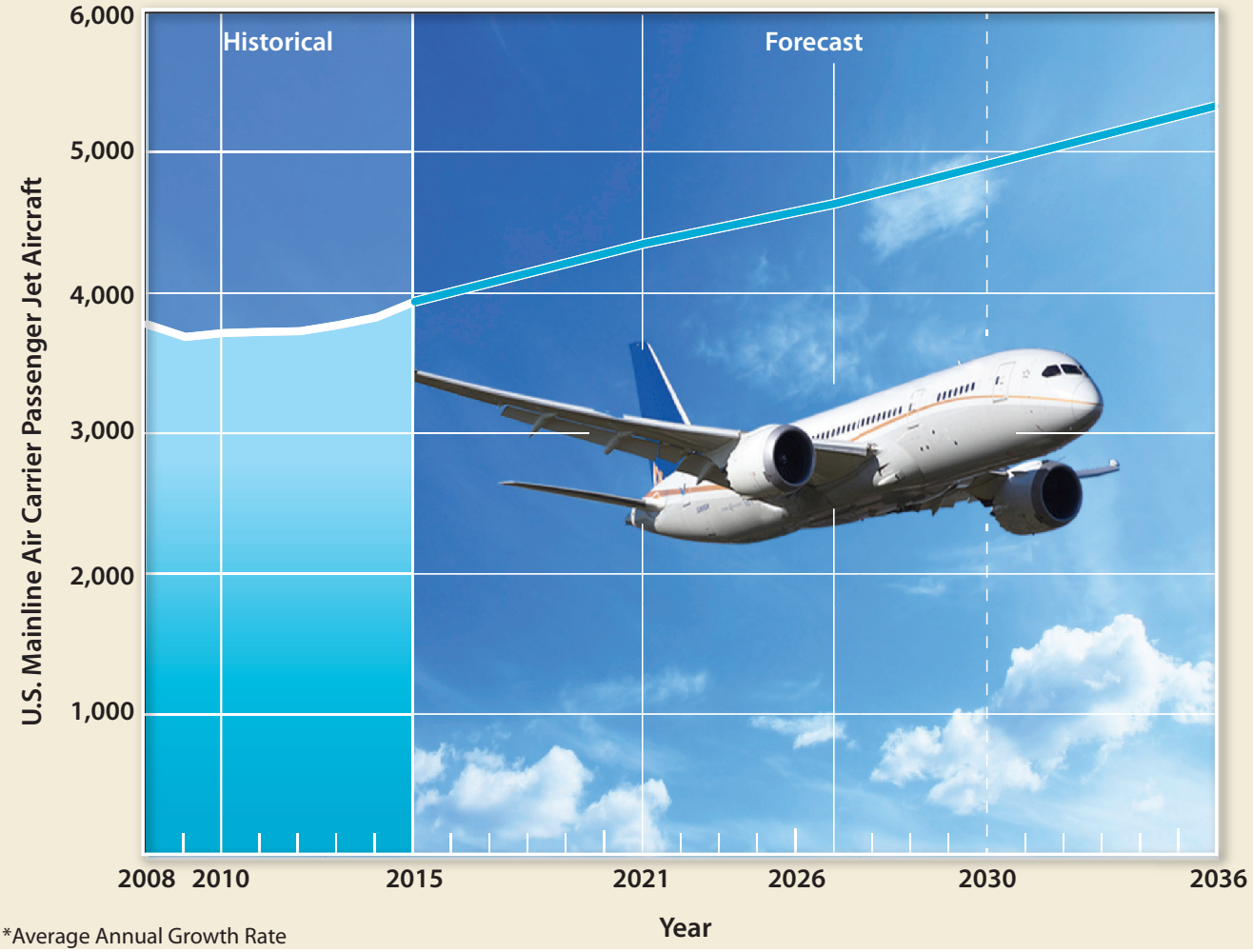
Scheduled Airline Historical Activity

As of the fall of 2016, GRK had regularly scheduled passenger service provided by regional airline carriers under the banner of the mainline carrier, American, United, and Delta. Fall 2016 service included the following schedules:

U.S. MAINLINE AIR CARRIER PASSENGER JET AIRCRAFT

	2015	2021	2026	2036	AAGR* 2015-2036
Large Narrow Body					
2 Engine	3,322	3,603	3,828	4,314	1.3%
3-4 Engines	2	2	0	0	0.0%
Large Wide Body					
2 Engine	492	586	636	840	2.6%
3-4 Wide Body Engines	31	0	0	0	N/A
Total Large Jets	3,847	4,191	4,464	5,154	1.4%
Total Regional Jets	99	169	181	185	3.0%
Total Mainline Passenger Jets	3,946	4,360	4,645	5,339	1.5%

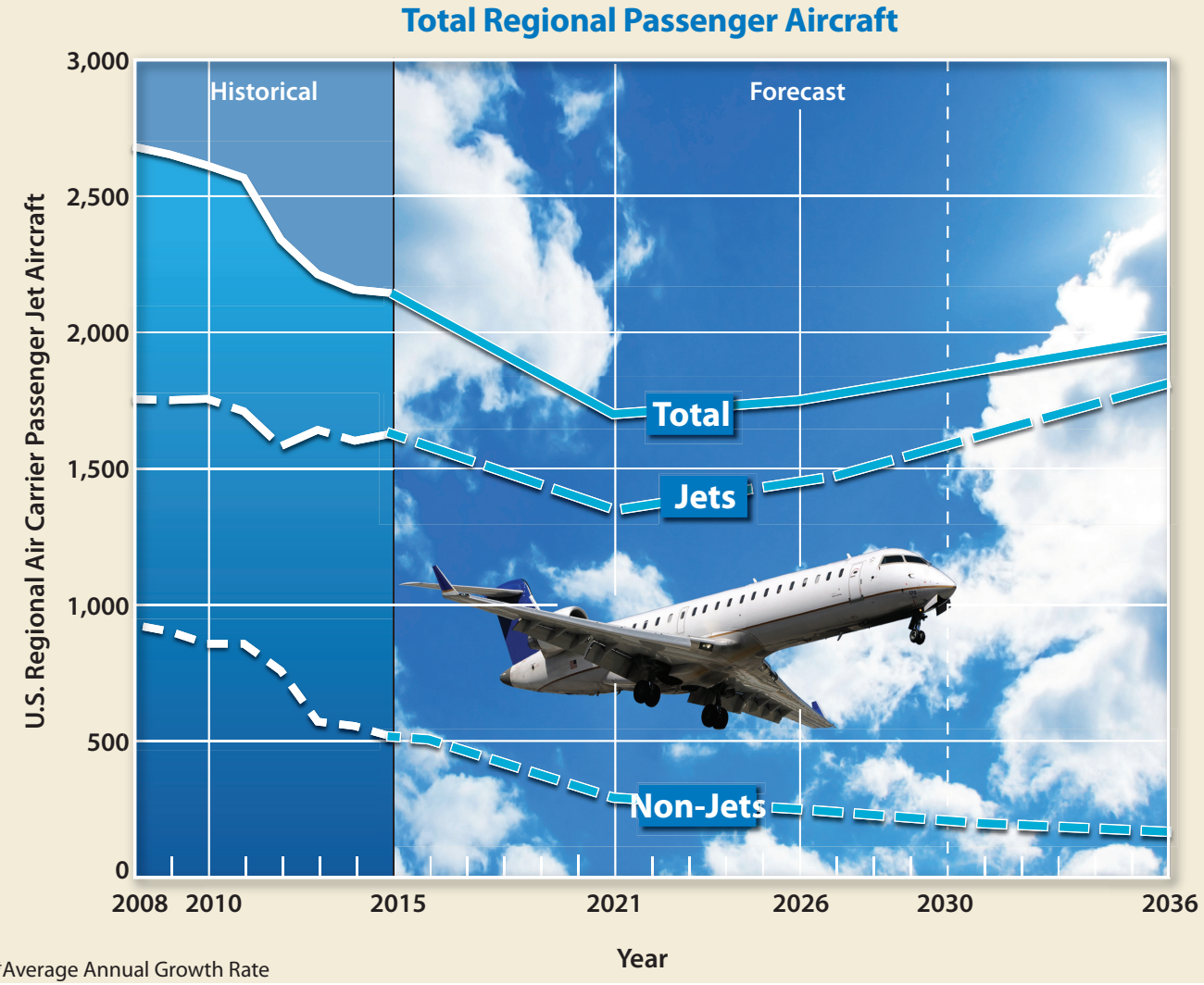
Total Mainline Passenger Jets



*Average Annual Growth Rate

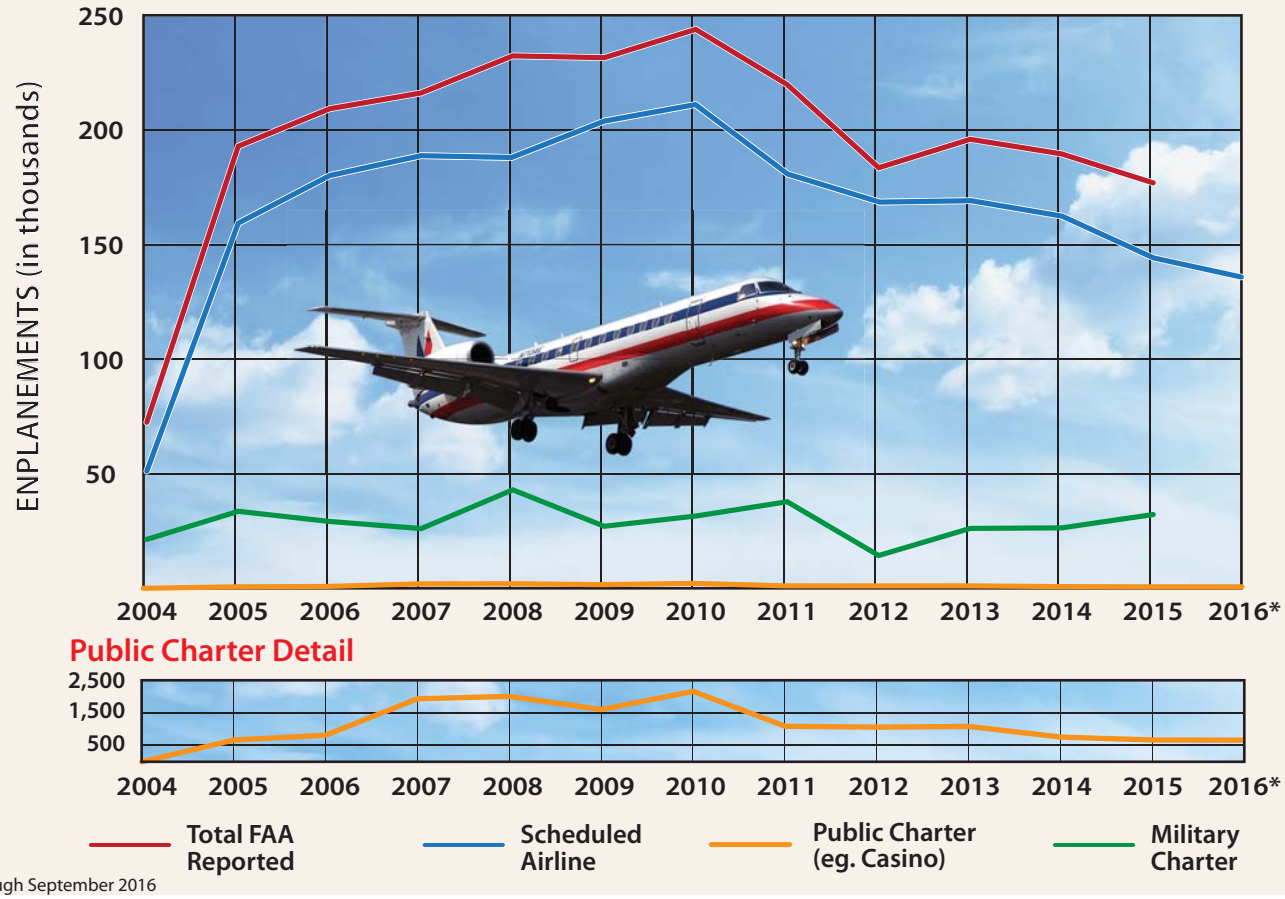
U.S. REGIONAL AIR CARRIER PASSENGER JET AIRCRAFT

	2015	2021	2026	2036	AAGR* 2015-2036
Less than 30 Seats					
Turboprop	427	234	181	74	-7.2%
31-40 Seats					
Turboprop	32	25	19	8	-6.4%
Over 40 Seats					
Turboprop	57	69	78	93	2.4%
Jet	1,628	1,384	1,460	1,786	0.4%
Non-Jet Total	516	328	278	175	-5.0%
Jet Total	1,628	1,384	1,460	1,786	0.4%
Total Regional Passenger Aircraft	2,144	1,712	1,738	1,961	-0.4%



*Average Annual Growth Rate

ENPLANEMENT SEGMENTS



*through September 2016

MONTHLY SEATS VS ENPLANEMENTS

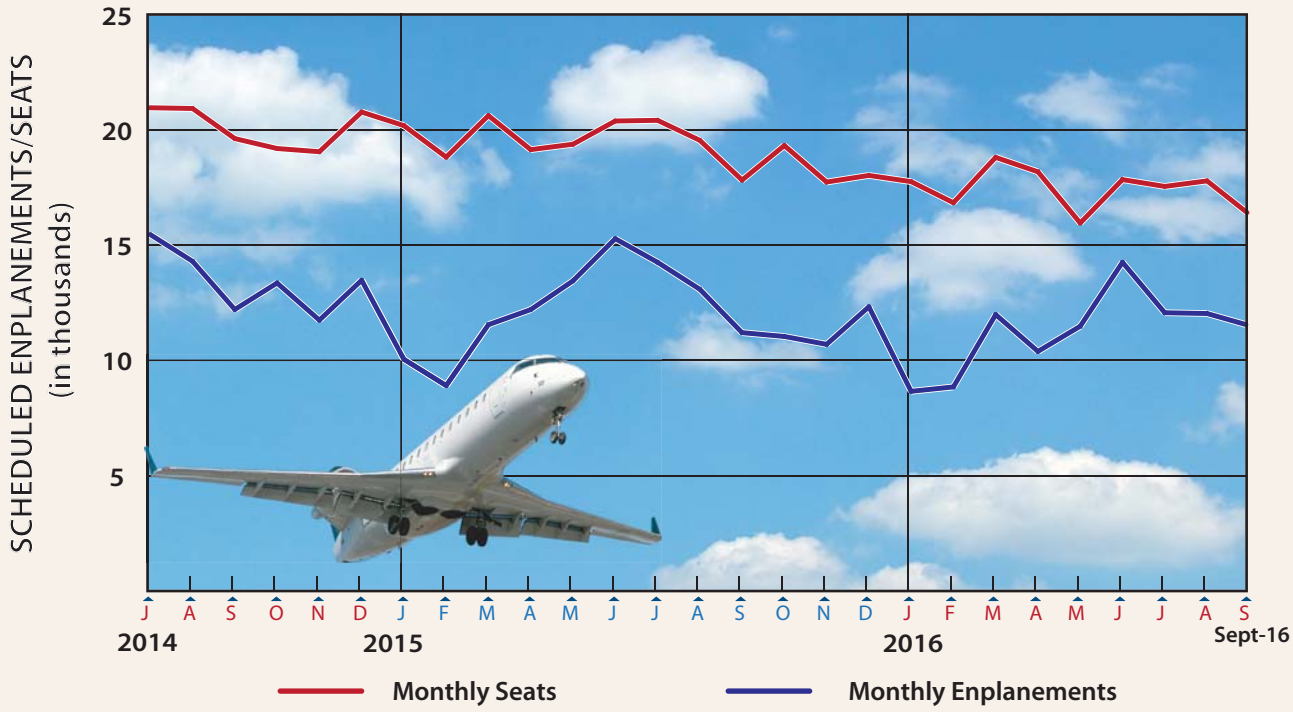


Exhibit 2D
HISTORICAL ENPLANEMENTS DETAIL

American Eagle

- Six daily departures to DFW, with three conducted by CRJ 900 aircraft and three by ERJ 145 aircraft (one fewer flight on limited schedule Tuesday and Sunday)

Delta Connection

- Two daily departures to ATL, one each on a CRJ 700 and CRJ 900 (one fewer flight on Tuesday, Wednesday, and Saturday)

United Express

- Two daily departures to IAH, one each on ERJ 145 and ERJ 135 aircraft (one fewer flight on Saturday)

Exhibit 2E presents a 12-month moving total enplanement graph for each of the three regional airlines and the aggregate scheduled airline total. The 12-month moving enplanement total offers insight to shifts in demand better than simple annualized data subsets as the analysis provides a month-to-month snapshot of a year's worth of enplanements, ending with the month shown. One important factor to point out is that the graph begins in July 2005, which is the first full 12-month enplanement recording at GRK. That period included both American and United (Continental at the time) regional carriers. Delta began service in August 2006, which can readily be deduced from the graph.

As depicted, American has always dominated regularly scheduled enplanements at GRK. Noted above, American regional carriers offer six flights per day (most days) compared to the two per day offered by the other regional airlines. For the most part, the aggregate enplanement total line mirrors that of American. From inception, American 12-month enplanement totals held steady, increased to a period high in February 2010 holding through February 2011, then generally and steadily declined through September 2016.

United/Continental enplanements peaked in the 12-month period ending January 2007, and have been generally declining ever since. Delta, on the other hand, experienced continued growth from service inception through February 2011, before enplanements began a gradual and slight decline through September 2016.

The bottom half of **Exhibit 2D** also presents a comparison of scheduled airline enplanements versus available seats monthly over the last two years. The gap between the two lines represents the number of empty regularly scheduled commercial airline seats departing the airport monthly. Simply stated, the total seats available line represents the highest enplanement level which could have occurred if all seats were sold through the period.

Over the period from July 2014 through September 2016, the three regular scheduled airlines offered a monthly average of 18,851 seats. Based on actual monthly totals, the ridership averages 64 percent

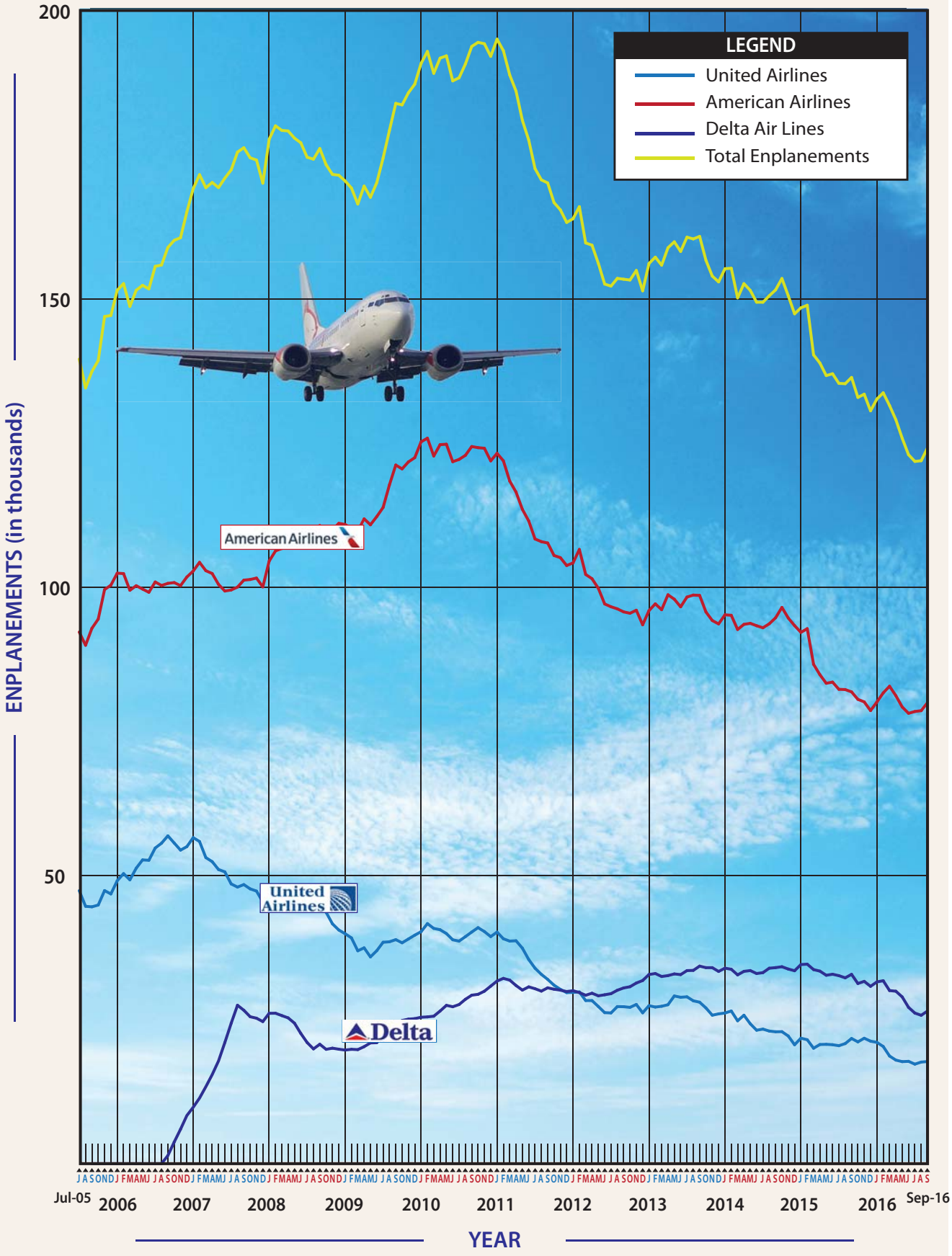


Exhibit 2E: GRK SCHEDULED ENPLANEMENT 12-MONTH MOVING TOTALS

occupancy over the period. Percent aircraft seat occupancy is commonly referred to as the board loading factor (BLF) in airport planning analysis. Airline BLF will be further explored later in this chapter.

Top 25 Origin and Destination Markets

A very important factor to consider when evaluating an airport's ability to accommodate a particular service area is to examine the airlines and non-stop and/or direct flight options provided. As mentioned earlier, passengers will utilize a more convenient airport if airfares are reasonably priced and if the airlines offer links to desired markets. Therefore, an examination of the passenger destination market for the Killeen area should be examined to determine if the current airline service options meet the demand.

The U.S. Department of Transportation (DOT) maintains a rolling quarterly survey of 10 percent of all airline tickets sold for each commercial service airport. This Origin & Destination (O&D) Survey provides information on passengers' starting and ending cities and shows the volume of traffic between city pairs. The figures do not include "through" connecting/transfer passengers.

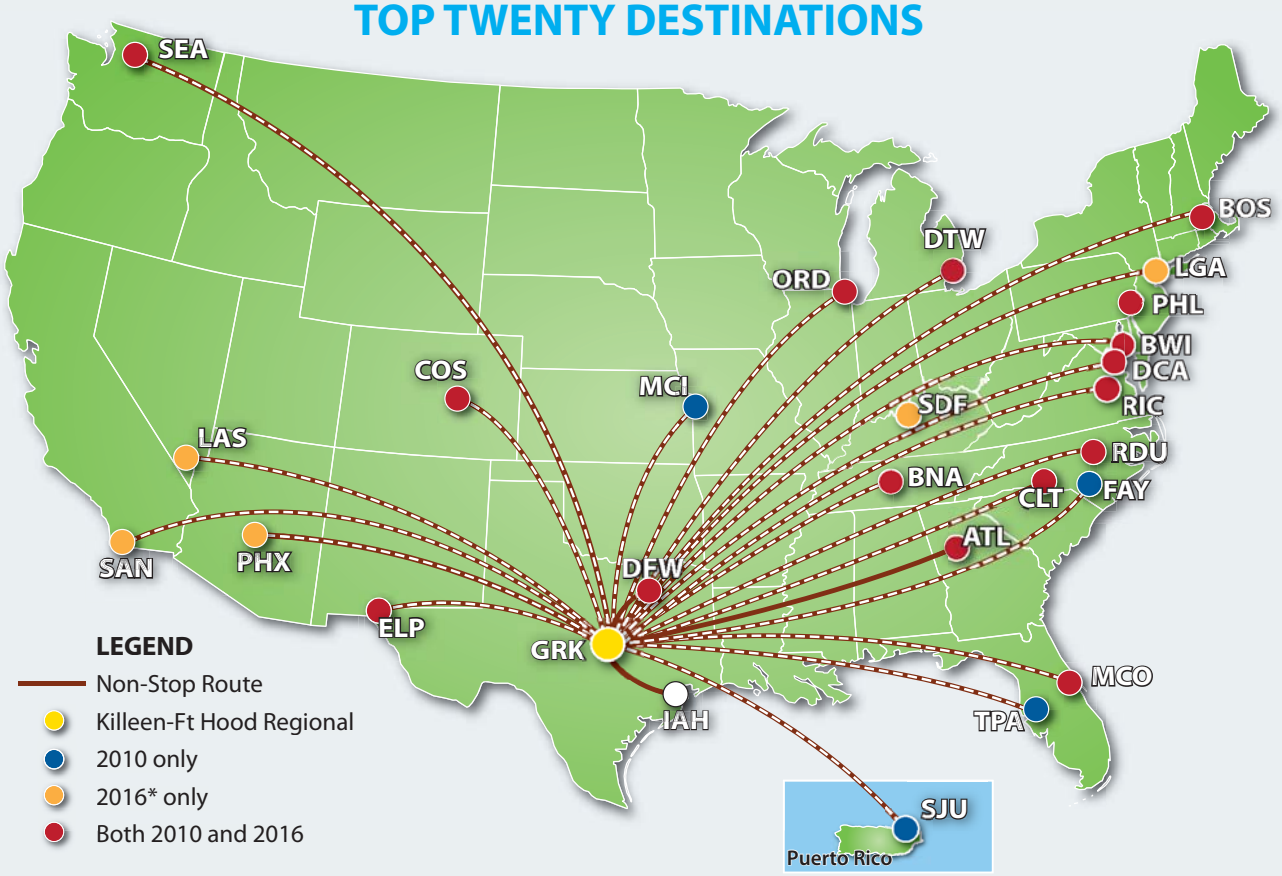
Information obtained from the O&D Survey provides final destinations for those traveling from GRK. Destination data is typically useful in examining the strength of the local market to and from other markets. **Exhibit 2F** shows the GRK O&D top 20 markets for 2010, the airport's highest enplanement level to date, and the 12-month period ending second quarter 2016, which was the most recent ticket lift data available from the DOT. The exhibit also depicts those market pair connections on the map with the understanding that only DFW, Atlanta Hartsfield International (ATL), and IAH have non-stop connections with GRK.

The results of the destination market analysis show that 15 destinations were in both 2010 and 2016 Top 20 lists. Atlanta and Washington/Baltimore claim the top two spots for both periods, as shown. Topical analysis of the 2010 list indicates that many markets in the Top 10 were those having military installations, suggesting that the destinations were due to military activities. The 2016 Top 10 includes five new and more traditional civilian destinations, such as Las Vegas (3), Orlando (4), Dallas (5), New York (7), and Chicago (10), suggesting more civilian and/or less military traveler influences.

Being served by three airlines, all of which offer direct non-stop links to the nation's top hub airports, GRK can provide linkage to all top destinations for Killeen area passengers. Moreover, most regional airports have fewer airline options. Waco, as an example, offers one link to DFW, which is adequate, but most passengers with east coast destinations would prefer to first travel east to cities such as Atlanta instead of first going north to DFW. Current service market options for GRK are more than adequate to accommodate the regional demand and are very good when compared to many other regionalized markets. Other considerations, such as flight frequency or departure/arrival times, could be less than ideal when compared to larger airport flight schedules such as those for hub airports in Austin, San Antonio, Dallas, and Houston.

KILLEEN-FT HOOD REGIONAL

TOP TWENTY DESTINATIONS



2010 Top Twenty Destinations	2016* Top Twenty Destinations
1. Atlanta, GA (ATL)	1. Atlanta, GA (ATL)
2. Washington D.C./Baltimore (BWI)	2. Washington D.C./Baltimore (BWI)
3. Seattle, WA (SEA)	3. Las Vegas, NV (LAS)
4. Washington D.C. (DCA)	4. Orlando, FL (MCO)
5. Orlando, FL (MCO)	5. Dallas, TX (DFW)
6. El Paso, TX (ELP)	6. Seattle, WA (SEA)
7. Richmond, VA (RIC)	7. New York, NY (LGA)
8. Fayetteville, NC (FAY)	8. Philadelphia, PA (PHL)
9. Raleigh/Durham, NC (RDU)	9. Washington D.C. (DCA)
10. Kansas City, MO (MCI)	10. Chicago, IL (ORD)
11. Philadelphia, PA (PHL)	11. El Paso, TX (ELP)
12. Boston, MA (BOS)	12. Louisville, KY (SDF)
13. Charlotte, NC (CLT)	13. Raleigh/Durham, NC (RDU)
14. Colorado Springs, CO (COS)	14. Phoenix, AZ (PHX)
15. Detroit, MI (DTW)	15. Nashville, TN (BNA)
16. Nashville, TN (BNA)	16. Richmond, VA (RIC)
17. Tampa, FL (TPA)	17. Colorado Springs, CO (COS)
18. Dallas, TX (DFW)	18. Charlotte, NC (CLT)
19. San Juan, PR (SJU)	19. San Diego, CA (SAN)
20. Chicago, IL (ORD)	20. Detroit, MI (DTW)

* 3rd quarter 2015 through 2nd quarter 2016
Source: Bureau of Transportation Statistics (BTS), Origin-Destination Survey of Airline Passenger Traffic (DB1B)

Exhibit 2F: GRK TOP TWENTY DESTINATIONS 2010 AND 2016*

Time-Series and Regression Enplanement Forecasts

A variety of time-series extrapolation and regression analyses using multiple variables, including aviation and socioeconomic factors, were tested in relation to historic GRK enplanement levels. For regression analysis, it is optimal to have an "r^2" value above 0.95, which generally represents a very strong correlation and greater statistical reliability.

Several variables were tested to determine if they might produce more reliable statistical trends. The variables tested were: 1) Killeen-Fort Hood MSA Population; 2) MSA Employment; 3) MSA Gross Regional Product; 4) MSA Capita Personal Income (PCPI); 5) U.S. Domestic Available Seat Miles; 6) U.S. Commercial Enplanements; and 7) Regional Airline Enplanements. The results of the regression analysis did not provide values above the 0.95 or even as high as the 0.90 threshold.

The time-series and regression analyses resulted in such low correlations they cannot be used reliably for forecasting purposes. The lack of a correlation for all variables is not surprising as enplanements grew initially, but have experienced decline later when all other factors have experienced some level of growth.

Travel Propensity Factor Forecasts

There are a variety of local factors that affect the potential for passengers within an area to travel. A key statistic to consider is the relationship between an airport's enplanement levels to the population it serves. The ratio of enplanements to population is termed the Travel Propensity Factor (TPF).

The TPF is predominantly impacted by the proximity of an airport to other regional airports with higher levels of service or "hub" airports. Regional airports with higher TPF ratios tend to be located farther from hub airports in relatively isolated areas. These airports generally have a service area that extends into adjacent, well-populated regions or have some type of air service advantage that attracts more of those passengers that might otherwise choose to drive to a more distant hub airport. Generally, the higher the TPF, the more likely air travelers are to utilize the local airport for commercial service.

For comparison purposes, 18 markets with similar characteristics to Killeen were analyzed. This analysis is presented in **Table 2E**. The markets have similar population bases or are in close proximity to a major military installation. A few of the airports are small hub qualifiers, while most are non-hub airports within a manageable driving distance to a larger hub airport. In 2010, average TPF of the airports serving the 18 selected markets was 0.87. By 2015, the average TPF had decreased slightly to 0.85, with ten airports increasing their TPF.

GRK was not among those with increasing TPF, with its TPF having decreased by approximately 35 percent. The GRK TPF in 2010 ranked as the 10th highest in the market grouping. By 2015, the GRK TPF ranking fell to 16th as regularly scheduled commercial passenger airline enplanements fell sharply over the period.

TABLE 2E
Travel Propensity Factor (TPF) Comparisons

Comparable Markets	2010 MSA Population	2010 Enplanements	TPF	2015 MSA Population	2015 Enplanements	TPF	Miles to Hub Airport
Cedar Rapids, IA	258,467	462,670	1.79	265,338	557,374	2.10	120 - Des Moines
Myrtle Beach SC	376,722	782,737	2.08	431,964	899,859	2.08	100 - Charleston
Pensacola, FL	448,991	729,748	1.63	478,043	787,916	1.65	210 - New Orleans
Lubbock, TX	290,805	508,858	1.75	311,154	443,239	1.42	130 - Midland
Madison, WI	579,403	766,953	1.32	640,743	826,640	1.29	75 - Milwaukee
Bloomington/ Normal, IL	169,329	274,677	1.62	191,705	186,633	0.97	165 St Louis/ 175 Indianapolis
Tallahassee, FL	365,319	325,097	0.89	379,826	332,762	0.88	160 - Jacksonville
Peoria, IL	376,104	249,595	0.66	380,566	318,156	0.84	168 St. Louis
Corpus Christi, TX	428,185	339,139	0.79	452,422	338,312	0.75	170 - San Antonio
Evansville, IN	353,039	169,967	0.48	316,531	203,350	0.64	120 - Louisville
Lincoln, NE	301,243	139,532	0.46	322,156	160,502	0.50	60 - Omaha
Baton Rouge, LA	797,706	382,687	0.48	835,067	366,091	0.44	60 - New Orleans
Lansing, MI	455,321	134,046	0.29	472,445	180,927	0.38	90 - Detroit
Columbia, MO	168,961	38,293	0.23	175,474	64,704	0.37	120 - St. Louis
College Station, TX	216,184	70,706	0.33	246,231	89,844	0.36	80 - Houston
Killeen, TX	***405,303***	***210,181***	***0.52***	***431,032***	***144,044***	***0.33***	***80 - Austin***
Waco, TX	252,772	61,159	0.24	262,813	63,581	0.24	90 - Dallas/ Fort Worth
Beaumont, TX	403,190	17,394	0.04	408,419	33,747	0.08	90 - Houston

Source: Enplanements from FAA; Population from U.S. Census Bureau

A more detailed TPF history for GRK is presented in **Table 2F**. As can be seen in the table, the TPF for GRK has generally trended downward since its climb from service inception in 2004 through 2016. The peak TPF value was 0.535 in 2009 with a period low in 2016 at 0.312.

Table 2F presents three enplanement projections based upon the TPF. The first projection maintains a declining TPF throughout the forecast period, which results in 152,921 enplanements by 2036. This projection assumes GRK enplanements will trail population growth in the MSA, but at a slower pace than the last six years. Next, a constant ratio TPF projection maintaining 0.312 through the period yields 173,496 scheduled airline enplanements. This projection would require passenger demand to keep pace with MSA population growth. The final projection increases the TPF to recapture a level experienced as recently as 2009, which would likely require expanded air service and capturing some travelers that may be utilizing other regional airports. This projection results in 297,502 enplanements by 2036.

TABLE 2F
GRK TPF Enplanement Projections
Killeen-Fort Hood Regional Airport

Year	GRK Scheduled Airline Enplanements	Killeen-Fort Hood MSA Population	TPF
2005	158,633	354,424	0.448
2006	179,273	358,547	0.500
2007	188,129	371,643	0.506
2008	187,346	379,569	0.494
2009	202,830	379,231	0.535
2010	210,181	405,303	0.519
2011	180,900	412,674	0.438
2012	168,134	420,073	0.400
2013	168,691	423,021	0.399
2014	162,404	425,143	0.382
2015	144,044	431,032	0.334
2016[1]	135,345	433,658	0.312
TPF PROJECTIONS			
Continued Decreasing TPF			
2021	136,951	464,242	0.295
2026	140,905	494,404	0.285
2036	152,921	556,078	0.275
Maintain Constant Share 2016 TPF			
2021	144,844	464,242	0.312
2026	154,254	494,404	0.312
2036	173,496	556,078	0.312
Increasing TPF Reaching 2009 Ratio			
2021	170,841	464,242	0.368
2026	209,627	494,404	0.424
2036	297,502	556,078	0.535

Source: GRK Enplanements from airport records; MSA Population history from U.S. Census Bureau; MSA Population projections from Woods & Poole Economics
[1] GRK 2016 enplanements are 12-month period October 2015-September 2016

Market Share of U.S. Domestic Enplanements

The next forecasting method employed considers GRK's market share of U.S. domestic enplanements. National forecasts of U.S. domestic enplanements are compiled each year by the FAA and consider the state of the economy, fuel prices, and prior year developments. The FAA's Aerospace Forecasts include forecasts of both total domestic passenger enplanements as well as forecasts of regional carrier passenger enplanements. GRK is currently served only by regional airlines for regular scheduled service. As such, enplanement forecasts based on GRK's historic market share of regional carrier enplanements have been developed.

The FAA forecasts enplanements by all airline carriers for all U.S. domestic routes to grow at 1.9 percent annually through 2036. The FAA also presents a regional carrier forecast which is a subset of total air carrier domestic enplanements. The FAA projects regional airline enplanements to increase at a 1.81 percent CAGR through the same period.

GRK scheduled airline enplanements have trailed the growth curve of U.S. domestic regional airline enplanements, as shown in **Table 2G**. Three enplanement projections have been developed as a market share of U.S. domestic regional airline enplanement forecasts and are presented in **Table 2G**. The first projection maintains a declining market share falling to 0.0760 percent, resulting in 169,480 enplanements by 2036. Maintaining a constant share of 0.0879 percent through the period yields 196,017 enplanements by 2036. The final projection considers a return to increasing market share reaching the historic average of 0.1123 percent by 2036, yielding 250,429 enplanements.

TABLE 2G
GRK Market Share of US Regional Airline Enplanement Forecasts
Killeen-Fort Hood Regional Airport

Year	GRK Scheduled Enplanements	US Regional Enplanements	Market Share of Regional Enplanements
2005	158,633	136,600,000	0.1161%
2006	179,273	152,200,000	0.1178%
2007	188,129	156,200,000	0.1204%
2008	187,346	159,100,000	0.1178%
2009	202,830	154,000,000	0.1317%
2010	210,181	161,700,000	0.1300%
2011	180,900	161,700,000	0.1119%
2012	168,134	159,000,000	0.1057%
2013	168,691	155,500,000	0.1085%
2014	162,404	154,100,000	0.1054%
2015	144,044	153,000,000	0.0941%
2016	135,345	154,000,000	0.0879%
MARKET SHARE PROJECTIONS			
Continued Decreasing Share of US Regional Enplanements			
2021	141,780	170,000,000	0.0834%
2026	146,400	183,000,000	0.0800%
2036	169,480	223,000,000	0.0760%
Maintain Constant Share of US Regional			
2021	149,430	170,000,000	0.0879%
2026	160,857	183,000,000	0.0879%
2036	196,017	223,000,000	0.0879%
Increasing Share of US Regional Enplanements			
2021	158,950	170,000,000	0.0935%
2026	181,170	183,000,000	0.0990%
2036	250,429	223,000,000	0.1123%

Airline Flight Schedule Enplanements

As has been discussed, GRK has been served by three regularly scheduled airlines for most of its recent history. At inception, many of the airlines' flights were conducted using either regional turboprop or jet aircraft with fewer than 60 seats. The regional airline fleet mix has evolved to now include more 70- and 90-seat jet aircraft options with the 35-50 seat capacity market waning. This analysis offers three enplanement projections with a methodology of three different potential future airline fleet mix and boarding load factor (BLF) situations at GRK. As previously noted, BLF is the percentage of enplaning seats occupied. **Table 2H** presents three enplanement scenarios based on these assumptions and the BLF at

75%. Several other BLF projections using the same fleet mix capacity have been calculated and are summarized later.

TABLE 2H
Potential Flight Schedule Enplanement Projections with 75% BLF
Killeen-Fort Hood Regional Airport

Aircraft Type	Seats	BLF %	Occupied Seats	Weekly Departure Frequency	Annual Enplanements
Scenario I - 2021					
MD-88	166	85%	141.1	2	14,674
CRJ/ERJ 900	90	75%	67.5	23	80,730
CRJ/ERJ 700	70	75%	52.5	11	30,030
ERJ 145/CRJ 200	50	75%	37.5	12	23,400
Annual Totals Scenario I	**208,104**	**71.5%**	**148,834**	**48**	**148,834**
Scenario II - 2026					
Boeing 737-800	160	85%	136	2	14,144
Airbus 319	128	75%	96	4	19,968
CRJ/ERJ 900	90	75%	67.5	27	94,770
CRJ/ERJ 700	70	75%	52.5	15	40,950
ERJ 145/CRJ 200	50	0%	0	0	0
Annual Totals Scenario II	**208,104**	**81.6%**	**169,832**	**48**	**169,832**
Scenario III – 2036					
Airbus 319	128	75%	96	6	29,952
Boeing 737-800	160	75%	120	6	37,440
CRJ/ERJ 900	90	75%	67.5	21	73,710
CRJ/ERJ 700	70	75%	52.5	17	46,410
Annual Totals Scenario II	**208,104**	**90.1%**	**187,512**	**50**	**187,512**

BLF – Boarding Load Factor
Source: Coffman Associates analysis

Scenario I (2021): The first scenario considers changes in the regional airline fleet mix as projected by the FAA and is occurring presently. Within the next five years, 50-seat regional jet aircraft will be significantly reduced in the market. Some projections indicate that the 50-seat models will be completely out of the market in the next five years. At present, the airlines operate the 35-50 seat models at 26 flights per week. This scenario projection reduces the weekly 50-seat aircraft departures to 12 while increasing the 70/90- seat model departures. Overall, there are 56 present day weekly departures by regularly scheduled airlines. This projection results in a reduction in weekly departures to 48 but due to the fleet mix shift, more weekly seats available. This forecast also includes an irregularly scheduled carrier, such as Allegiant, which generally departs twice per week with larger narrow body aircraft models such as the MD-88, as shown. Finally, the scenario offers a projected 75 percent BLF for the regional carriers and 85 percent for the irregularly scheduled carrier. This projection yields 148,834 enplanements.

Scenario II (2026): The next scenario maintains similar assumptions like the first, except a narrow body airline operation per day is added. Moreover, this scenario projects all 50-seat aircraft replaced by larger

70/90-seat models. Two weekly departures by an irregularly scheduled carrier is also maintained, as is the BLF presented in the previous scenario. This scenario projection results in 169,832 enplanements.

Scenario III (2036): The third scenario builds on the changes made in the second to add a second daily narrow body airline departure per day. The regional airline aircraft model assumptions remain similar to the second. This projection yields 187,512 enplanements.

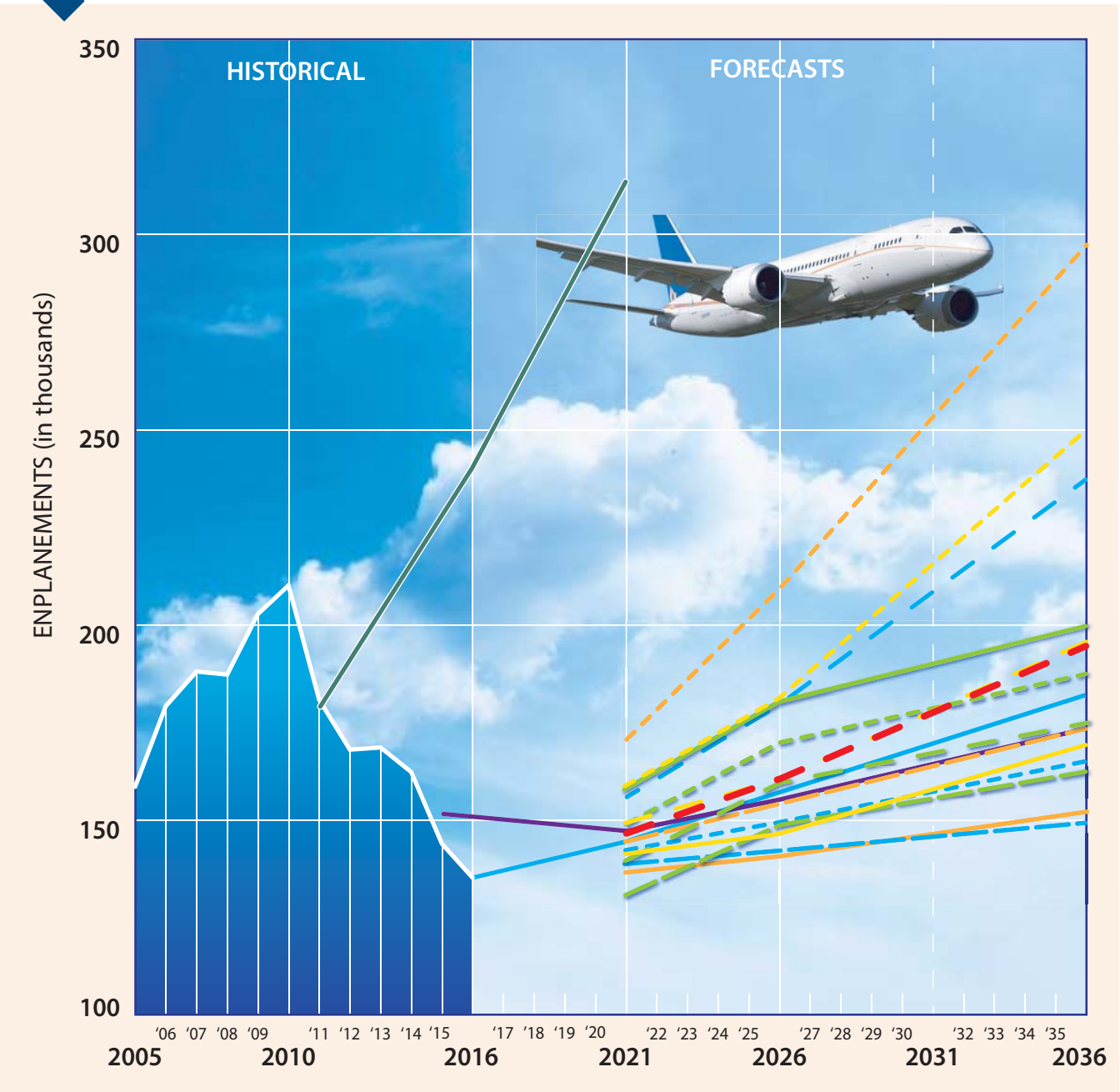
These scenarios are not based on any currently indicated changes by the airlines serving the airport. They are simply assumptions made based on market indicators and offer a more detailed evaluation on the potential make-up of future enplanements. There are several key variables assumed which, if changed, would yield significantly differing enplanements. For example, a shift in the BLF for any and/or all assumed flights would have a noticeable impact; so too would any equipment change and/or seating configuration. Several enplanement projections considering the change in BLF ranging between an average of 65 percent to 80 percent have been made, as depicted on **Exhibit 2G**.

Annual Growth Projections

The most simplistic enplanement forecasting model utilizes simple extensions of a selected annual growth rate. Historic enplanement levels have fluctuated reaching a peak in 2010 then falling. The first full year's enplanement level in 2005 was higher than that experienced over the last 12-month period (October 2015-September 2016), thus resulting in an overall slightly decreasing CAGR for the period. The period between 2005 and 2010, however, experienced strong and rapid growth, equating to a 5.8 percent CAGR. Such growth cannot be reasonably assumed to continue at most airports today. While the current trend is negative, the local economic base and community make-up certainly can support a return to growth and should be factored. Several projections for the simple percentage growth extension have been made, as presented in **Table 2J** and depicted on **Exhibit 2G**. The highest projection, considering a 2.85 CAGR, would be half that experienced between 2005 and 2010. While not shown, a 2.0 percent CAGR would yield 200,000 annual regular scheduled enplanements.

Regular Scheduled Commercial Airline Enplanement Summary

Table 2J and **Exhibit 2G** summarize all projections made for regular scheduled commercial airline enplanements. These projections provide an envelope from which a reasonable forecast can be selected. The purpose of these forecasts is to later support planning initiatives for future facility development directly tied to the demand element, in this case passenger enplanements. It is important to note that these projections all consider a return to growth over the period. As such, it is the intent of this study to examine needs based on reasonable levels of future demand segments which could spur a response to the demand elements.



LEGEND

TPF Projections
- Continued Decreasing Share (Falling to 0.275)
- Constant Share (maintaining 0.312)
- Increasing Share (Reaching Previous High of 0.53)

Market Share Of U.S. Regional Airline Domestic Enplanements
- Continued Decreasing Share (Falling to 0.076%)
- Constant Share (maintaining 0.0879%)
- Increasing Share (Reaching Previous High of 0.1123%)

FAA TAF

Previous Master Plan

Schedule Scenarios I, II, and III
- BLF 65%
- BLF 70%
- BLF 75%
- BLF 80%

Annual Growth Rate Projections
- 0.5% CAGR
- 1% CAGR
- 1.5% CAGR
- 2.85% CAGR

Selected Forecast

Exhibit 2G: REGULAR SCHEDULED AIRLINE ENPLANEMENT PROJECTIONS

TABLE 2J
Summary of Regular Scheduled Commercial Airline Enplanement Projections
Killeen-Fort Hood Regional Airport

FORECASTING METHOD	Base Year*	2021	2026	2036
TPF Projections				
Continued Decreasing Share (Falling to 0.275)	135,345	136,951	140,905	152,921
Constant Share (Maintaining 0.312)	135,345	144,844	154,254	173,496
Increasing Share (Reaching Previous high of 0.535)	135,345	170,841	209,627	297,502
Market Share of U.S. Regional Airline Domestic Enplanements				
Continued Decreasing Share (Falling to 0.076%)	135,345	141,780	146,400	169,480
Constant Share (Maintaining 0.0879%)	135,345	149,430	160,857	196,017
Increasing Share (Reaching high of 0.1123%)	135,345	158,950	181,170	250,429
Schedule Scenarios I, II, and III				
BLF 65%	135,345	130,946	149,074	162,510
BLF 70%	135,345	139,890	159,453	175,011
BLF 75%	135,345	148,834	169,832	187,512
BLF 80%	135,345	157,778	180,211	200,013
Annual Growth Rate Projections				
0.5% CAGR	135,345	138,763	142,267	149,542
1% CAGR	135,345	142,249	149,505	165,147
1.5% CAGR	135,345	145,805	157,073	182,290
2.85% CAGR	135,345	155,763	179,261	237,426
FAA TAF (Published March 2016)				
Air Carrier	872	929	962	1,081
Commuter	150,843	146,401	154,915	173,013
Total	151,715	147,330	155,877	174,094
Previous Master Plan (2005)	**2006**	**2011**	**2016**	**2021**
Passenger Enplanements	131,920	178,980	240,620	313,441

** Base Year Oct 2015-Sept 16 for all but FAA TAF, which is 2015.*

The projections presented form an enplanement planning envelope with a high of 297,502 and a low of 149,542. Based on the recent trend post 2010, it is unreasonable to believe that short-term and even long-term growth will follow the projections in the higher end of the planning envelope. The recent trend is likely due to more limited military engagements worldwide, thus driving down the military use of the regular scheduled commercial carriers. The community make-up and socioeconomic factors, however, do provide the ability to reverse the trend and return to growth like the communities similarly presented in the TPF analysis earlier. The greatest inhibitor to growth at GRK is presently and will continue to be the availability of higher levels of service in Austin and, to a lesser extent, Dallas, Houston and San Antonio.

The selected enplanement projection is the combination of the 1.5 percent growth rate with the constant share of U.S. Regional Airline domestic enplanements. This projection will be rounded for planning purposes as follows:

2021 – 147,000
2026 – 161,000
2036 – 196,000

The selected forecast assumes an initial 1.5 percent CAGR through the first five years, increasing to 1.8 percent for the next five years, then 1.97 percent annually through the remainder of the planning horizon. The forecasted demand is quite attainable as it has been reached and has even been exceeded twice previously in 2009 and 2010.

PUBLIC CHARTER ENPLANEMENT PROJECTIONS

GRK supports infrequent commercial passenger charter operations, which are associated with casino junkets and regional college sports teams. A review of historical enplanements by the public charters is provided in **Table 2K**.

TABLE 2K
Public Charter Enplanements
Killeen-Fort Hood Regional Airport

Year	Public Charter Enplanements	Annual Passenger Increase	% Change
2005	668	N/A	N/A
2006	815	147	22.0%
2007	1,934	1,119	137.3%
2008	2,005	71	3.7%
2009	1,604	-401	-20.0%
2010	2,160	556	34.7%
2011	1,089	-1,071	-49.6%
2012	1,063	-26	-2.4%
2013	1,084	21	2.0%
2014	758	-326	-30.1%
2015	669	-89	-11.7%
2016	663	-6	-0.9%
Period Average			***1,200***

Source: Airport Records

Based on historical trends and the infrequent nature of this type of activity, no forecasting method can reliably predict future figures. It is reasonable to suggest that the future activity will range between 600 and 2,000 enplanements. As such, this forecasting effort will utilize the period average of 1,200 for planning purposes. The period high at or above 2,000 enplanements could be used; however, it was only achieved three times, while figures lower than 1,604 and lower were achieved nine times. For most future years, 1,200 enplanements will be on the high end of that experienced, with few being higher. As such, the 1,200 represents a reasonable figure to utilize for facility planning.

MILITARY CHARTER COMMERCIAL AIRLINE ENPLANEMENTS

Fort Hood is the largest military installation in the world and supports a large share of troop movement between the United States and conflict zones throughout the world. It often is the location troops stage before departing to and returning from conflict. The U.S. military has frequently utilized commercial airlines, via charter agreements, to transport its troops from Fort Hood and other military installations. As these operations are conducted by civilian airlines, they are counted by the FAA as official enplanements for the airport.

Table 2L presents military charter enplanements for the airport since it became a joint use facility in 2004. Forecasts for future activity will follow the same methodology used for public charters due to the wide fluctuations in activity. Moreover, the predictability of these enplanements are further complicated by the lack of predicting future conflicts and or military missions. As such, the period average of 29,000 annual military charter commercial airline enplanements will be utilized for planning purposes.

TABLE 2L
Military Charter Commercial Airline Enplanements
Killeen-Fort Hood Regional Airport

Year	Military Enplanements	Annual Passenger Increase	% Change
2004	21,338	N/A	N/A
2005	33,586	12,248	57.4%
2006	29,148	-4,438	-13.2%
2007	26,066	-3,082	-10.6%
2008	42,948	16,882	64.8%
2009	27,066	-15,882	-37.0%
2010	31,520	4,454	16.5%
2011	37,764	6,244	19.8%
2012	14,304	-23,460	-62.1%
2013	26,124	11,820	82.6%
2014	26,367	243	0.9%
2015	32,182	5,815	22.1%
Period Average			29,000
Passenger difference between period high and low			28,644
CAGR 2004-2015			3.8%

AIRLINE FLEET MIX AND OPERATIONS FORECAST

The airline fleet aircraft mix defines several key parameters in airport planning, including critical aircraft (for pavement design and ramp geometry), terminal complex layout, and maximum stage length capabilities (affecting runway length evaluations). For the base year analysis, the period of October 2015 through September 2016 was utilized.

Changes in equipment, airframes, and engines have always had a significant impact on airlines and airport planning. There are many ongoing programs by the manufacturers to improve performance characteristics. These programs continue to focus on improvements in fuel efficiency. Regional jets (RJs) also became a larger factor as the airlines looked for ways to reduce costs. Many airlines replaced larger commercial jets, as well as commuter turboprops, on smaller emerging routes with RJs.

Commuter airlines are transitioning to advanced turboprop aircraft and RJs to fit their market needs. Many of these aircraft have greater seating capacity, lower operating costs, and are considerably more comfortable for the flying public. The RJs made their initial impact in the 44- to 50-seat range. RJ aircraft eventually became available with as few as 37 seats and as many as 100 seats. This bridged a long-existing gap in seating capacity, making RJs the aircraft of choice at non-hub and small-hub airports.

As the price of fuel rose, however, the 50-seat and smaller RJs have been found to be less cost-effective than their counterparts over 60 seats. In fact, the higher seat capacity turboprops, such as the Q400 and even ATR-72, have been more cost-effective than the 50-seat jet carrying the same number of passengers. As a result, the 50-seat RJs are no longer in production and can eventually be expected to be eliminated from the fleet. This will occur over time, however, as some regional carriers will maintain them for some services, as well as in codesharing with major airlines that have restrictive scope clauses with pilots' unions that prohibit codesharing on aircraft above a certain seating capacity.

In addition, turboprops that have been the workhorses for the small commuter markets are also no longer in production. In fact, the only commuter turboprops still in production are the ATR 42 in the 40- to 60-seat range, as well as the Q-400 and ATR-72, each with more than 60 seats. Unless there is a new aircraft manufactured in the range of 10 to 39 seats, smaller markets that cannot support the larger turboprops could lose service from anything over nine-seat but less than 40 seat aircraft.

Table 2M presents the historical airline operational fleet mix by seat capacity for 2010 and 2016 (12-month ending September 2016) along with the forecast fleet mix. In 2010, most aircraft operations were by those with fewer than 74 passenger seats, including the ATR-72. The largest aircraft mix grouping was in the 50-seat category represented by the ERJ 145 and CRJ 200. The remaining 31.65 percent of flights were by 10-39 market with Saab 340 turboprop and ERJ 135 regional jet aircraft.

The average seats per departure increased from 51.89 in 2010 to 59.23 in 2016. Fleet mix changes of note include the removal of ATR models replaced by ERJ/CRJ 50-, 70-, and 90-seat aircraft models as presented in the table. The BLF at GRK was 64.81 percent in 2010 and dropped slightly to 63.90 percent in 2016. Stability and growth in BLF in recent years has occurred at airports across the country as airlines have worked to improve efficiency and reduce costs. The BLF for GRK was slightly lower in 2016 versus 2010, but remained markedly steady given the significant shift to larger aircraft operations. In the future, BLFs can be expected to continue to grow up to 75 percent reflecting growth projected by the FAA for the regional carrier industry in the long term.

TABLE 2M
Regular Scheduled Commercial Passenger Airline Fleet Mix and Operations Forecast
Killeen-Fort Hood Regional Airport

Fleet Mix	HISTORICAL		FORECAST		
Seating Capacity/Example Aircraft	2010	2016*	2021	2026	2036
100-180/MD88, A320	0.00%	0.00%	5.00%	5.00%	10.00%
75-99/ERJ-CRJ 190/900	0.03%	26.90%	30.00%	40.00%	45.00%
60-74/ERJ/CRJ-700, Q-400	33.10%	5.40%	30.00%	40.00%	45.00%
40-59/CRJ 200	35.22%	50.30%	30.00%	15.00%	0.00%
10-39/ERJ 135	31.65%	17.40%	5.00%	0.00%	0.00%
Total	100.00%	100.00%	100.00%	100.00%	100.00%
Avg. Seats per Departure	51.89	59.23	71.75	78.50	86.00
Boarding Load Factor	64.81%	63.90%	65.00%	68.00%	75.00%
Enplaned per Departure	33.63	37.85	46.64	53.38	64.50
Annual Enplanements	210,181	135,345	147,000	161,000	196,000
Annual Departures	6,250	3,576	3,152	3,016	3,039
Annual Operations	12,500	7,152	6,304	6,032	6,078
Air Carrier Ops (>60 seats)	4,142	2,310	4,098	5,127	6,078
Commuter/AT Ops (<60 seats)	8,358	4,842	2,206	905	0

* 12-month period from October 2015 through September 2016

With an increase in seating capacity, the number of passengers on each aircraft flight has also grown over the past five years. The average enplanements per departure in 2010 was 33.63, and by 2016 it had jumped to 37.85 enplanements per departure. Along with the 35.6 percent reduction in enplanements over that period, there has been a 47 percent reduction in the number of scheduled airline flights.

As the airlines retire older aircraft that are no longer in production, they are likely to utilize aircraft with more seats primarily because these are the aircraft in production, and they are more economical than smaller regional jets. It is anticipated that the airlines will begin the transition to the 60-90 seat aircraft by 2026 and continue through 2036. Those aircraft with 60 or more seats are considered air carrier aircraft operations by the ATCT. As a result, the number of operations by commuter aircraft (less than 60 seats) will decrease, while air carrier aircraft operations will increase, as presented in **Table 2M**.

AIR CARGO FORECASTS

Air freight includes the combined activities of the scheduled passenger airlines carrying freight on scheduled flights and the dedicated all-cargo carriers. Air mail may also be carried by both the scheduled passenger airlines and all-cargo carriers. Freight and mail together make up air cargo activity at an airport. This section describes the national aviation trends in the air cargo airline industry, historical activity at GRK, and future projections of air cargo activity.

NATIONAL AIR CARGO TRENDS

Air cargo activity has historically had a high correlation to gross domestic product (GDP). Other factors that affect air cargo growth are real yields, fuel price volatility, and globalization. Ongoing trends that are and will continue to impact the air cargo market include security regulations by the FAA and TSA, maturation of the domestic express market, a shift from air to other modes (especially truck), use of all-cargo carriers (e.g., FedEx) by the U.S. Postal Service to transport mail, and the increased use of mail substitutes (e-mail and cloud-based services).

Before 2001, air cargo was the fastest growing sector of the aviation industry. From 1994 through 2000, total tons and revenue ton-miles (RTMs) grew at annual average rates of 8.0 and 8.6 percent, respectively. An economic slowdown in the U.S., combined with the collapse in the high-tech industry and a slowing of imports, resulted in declines of 5.0 percent in tons and 3.9 percent in RTMs in 2002. Domestic RTMs grew modestly through 2007 and then realized a steep decline that coincided with the 2008-2009 national recession. In 2006, RTMs had reached 15.4 billion tons; by 2009, 11.9 billion RTMs were realized. U.S. carriers flew 35.9 billion RTMs in 2015, up 2.2 percent from 2014 with domestic cargo RTMs increasing 3.3 percent to 13.1 billion. Domestic RTMs are forecast to grow 1.9 percent in 2016. Domestic RTMs are forecast to grow at an average annual rate of 0.4 percent, reaching 14.4 billion by 2036. Domestic RTMs flown by all-cargo carriers comprised 89.2 percent of total RTMs in 2015, with passenger carriers flying the remainder. The all-cargo share is forecast to grow to 90.8 percent by 2036.

The FAA notes there are several structural changes that are occurring within the air cargo industry. Among them are the following:

- **Security regulations** – On August 3, 2007, *Recommendations of the 9/11 Commission Act of 2007* was signed into law. Section 1602 of this Act states that air cargo placed on passenger aircraft will receive the same level of screening as passenger-checked baggage. Legislation called for the establishment of a system by 2010 that required 100 percent inspection of cargo transported by passenger aircraft.

- **Market maturation** – The express market in the United States has matured after dramatic growth over the last two decades. This represents the majority of domestic air cargo activity.

- **Modal shift** – Improved service and economics from the use of alternative modes of cargo transported by the integrated cargo carriers (e.g., FedEx and UPS) has matured.

- **Increases in air fuel surcharges** – Fuel costs are a significant factor for all aviation.

- **Increased USPS use of all-cargo carriers** – This initially resulted from the U.S. Postal Service's (USPS) need to improve control over delivery. The trend has continued due to security regulations.

- **Increased use of mail substitutes** – Substitutes such as e-mail affect mail volume. The residual fear of mail because of terrorism has also been a factor.

The FAA forecast for RTMs was based on several specific assumptions exclusive to the air cargo industry. First, security restrictions will remain in place. Second, most of the shift from air to ground transportation has occurred. Finally, long-term cargo activity is tied to economic growth.

The number of large cargo jet aircraft is forecast to increase from 781 aircraft in 2015 to 1,114 in 2036, driven by the growth in freight RTMs. The narrow-body cargo jet fleet is projected to increase by two aircraft a year as 757s and 737s are converted from passenger use to cargo service. The wide body cargo fleet is forecast to increase by 14 aircraft a year as new 747-800, 767-300, and 777-200 aircraft are added to the fleet, replacing older MD-11 and 767-200 freighters.

AIR CARGO FORECAST

Air cargo at GRK is handled by the scheduled airlines as "belly freight." **Table 2N** summarizes air cargo activity at the Airport since 2011. GRK's market share of U.S. RTMs has fluctuated from a high of 0.0295 percent in 2011, before dropping down to 0.0238 percent in 2013, followed by a return to growth in 2014 and another decline in 2015 at 0.0242 percent. The forecast for air cargo at GRK projects overall growth in the market share returning to its recent peak market share of 0.0295 percent by 2036. This growth is considered reasonable considering the anticipated overall growth of the local population and economy.

Air cargo operations data was gathered from airport records. According to this data, the airline operators at GRK have hauled an average of 43,577 pounds per year, which is skewed by the 2010 and 2011 figures. The fluctuations in activity make it impossible to forecast with any reliability; however, for planning purposes, the forecasts presented in **Table 2N** will aid in ensuring that facilities are adequately sized to meet reasonable demand levels. The airport is not served by a dedicated cargo airline at present. Future conditions will not likely change as the cargo airlines have found it more economical to ship freight via ground modes for areas within a three-hour drive of an existing cargo hub/center which is already established in Austin/HOU/DFW. As such, forecasts will assume larger availabilities to carry freight by larger commercial passenger fleets in the future.

TABLE 2N
Air Cargo Projection
Killen-Fort Hood Regional Airport

Year	Belly Freight (pounds)
2004	11,165
2005	19,726
2006	34,438
2007	21,548
2008	6,763
2009	79,026
2010	109,422
2011	216,358
2012	32,620
2013	10,306
2014	10,704
2015	12,788
2016	1,375
FORECASTS	
2021	20,000
2026	50,000
2036	100,000

Source: Airport records, 2016 partial year data through September

GENERAL AVIATION FORECASTS

General aviation encompasses all portions of civil aviation except commercial service and military operations. To determine the types and sizes of facilities that should be planned to accommodate general aviation activity at GRK, certain elements of this activity must be forecast. These indicators of general aviation demand include based aircraft, aircraft fleet mix, and annual operations.

NATIONAL GENERAL AVIATION TRENDS

The FAA forecasts the fleet mix and hours flown for single engine piston aircraft, multi-engine piston aircraft, turboprops, business jets, piston and turbine helicopters, light sport, experimental, and others (gliders and balloons). The FAA forecasts "active aircraft," not total aircraft. An active aircraft is one that is flown at least one hour during the year. From 2010 through 2013, the FAA undertook an effort to have all aircraft owners re-register their aircraft. This effort resulted in a 10.5 percent decrease in the number of active general aviation aircraft, mostly in the piston category.

The long-term outlook for general aviation is favorable, led by gains in turbine aircraft activity. The active general aviation fleet is forecast to increase 0.2 percent a year between 2015 and 2036, equating to an absolute increase in the fleet of about 7,000 units. While steady growth in both GDP and corporate profits results in continued growth of the turbine and rotorcraft fleets, the largest segment of the fleet – fixed-wing piston aircraft – continues to shrink over the FAA's forecast.

In 2015, the general aviation industry experienced its first decline in aircraft deliveries since 2010. While the single engine piston aircraft deliveries by U.S. manufacturers continued to grow and business jet deliveries recorded a very modest increase compared to the previous year, turboprop deliveries declined by 10 percent, and the much smaller category of multi-engine piston deliveries declined by 40 percent.

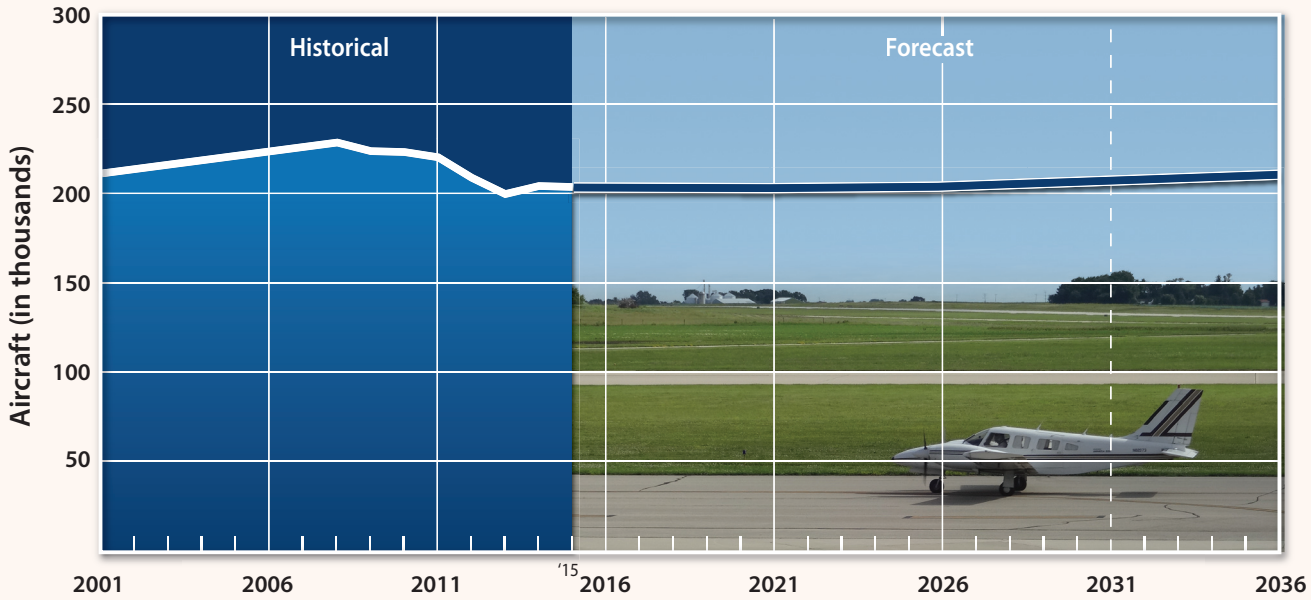
In 2015, the FAA estimated there were 138,135 piston-powered aircraft in the national fleet. The total number of piston-powered aircraft in the fleet is forecast to decline by 0.7 percent from 2015-2036, resulting in 118,855 by 2036. This includes -0.7 percent annually for single engine piston aircraft and -0.5 percent for multi-engine piston aircraft.

Total turbine aircraft are forecast to grow at an annual growth rate of 2.1 percent through 2036. The FAA estimates there were 29,040 turbine-powered aircraft in the national fleet in 2015, and there will be 44,655 by 2036. This includes annual growth rates of 1.3 percent for turboprops, 2.5 percent for business jets, and 2.3 percent for turbine helicopters.

While comprising a much smaller portion of the general aviation fleet, experimental aircraft, typically identified as home-built aircraft, are projected to grow annually by 0.9 percent through 2036. The FAA estimates there were 26,435 experimental aircraft in 2016, and these are projected to grow to 31,640 by 2036. Sport aircraft are forecast to grow 4.5 percent annually through the long term, growing from 2,410 in 2015 to 6,100 by 2036. **Exhibit 2H** presents the historical and forecast U.S. active general aviation aircraft.

U.S. ACTIVE GENERAL AVIATION AIRCRAFT

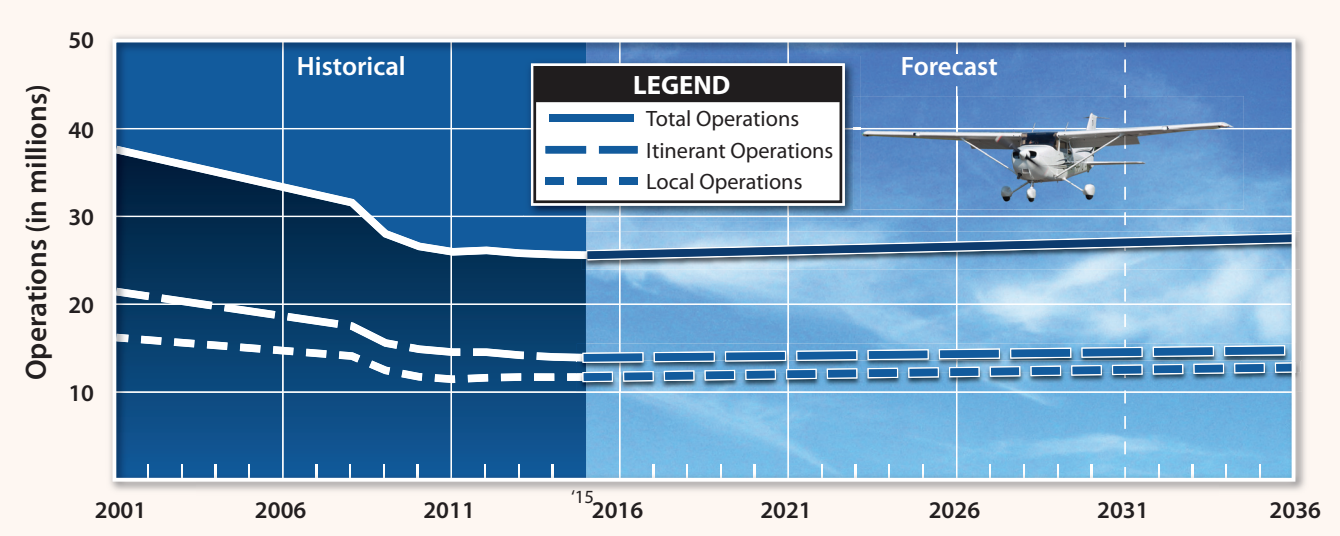
	2015	2021	2026	2036	AAGR 2015-2036
Fixed Wing					
Piston					
Single Engine	125,050	119,585	115,045	107,160	-0.7%
Multi-Engine	13,085	12,760	12,480	11,695	-0.5%
Turbine					
Turboprop	9,570	9,215	9,775	12,635	1.3%
Turbojet	12,475	13,975	15,735	20,770	2.5%
Rotorcraft					
Piston	3,245	3,770	4,170	5,005	2.1%
Turbine	6,995	8,215	9,185	11,250	2.3%
Experimental					
	26,435	27,690	28,735	31,640	0.9%
Sport Aircraft					
	2,410	3,490	4,410	6,100	4.5%
Other					
	4,615	4,525	4,495	4,440	-0.2%
Total Pistons	**141,380**	**136,115**	**131,695**	**123,860**	**-0.6%**
Total Turbines	**29,040**	**31,405**	**34,695**	**44,655**	**2.1%**
Total Fleet	**203,880**	**203,225**	**204,030**	**210,695**	**0.2%**



Notes: An active aircraft is one that has a current registration and was flown at least one hour during the calendar year.
Source: FAA Aerospace Forecast - Fiscal Years 2016-2036

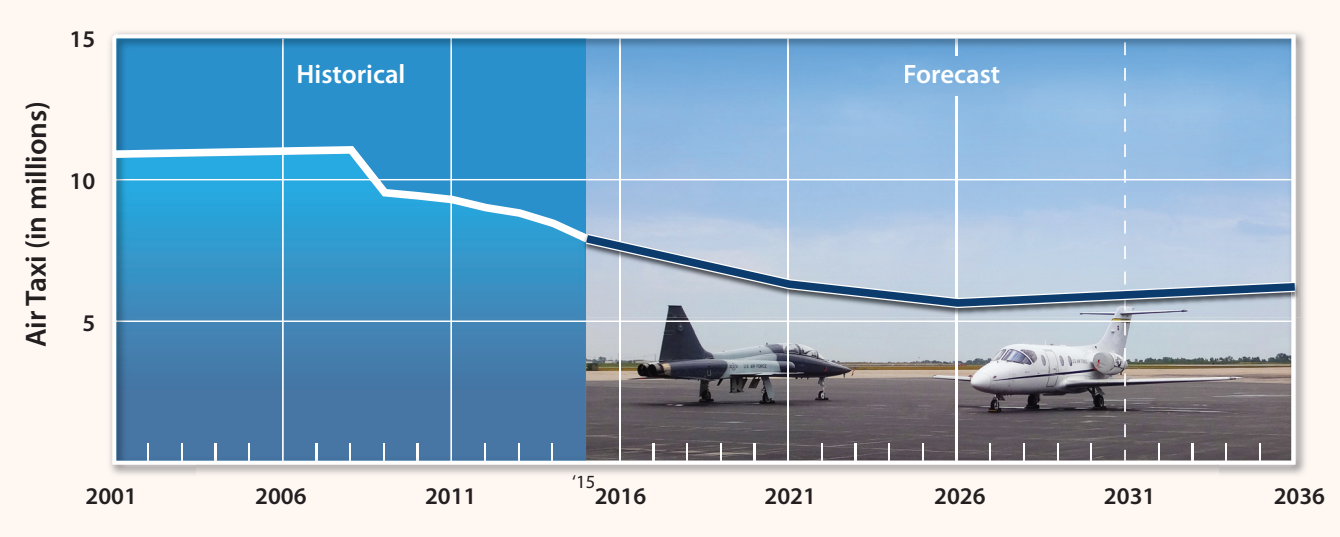
U.S. GENERAL AVIATION OPERATIONS

	2015	2021	2026	2036	AAGR 2015-2036
Itinerant					
	13,887,000	14,103,000	14,309,000	14,742,000	0.3%
Local					
	11,691,000	12,011,000	12,255,000	12,772,000	0.4%
Total GA Operations	**25,578,000**	**26,114,000**	**26,564,000**	**27,514,000**	**0.3%**



U.S. GENERAL AVIATION AIR TAXI

	2015	2021	2026	2036	AAGR 2015-2036
Air Taxi/Commuter Operations					
Itinerant	7,895,000	6,294,000	5,631,000	6,199,000	-1.1%



The FAA also forecasts total operations based upon activity at control towers across the U.S. Operations are categorized as air carrier, air taxi/commuter, general aviation, and military.

General aviation operations, both local and itinerant, declined significantly because of the 2008-2009 recession and subsequent slow recovery. Through 2036, total general aviation operations are forecast to grow 0.3 percent annually. Air taxi/commuter operations are forecast to decline by 3.4 percent through 2025, and then increase slightly through the remainder of the forecast period. Overall, air taxi/commuter operations are forecast to decline by 1.1 percent annually from 2015 through 2036.

General Aviation Aircraft Shipments and Revenue

As previously discussed, the 2008-2009 economic recession has had a negative impact on general aviation aircraft production, and the industry has been slow to recover. Aircraft manufacturing declined for three straight years from 2008 through 2010. According to the General Aviation Manufacturers Association (GAMA), there is optimism that aircraft manufacturing will stabilize and return to growth, which has been evidenced since 2011. **Table 2N** presents historical data related to general aviation aircraft shipments.

TABLE 2N
Annual General Aviation Airplane Shipments
Manufactured Worldwide and Factory Net Billings

Year	Total	SEP	MEP	TP	J	Net Billings ($millions)
1994	1,132	544	77	233	278	3,749
1995	1,251	605	61	285	300	4,294
1996	1,437	731	70	320	316	4,936
1997	1,840	1043	80	279	438	7,170
1998	2,457	1508	98	336	515	8,604
1999	2,808	1689	112	340	667	11,560
2000	3,147	1,877	103	415	752	13,496
2001	2,998	1,645	147	422	784	13,868
2002	2,677	1,591	130	280	676	11,778
2003	2,686	1,825	71	272	518	9,998
2004	2,962	1,999	52	319	592	12,093
2005	3,590	2,326	139	375	750	15,156
2006	4,054	2,513	242	412	887	18,815
2007	4,277	2,417	258	465	1,137	21,837
2008	3,974	1,943	176	538	1,317	24,846
2009	2,283	893	70	446	874	19,474
2010	2,024	781	108	368	767	19,715
2011	2,120	761	137	526	696	19,042
2012	2,164	817	91	584	672	18,895
2013	2,353	908	122	645	678	23,450
2014	2,454	986	143	603	722	24,499
2015	2,331	946	110	557	718	24,120

SEP - Single Engine Piston; MEP - Multi-Engine Piston; TP - Turboprop; J - Turbofan/Turbojet

Source: General Aviation Manufacturers Association *2015 General Aviation Statistical Databook & 2016 Industry Outlook*

Worldwide shipments of general aviation airplanes decreased in 2015, with a total of 2,331 units delivered around the globe, compared to 2,454 units in 2014. Worldwide general aviation billings were also lower than the previous year. In 2015, $24 billion in new general aviation aircraft were shipped, but yearend results were mixed across the market segments. Results were impacted by economic uncertainty in key markets, including Brazil, Europe, and China; however, the U.S. experienced stronger delivery numbers, which is cause for cautious optimism.

Business Jets: General aviation manufacturers delivered 718 business jets in 2015, as compared to 722 units in 2014. The industry's continued investment in new products helped maintain the delivery rate for business jets.

Turboprops: In 2015, 557 turboprop airplanes were delivered to customers around the world, a decline from the 603 delivered in 2014. Overall, the turboprop market is still significantly stronger over the past five years compared to years prior to 2011.

Pistons: Piston deliveries declined from 1,129 units during 2014 to 1,056 in 2015. Two-thirds of piston shipments were to North American customers, a significant increase from the 2014 North American market share of 55.1 percent.

BASED AIRCRAFT

The number of based aircraft is the most basic indicator of general aviation demand. By first developing a forecast of based aircraft for the Airport, other general aviation activity and demand can be projected. The process of developing forecasts of based aircraft begins with an analysis of aircraft ownership in the primary general aviation service area through a review of historical aircraft registrations.

Service Area Aircraft Ownership (Registered Aircraft)

The primary service area for general aviation demand typically extends about 30 miles from an airport. As was discussed in Chapter One, there are several other public-use airports within that 30-mile radius from GRK, including Killeen's Skylark Field Airport (ILE) (seven miles east), Lampasas Airport (19 miles west), Draughon-Miller Central Texas Airport in Temple, Texas (22 miles east/northeast), and Georgetown Municipal Airport (25 miles south). Convenience, meaning proximity to an airport, is typically the most important factor aircraft owners/operators consider when choosing where to base their aircraft. This is especially true for owners and operators of turbine-powered aircraft.

The City of Killeen is the sponsor and primary operator of two airports, GRK and ILE. Chapter One of this study outlined the parameters set for joint use operation at Robert Gray Army Airfield, which includes the prohibition of small general aviation aircraft basing and operation. Small general aviation aircraft are defined as those aircraft weighing less than 12,500 pounds maximum certified take-off weights. Small general aviation aircraft basing and operation are to be accommodated at ILE or other general

aviation airports in the region. The agreement does allow for GRK to accommodate large general aviation aircraft (> 12,500 pounds), generally referred to as "large aircraft." Consideration should then be given to the potential for future large general aviation aircraft basing at GRK, as at present there are no civilian aircraft based at the airport.

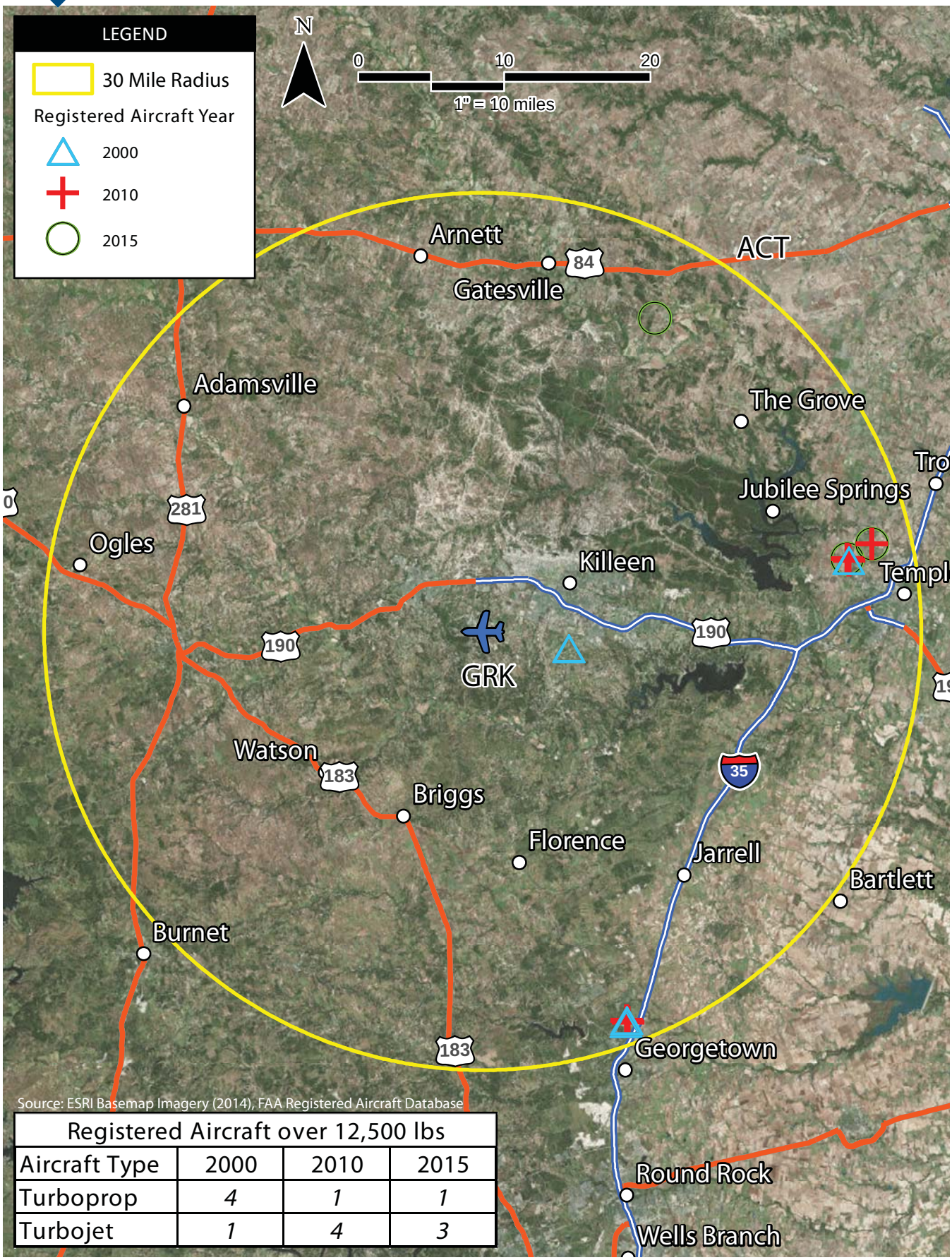
There is a desire by the City to accommodate large aircraft at GRK in the future. For this reason, the primary service area for based aircraft is the immediate area of Killeen and corporate entities nearby. As such, an analysis of the aircraft registrations in a 30-mile radius of GRK was made. **Exhibit 2J** presents the location of large general aviation aircraft within the 30-mile radius. The exhibit also presents the physical address of the owner only, not the location of the aircraft basing location. It is important to note that many large general aviation aircraft are owned by trusts or financial institutions and their registrations are held in distant locations, commonly on the east and/or west coasts. As such, understand the limited number of aircraft on the list is not indicative of all large aircraft in the area, just those owned and registered by operators locally.

GRK Based Aircraft Forecast

Determining the number of based aircraft at an airport can be a challenging task as most airport records are not complete due to the transient nature of general aviation aircraft basing. For GRK, the analysis is less complicated as there are no aircraft currently based at the airport. As previously noted, the joint-use agreement prohibits the basing of general aviation aircraft weighing less than 12,500 pounds. Aircraft weighing less than 12,500 pounds comprise the clear majority of general aviation aircraft in the national system. Large general aviation aircraft are more expensive and sophisticated to operate, thus, ownership is less numerous.

The FAA TAF is an initial forecast source for based aircraft at airports. The 2016 TAF for GRK indicates no based aircraft with no based aircraft projected for the Airport. Given the lack of any trends at the Airport and the lack of FAA guidance, forecast of based aircraft at GRK must follow reasonable assumptions. First, the Airport offers no current facility to house many aircraft. Second, future expansion of joint-use agreement space could allow for some aircraft hangar development. Third, the Killeen MSA, most prominently the City of Killeen, has a robust socioeconomic condition to support large general aviation aircraft basing. Finally, the area's registered aircraft indicates few large general aviation aircraft within the service area.

Based on FAA forecasts, turboprop and turbojet aircraft are the only truly growing aircraft segment at present and for the foreseeable future. For planning purposes, it is not unreasonable to assume that based on the assumptions outlined above, GRK could house up to ten turbine-powered aircraft in the study period. This forecast also assumes the Airport would respond to such a demand with the construction of new hangar facilities, without which these aircraft may choose to base elsewhere. This is not to suggest that building a hangar would spur the growth but only that if demand presents itself, hangar construction would likely be a necessary condition for the aircraft to base at GRK. It is believed public and/or private partnerships could support such growth and forecasts of future based aircraft will be ten turbine-powered aircraft.



Source: ESRI Basemap Imagery (2014), FAA Registered Aircraft Database

Registered Aircraft over 12,500 lbs			
Aircraft Type	2000	2010	2015
Turboprop	*4*	*1*	*1*
Turbojet	*1*	*4*	*3*

The based aircraft fleet mix forecast for GRK is presented in **Table 2P**. Again, there are currently no based general aviation aircraft at GRK. Projections for based general aviation aircraft include two turboprops in the next five years, followed by four more by 2036. One jet aircraft is projected to be based at the airport by 2021 and three more by 2036.

TABLE 2P
Based Aircraft Fleet Mix
Killeen-Fort Hood Regional Airport

	EXISTING		FORECAST					
Aircraft Type	**2016**	**%**	**2021**	**%**	**2026**	**%**	**2036**	**%**
Single Engine	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Multi-Engine	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Turboprop	0	0.0%	2	100.00%	3	75.00%	6	60.00%
Jet	0	0.0%	0	0.00%	1	25.00%	4	40.00%
Helicopter	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Other	0	0.0%	0	0.0%	0	0.0%	0	0.0%
Totals	**0**	**100.0%**	**2**	**100.0%**	**4**	**100.0%**	**10**	**100.0%**

Source: Coffman Associates analysis

GENERAL AVIATION OPERATIONS

General aviation (GA) operations are classified by the airport traffic control tower (ATCT) as either local or itinerant. A local operation is a take-off or landing performed by an aircraft that operates within sight of an airport, or which executes simulated approaches or touch-and-go operations at an airport. Itinerant operations are those performed by aircraft with a specific origin or destination away from an airport. Generally, local operations are characterized by training operations. Typically, itinerant operations increase with business and commercial use, since business aircraft are operated on a higher frequency.

Table 2Q summarizes GA itinerant operations at GRK from 2005 through 2015 as provided by the GRK ATCT. GA itinerant operations at the Airport have been on a gradual increase since 2005, which is opposite of the declining GA activity nationwide. National GA itinerant operations have been declining since at least 2000, but have taken a steeper decline since the beginning of the recession and have yet to recover; however, the FAA forecasts a reversal in 2016. Through 2036, the FAA forecasts an annual growth rate of 0.3 percent for itinerant GA operations.

Three forecasts were examined for future itinerant GA operations; two projections were considered. The first projection is an extension of a constant share of U.S. general aviation itinerant operations at towered airports, resulting in 2,396 itinerant operations by 2036 at a CAGR of 0.30 percent. The second projection considered GRK itinerant general aviation operations increasing at a continued 3.30 percent CAGR, which would be supported by based aircraft presented in the previous section. The 2016 FAA TAF is the final projection considered, which presents an itinerant GA operations forecast that remains at their estimated 92 through the planning period.

TABLE 2Q
General Aviation Itinerant Operation Projections
Killeen-Fort Hood Regional Airport

Year	GRK Itinerant GA Ops	U.S. GA Itinerants Ops at ATCT Airports (millions)	Market Share
2005	1,641	19.32	0.0085%
2006	1,508	18.74	0.0080%
2007	1,492	18.58	0.0080%
2008	1,751	17.49	0.0100%
2009	1,972	15.57	0.0127%
2010	2,189	14.86	0.0147%
2011	2,307	14.53	0.0159%
2012	1,901	14.52	0.0131%
2013	3,195	14.12	0.0226%
2014	2,199	13.98	0.0157%
2015	2,270	13.89	0.0163%
CAGR (2000-2015)	*3.30%*	*-3.25%*	
Constant 2015 Market Share of U.S. GA Itinerant Ops Projection			
2021	2,292	14.06	0.0163%
2026	2,326	14.27	0.0163%
p	2,396	14.70	0.0163%
CAGR (2015-2036)	*0.30%*	*0.30%*	
Continued Increasing Market Share and Constant CAGR 3.30% Projection (Selected Forecast)			
2021	2,670	14.06	0.0190%
2026	3,140	14.27	0.0220%
2036	4,345	14.70	0.0296%
CAGR (2015-2036)	*3.30%*	*0.30%*	
2016 FAA TAF			
2021	92	14.06	0.0007%
2026	92	14.27	0.0006%
2036	92	14.70	0.0006%
CAGR (2015-2036)	*0.00%*	*0.30%*	

[1] Historical data from ATCT records as reported to consultant.
[2] FAA Forecasts Fiscal Years 2016-2036
CAGR - Compound Annual Growth Rate
Source: Coffman Associates analysis

Itinerant GA operations at GRK have grown as national itinerant GA operations have continued to decline. As a result, its market share has grown slightly. It is reasonable to consider GRK's market share continuing to increase, especially should general aviation aircraft base at the Airport in the future. Therefore, the continued increasing market share projection has been chosen as the selected forecast for the master plan for itinerant GA operations.

Local General Aviation Operations

Local general aviation operations are typically conducted by small general aviation aircraft. As previously discussed, small general aviation aircraft operations are generally prohibited and are directed to Killeen Skylark Field. Review of ATCT counts indicates no local general aviation aircraft operations. The master plan forecasts will assume no future local general aviation operations as a change to the joint-use agreement is not anticipated.

CIVILIAN AIR CARRIER CHARTER, MILITARY CHARTER, AND OTHER AIR TAXI

Operations by for-hire charter operators include those that move through the civilian terminal (civilian air carrier charters) and those that move through the military terminal complex (military charters). Both have had relatively stable enplanement levels through the planning period as outlined earlier. Both also generate large commercial aircraft operations. Other air taxi operations can include small commercial service aircraft operations, as well as general aviation type aircraft for the "on-demand" commercial transport of persons and property in accordance with 14 Code of Federal Regulations (CFR) Part 135 and Subchapter K of 14 CFR Part 91 (fractional ownership). Air carrier charter (both civilian and military) operations are conducted by aircraft within the "air carrier" category, while other air taxi operations are those likely conducted in general aviation fleet mix aircraft models. Air carrier charter operations are those conducted commercially by aircraft having a seating capacity of 60 or more and/or a maximum payload capacity of 18,000 pounds.

Table 2R presents historical estimates of charter operations for each category. The estimates were based on ATCT counts (not complete), airport records of annual enplanement information, the GCR Airport IQ data system, and FAA database information. While these figures are not an exact count for the periods represented, they are reasonably close and usable for planning purposes.

Historical civilian air carrier charter operations have generally been conducted via narrow-bodied aircraft models for casino junkets and other similar purposes. Military charters were conducted to transport troops to and from military and training theaters of operation utilizing a wide range of aircraft, most of which were wide-bodied aircraft models. Charter operation forecasts assume similar aircraft types being used for similar functions with assumptions made based on activity at other similar markets. Each charter category, civilian air carrier, military, and other air taxi, are non-scheduled and are primarily influenced by factors not forecastable today, such as military events and conflicts and major shifts in the economy. The forecasts presented in **Table 2R** are reasonable expectations of future activity allowing for planning efforts to follow.

TABLE 2R
Charter and Other Air Taxi Operation Forecasts
Killeen-Fort Hood Regional Airport

Year	Air Carrier Charter	Military Airline Charter	Other Air Taxi
2005	12	336	2,745
2006	15	291	2,685
2007	35	261	2,420
2008	36	429	2,469
2009	29	271	2,413
2010	39	315	2,444
2011	20	378	2,180
2012	19	143	2,487
2013	20	261	2,369
2014	14	264	2,432
2015	12	322	2,264
FORECASTS			
2021	15	300	2,300
2026	30	350	2,500
2036	40	450	3,000
CAGR	*5.83%*	*1.61%*	*1.35%*

Sources: Estimates based on data from the following: FAA Airline Service Quality Performance System data; Airport IQ (GCR); ATCT counts; Coffman Associates analysis.

MILITARY OPERATIONS FORECAST

GRK is primarily a military airfield, Robert Gray Army Airfield, which has a civilian component. Military operators routinely utilize GRK for various training operations and activities. There are a wide variety of activities ranging from fighter jets to tanker and transport aircraft and, most recently, unmanned aircraft systems (UAS) operations. **Table 2S** presents a summary of military operations, both local and itinerant, since 2005.

Tower records indicate that military operations have remained relatively constant from 2011 to 2015 after decreasing from a period high in 2010. The purpose of this study is to determine civilian demand and future needs, understanding the military nature and use of the facility. The FAA will not participate in funding any future facility driven primarily by military demand. In fact, the FAA TAF presents current and future military operations as zero, being that these operations do not influence their planning and facility development. As such, forecasts of military operations in a civilian FAA airport master planning effort are generally for information purposes only.

Developing a reliable forecast of military activity is inherently difficult, primarily because the military mission can change rapidly. Given the relatively stable nature of historical military operations, a period average of 54,500 annual military operations will be used for forecast planning purposes. Therefore, the master plan will carry forward a forecast of 23,700 itinerant military and 30,800 local military operations through 2036.

TABLE 2S
Military Aircraft Operations Forecast
Killeen-Fort Hood Regional Airport

Year	Itinerant	% of Total	Local	% of Total	Total Military
2005	23,498	37.6%	39,028	62.4%	62,526
2006	21,783	41.3%	30,913	58.7%	52,696
2007	21,271	47.6%	23,395	52.4%	44,666
2008	25,454	42.4%	34,560	57.6%	60,014
2009	22,788	51.0%	21,885	49.0%	44,673
2010	26,975	41.9%	37,333	58.1%	64,308
2011	28,339	55.2%	22,970	44.8%	51,309
2012	22,993	41.7%	32,209	58.3%	55,202
2013	20,341	36.9%	34,818	63.1%	55,159
2014	23,483	44.3%	29,546	55.7%	53,029
2015	21,881	38.8%	34,500	61.2%	56,381
Selected Forecast					
2021	23,700	43.5%	30,800	56.5%	54,500
2026	23,700	43.5%	30,800	56.5%	54,500
2036	23,700	43.5%	30,800	56.5%	54,500

Sources: Historical data from ATCT records.
Forecast – Coffman Associates analysis.

PEAKING CHARACTERISTICS

Many airport facility needs are related to the levels of activity during peak periods. The peak periods that will be used in developing facility requirements for this study are as follows:

- **Peak Month** – The calendar month when peak aircraft operations occur.
- **Design Day** – The average day in the peak month. This indicator is derived by dividing the peak month operations by the number of days in a month.
- **Busy Day** – The busy day of a typical week in the peak month. This peaking factor is used primarily to determine transient ramp parking requirements.
- **Design Hour** – The peak hour within the design day or busy day.

It is important to note that only the peak month is an absolute peak within a given year. All other peak periods will be exceeded at various times during the year. However, they do represent reasonable planning standards that can be applied without overbuilding or being too restrictive.

SCHEDULED AIRLINE PEAKING CHARACTERISTICS

Table 2T outlines the peak baseline and forecast peaking characteristics for scheduled airline activity at GRK. In general, airport capacity and facility needs related to specific activity types will typically consider the levels of activity during a peak or design period. Determination of peaking characteristics related to commercial activity is important for the planning and design of the passenger terminal building, as well as associated facilities and services. The analysis is commonly utilized as a basis for determining the

appropriate size of the terminal building and the functional areas therein. Terminal building elements include hold rooms, security checkpoints, concessions, restrooms, baggage claim area, etc. The airline peaking characteristics also relate to aircraft gates and apron space.

TABLE 2T
Public Scheduled and Charter Commercial Airline Peaking Forecast
Killeen-Fort Hood Regional Airport

	Based Year	2021	2026	2036
Total Civilian Enplanements				
Annual	136,008	148,200	162,500	198,000
Peak Month	14,281	15,413	16,738	19,800
Design Day	476	514	558	660
Design Hour Enplanements	140	195	209	296
Design Hour Total Passengers	280	391	418	591
Total Civilian Commercial Passenger Aircraft Operations				
Annual	7,164	6,320	6,064	6,118
Peak Month	752	657	625	612
Design Day	25	22	21	20
Design Hour	6	6	8	8
Departures	2	3	3	4

Source: Coffman Associates analysis.

The peak month projections for airline activity were based upon the average peak month from 2005 through 2015. Looking at the full 11-year history of monthly enplanement data, the peak month averaged 10.5 percent of annual enplanements. Operations are similarly spread with the peak month being 10.5 percent as well. The design day is based upon the average day of the peak month, as activity during the peak month tends to be distributed relatively evenly through any given week.

The design hour enplanement estimate is based on the airline schedules, which was previously discussed. It is based on the enplanements per departure as calculated and presented earlier in the commercial airline fleet mix table to include smaller regional airline aircraft and one air carrier aircraft as an air charter.

Itinerant GA, military, and other air taxi peaking characteristics are summarized in **Table 2U**. The figures presented in the table are based on counts obtained from the ATCT and other industry standards.

TABLE 2U
Itinerant GA, Military, Other Air Taxi Peaking Characteristics
Killeen-Fort Hood Regional Airport

	Based Year	2021	2026	2036
Annual	61,237	59,770	60,490	62,295
Peak Month	7,042	6,575	6,351	6,230
Design Day	235	219	212	208
Busy Day	626	633	633	640
Design Hour	62	63	63	63

Source: Coffman Associates analysis.

TOTAL OPERATIONS PEAKING

The peaking characteristics of total aircraft operations, which include commercial airline, air taxi, general aviation, and military operations, are utilized in examining the operational capacity of the airfield. Similar methodologies were utilized to establish the various total operations peaking characteristics as were utilized for the other peaking characteristics. Total operations peaking characteristics are summarized in **Table 2V**.

TABLE 2V
Total Airport Operations Peaking Characteristics
Killeen-Fort Hood Regional Airport

	2015	2021	2026	2036
Annual	68,401	66,090	66,554	68,413
Peak Month	7,794	7,232	6,976	6,841
Design Day	260	241	233	228
Busy Day	632	639	641	648
Design Hour	64	66	66	67

Source: Coffman Associates analysis.

FORECAST COMPARISON TO THE *TERMINAL AREA FORECAST*

The FAA will review the forecasts presented in this Master Plan for consistency with the *Terminal Area Forecast*. The local FAA Airport District Office (ADO) or Regional Airports Division (RO) is responsible for forecast approvals. When reviewing a sponsor's forecast, the FAA must ensure that the forecast is based on reasonable planning assumptions, uses current data, and is developed using appropriate forecast methods. Forecasts of enplanements, operations, and based aircraft are considered consistent with the TAF if they differ by less than 10 percent in the five-year period and 15 percent in the 10-year forecast period. If the forecast is not consistent with the TAF, differences must be resolved if the forecast is to be used for FAA decision-making. The reason the FAA allows this differential is because the TAF forecasts are not meant to replace forecasts developed locally (i.e., in this master plan). While the TAF can provide a point of reference for comparison, their purpose is much broader in defining FAA national workload measures.

All segments of activity at GRK are projected higher than the TAF. As noted earlier in this chapter, the TAF did not present any forecasts for several segments and ignored military operations all together. As such, these forecasts presented here exceed all FAA TAF comparison tolerances; however, these forecasts are reasonable based on actual activity levels occurring at the Airport. FAA will provide a thorough review of the forecasts for approval. **Exhibit 2K** presents a summary of the master plan forecasts. Moderate growth is forecast for all activity demand indicators.

AIRCRAFT/AIRPORT/RUNWAY CLASSIFICATION

The FAA has established several aircraft classification systems that group aircraft types based on their performance (approach speed in landing configuration) and design characteristics (wingspan and landing

FORECAST CATEGORY	BASE YEAR	2021	2026	2036
PASSENGER ENPLANEMENTS				
Civilian Airline Passenger Enplanements				
Regularly Scheduled	135,345	147,000	161,000	196,000
Charter	663	1,200	1,500	2,000
Total Civilian Enplanements	**136,008**	**148,200**	**162,500**	**198,000**
Military Charter Enplanements	**32,182**	**29,000**	**29,000**	**29,000**
TOTAL AIRPORT ENPLANEMENTS	***168,190***	***177,200***	***191,500***	***227,000***
AIRCRAFT OPERATIONS				
Itinerant Operations				
Commercial Passenger Airline				
Air Carrier (60 seats or more)	2,644	4,414	5,508	6,568
Air Taxi (Less than 60 seats)	4,842	2,206	906	0
Total Airline	***7,486***	***6,620***	***6,414***	***6,568***
Other Air Taxi	2,264	2,300	2,500	3,000
General Aviation	2,270	2,670	3,140	4,345
Military	21,881	23,700	23,700	23,700
Total Itinerant Operations	***33,901***	***35,290***	***35,754***	***37,613***
Local Operations				
General Aviation	0	0	0	0
Military	34,500	30,800	30,800	30,800
Total Local Operations	***34,500***	***30,800***	***30,800***	***30,800***
TOTAL AIRPORT OPERATIONS	***68,401***	***66,090***	***66,554***	***68,413***
BASED GENERAL AVIATION AIRCRAFT				
Turboprop	0	2	3	6
Turbojet	0	0	1	4
TOTAL BASED AIRCRAFT	***0***	***2***	***4***	***10***

Exhibit 2K
FORECAST SUMMARY

gear configuration). These classification systems are used to determine the appropriate airport design standards for specific airport elements, such as runways, taxiways, taxilanes, and aprons.

AIRCRAFT CLASSIFICATION

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, an airport. The critical design aircraft is used to define the design parameters for an airport. The design aircraft may be a single aircraft type or, more commonly, is a composite aircraft representing a collection of aircraft with similar characteristics. The critical design aircraft is defined by three parameters: Aircraft Approach Category (AAC), Airplane Design Group (ADG), and Taxiway Design Group (TDG). FAA AC 150/5300-13A, *Airport Design*, describes the following airplane classification systems, the parameters of which are presented on **Exhibit 2L**.

Aircraft Approach Category (AAC): A grouping of aircraft based on a reference landing speed (V_{REF}), if specified, or if V_{REF} is not specified, 1.3 times stall speed (V_{SO}) at the maximum certificated landing weight. V_{REF}, V_{SO}, and the maximum certificated landing weight are those values as established for the aircraft by the certification authority of the country of registry.

The AAC generally refers to the approach speed of an aircraft in landing configuration. The higher the approach speed, the more restrictive the applicable design standards. The AAC, depicted by a letter A through E, is the aircraft approach category and relates to aircraft approach speed (operational characteristic). The AAC generally applies to runways and runway-related facilities, such as runway width, runway safety area (RSA), runway object free area (ROFA), runway protection zone (RPZ), and separation standards.

Airplane Design Group (ADG): The ADG, depicted by a Roman numeral I through VI, is a classification of aircraft which relates to aircraft wingspan or tail height (physical characteristic). When the aircraft wingspan and tail height fall in different groups, the higher group is used. The ADG influences design standards for taxiway safety area (TSA), taxiway object free area (TOFA), taxilane object free area, apron wingtip clearance, and various separation distances.

Taxiway Design Group (TDG): A classification of airplanes based on outer-to-outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance. The TDG relates to the undercarriage dimensions of the design aircraft. The taxiway design elements determined by the application of the TDG include the taxiway width, taxiway edge safety margin, taxiway shoulder width, taxiway fillet dimensions, and, in some cases, the separation distance between parallel taxiways/taxilanes. Other taxiway elements, such as the taxiway safety area (TSA), taxiway/taxilane object free area (TOFA), taxiway/taxilane separation to parallel taxiway/taxilanes or fixed or movable objects, and taxiway/taxilane wingtip clearances are determined solely based on the wingspan (ADG) of the design aircraft utilizing those surfaces. It is appropriate for taxiways to be planned and built to different TDG standards based on expected use.

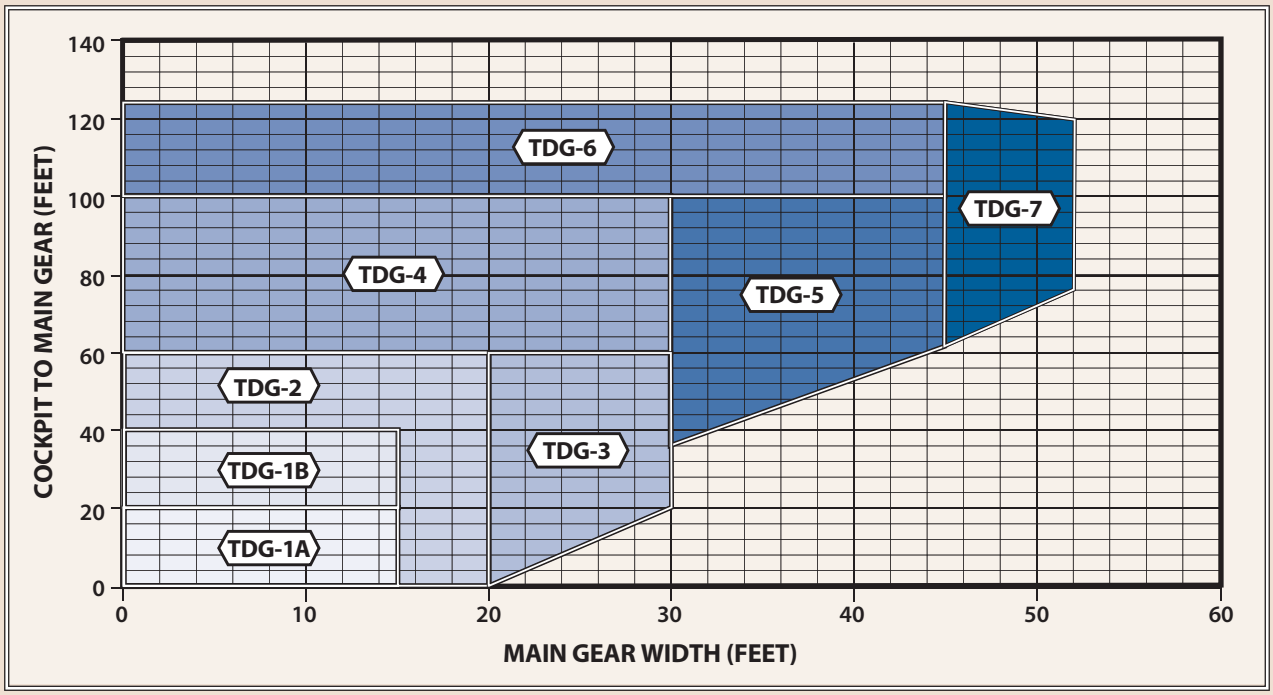
Exhibit 2M presents the aircraft classification of the most common jet aircraft in operation today.

AIRCRAFT APPROACH CATEGORY (AAC)	
Category	**Approach Speed**
A	less than 91 knots
B	91 knots or more but less than 121 knots
C	121 knots or more but less than 141 knots
D	141 knots or more but less than 166 knots
E	166 knots or more

AIRPLANE DESIGN GROUP (ADG)		
Group #	**Tail Height (ft)**	**Wingspan (ft)**
I	<20	<49
II	20-<30	49-<79
III	30-<45	70-<118
IV	45-<60	118-<171
V	60-<66	171-<214
VI	66-<80	214-<262

VISIBILITY MINIMUMS	
RVR (ft)	**Flight Visibility Category (statute miles)**
VIS	3-mile or greater visibility minimums
5,000	Lower than 3 miles but not lower than 1-mile
4,000	Lower than 1-mile but not lower than ¾-mile (APV ≥ ¾ but < 1-mile)
2,400	Lower than ¾-mile but not lower than ½-mile (CAT-I PA)
1,600	Lower than ½-mile but not lower than ¼-mile (CAT-II PA)
1,200	Lower than ¼-mile (CAT-III PA)

TAXIWAY DESIGN GROUP (TDG)



KEY
APV: Approach Procedure with Vertical Guidance
PA: Precision Approach
RVR: Runway Visual Range
TDG: Taxiway Design Group

Source: FAA AC 150/5300-13A, Change 1, Airport Design

A-I

- Beech Baron 55
- **Beech Bonanza**
- Cessna 150
- Cessna 172
- Cessna Citation Mustang
- Eclipse 500/550
- Piper Archer
- Piper Seneca

B-I

- Beech Baron 58
- Beech King Air A90/100
- Cessna 402
- **Cessna 421**
- Piper Navajo
- Piper Cheyenne
- Swearingen Metroliner
- Cessna Citation I (525)

B-II

- Super King Air 200
- Cessna 441
- DHC Twin Otter
- Super King Air 350
- Beech 1900
- Citation Excel (560), Sovereign (680)
- Falcon 50, 900, 2000
- **Citation Bravo (550)**
- Embraer 120

A-III, B-III

- DHC Dash 7
- **DHC Dash 8**
- DC-3
- Convair 580
- Fairchild F-27
- ATR 72
- ATP

C-I, D-I

- Beech 400
- **Lear 31, 35,** 45, 60
- Israeli Westwind

C-II, D-II

- **Cessna Citation X (750)**
- Gulfstream 100, 200,300
- Challenger 300/600
- ERJ-135, 140, 145
- CRJ-200/700
- Embraer Regional Jet
- Lockheed JetStar
- Hawker 800

C-III, D-III *less than 100,000 lbs.*

- ERJ-170
- CRJ 705, 900
- Falcon 7X
- **Gulfstream 500**, 550, 650
- Global Express, Global 5000
- Q-400

C-III, D-III *over 100,000 lbs.*

- ERJ-190
- Boeing Business Jet
- B-727
- **B-737**-300, **700,** 800
- MD-80, DC-9
- A319, A320

C-IV, D-IV

- **B-757**
- B-767
- C-130 Hercules
- DC-8-70
- MD-11

D-V

- **B-747-400**
- B-777
- B-787
- A-330, A-340

Note: Aircraft pictured is identified in bold type.

AIRPORT AND RUNWAY CLASSIFICATION

These classifications, along with the aircraft classifications defined previously, are used to determine the appropriate FAA design standards to which the airfield facilities are to be designed and built.

***Airport Reference Code (ARC)*:** An airport designation that signifies the airport's highest Runway Design Code (RDC), minus the third (visibility) component of the RDC. The ARC is used for planning and design only and does not limit the aircraft that may be able to operate safely on the airport.

Runway Design Code (RDC): A code signifying the design standards to which the runway is to be built. The RDC is based upon planned development and has no operational component. The AAC, ADG, and runway visual range (RVR) are combined to form the RDC of a particular runway. The RDC provides the information needed to determine certain design standards that apply. The first component, depicted by a letter, is the AAC and relates to aircraft approach speed (operational characteristics). The second component, depicted by a Roman numeral, is the 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 RVR values in feet of 1,200 (⅛-mile); 1,600 (¼-mile); 2,400 (½-mile); 4,000 (¾-mile); and 5,000 (1-mile). The RVR values approximate standard visibility minimums for instrument approaches to the runways. The third component should read "VIS" for runways designed for visual approach use only.

Approach Reference Code (APRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to landing operations. Like the RDC, the APRC is composed of the same three components: the AAC, ADG, and RVR. The APRC describes the current operational capabilities of a runway under particular meteorological conditions where no special operating procedures are necessary, as opposed to the RDC which is based upon planned development with no operational component. The APRC for a runway is established based upon the minimum runway-to-taxiway centerline separation.

Departure Reference Code (DPRC): A code signifying the current operational capabilities of a runway and associated parallel taxiway with regard to take-off operations. The DPRC represents those aircraft that can take off from a runway while any aircraft is present on adjacent taxiways, under particular meteorological conditions with no special operating conditions. The DPRC is similar to the APRC, but is composed of two components: ACC and ADG. A runway may have more than one DPRC depending on the parallel taxiway separation distance.

CRITICAL DESIGN AIRCRAFT

The selection of appropriate FAA design standards for the development and location of airport facilities is based primarily upon the characteristics of the aircraft which are currently using, or are expected to use, an airport. The critical design aircraft is used to define the design parameters for an airport. The

design aircraft may be a single aircraft or a composite aircraft representing a collection of aircraft classified by the three parameters: AAC, ADG, and TDG. In the case of an airport with multiple runways, a design aircraft is selected for each runway.

The first consideration is the safe operation of aircraft likely to use an airport. Any operation of an aircraft that exceeds design criteria of an airport may result in either an unsafe operation or a lesser safety margin; however, it is not the usual practice to base the airport design on an aircraft that uses the airport infrequently.

The critical design aircraft is defined as the most demanding civilian aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, excluding touch-and-go operations. Planning for future aircraft use is of particular importance since the design standards are used to plan separation distances between facilities. These future standards must be considered now to ensure that short term development does not preclude the reasonable long range potential needs of the airport. Therefore, if the critical design aircraft is anticipated to change within the next five years, that aircraft (or family of aircraft) should be used as the current critical design aircraft.

AIRPORT CRITICAL DESIGN AIRCRAFT

The FAA maintains the Traffic Flow Management System Count (TFMSC) database which documents aircraft operations at most NPIAS airports. Information is added to the TFMSC database when pilots file flight plans and/or when flights are detected by the National Airspace System, usually via radar. The database includes documentation of commercial traffic (air carrier and air taxi), general aviation, and military aircraft. TFMSC data was not contained in the FAA database, but the ATCT provided a similar, but less complete, dataset. This information is provided on **Exhibit 2N**.

Current Critical Design Aircraft

GRK experiences frequent activity by a wide array of commercial, military, business aircraft types detailed on **Exhibit 2N**, which presents the operational mix at the Airport for turbine operations from 2008 through 2015. The majority of aircraft operations presented in the table were conducted by the military and are not usable for civilian FAA airfield design purposes. Only those civilian aircraft most critical can constitute the airport's critical aircraft. Based on the data in the exhibit, civilian commercial and general aviation aircraft models in AAC C exceed 500 annual operations by a sizeable margin. Civilian aircraft operations in AAC D are well below the 500 annual operations threshold to be considered the critical design AAC; **therefore, the Master Plan will consider AAC C as the current critical design AAC**.

Based on information provided by the ATCT, the CRJ 900, in a similar grouping with the Boeing 737 and the MD-88, comprise the airport's civilian critical aircraft. These aircraft fall within ARC C-III. Aircraft in ADG IV and V operate at the airport, but are either military operations or too few civilian operations to

AIRPORT REFERENCE CODE OPERATIONS SUMMARY

ARC Code	Grouping	2008*	2009	2010	2011	2012	2013	2014	2015
A-I	Cessna 150/152/172/177	2	0	0	0	0	0	0	0
	Cessna 210 Turbine	0	0	0	0	0	0	2	0
	M-18 Dromader	0	2	2	0	0	0	0	0
	T-34 Mentor	0	0	0	2	0	0	0	0
	Twin Bonanza	0	0	0	0	0	10	0	0
	TOTAL 2	2	2	2	0	10	2	0	
A-II	Drone0 81	72	126	120	390	212	380		
	DHC-6 Twin Otter	0	0	0	0	0	0	0	0
	TOTAL 0	81	72	126	120	390	212	380	
A-II	De Haviland Dash 7/8-300	0	0	0	2	4	0	2	4
	TOTAL 0	0	0	2	4	0	2	4	
B-I	Cessna CJ 1	0	0	2	0	0	0	0	0
	Swearingen Merlin 3	0	0	0	0	0	0	0	0
	Beechjet 400	0	0	4	6	0	7	12	2
	Cessna 182/206	4	0	0	0	0	0	0	0
	Hawker 400/MU-300	88	91	218	41	4	14	7	2
	King Air 100	20	67	60	0	2	1	0	0
	Mitsubishi MU-2	0	0	2	0	0	0	0	0
	Raytheon Texan II	11	3	4	6	6	8	4	6
	Shrike Commander	0	0	2	0	0	0	0	0
	Swearingen Metroliner	34	54	28	42	48	78	77	35
	T-2 Buckeye	0	0	0	0	0	0	0	3
	TOTAL	157	215	320	95	60	108	100	48
B-II	Falcon 20	14	2	2	2	0	0	0	2
	Falcon 200/900	0	0	2	2	2	2	4	0
	Saab 340	3,576	3,968	3,526	3,584	1,500	0	0	0
	Beech 1900	1	0	0	0	0	0	0	0
	Cessna 441 Conquest	0	0	0	2	0	0	0	0
	Cessna Caravan	202	495	813	1,083	1,503	1,235	1,090	321
	Cessna Citation V/Encore/Ultra	302	531	505	561	646	684	548	471
	Cessna CJ3/C-25	0	0	0	0	0	0	0	0
	Dassault Falcon 20/50	4	6	6	2	0	6	2	8
	Dassault Falcon 200	0	0	0	0	0	0	0	0
	Dassault Falcon 2000	0	0	0	0	2	0	0	0
	Dassault Falcon 900	0	0	0	2	2	0	0	0
	Dornier 328 (C-146)	0	0	0	0	0	0	0	2
	King Air 90/200/300/350	1,702	2,120	3,277	2,306	3,513	3,636	1,962	2,450
	Shorts 330/360	52	85	51	66	54	13	0	0
	TOTAL	5,853	7,207	8,182	7,610	7,222	5,576	3,606	3,254
B-III	C-2 Greyhound 0	0	0	0	0	0	0	1	
	TOTAL	0	0	0	0	0	0	0	1
B-IV	Mcdonnell Douglas DC-7	0	0	0	0	0	0	0	0
	TOTAL	0	0	0	0	0	0	0	0

ARC Code	Grouping	2008*	2009	2010	2011	2012	2013	2014	2015
C-I	AV-8B Harrier	0	0	0	0	0	8	0	0
	Learjet 30 Series	42	92	34	35	81	44	16	20
	Learjet 60	0	0	0	0	0	0	8	1
	Learjet 55	2	32	0	0	0	0	0	0
	TOTAL	44	124	34	35	81	52	24	21
C-II	Citation X	0	0	0	6	0	2	2	0
	-IICRJ 100/200/700	3,020	1,504	1,580	1,328	1,162	1,120	946	2,088
	Challenger 600	0	0	4	3	0	0	0	0
	ERJ-135/140/145/Legacy	4,258	2,578	4,342	870	7,338	7,512	7,164	5,206
	Fairchild A-10	16	47	2	18	0	0	2	4
	Gulfstream 300	0	4	0	2	0	0	16	0
	Hawker 800	0	3	0	2	2	0	0	0
	Rockwell Sabreliner 80	0	2	0	0	0	0	0	0
	TOTAL	7,294	4,138	5,928	2,229	8,502	8,634	8,130	7,298
C-III	Airbus A319/320 Series	0	0	18	10	2	40	0	30
	ATR-72	1,596	4,224	3,048	5,296	466	0	0	0
	Boeing 717	0	0	0	0	0	0	10	0
	Boeing 727	16	0	0	0	0	0	0	0
	CRJ 900	0	2	4	26	226	860	688	1,122
	Boeing 727	32	0	0	0	0	0	0	0
	Boeing 737	316	185	240	235	193	259	217	454
	Gulfstream G550/650	9	23	13	16	13	11	9	19
	Mcdonnell Douglas DC-9/MD-80's	46	20	64	48	28	24	32	20
	TOTAL	2,015	4,454	3,387	5,631	928	1,194	956	1,645
C-IV	DC-10	158	154	88	48	0	0	0	0
	Boeing 707 (E-3/E-6)	36	0	0	0	0	0	0	0
	Boeing 757 200 Series	88	63	79	93	35	16	51	31
	Boeing 767 Series	66	148	158	302	148	139	144	108
	C-130 Hercules	209	299	247	247	160	226	165	97
	C-17 Globemaster	49	155	156	325	237	182	261	166
	KC-135 Stratotanker	16	6	6	12	18	8	8	12
	Mcdonnell Douglas DC-10	97	183	101	77	8	13	5	4
	TOTAL	719	1,008	835	1,104	606	584	634	418
C-V	Airbus A330	0	0	2	0	41	2	12	4
	TOTAL	0	0	2	0	41	2	12	4
C-VI	Antonov AN-124	0	22	16	41	15	0	0	0
	C-5 Galaxy	46	154	119	236	108	70	51	79
	TOTAL	46	176	135	277	123	70	51	79
D-I	F/A-18 Hornet	16	12	6	3	6	1	7	0
	F-15 Eagle	119	6	0	0	4	0	0	0
	F-22 Raptor	27	0	0	0	0	0	0	0
	T-38 Talon	23	30	23	14	36	33	21	28
	TOTAL	185	48	29	17	46	34	28	28

*Includes only months April Thru Dec

Exhibit 2N
FULL STOP OPERATIONS FLEET MIX

AIRPORT REFERENCE CODE OPERATIONS SUMMARY (continued)

ARC Code	Grouping	2008*	2009	2010	2011	2012	2013	2014	2015
D-II	Gulfstream 200/400	1	8	2	4	4	7	5	2
	TOTAL	1	8	2	4	4	7	5	2
D-III	Boeing 737-800/900	166	68	72	100	82	56	80	174
	TOTAL 166	68	72	100	82	56	80	174	
D-IV	Boeing 757-300	6	6	4	14	6	2	0	22
	Lockheed L-1011	4	0	0	0	0	0	0	0
	Ilyushin IL-76	0	0	5	0	0	0	0	0
	Mcdonnell Douglas MD-11	80	95	89	156	58	85	14	0
	TOTAL	90	101	98	170	64	87	14	22
D-V	Airbus A340	0	0	0	0	0	0	1	0
	Boeing 747 Series	38	58	38	18	54	74	106	86
	Boeing 777 Series	2	0	2	6	23	51	75	37
	TOTAL	40	58	40	24	77	125	182	123
E-I	F-16 Falcon	4	2	0	0	10	2	0	4
	TOTAL	4	2	0	0	10	2	0	4
E-IV	B-1 Lancer	0	0	2	0	0	0	0	0
	TOTAL	0	0	2	0	0	0	0	0
Helo	Helo	4,820	2,102	5,626	3,884	6,572	6,750	4,066	2,390
	TOTAL	4,820	2,102	5,626	3,884	6,572	6,750	4,066	2,390
Unk	Unknown	0	18	2	0	0	0	0	5
	TOTAL	0	18	2	0	0	0	0	5

APPROACH CATEGORY SUMMARY

AC	2008*	2009	2010	2011	2012	2013	2014	2015
A	2	83	74	130	124	400	216	384
B	6,010	7,422	8,502	7,705	7,282	5,684	3,706	3,303
C	10,118	9,900	10,321	9,276	10,281	10,536	9,807	9,465
D	482	283	241	315	273	309	309	349
E	4	2	2	0	10	2	0	4
UNK	0	18	2	0	0	0	0	5
TOTAL	16,616	17,708	19,142	17,426	17,970	16,931	14,038	13,510

AIRPORT REFERENCE CODE OPERATIONS SUMMARY

ARC	2008	2009	2010	2011	2012	2013	2014	2015
A-I	2	2	2	2	0	10	2	0
A-II	0	81	72	126	120	390	212	380
A-III	0	0	0	2	4	0	2	4
B-I	157	215	320	95	60	108	100	48
B-II	5,853	7,207	8,182	7,610	7,222	5,576	3,606	3,254
B-III	0	0	0	0	0	0	0	1
B-IV	0	0	0	0	0	0	0	0
C-I	44	124	34	35	81	52	24	21
C-II	7,294	4,138	5,928	2,229	8,502	8,634	8,130	7,298
C-III	2,015	4,454	3,387	5,631	928	1,194	956	1,645
C-IV	719	1,008	835	1,104	606	584	634	418
C-V	0	0	2	0	41	2	12	4
C-VI	46	176	135	277	123	70	51	79
D-I	185	48	29	17	46	34	28	28
D-II	1	8	2	4	4	7	5	2
D-III	166	68	72	100	82	56	80	174
D-IV	90	101	98	170	64	87	14	22
D-V	40	58	40	24	77	125	182	123
E-I	4	2	0	0	10	2	0	4
E-IV	0	0	2	0	0	0	0	0
UNK	0	18	2	0	0	0	0	5
TOTAL	16,616	17,708	19,142	17,426	17,970	16,931	14,038	13,510

DESIGN GROUP SUMMARY

DG	2008*	2009	2010	2011	2012	2013	2014	2015
I	392	391	385	149	197	206	154	101
II	13,148	11,434	14,184	9,969	15,848	14,607	11,953	10,934
III	2,181	4,522	3,459	5,733	1,014	1,250	1,038	1,824
IV	809	1,109	935	1,274	670	671	648	440
V	40	58	42	24	118	127	194	127
VI	46	176	135	277	123	70	51	79
UNK	0	18	2	0	0	0	0	5
TOTAL	16,616	17,708	19,142	17,426	17,970	16,931	14,038	13,510

*Includes only months April Thru Dec
Source: Traffic Flow Management System Counts

Exhibit 2N (continued)
FULL STOP OPERATIONS FLEET MIX

constitute the critical aircraft. **Therefore, the Master Plan will consider ADG III as the current critical design ADG. The current critical design aircraft for GRK is best described as ARC C-III.**

Future Critical Design Aircraft

The master plan forecast anticipates some fleet mix changes for the scheduled airline operators over time. Airline fleet mix changes will include a higher mix of narrow-bodied aircraft; however, the narrow-body fleet is generally within the current design standard C-III. Business jet operations and charter activity has historically been the driver for AAC D aircraft operations, such as the Gulfstream family of aircraft, and large commercial airline airframes, including Airbus 340, Boeing 767/777/747 models, as well as DC-10 and MD-11 models. The large airline aircraft were utilized to move military personnel between conflict zones and have been reduced in recent years. Obviously, future conflicts, should they occur, will likely increase the number of large aircraft operations.

Based on historical reference, future plans should include the chance for increased operations by large civilian aircraft to ensure that the facility is planned accordingly. **Therefore, the future critical design aircraft is the Boeing 777/747, combined with the Airbus 340 (ARC D-V). It should be clearly stated that these large, wide-body aircraft generally will not utilize the existing civilian terminal facility on a regular basis as they utilize the military terminal facility. The future critical aircraft for the civilian terminal will likely remain in ARC C-III/-IV to accommodate the Boeing 737 up to the Boeing 757 and Airbus 321 models.**

SUMMARY

This chapter has outlined the various activity levels by demand indicators that might reasonably be anticipated over the planning period. GRK provides an important and convenient air passenger link to the national airspace system for the City of Killen, Fort Hood, and the entire MSA. Nonetheless, competing airports in the region, as well as the direct links via the highways to larger hub airports in the Austin, San Antonio, Houston, and Dallas-Fort Worth areas, lead to a significant level of passenger leakage. The leakage will remain through the planning period; however, GRK has sufficient service and a growing socioeconomic condition to support a return to enplanement growth.

The Airport can host based aircraft with a projection of up to 10 aircraft basing at GRK by 2036. There are no based aircraft at present and future basing will depend upon the hangar facility availability to support such activity. Airport operations have remained relatively constant recently. All civilian operational categories are expected to grow in number and/or size to include a higher use of larger commercial airline aircraft through the planning period.

The next step in the planning process is to assess the capabilities of the existing facilities to determine what upgrades may be necessary to meet future demands. The range of forecasts developed here will be taken forward in the next chapter as planning horizon activity levels that will serve as milestones or activity benchmarks in evaluating facility requirements.

Killeen-Fort Hood
REGIONAL AIRPORT

CHAPTER THREE

FACILITY REQUIREMENTS

Killeen-Fort Hood
REGIONAL AIRPORT

CHAPTER THREE

FACILITY REQUIREMENTS

To properly plan for the long term future of the Killeen-Fort Hood Regional Airport (Airport or GRK), it is necessary to translate forecast aviation demand into the specific types and quantities of facilities that can adequately serve the identified demand. This chapter uses the results of the forecasts presented in Chapter Two, as well as established planning criteria, to determine the airside (i.e., runways, taxiways, navigational aids, marking and lighting) and landside (i.e., commercial passenger terminal complex, hangars, aircraft parking apron, and automobile parking) facility requirements.

The objective of this effort is to identify the adequacy of existing airport facilities and outline what new facilities may be needed, and when these may be needed, to accommodate forecast demands. Having established these facility requirements, alternatives for providing these facilities will be evaluated in Chapter 4.

The facility requirements at the Airport were evaluated using guidance contained in several Federal Aviation Administration (FAA) publications, including:

- Advisory Circular (AC) 150/5300-13A, Change 1, Airport Design
- AC 150/5060-5, Airport Capacity and Delay
- AC 150/5325-4B (and Draft 4C), Runway Length Requirements for Airport Design
- AC 150/5360-13 Planning and Design Guidelines for Airport Terminal Facilities,
- Federal Aviation Regulation (FAR) Part 77, Objects Affecting Navigable Airspace
- FAA Order 5090.3C Field Formulation of the National Plan of Integrated Airport Systems (NPIAS)

It is important to consider that actual activity at the Airport may be higher or lower than what the annualized forecast portrays. By planning according to activity milestones, the resultant plan can accommo-

date unexpected shifts or changes in the area's aviation demand. It is important for the plan to accommodate these changes so Airport officials can respond to unexpected changes in a timely fashion.

The most important reason for utilizing milestones is it allows Airport management the flexibility to make decisions and develop facilities according to needs generated by actual demand levels. The demand-based schedule provides flexibility in development, as development schedules can be slowed or expedited according to demand at any given time over the planning period. The resultant plan provides airport officials with a financially responsible and needs-based program. The milestones, established by aviation demand projections, are generally set at years five (2021), ten (2026), and twenty (2036) with the understanding that demand will dictate future developmental needs, not simply a date in time.

AIRFIELD CAPACITY AND DELAY

Airfield capacity is measured in a variety of different ways. The **hourly capacity** of a runway measures the maximum number of aircraft operations that can take place in an hour. The **annual service volume** (ASV) is an annual level of service that may be used to define airfield capacity needs and is a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year without incurring significant delay factors. **Aircraft delay** is the total delay incurred by aircraft using the airfield during a given timeframe. The Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5060-5, *Airport Capacity and Delay*, provides a methodology for examining the operational capacity of an airfield for planning purposes.

It should be noted that the Killeen Ft. Hood Regional Airport is not the same as the Robert Gray Army Airfield and is only a user and not the operator of the airfield. This chapter will discuss the conformance of the airfield with FAA civil design standards; however, those standards will not necessarily be adopted by the Army.

FACTORS AFFECTING ANNUAL SERVICE VOLUME

This analysis considers specific factors about the airfield, such as airfield layout, weather conditions, aircraft mix, and operations to calculate the Airport's ASV. These factors are depicted in **Exhibit 3A**. The following describes the input factors as they relate to GRK.

- **Runway Configuration –** The existing runway configuration consists of a single runway supported by full-length parallel taxiways on each side of the runway. Runway 15-33 is 10,000 feet long and 200 feet wide.

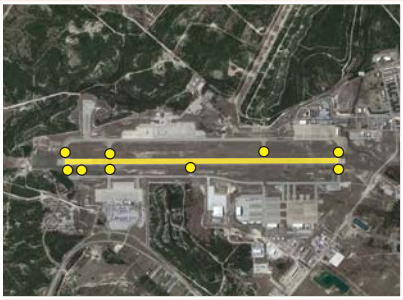
- **Runway Use –** Runway use in capacity conditions will be controlled by wind and/or airspace conditions. The direction of takeoffs and landings are generally determined by the direction of the wind. It is generally safest for aircraft to take off and land into the wind, to avoid crosswind (wind that is blowing perpendicular to the travel of the aircraft) or tailwind components. Based upon detailed

AIRFIELD LAYOUT

Runway Configuration

Runway Use

Number of Exits



WEATHER CONDITIONS

VMC
Visual Meteorological Conditions

IMC
Instrument Meteorological Conditions

PVC
Poor Visibility Conditions

AIRCRAFT MIX

Category A & B Aircraft

Category C Aircraft

Category D Aircraft

OPERATIONS

Arrivals

Departures

Touch-and-Go Operations

Total Annual Operations

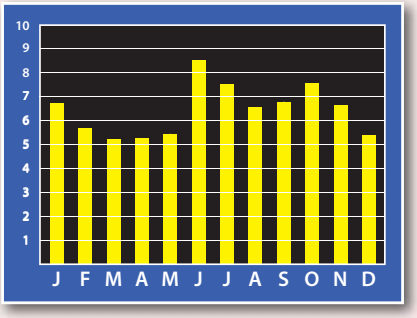


Exhibit 3A
AIRFIELD CAPACITY FACTORS

wind information for the area and upon confirmation from observations made by airport traffic control (ATCT), winds favor the use of Runway 15 most often.

The availability of instrument approaches is also considered. Each runway end provides instrument approach capability; however, Runway 15 is primarily utilized in instrument weather conditions.

- **Exit Taxiways –** Exit taxiways have a significant impact on airfield capacity since the number and location of exits directly determine the occupancy time of an aircraft on the runway. The airfield capacity analysis gives credit to taxiway exits located within the prescribed range from a runway's threshold. This range is based upon the mix index of the aircraft that use the runways. Only exit taxiways located between 3,500 and 6,500 feet from the landing threshold count in the capacity determination. The exits must be at least 750 feet apart to count as separate exits. Under these criteria, Runway 15-33 is credited with one exit taxiway, Taxiway D, in each operational direction.

- **Weather Conditions –** Weather conditions can have a significant impact on airfield capacity. Airport capacity is usually highest in clear weather, when flight visibility is at its best. Airfield capacity is diminished as weather conditions deteriorate and cloud ceilings and visibility are reduced. As weather conditions deteriorate, the spacing of aircraft must increase to provide allowable margins of safety and air traffic vectoring. The increased distance between aircraft reduces the number of aircraft which can operate at the airport during any given period, thus reducing overall airfield capacity.

  According to meteorological data collected from weather resources for the locale, the Airport experiences visual flight rule (VFR) conditions a large majority of the time (91.4 percent of the year). VFR conditions exist whenever the cloud ceiling is greater than or equal to 1,000 feet above ground level (AGL) and visibility is greater than three statute miles. Instrument flight rule (IFR) conditions are defined when cloud ceilings are between 500 and 1,000 feet AGL or visibility is between one and three miles. According to the weather observations, IFR conditions accounted for 7.3 percent of the time. Poor visibility conditions (PVC) apply for cloud ceilings below 500 feet and visibility minimums below one mile, and accounted for approximately 1.3 percent of the time. **Table 3A** summarizes the weather conditions used for capacity analysis.

TABLE 3A
Weather Conditions
Killeen-Fort Hood Regional Airport

Condition	Cloud Ceiling	Visibility	Percent of Total
VFR	≥ 1,000' AGL	> 3 statute miles	91.4%
IFR	≥ 500' AGL and < 1000' AGL	1-3 statute miles	7.3%
PVC	< 500' AGL	< 1 statute mile	1.3%

VFR - Visual Flight Rules
IFR - Instrument Flight Rules
PVC - Poor Visibility Conditions
AGL - Above Ground Level

- **Aircraft Mix –** The aircraft mix for the capacity analysis is defined in terms of four aircraft classes. Classes A and B consist of small and medium-sized propeller-driven aircraft and some smaller business jets, all weighing 12,500 pounds or less. These aircraft are associated primarily with general

aviation activity, but do include some air taxi, air cargo, and commuter aircraft. Class C consists of aircraft weighing between 12,500 pounds and 300,000 pounds. These aircraft include most business jets and some turboprop aircraft. Class D consists of large aircraft weighing more than 300,000 pounds. These aircraft are associated with major airline and air cargo activities, and include the Boeing 747 and 777, among others. The Airport does experience some limited operations by Class D aircraft, all of which are civilian charter airlines supporting military troop movements to overseas operation areas. These aircraft include large commercial airliners up to and including Boeing 747 aircraft models. A description of the classifications and the percentage mix for each planning horizon is presented in **Table 3B**.

For the capacity analysis, the percentage of Classes C and D aircraft operating at GRK is critical in determining the ASV as these classes include the larger and faster aircraft in the operational mix. The percentage of Class C and D aircraft operations at the Airport is very high and is expected to remain constant through the planning period as all Class A and B aircraft are military users (generally helicopter and/or UAS) only. The military prohibits operations by general aviation aircraft weighing less than 12,500 pounds without a prior permission request (PPR). Consequently, the number of small general aviation operations does not significantly impact the capacity analysis.

TABLE 3B
Aircraft Operational Mix - Capacity Analysis
Killeen-Fort Hood Regional Airport

Aircraft Classification	Base Year (2016)	Short Term (1-5 Years)	Intermediate Term (6-10 Years)	Long Term (11-20 Years)
Classes A & B	28.5%	28.5%	28.5%	28.5%
Class C	70.0%	70.0%	70.0%	70.0%
Class D	1.5%	1.5%	1.5%	1.5%

Class A - Small single engine aircraft with gross weights of 12,500 pounds or less
Class B - Small multi-engine aircraft with gross weights of 12,500 pounds or less
Class C - Large aircraft with gross weights over 12,500 pounds up to 300,000 pounds
Class D - Large aircraft with gross weights over 300,000 pounds

Source: Coffman Associates analysis supported by airport landing reports and airport traffic control tower observations.

- **Percent Arrivals vs. Departures –** The aircraft arrival/departure split is typically 50/50 in the design hour. At GRK, traffic information indicated no major deviation from this pattern.

- **Touch-And-Go Activity –** A touch-and-go operation involves an aircraft making a landing and then an immediate takeoff without coming to a full stop or exiting the runway. As discussed in Chapter Two, these types of operations are normally associated with aviation training activity and classified as a local operation; however, small general aviation activity including flight training is not common at GRK. The only touch-and-go activity at the Airport is conducted by the military, as civilian training activity is prohibited. A high percentage of touch-and-go traffic normally results in a higher operational capacity because one landing and one takeoff occurs within a shorter time period than individual operations. Touch-and-go operations at GRK account for approximately 45 percent of total annual operations. A similar ratio is expected in the future.

- **Peak Period Operations –** Typical operations activity is important in the calculation of an airport's ASV as "peak demand" levels occur sporadically. The peak periods used in the capacity analysis are

representative of normal operational activity and can be exceeded at various times throughout the year. For the airfield capacity analysis, average daily operations and average peak hour operations during the peak month, as calculated in the previous chapter and detailed earlier in this chapter, are utilized.

CALCULATION OF ANNUAL SERVICE VOLUME

The preceding information was used in conjunction with the airfield capacity methodology developed by the FAA to determine airfield capacity for GRK.

Hourly Runway Capacity

The first step in determining ASV involves the computation of the hourly capacity of the runway configuration. The percentage use of the runway, the amount of touch-and-go activity, and the number and locations of runway exits are the important factors in determining hourly capacity.

Based upon these factors, the current and future hourly capacities for GRK were determined. As the operational mix of aircraft at an airport changes to include a higher percentage of large aircraft weighing over 12,500 pounds, the hourly capacity of the system declines. This is a result of the additional spacing and sequencing time required by larger aircraft in the traffic pattern and on the runway. As indicated in **Table 3B**, the percentage of Class C and D aircraft is projected to remain relatively constant through each planning horizon activity milestone. Class C aircraft at the Airport currently represents approximately 70.0 percent of the operational mix, with Class D at 1.5 percent.

The current and future weighted hourly capacities are depicted in **Table 3C**. Weighted hourly capacity is the measure of the maximum number of aircraft operations that can be accommodated on the airfield in a typical hour. It is a composite of estimated hourly capacities for different airfield operating configurations adjusted to reflect the percentage of time in an average year that the airfield operates under each specific configuration. The current weighted hourly capacity on the airfield is 60 operations; likewise, the weighted hourly capacity is expected to remain at 60 operations through the long term horizon.

TABLE 3C
Airfield Capacity Summary
Killeen-Fort Hood Regional Airport

	Base Year (2016)	Short Term (1-5 Years)	Intermediate Term (6-10 Years)	Long Term (11-20 Years)
Operational Demand				
Annual	68,401	66,090	66,554	68,413
Capacity				
Annual Service Volume	173,000	172,000	170,000	173,000
Percent Capacity	39.5%	38.4%	39.1%	39.5%
Weighted Hourly Capacity	60	60	60	60

Source: FAA AC 150/5060-5, *Airport Capacity and Delay*

Annual Service Volume

The ASV is determined by the following equation:

Annual Service Volume = C x D x H
C = weighted hourly capacity
D = ratio of annual demand to the average daily demand during the peak month
H = ratio of average daily demand to the design hour demand during the peak month

The current ASV for the airfield has been estimated at 173,000 operations. The relatively constant operational projections (aircraft mix and volume) over the planning period will attribute to a relatively constant ASV, ranging between 170,000 and 173,000 over the period. With operations in 2016 estimated at 68,401, the airport is currently at 39.5 percent of its ASV. Long range annual operations are forecast to remain at 68,413, which would equate to 39.52 percent of the Airport's ASV. **Table 3C** and **Exhibit 3B** summarize and compare the Airport's ASV and projected annual operations over the short, intermediate, and long range planning horizons.

AIRFIELD FACILITY REQUIREMENTS

Once forecasts of aviation demand are developed and airfield capacity is determined, the physical facilities of the airport can be evaluated. The evaluation must factor both forecasted aviation demand as well as the critical aircraft using the airfield over the planning horizon. In addition, the existing facilities should be compared to current design standards to identify deficiencies and plan for future conformity to current FAA planning guidance. **Table 3D** presents the physical characteristics used for planning purposes for the critical aircraft identified in the previous chapter.

TABLE 3D
Existing and Future Critical Aircraft Characteristics
Killeen-Fort Hood Regional Airport

Aircraft Type and ARC	Wing Span (ft.)	Aircraft Length (ft.)	Aircraft Tail Height (ft.)	PAX Seating Capacity	Max Gross Takeoff Weight	Approach Speed (kts.)
CRJ 900 C-III	81.5	118.9	24.5	90	80,500 lbs.	121-141
Boeing 737 C-III	93	94	37.2	149	110,000 lbs.	136
MD-88 C-III	107.8	147.8	30.5	149	149,500 lbs.	135
Boeing 777 ARC D-V (Airfield Only)	199.8	242.5	61.5	247	660,000 lbs.	149
Airbus 321 ARC C-III (Terminal Area)	111.9	146	39.7	187	206,132 lbs.	142

Source: Garver

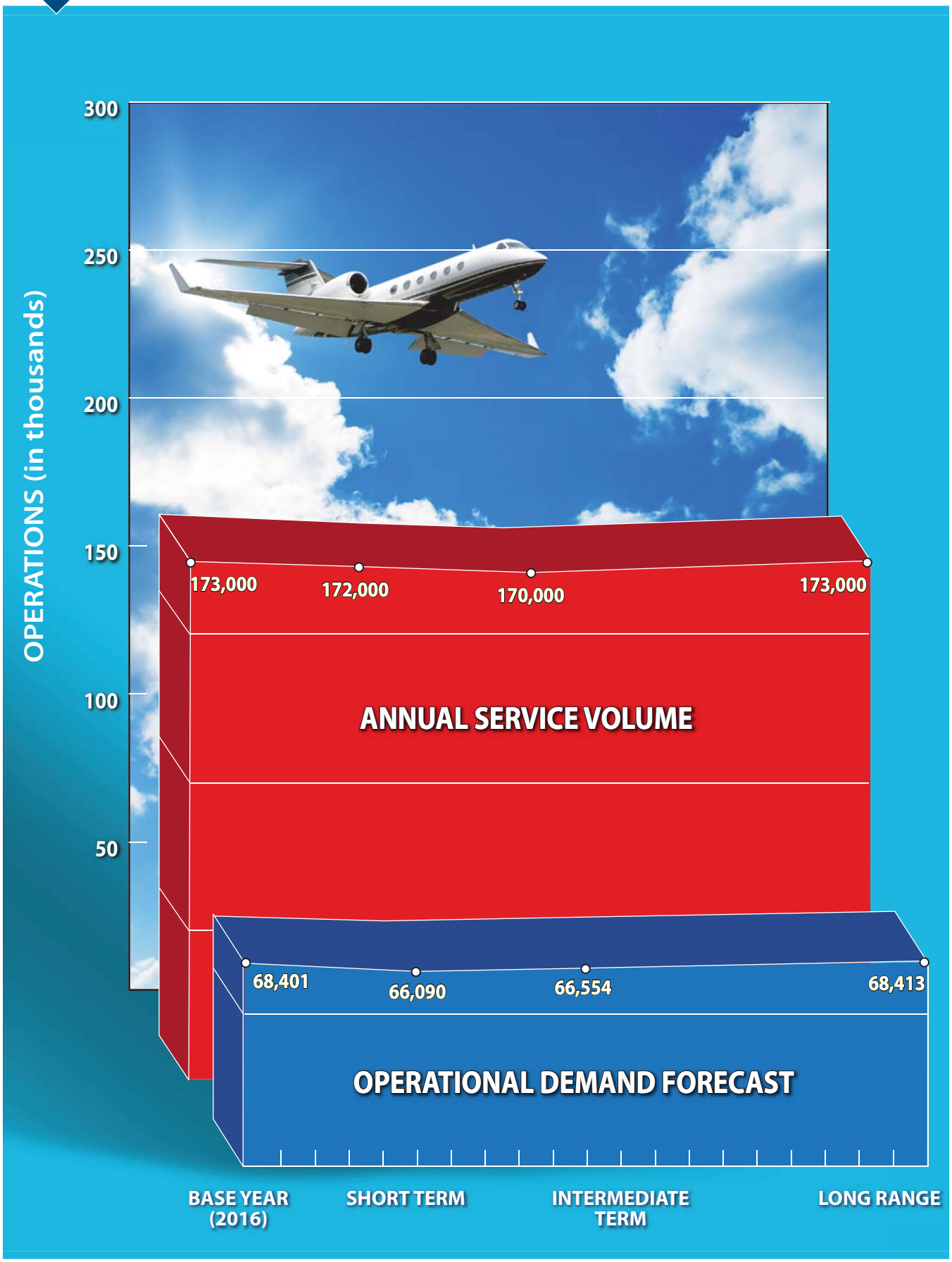


Exhibit 3B
CAPACITY ANALYSIS

AIRFIELD DESIGN STANDARDS

Compliance with airport design standards is required to maintain a minimum level of operational safety. The major airport design elements are established from FAA AC 150/5300 (current series), *Airport Design* and Federal Aviation Regulations (FAR) Part 77, *Objects Affecting Navigable Airspace*, and should conform with FAA airport design criteria without modification to standards. According to the joint use agreement between the Department of the Army and the City of Killeen, the airfield facility elements including runways, taxiways, aprons, lighting, signage and marking will be maintained to FAA Part 139 standards.

This chapter will compare the existing facilities available to the forecasted demand to identify design or development deficiencies. Identification of a needed facility, change, or infrastructure does not constitute a "requirement," but rather an "option" for facility improvement to improve safety, operations, and accommodate future aviation activity. The timing of all requirements will be driven by the operational demand levels.

RUNWAY ORIENTATION

Runway Orientation requirements are determined by the amount of prevailing wind coverage provided. According to the FAA, a runway should provide 95 percent coverage for aircraft forecast to use the airport on a regular basis. For aircraft with an ARC of A-I and B-I, the runway should provide 95% wind coverage for 10.5 knots (12 mph) winds; for ARC A-II and B-II, the runway should provide 95% coverage for 13 knot (15 mph) winds; for ARC A-III and B-III and C-I and D-II 16 knots (18 mph); and ARC C-III through D-IV 20 knots (23 mph).

According to the most recent 10 years of wind data collected at the airport, the current runway orientation provides all weather wind coverage of 95.10% for the 10.5 knot winds, 97.78% for the 13 knot winds, 99.38% for the 16 knot winds, and 99.84 for the 20 knot winds. In instrument meteorological conditions, the runway provides 94.96% coverage for 10.5 knot winds, 97.70% coverage for 13 knot winds, 99.30% coverage for 16 knot winds, and 99.79 percent coverage for 20 knot winds.

While the percent coverage is close to the 95% threshold for the smaller aircraft classes, GRK primarily serves aircraft weighing over 12,500 pounds (except for military applications). Small to medium sized general aviation (GA) aircraft primarily utilize ILE (Skylark Field), especially those under 12,500 pounds; therefore, the wind coverage provided by Runway 15-33 is adequate to serve the aircraft utilizing the airfield and no need for a crosswind runway is anticipated over the planning horizon. Wind information for the Airport is provided in **Table 3E** as well as on **Figures 3A and 3B**.

TABLE 3E
Runway Wind Coverage
Killeen-Fort Hood Regional Airport

	All Wind Coverage (Percent)				Instrument Meteorological Conditions Wind Coverage (Percent)			
	10.5 kts	13.0 kts	16.0 kts	20.0 kts	10.5 kts	13.0 kts	16.0 kts	20.0 kts
Runway 15-33	95.10	97.78	99.38	99.84	94.96	97.70	99.30	99.79

Source: FAA Airports – GIS Wind Analysis Tool using GRK wind data

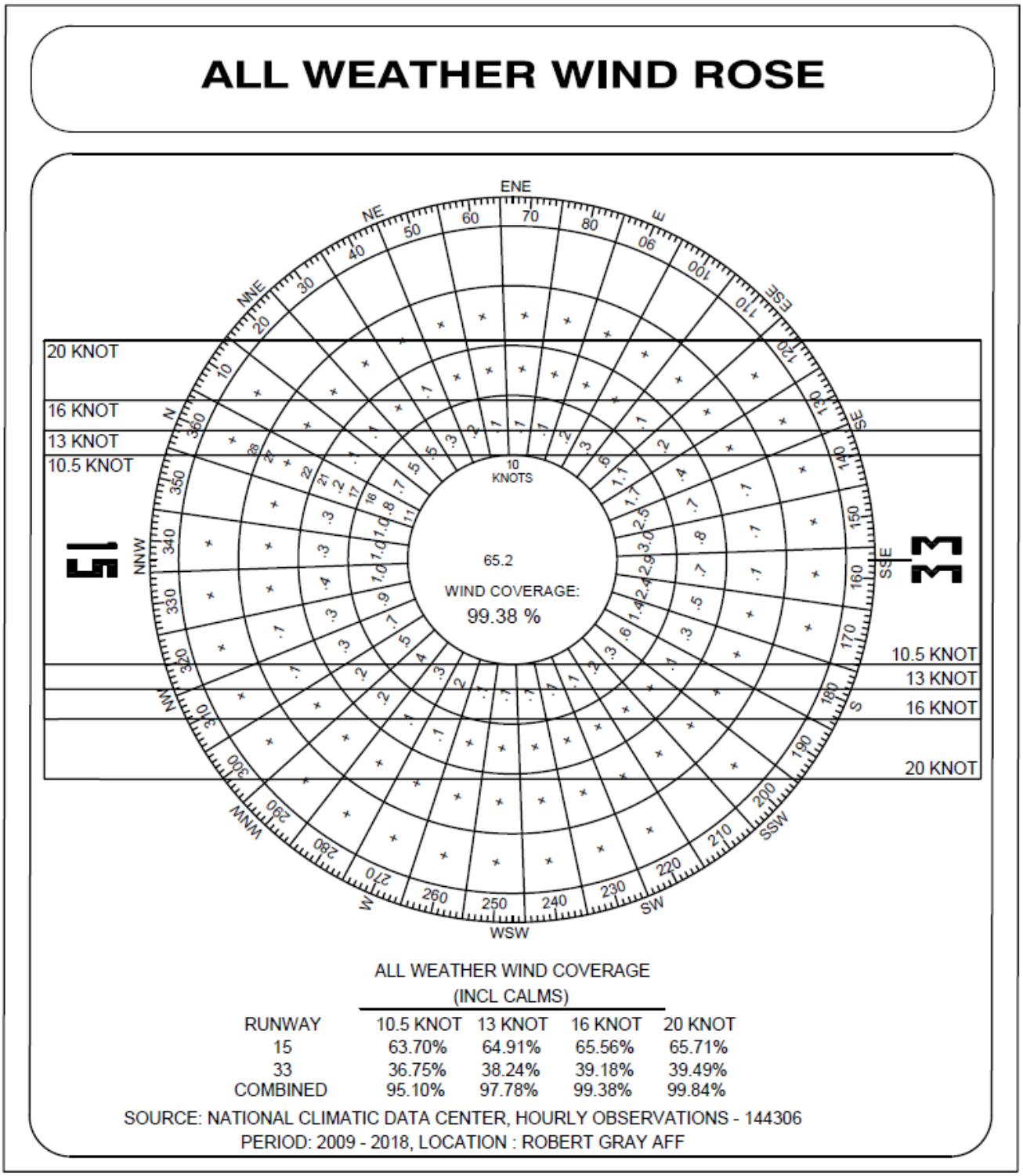
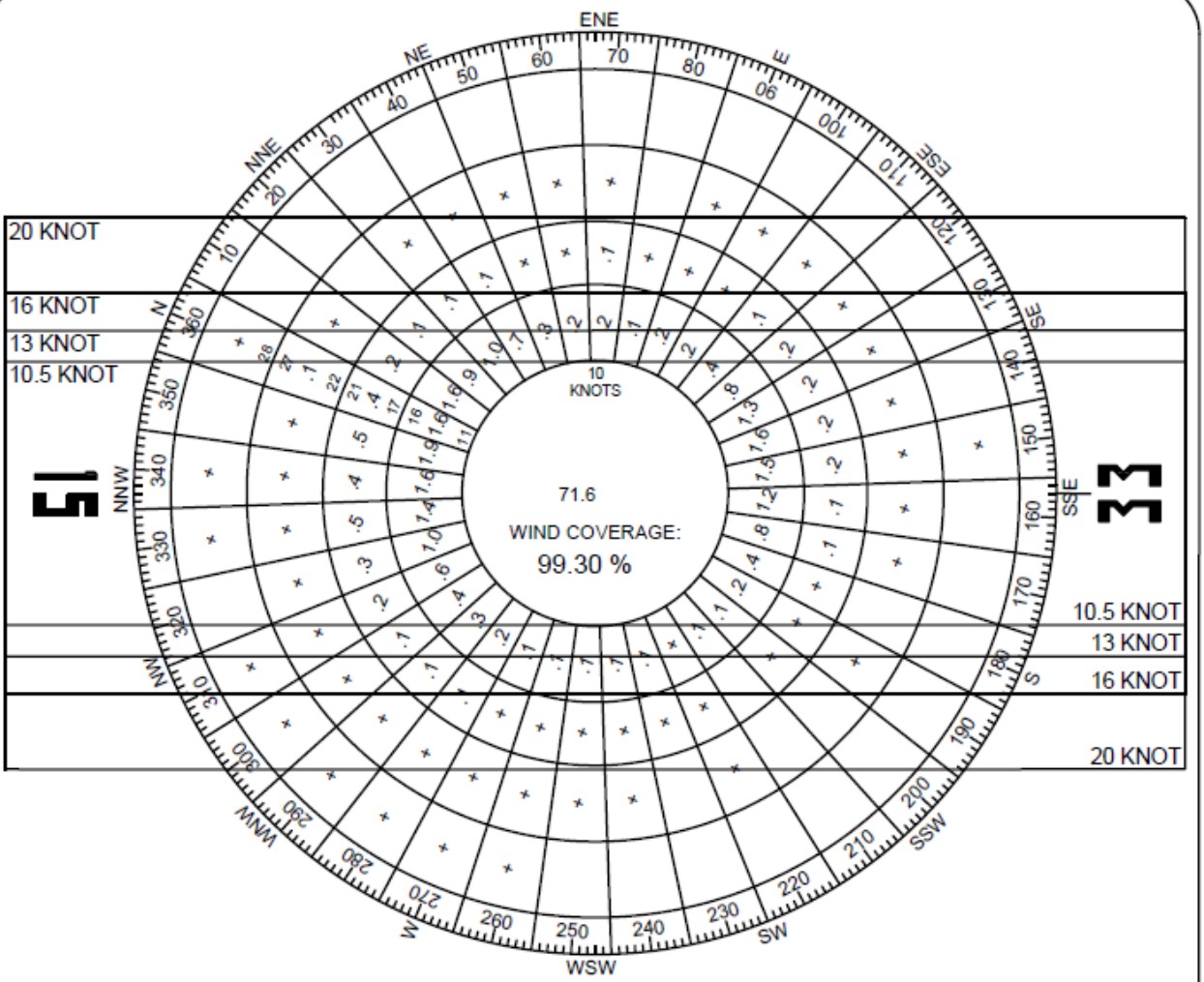


Figure 3A: All Weather Wind Rose
Source: Garver

IFR WIND ROSE



IFR WIND COVERAGE
(INCL CALMS)

RUNWAY	10.5 KNOT	13 KNOT	16 KNOT	20 KNOT
15	51.28%	52.09%	52.60%	52.78%
33	49.13%	51.06%	52.15%	52.47%
COMBINED	94.96%	97.70%	99.30%	99.79%

SOURCE: NATIONAL CLIMATIC DATA CENTER, HOURLY OBSERVATIONS - 22657
PERIOD: 2009 - 2018, LOCATION : ROBERT GRAY AFF

Figure 3B: Instrument Flight Rule Wind Rose
Source: Garver

RUNWAY LENGTH

FAA AC 150/5325-4B, *Runway Length Requirements*, provides guidance to help determine the most appropriate recommended runway lengths for an airport predicated upon the category of aircraft using the airport.

Based upon the forecasted activity discussed in Chapter 3 and the expected critical aircraft that will use the airfield, Runway lengths were determined. Currently, the scheduled airline service is provided by CRJ-900 and ERJ-145 aircraft. The airlines serving Killeen also utilize Boeing 737-900 and MD-88 aircraft in their fleet and may use those at any time. If future demand warrants the use of higher capacity aircraft to run the commercial service routes, or if larger, specialty charter flights use the airfield, it is likely that Airbus 321 or Boeing 777 aircraft will be used for those increased loads. Unique to GRK is the amount of baggage typically included on commercial service flights. Because the airport serves a large number of military service members who are travelling to and from deployments, there is typically an above average amount of baggage per enplaned passenger on each flight. Due to this scenario, the length calculations included in this analysis will be based on maximum takeoff weights to account for the typical aircraft loadings occurring at GRK. Based upon the maximum takeoff weight of the typical aircraft expected to use the airfield, takeoff lengths, landing lengths in dry conditions, and landing lengths in wet conditions were compiled. The calculations are based on 1,015 feet MSL airport elevation, a mean maximum daily temperature of 96 degrees, and a maximum difference in runway elevation of 40 feet.

Currently the existing 10,000-foot runway length accommodates most of the commercial service traffic without much adjustment to takeoff weights as presented on **Table 3F**. For the CRJ 900 aircraft that requires 10,000 feet of runway length for takeoff at its maximum loading weight, the amount of passenger, baggage, and fuel weight will be restricted infrequently under some weather conditions. Currently, such flights typically travel a short distance and are able to operate normally the majority of the time. If demand increases for the larger, charter flights that operate out of the airport on aircraft such as the Boeing 737 or Airbus 321, a **runway length of 12,000 feet is recommended** to accommodate the majority of those operations. Even at the recommended future length of 12,000 feet, operations by very large aircraft such as the Boeing 777 will be weight-restricted for very long flights on the hottest days.

TABLE 3F
Runway Length Requirements – Runway 15-33
Killeen-Fort Hood Regional Airport

	Takeoff Length at MTOW	Landing Length (Dry)	Landing Length (Wet)	Final Recommended Length	Runway 15-33 Deficiency
Critical Aircraft – Existing					
CRJ 900	9,600	6,400	N/A	10,000	0
ERJ-145	8,100	4,850	N/A	8,000	0
Boeing 737-900	12,200	6,600	7,400	12,000	2,200
MD-88	8,500	5,300	6,100	8,500	0
Critical Aircraft – Future					
Boeing 777	14,900	6,700	7,700	15,000	4,900
Airbus 321	10,900	6,300	N/A	11,000	900

Source: AC 150/5325-4C, *Runway Length Requirements for Airport Design*, Figures 3-1 and 3-2. Useful load refers to all usable fuel, passengers, and cargo.
Calculations based on 1,015' airport elevation, mean maximum daily temperature of 96˚ and maximum difference in runway end elevation of 40'.
Figures are increased 10 feet for each foot of elevation difference between high and low points of runway centerline.
By regulation, the length for turbo-jet powered airplanes is increased 15% up to 5,500', whichever is less for 60% useful loads and 15% up to 7,000', whichever is less for 90% useful loads.

RUNWAY DESIGN AND PROTECTION REQUIREMENTS

Runway Width

The runway is currently 200 feet wide. For both C-III and D-V aircraft categories at less than ¾-mile visibility, the required runway width is 150 feet for both the current and future critical design aircraft. The Airport Design Advisory Circular explains that runway shoulders provide resistance to blast erosion and accommodate passage of maintenance and emergency equipment and the occasional passage of aircraft veering from the runway. Paved shoulders are required for runways accommodating Airplane Design Group (ADG) IV and higher aircraft and are recommended for runways accommodating ADG-III aircraft.

Runway Separation Protections

The runway separation required to a parallel taxiway for both C-III and D-V aircraft is 400 feet. The portion of the parallel Taxiway B that serves the commercial airline service area of the airfield is positioned 540 feet from the runway center line. The remainder of parallel Taxiway B that serves the army airfield is located 775 from the runway centerline. The parallel Taxiway A that exclusively serves the army airfield operations is located 785 feet from the runway centerline. The runway/taxiway separations currently offered by the airfield facilities are more than adequate to provide the safety required to protect the approaches of the III-V category aircraft.

A separation of 500 feet is required between the runway centerline and aircraft parking aprons for ADG III-V runways. The apron areas at GRK are all outside the parallel taxiway areas and meet all requirements.

Hold position markings are required to be 250 feet way from the runway centerline plus an additional one foot for every 100 feet of elevation above sea level. Existing markings meet all requirements.

Pavement Strength

Per FAA AC 150/5300-13A, Change 1, *Airport Design*, airfield pavements are constructed to provide adequate support for the loads imposed by aircraft using the airport as well as resisting the abrasive action of traffic and deterioration from adverse weather conditions and other influences. They are designed not only to withstand the loads of the heaviest aircraft expected to use the airport, but must also be able to withstand the repetitive loadings of the entire range of aircraft expected to use the pavement over many years.

Currently, the asphalt runway pavement of 15-33 has a weight bearing capacity of 135,000 pounds for Dual Wheel Gear (DWG) aircraft and 345,000 pounds for Dual Tandem Wheel (DTG) aircraft. GRK requirements for pavement strength may be atypical because of the unique situation of the joint-use

agreement with the airfield. Runway 15-33 pavement must withstand loadings of not only the commercial service aircraft using the airfield, but also the military aircraft. This unique situation could require that GRK provide higher pavement strength relative to other similar commercial service airports to accommodate the military operations. The critical aircraft used for the military operations is larger and heavier than the current critical aircraft for the commercial service operations. Currently, however, the pavement strength is sufficient to accommodate all existing and forecasted critical aircraft for the airfield.

Airfield design standards for differing critical aircraft options are presented on **Table 3G**. **Table 3H** presents runway declared distance calculations.

TABLE 3G
Airport Design Standards
Killeen-Fort Hood Regional Airport

Item	Runway 15-33 (C-III)	FAA Design Standard (C-III-2400)	FAA Design Standard (D-IV-2400)
Runway Design			
Width (ft)	150	150	150
RSA Width (ft)	500	500	500
RSA Length from R/W end (ft) (approach/departure)	600/1,000	600/1,000	600/1,000
OFA Width (ft)	800	800	800
OFA Length from R/W end (ft) (approach/departure)	600/1,000	600/1,000	600/1,000
OFZ Width (ft)	400	400	400
OFZ Length (ft)	10,400	(Runway Length + 400)	(Runway Length + 400)
Lighting	HIRL	HIRL	HIRL
Marking	PIR	PIR	PIR
POFZ Width at Runway end	N/A	800	800
Runway Setbacks – Runway Centerline to:			
Parallel Taxiway Centerline (ft)	538-785	400	400
Parallel Runway Centerline (ft)	N/A	N/A	5,000
Holdline (ft)	260	260	260
POFZ Holdline	N/A	N/A	N/A
Aircraft Parking Area (ft)	500	500	500
Taxiway Design			
Width (ft)	60-80	50	75
Safety Area Width (ft)	262	118	214
Lighting	MITL	MITL	MITL
Marking	Centerline, Edge	Centerline, Edge	Centerline, Edge
OFA Width (ft)	386	186	320

Source: AC 150/5300-13A, Change 1, *Airport Design*
OFA: Obstacle Free Area
OFZ: Obstacle Free Zone
POFZ: Precision Obstacle Free Zone
HIRL: High Intensity Runway Lighting
PIR: Precision Instrument Runway
MITL: Medium Intensity Taxiway Lighting

TABLE 3H
Existing and Ultimate Declared Distances
Killeen-Fort Hood Regional Airport

Declared Distances	Runway 15-33 (Existing)	Runway 15-33 (Ultimate)
Takeoff Run Available (TORA)	10,000'/10,000'	12,000'/12,000'
Takeoff Distance Available (TODA)	10,000'/10,000'	12,000'/12,000'
Accelerate-Stop Distance Available (ASDA)	10,000'/10,000'	12,000'/12,000'
Landing Distance Available (LDA)	10,000'/9,806'	12,000'/12,000'

PARALLEL RUNWAY PLANNING

Since 2002, plans have been considered to construct a second runway, separated by 5,000 feet from the current runway at the airfield. A 2012 environmental assessment by the City studied two runway length options for construction: one at 10,000 feet and another at 12,000 feet. The study defines the need for the additional runway as providing "redundancy for air operations when a runway must be closed because of emergency, maintenance, or construction activities."

An additional runway could separate civilian and military operations as needed and enable Fort Hood to deploy soldiers more quickly and efficiently during a national emergency. It would also support antimilitary joint-training opportunities. Because of the desire for an additional runway to support the military mission, it is recommended that alternatives for an additional runway be considered. It should be clearly understood, however, the capacity analysis did not indicate a strong need for additional capacity in the planning period.

If a parallel runway remains a part of this planning process, it should be developed to serve autonomous and simultaneous aircraft operations. The recommended separation between runways having simultaneous Instrument Flight Rules (IFR) approaches with ATCT services is at least 5,000 feet. Simultaneous approaches for precision instrument operations require electronic NAVAIDs and monitoring equipment, ATC, and approach procedures for both runways. Dual simultaneous approaches can be approved for runways with separations down to 4,300 feet and will be considered for runway separation down to 3,000 feet. If IFR approaches are not required for both runways, the minimum runway centerline separation distance recommended for ADG-V and VI runways is 1,200 feet. It is expected that an additional runway at GRK would need precision instrument approaches on both runways to safely accommodate both the military and commercial service operations. Therefore, future construction of a parallel runway at GRK is recommended to be at least 4,300 feet from the current runway, and preferably 5,000 feet; the existing ALP shows a separation of approximately 5,280 feet.

RUNWAY AIRSPACE REQUIREMENTS

Runway Protection Zone

The purpose of the runway protection zone (RPZ) is to enhance the protection of people and property on the ground and to prevent obstructions that are potentially hazardous to aircraft operations. The FAA

recommends that airports own the entire RPZ in "fee simple" title and that the RPZ be clear of any non-aeronautical structure or object that would interfere with the arrival and departure of aircraft. However, if "fee simple" interest is unachievable, the next option is controlling the heights of objects through an avigation easement or height zoning ordinance.

The RPZ is a two-dimensional trapezoid area that normally begins 200 feet beyond the paved runway end and extends along the runway centerline. When it begins somewhere other than 200 feet from a runway end, there is a need for two RPZs: approach and departure. The approach RPZ begins 200 feet from the threshold. A departure RPZ begins 200 feet from the end of runway pavement or Takeoff Run Available if different.

An FAA Interim Guidance Letter (IGL) (Sept 2012) addressed acceptable property uses within an RPZ. The IGL was released to specify and emphasize existing use standards and indicates that if any of the following parameters are met, then RPZ ownership must be reevaluated:

- An airfield project (e.g., a runway extension, runway shift);
- A change in the critical design aircraft that increases the RPZ size;
- A new or revised instrument approach procedure that increases the RPZ dimensions; and,
- A local development proposal in the RPZ (either new or reconfigured).

Land uses within an RPZ which require specific and direct coordination with the FAA include:

- Buildings and structures;
- Recreational land uses;
- Transportation facilities;
- Rail facilities;
- Public road/highways;
- Vehicular parking facilities;
- Fuel storage facilities;
- Hazardous material storage;
- Wastewater treatment facilities; and,
- Above-ground utility infrastructure.

RPZ dimensions are determined by the type/size of aircraft expected to operate at an airport and the type of approach, existing or planned, for each runway end (visual, precision, or non-precision). The recommended visibility minimums for the runway ends are determined per published instrument approach procedures, the ultimate runway design code (RDC), airfield design standards, instrument meteorological conditions, wind conditions, and physical constraints (approach slope clearance) along the extended runway centerline beyond the runway end.

At GRK, all of the land under the RPZs is part of Ft. Hood, however there is a boundary within the Ft. Hood property for the airfield, and that boundary will be mentioned in the following discussion. Land will be mentioned as either on the airfield or not.

Table 3J, *Runway Protection Zone Dimensions*, delineates the RPZ requirements. Runway 15-33 current approach RPZ dimensions are 2,500' total length, 1,000' inner width, and 1,750' outer width for both runway ends. Because of the displaced threshold at Runway 33, the departure RPZ begins 200 feet from the end of the runway pavement, while the approach RPZ begins 200 feet from the Runway threshold. Off the end of Runway 15, the roadway named Mohawk Drive traverses both the approach RPZ and the smaller departure RPZ. Off the end of Runway 33, the airfield property line and fence traverses both the approach and departure RPZs, indicating that the entire RPZ area is not contained on the airfield. Additionally, there is a wetland area located within the Runway 15 RPZ and bodies of water located in the Runway 33 RPZ. The portion of the RPZ off Runway 33 that is outside the airfield boundary is owned by Fort Hood, and therefore has a controlled use that is most likely compatible with airport operations. **Table 3K** presents dimensional requirements for other protection zones. The existing RPZs are depicted in **Figures 3C and 3D**.

TABLE 3J
Runway Protection Zone Dimension
Killeen-Fort Hood Regional Airport

Approach Visibility Minimums	Facilities Expected to Serve	Length (ft)	Inner Width (ft)	Outer Width (ft)	Acres
Visual and Not Lower than 1-Mile	Aircraft Approach Category C	1,700	500	1,010	29.465
Not Lower than ¾-Mile	All Aircraft	1,700	1,000	1,510	48.978
Lower than ¾-Mile	All Aircraft	2,500	1,000	1,750	78.914

TABLE 3K
GRK Field Protection Zone Dimensions
Killeen-Fort Hood Regional Airport

Protection Zones	Existing	Ultimate	Deficiencies
Building Restriction Line (BRL)	745'	745'	NONE
Approach RPZ	2,500' X 1,000' X 1,750'	2,500' X 1,000' X 1,750'	NONE
Departure RPZ	1,700' X 500' X 1,010'	1,700' X 500' X 1,010'	NONE
Approach Surface	10,000' X 1,000' X 16,000'	10,000' X 1,000' X 16,000'	NONE
Approach Angle	50:1 / 50:1	50:1 / 50:1	NONE

RPZ: Runway Protection Zone

Figure 3C: Existing Airfield and RPZs

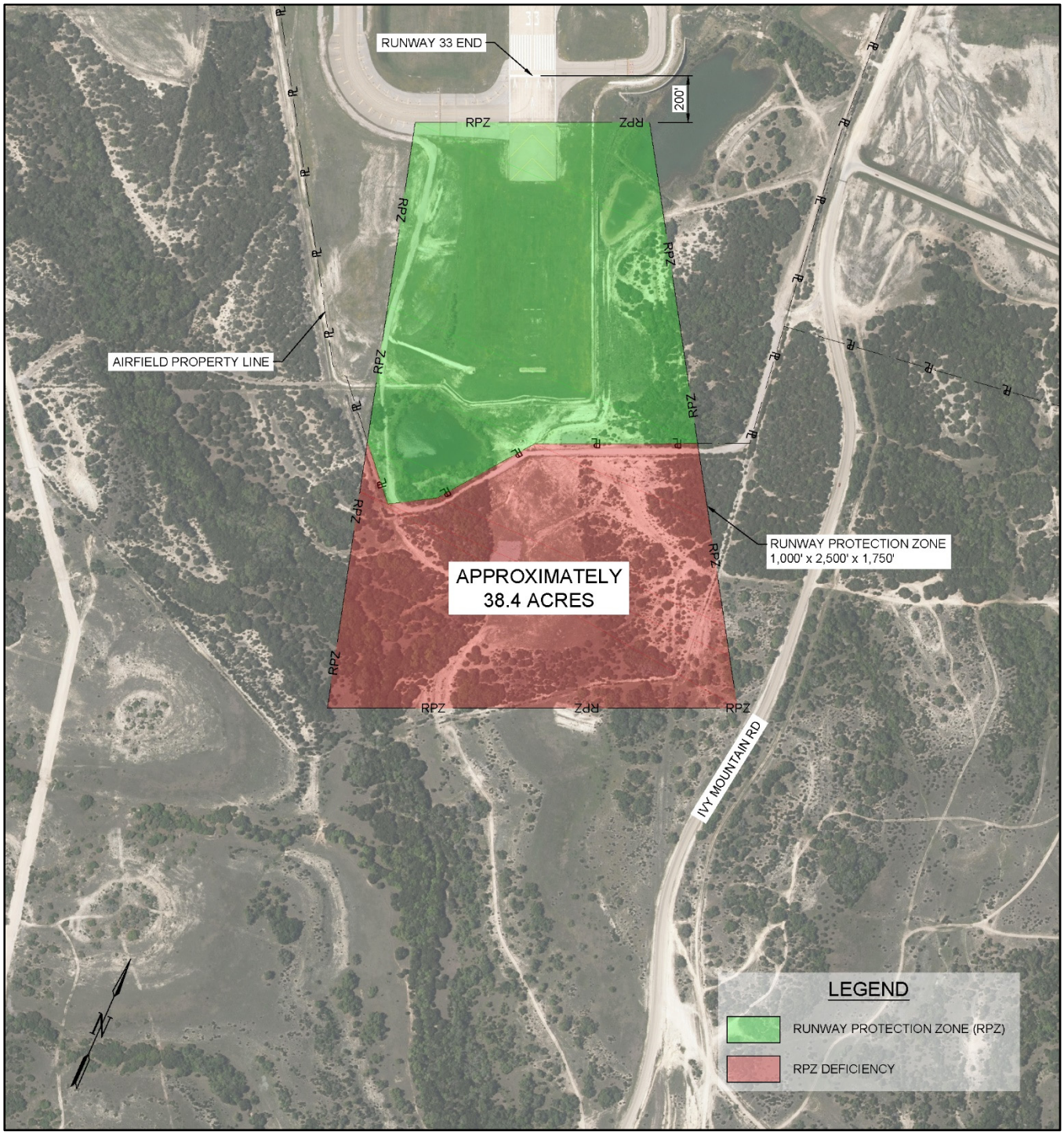


Figure 3D: Existing Airfield and RPZs

TAXIWAY REQUIREMENTS

The taxiways at GRK consist of parallel, connector, and entrance/exit taxiways that provide access from the runway to both the military and commercial service areas of the airport. The taxiways or portions thereof that primarily serve the military areas should conform to Department of Defense (DoD) standards, and the taxiways or potions thereof designated to serve the commercial service area of the airfield should conform to FAA standards. This examination of taxiway facilities at GRK will focus on the FAA standards governing the taxiways serving the commercial service areas. FAA standards for taxiway design as explained in AC 150/5300-13A (Change 1) recommend taxiway and taxilane layouts that enhance safety by avoiding runway incursions. Taxiway turns and intersections are designed to enable safe and efficient taxiing by airplanes while minimizing excess pavement. Taxiway separation standards are designed to provide ample wingtip clearance driven by the fact that the pilots of most modern jets cannot see their aircraft's wingtips. Taxiway widths are based upon Taxiway Design Group (TDG), which accounts for the dimensions of the airplane's undercarriage dimensions. Individual taxiways are designed for the specific aircraft that will use that taxiway.

The taxiways at GRK are more than sufficient at every location to meet FAA design width and separation requirements. Existing dimensions are compared with design requirements in **Table 3L**. The bypass taxiway (Taxiway G) is located 350 feet from the entrance taxiway (Taxiway B) to Runway 33, which is greater than the required 324 feet.

TABLE 3L
Airside Taxiway Design Group and Safety Standards
Killeen-Fort Hood Regional Airport

Taxiway/ Taxilane	FAA TDG	Type	Actual Width (ft)	Design Width (ft)	Taxiway Edge Safety Margin (ft)	Taxiway Shoulder Width (ft)
A*	5	Parallel/Connector	75	75	15	30
B	5	Parallel/Connector	75/60	75/50	15	30
B1*	4	Connector	40	35	10	20
B2*	4	Connector	40	35	10	20
B3	5	Connector	90	75	15	30
C*	5	Connector/Exit	75/45	75/35	15	30
C1*	4	Connector	50	50	10	20
D	5	Connector/Exit	60	50	15	30
E	5	Connector/Exit	75	75/50	15	30
F*	5	Connector	75	75	15	30
G	5	Connector/Exit	80	75	15	30

Source: FAA AC 150/5300-13A, Change 1, *Airport Design*.
*Primarily used by military aircraft and meets military design standards.

According to FAA Design Standards, Change 1 recommendations presented in **Table 3M**, to maximize safety, taxiway intersections should be at 90 degrees to maximize line of sight visibility; connecting taxiways should not be located in the middle third of the length of the runway; a connector should not provide direct access to a runway end via an entrance taxiway; parallel taxiways should be curved at the

ends to differentiate them visually from the runway; and aircraft apron areas should not be adjacent and connected to parallel taxiways. Taxiway A has two ramp areas that are immediately adjacent to the taxiway, but those ramps only serve military operations and are therefore not governed by FAA design requirements. The north end of Taxiway B is squared off and adjacent to aircraft apron pavement. Taxiway D is located in the center third of the runway, but its location provides access to the UAS ramp for military traffic. The portion of Taxiway E located between the parallel taxiway and the runway provide access directly to the runway from a ramp area which is not recommended; however, the access is not directly to a runway end, which is prohibited. In the future, before major rehabilitation work is done to Taxiway E, consideration should be given to removing the portions of the taxiway between the parallel taxiway and the runway to enhance safety for taxiing aircraft. The operation of the control tower at GRK currently sufficiently mitigates the risk associated with those taxiway configurations.

TABLE 3M
Change 1 – Taxiway Hot Spots
Killeen-Fort Hood Regional Airport

Taxiway/Taxilane	Hot Spot	Severity – Recommended Action
A*	Two ramps adjacent to parallel	Minimal (ops controlled by DoD) – Do Nothing
B	North end not curved	Minimal (ops controlled by DoD) – Do Nothing
D	Located in center third of RW	Moderate – consider eliminating at end of service life
E	Direct Access to RW	Minimal (ops controlled by DoD) – consider eliminating at end of useful life

PAVEMENT MARKING REQUIREMENTS

Runway pavement markings should follow requirements prescribed in FAA AC 150/5300-13 (current series), and AC 150/5340-1J, *Standards for Airport Markings*. Runway 15/33 has precision markings supporting its approaches and runway hold short markings protecting the runway. Hold short markings for Runway 15/33 should be located a minimum of 260 feet from the runway centerline (250 feet for ADG VI plus one foot for every 100 feet above sea level).

All paved taxiways should be painted with standard taxiway markings as prescribed in FAA Advisory Circular 150/5340 (current series), *Standards for Airport Markings*. The taxiway system at GRK is currently marked or is being remarked to FAA standards for the portion of the system servicing civilian operations and to DoD standards for the portions of the taxiway system primarily serving military operations.

Currently, on the east side of the airfield, the hold short lines and signs meet FAA standards for the airport design group for the civilian traffic. Because larger aircraft typically use the west (military) side of the airfield, RGAAF has identified the deficiency of the markings on the west side of the airfield as a desired upgrade and would like for all airfield signs and markings to be consistent at the larger design group locations.

AIRFIELD LIGHTING AND SIGNAGE REQUIREMENTS

Airport lighting is used to maximize the utility of the airport during day, night and adverse weather conditions. FAA Order 7021.2C, *Airport Planning Standard Number One - Terminal Air Navigation Facilities and Air Traffic Control Services* specify minimum activity levels to qualify for visual and electronic navigational aids and equipment. Currently, Runway 15-33 is equipped with High Intensity Runway Lights (HIRL) including runway edge lights supporting its instrument approaches. GRK has Medium Intensity Taxiway Lighting (MITL) equipping all taxiways associated with Runway 15/33. FAA Advisory Circular 150/5345-44G, *Specifications for Taxiway and Runway Signs* and FAA Advisory Circular 150/5340-18D, *Standards for Airport Sign Systems*, outline the specifications for airport signage and should be followed for proper implementation, upgrades, and upkeep of airport signs.

The airport has signage indicating runway and taxiway designations, holding positions, instrument landing system (ILS) critical areas, routing/directional, runway end and exits, and runway distance remaining. At the runway ends, the approach lighting available to assist pilots includes a PAPI-4 system at both ends of the runway and a MALSR supporting the ILS approach that provides the means to transition from instrument flight to visual flight for landing. Currently, no deficiencies to standards exist for the lighting and signage at GRK. However, to promote sustainability and decrease maintenance costs, it is recommended that LED lighting fixtures be utilized wherever possible. Currently, LED fixtures are utilized for the Taxiway Edge Lights, Apron Edge lights, the Helipad Perimeter Lights, the two windcones owned and maintained by Fort Hood, and the guidance signs at the following intersections: Twy B and C, Twy B and B-1, Twy B and B-2. It is recommended that alternatives development consider the feasibility and timing of upgrading all airfield lighting to LED fixtures as feasible.

NAVIGATIONAL AIDS

Airport navigation aids (NAVAIDs) are installed on or near an airport to increase the airport's reliability during night and inclement weather conditions and to provide electronic guidance and visual references for executing an instrument approach to the airport or runway.

FAA Order 7021.2C, *Airport Planning Standard Number One - Terminal Air Navigation Facilities and Air Traffic Control Services*, governs instrument approach equipment and approach procedures.

INSTRUMENT LANDING SYSTEM

An instrument landing system (ILS) system is composed of two primary land-based components, the localizer and glideslope. The ILS system enables an appropriately equipped and piloted aircraft to be flown to a runway end with visibility as low as ½-mile and cloud ceilings at or near 200 feet above ground level. The localizer provides lateral (horizontal) alignment guidance while the glideslope provides descent (vertical) guidance. Often functioning with these two components are marker beacons and non-directional beacons that provide identification of interim points on the approach, and an ALS that pro-

vides for rapid identification of the runway environment during inclement weather conditions. The airport has a localizer and glideslope NAVAID serving both ends of Runway 15-33. The visibility and decision height minimums for Runway 33 are 200 feet and ½-mile, and for Runway 15 are 300 feet and 1/2-mile.

VERY HIGH FREQUENCY OMNI-DIRECTIONAL RADIO RANGE

The Very High Frequency Omni-Directional Radio Range (VOR/VORTAC) system emits a very high frequency radio signal utilized for both enroute navigation and non-precision approaches. It provides the instrument rated pilot with 360 degrees of azimuth information oriented to magnetic north. Due to the recent development of more precise navigational systems, it is planned to be phased-out by the FAA (no additional enroute units installed after 1995). GRK is served by the Gray VOR/DME, located on Gray Army Airfield, and used for the VOR-A instrument approach procedure to GRK and the VOR approach to Runway 15. The GRK VOR is also used for instrument approaches to HLR (Hood Army Airfield) and ILE (Skylark Field).

DISTANCE MEASURING EQUIPMENT

Distance measuring equipment (DME) provides a continuous readout of the distance remaining to the touchdown point at an airport or to the equipment location when not at an airport. DME are often co-located with Very High Frequency Omni-Directional Radio Range (VOR/VORTAC) systems. See VOR/VORTAC information below for GRK approaches.

GLOBAL POSITIONING SYSTEM

Global positioning system (GPS) is a highly accurate worldwide satellite navigational system that is unaffected by weather and provides point-to-point navigation by encoding transmissions from multiple satellites and ground-based data-link stations using an airborne receiver. GPS is presently FAA-certified for en-route and non-precision instrument approach navigation with precision instrument approaches based on GPS being developed for commercial airports. The current program provides for GPS stand-alone and overlay approaches (GPS overlay approaches published for runways with existing VOR/DME, RNAV and NDB approaches). Both ends of Runway 15-33 have published RNAV (GPS) approaches.

LANDSIDE FACILITY REQUIREMENTS

Landside facilities are those necessary for handling aircraft and passengers while on the ground. These facilities provide the essential interface between the air and ground transportation modes. The capacities of the various components of each area were examined in relation to projected demand to identify future landside facility needs. This analysis is heavily focused on the needs to support commercial passenger aviation activity, but also includes general aviation personal/business aviation, charter, military, and some portions of air cargo and air ambulance activity. The landside components include:

- Commercial Passenger Terminal Building
- Auto Parking and Access
- Aircraft Parking Apron
- General Aviation Terminal and Support Services

PASSENGER TERMINAL FACILITIES

The forecasts in Chapter 2 were translated into three future passenger scenarios representing the level of activity expected in the 5-, 10-, and 20-year planning horizons. Terminal space requirements for Killeen-Fort Hood Regional Airport were determined by applying planning factors to future passenger scenarios, based on Level of Service standards set by IATA and various best practices for terminal planning. Peak hour passenger demand calculated in the forecasting chapter was used to size terminal facilities and determine requirements for Scenarios 1, 2, and 3 as presented in **Table 3N**.

TABLE 3N
Terminal Building – Conceptual Facility Requirements Comparison
Killeen-Fort Hood Regional Airport

Description	Existing Terminal	Projected Requirements		
		Scenario 1 2021	Scenario 2 2026	Scenario 3 2036
AIRLINE FUNCTIONS				
Ticket Counter Area	1,719	761	815	1,154
Ticket Counter Length (10 Positions)	143	78	83.6	118.4
Ticket Counter Queuing	2,335	1,131	1,212	1,717
Curbside Baggage Check	-	164	176	249
Baggage Claim Area/ Oddsize Area	4,769	4,900	5,225	7,375
Baggage Claim Frontage	190	274.4	292.6	413
Oversized Bag Claim	8	8	8	8
Baggage Service Office	-	563	600	847
Outbound Baggage	8,643	4,875	5,225	7,400
Inbound Baggage	2,419	2,313	2,466	3,481
Airline Operations/ Airline Ticket Office	3,569	3,409	3,738	4,554
Departures Lounges (Holdrooms)	10,604	9,620	9,620	9,620
Jet Gates	6	6	6	6
Subtotal Airline Functions	**34,058**	**27,734**	**29,076**	**36,396**
CONCESSIONS				
Concessions (Food/Beverage)	1,545	800	878	1,069
Concessions (News/Gifts/Sundry)	1,847	534	585	713
Concessions (Concession Storage)	169	267	293	356
Concessions (Open Seating)	3,452	-	-	-

TABLE 3N (Continued)

CONCESSIONS (Continued)				
Ground Transportation	-	593	650	792
Information	73	-	-	-
Rental Car Counters	2,656	2,223	2,438	2,970
Subtotal Concessions	**9,741**	**4,416**	**4,843**	**5,900**
SECURE PUBLIC AREA				
Security	2,501	3,600	3,600	4,800
Circulation	1,160	5,250	5,250	5,250
Restrooms (A202, A203, C202, C203)	978	1,876	1,876	1,876
Bag Screen Room	3,968	2,500	3,750	3,750
TSA Offices/Training/ Restroom (D106, D107)	3,440	273	293	414
TSA Break	280	573	614	870
Airport Administration/ Training	7,251	1,630	1,788	2,178
Other	-	-	-	-
Subtotal Secure Public Area	**19,579**	**15,703**	**17,171**	**19,139**
NON-SECURE PUBLIC AREA				
Circulation – Ticketing	-	1,697	1,818	2,575
Circulation – Baggage Claim	-	1,960	2,090	2,950
Circulation – General	19,793	2,964	3,250	3,960
Restrooms (B105, B106b, C120, C121, C122, B212, B215)	1,679	1,173	1,254	1,773
Other	-	-	-	-
Subtotal Non-Secure Public Area	**21,472**	**7,794**	**8,412**	**11,258**
NON-PUBLIC AREA				
Loading Dock	-	167	179	218
Storage	1,600	556	595	727
Maintenance	392	556	595	727
Mech./Elec./Bldg. Systems	7,849	6,678	7,140	8,723
Restrooms (B311, B312)	282	278	298	363
Subtotal Non-Public Area	**10,122**	**8,236**	**8,806**	**10,759**
GRAND TOTAL	**94,972**	**63,882**	**68,308**	**83,452**

Source: Corgan

After the terminal space requirements were generated for each planning scenario, the individual functions of the terminal were examined in more detail to clearly define future needs. The terminal functions and more detailed information for each follow.

Passenger Processing

The terminal accommodates passenger processing functions such as ticketing, checked baggage screening, passenger security screening, and baggage claim.

Ticketing

The ticketing area includes check-in counters and queue area in front of the counters. The airline ticket offices behind the counters serve as airline operations. Facility requirements analysis in **Table 3M** shows the existing area for check-in counters is 1,719 square feet and exceeds the requirements set for the three scenarios. The queuing area in front of the check-in counters is 2,335 square feet and also exceeds the requirements for the three demand scenarios. It is noted, however, that the Airport has observed congestion at the ticket counter queuing and passenger circulation during troop movements as well as irregular operations when flight cancellations occur. Currently, the Airline Ticket Offices and Airline Operations are calculated at 3,569 square feet, which is a sufficient amount of space for the current needs in Scenario 1, but will need to increase to 3,738 for Scenario 2 and 4,554 square feet for Scenario 3.

Baggage Screening

The baggage screening projected requirements are based on TSA's 2016 actual bag count. This includes bags through the Explosive Detection System (EDS) machines and hand searched bags (trace detection) compared to the total enplanements for 2016. Presently, the existing terminal has two independent EDS machines, a CT80 and CT80XL, which can inspect up to 226 bags per hour. Due to machine limitations for oversized baggage, twenty percent of the checked bags are hand searched. At GRK, the ratio of bags per departing passengers is less than the planning factor of 1.5 bags per enplaned passenger typically applied. Soldier deployment occurs frequently at GRK and results in the potential higher ratio of bags per departing passenger than the typical commercial passenger at GRK. The larger bags are not backing up at the EDS machines, but rather at the tables that require hand searching because the bags are oversized or possibly include weapons. Backup will still occur when additional EDS machines are added due to the staffing requirements from TSA to hand search baggage. The findings show that the two existing EDS machines are sufficient to accommodate projected demand through the ten-year horizon. A third EDS machine would be needed to accommodate the twenty- year demand horizon. The bag screen room is currently 4,538 square feet which exceeds all three scenarios.

Outbound Baggage

The outbound baggage area is located behind the baggage screening room and ticketing offices. The existing total square footage is 8,643 and satisfies the requirements for all scenarios.

Baggage Claim

The baggage claim area consists of non-secure public space for claiming bags including area around the claim carousels. The existing terminal has two flat plate carousels with a linear frontage of 190 feet and one sloped baggage slide for the oversized bags with a linear frontage of eight feet. The existing baggage

claim area is 4,769 square feet. Projected requirements for Scenario 1 equal 4,900 square feet with linear frontage at 275 feet. By Scenario 3, 7,375 square feet is required with a corresponding linear frontage of 413 feet.

Inbound Baggage

The existing inbound baggage area, located behind the baggage claim carousel, is 2,419 square feet. To meet Scenario 3 requirements, the area projected for inbound baggage is 3,481 square feet.

Baggage Service Office

Baggage service offices, managed by the airlines, generally provide assistance for delayed, damaged, or lost baggage. There is no provision for such offices in the existing terminal. The airlines currently store delayed baggage where space is available and periodically rent ATO Office #3 for a daily rate. Scenario 1 and Scenario 3 requirements identify 563 square feet and 847 square feet of space respectively needed for baggage services offices.

Concessions

Concessions requirements were projected in terms of four categories of use for the terminal. Currently, all concession areas are located landside and accessible to the public with no secure concessions.

- Food and Beverage typically includes food and beverage restaurants, kiosks, and quick serve locations. The existing terminal has space for two restaurants and a bar on the second level in the non-secure area, with vending machines on the first level and in both holdrooms. A total of 1,545 square feet is provided for this category, which exceeds requirements for all Scenarios.

- News, Gifts, and Sundry includes bookstores, newsstands, small gift shops, specialty shops, and other retail. Currently, a gift shop and retail shop are located on the non-secure side on the Concourse level. A total of 1,847 square feet currently serves the Airport for this category, which exceeds requirements for all Scenarios.

- Concession Storage constitutes the storage and support spaces separate from the individual concessions locations. Currently, there are 169 square feet reserved for concession storage; Scenario 3 is projected to be 356 square feet.

- Concession Open Seating includes the open seating located on the Concourse level between the food and beverage concessions as well as adjacent to the gift shop and retail on the balcony overlooking the first floor lobbies. The open seating is 3,452 square feet.

Apart from these spaces, rental car services and ground transportation services also require space inside the terminal building. The rental car counters and offices cover 2,656 square feet in the existing terminal.

This area would need to expand an additional 314 square feet to meet the requirements listed in Scenario 3. Currently, area for a shuttle service and other ground transportation is not included. The area is projected to be 792 square feet in Scenario 3. GRK has an information center with 73 square feet. This area will be maintained throughout the Scenarios.

Overall, the total concession spaces provided for the existing terminal exceeds the demands in Scenario 3.

Secure Public Area

The secure public area within the airport includes security screening check points, holdrooms, restrooms, and airline administration.

Security Screening Checkpoints

The existing Security Screening Check Point (SSCP) consist of two separate screening lanes with an hourly passenger capacity of 300 passengers. The typical passenger arrives 1 – 1.5 hours before the flight. Currently, the passengers wait in the landside concession, prolonging their visit with well-wishers prior to flying. The projected requirements show that three security checkpoints would be needed for Scenarios 1 and 2 with an hourly passenger demand of 195 and 209 passengers per hour respectively to accommodate 50% of the passengers going through security 30-40 minutes prior to their flight. Four security checkpoints would be needed for Scenario 3. The current space allocated for the SSCP is 2,501 square feet; Scenario 1 and 2 require 3,600 square feet for three checkpoints. The requirements for Scenario 3 would grow to 4,800 square feet for four checkpoints.

TSA Administration

In addition to the passenger screening area that TSA operates, TSA needs space for administrative functions, including break, restroom, and training areas. TSA offices, a training area, restroom, and a breakroom in the existing terminal are located on the first level near Ticketing and the Bag Screening Room. The offices, restrooms, and training area measure 2,964 square feet, and the breakroom measures 309 square feet. While the existing TSA office space is adequate to meet future demand, requirements show that 573 square feet is needed for the TSA breakroom space for Scenario 1; 614 square feet is required for Scenario 2; and 870 square feet is required for Scenario 3. The Airport has also indicated the structure located in the TSA administration area was sized to support future expansion on the second level.

Holdrooms

GRK has six gates in the terminal building with passengers deplaning to the holdrooms via passenger boarding bridges. Holdrooms are categorized by the aircraft design group they serve, and the spaces for these holdrooms are determined as per the number of operations of each aircraft design group. The existing terminal has 10,604 square feet of holdroom space on the secure side which is only accessible to departing passengers. The existing holdroom space is adequate to serve future demands to Scenario 3. Although secure circulation is not currently included in the holdroom square footage presented in

Table 3N, areas for circulation are counted as holdroom space. As congestion occurs, the holdrooms will need to be expanded. Secure circulation is shown as deficient for Scenarios 1, 2 and 3. See the following circulation paragraph for Secure Circulation requirements.

Restrooms

Restrooms on the secure side of the existing terminal measure 978 square feet. They are located on each north and south side adjacent to the security screening lanes. The projected requirements show that the existing restroom area needs to expand to 1,876 square feet of secure-side restrooms to meet the demands for Scenarios 1, 2 and 3.

Circulation

The area for secure-side circulation in the existing terminal is 1,458 square feet. This circulation space provides passage from the holdrooms through the exit corridor to landside. To meet the current demand and future Scenario 3 requirements, 5,250 square feet of circulation space is needed on the secure side. In the future, this terminal facility requirement may be reached by including secure circulation within the holdrooms, which currently do not include secure circulation.

Airport Administration/Training

The existing terminal has 6,414 square feet of airport administration space located on the non-secure side on the third level. It includes eight offices, two conference rooms, a breakroom, a workroom, and reception area. Administration space is also included on the first level adjacent to the TSA designated areas. The existing airport administration space exceeds the projected requirements through Scenario 3. A training room is located on the 1st level adjacent to the baggage claim. The Airport has indicated the square footage of this room needs to be increased to accommodate meetings of 25-35 people as well as a staging area for military troop movements.

Non-secure Public Area

Non-secure public area entails facilities and spaces available to passengers on the non-secure side of the terminal. These spaces include non-secure circulation and areas for non-secure restrooms and other support functions.

Non-secure Restrooms

Non-secure restrooms in the existing terminal are located adjacent to the ticketing area and adjacent to the main vertical circulation in the main lobby. The existing 1,679 square feet meet the current demand, but will need to increase to 1,773 square feet to accommodate Scenario 3 demand.

Non-secure Circulation

Non-secure circulation space is comprised of circulation for ticketing and baggage claim as well as general circulation. In total, non-secure circulation space in the existing terminal is 19,789 square feet, which exceeds the requirements of Scenarios 1, 2, and 3.

Non-Public Areas

Non-public areas were assessed as a whole for the terminal. These areas include mechanical, communications rooms and electrical spaces, loading docks, general storage for custodial and Airport, and restrooms not accessible to the public.

Loading Dock

The existing terminal does not currently include an on-site loading dock with access to both the first and second floors. Instead, the Airport provides a portable loading dock parked on the apron. Scenario 1 requires 167 square feet and 218 square footage by Scenario 3. Future planning should include the addition of a permanent loading dock.

Storage

Existing storage appears to meet all Scenario requirements with 1,919 square feet. However, observations show additional storage is required within the terminal building. Currently, the Airport utilizes four 40' Conex boxes for long term storage solutions for their holiday decorations, attic stock, signage, lawncare, and daily maintenance items. The Conex box square footage is not included in the storage facility requirement listed in **Table 3N**. Temporary storage containers are not an optimal permanent solution for the Airport. The Airport also utilizes office spaces and other areas for their storage needs. Storage shelves are located in the existing equipment rooms. The Airport has noted an estimated 2,000 sq. ft. is required above the programmed space for the existing storage to be relocated and allocated to designated storage areas.

Maintenance

Existing maintenance areas account for 392 square feet. Maintenance areas include janitor closets and closets to store custodial supplies. Maintenance spaces will need to grow to 727 square feet to meet requirements identified for Scenario 3.

Mechanical/Electrical/Building Systems

Mechanical, electrical and building systems areas include the interior rooms in the Airport that house air handling units, electrical panels, and communications systems. Currently, existing mechanical, electrical, and building systems rooms exceed the requirements for Scenarios 1 and 2 at 7,951 square feet. These spaces will need to be expanded to 8,723 square feet to meet the requirements for Scenario 3. The

Airport has indicated for building expansion and new passenger boarding bridges, the electrical infrastructure will need to increase to accommodate additional power supply and the emergency generator capacity.

Non-Public Restrooms

Non-public restrooms include the restrooms in the Airport only accessed via card reader. These restrooms are located in the TSA office suite and on the third level adjacent to the Airport Administration offices. These restrooms total 282 square feet and need to expand to 363 square feet to meet the requirements through Scenario 3.

Terminal Curb Roadways

Landside facilities are used by originating and terminating passengers. It was assumed over the planning period there will not be a significant change in the relative availability and convenience of the various landside modes or facilities.

As with circulation roadways, demand, capacity, and performance are measured by Level of Service (LOS) and a curb roadway is determined using several factors. These LOS-calculating factors include:

- Peak hour commercial airline schedule
- Ratio of private vehicles to commercial vehicles
- Length of the curbs
- Number of lanes
- Curbside roadway operational allocations and active management

Zones set aside for certain modes influence capacity and LOS, as does the presence of crosswalks, and spaces where vehicles should not stop to serve passengers. The level of enforcement strongly influences capacity and LOS, as both decrease with longer dwell times. These dwell times increase with less effective enforcement. Observed vehicle types utilizing the curb include private vehicles, commercial vans with 12-15 passengers, and hotel shuttles. The current commercial curb is evenly divided into two separate operational areas: (1) curbside immediately adjacent to the terminal building; and, (2) outer median. The combined length of these two operational areas equal 978 linear feet, which meets the forecasted demand in Scenario 3 and projected level of service.

Wayfinding

The Airport includes high contrast signage with a brown background and large format white lettering for passengers to easily view. Overall, the building is arranged in a three-part configuration with ticketing on the north side of the Airport and baggage claim on the south. This arrangement allows for intuitive wayfinding.

The departing passenger approaches the terminal building at the curbside and is greeted by signage at the canopy designating the different airlines and proceeds to the main entrance at the ticketing area.

The passenger is immediately introduced to visual cues leading to the ticketing counters and escalators leading upstairs to the security checkpoint. Once the passenger acquires their boarding pass, signage for the gates can be seen from the ticketing area. Restroom signage is located directly west of the ticketing area for public use. Signage at the central node of the Airport includes directions to the elevator, restrooms, and SSCP. The passenger advances up the escalator to the Concourse at the second level. Once upstairs, the passenger navigates through the corridor where signs on the walls provide gate number signs, direction to gate areas, and flight information display monitors indicate arrival and departure times. Once the passenger follows the appropriate sign, they proceed through the appropriate SSCP and view signage for laptop stations and restrooms while inside of the holdrooms.

For the arriving passenger, the path is more intuitive than the departing path and less dependent on visual cues. With a one-way flow, the passenger continues toward the center of the concourse and to the exit corridor adjacent to the SSCP. Due to the restroom signage being surface mounted to the wall, there is less visibility to the arriving passenger for the secure restrooms. Once the passenger exits the holdroom, visual clutter from non-fixed objects and dynamic advertising limits the visibility of the baggage claim signage. Once the passenger enters the vertical transportation node with the escalators and elevator, the decision point is clear to go south toward baggage and rental cars. If the passenger does not need to go to baggage claim, the exit doors are prominently seen in the front.

AIRPORT AND PARKING OPERATIONS

Parking at the airport is served by a total of 1,444 public spaces and 37 additional reserved spaces near the terminal as illustrated on **Figure 3E**. All public parking is located in two adjacent surface lots directly across from the front of the terminal. There is no remote parking area.

Parking Area	Capacity
Short-Term Parking	513
Long-Term Parking	931
Total	**1,444**

Access into and out of all public parking facilities is gate controlled per the locations shown on **Figure 3F**. Airport patrons take tickets at the entry points to the various parking areas and exit through a common exit plaza. Each ticket is encoded with the entry date, entry time, entry gate location and appropriate rate code for that parking area. The entry ticket, when processed by computer-based equipment at the exit, also provides statistical information about exit date and time, exit lane, and rate code for the specific parking area. When staff approach the parking areas, tag-recognition equipment sends a signal to parking equipment. Upon confirmation of the credential, the gate opens allowing access.

Patrons exit the parking areas through four lanes in the exit plaza. For employees, the exit plaza operates similarly to the entrance lanes with use of the transponder. For patrons, the exit plaza is equipped with both cashiered exits (staffed personnel in the cashier booth) and automated exits that accept payment by credit card without requiring a cashier. Patrons with parking fee exemptions (certain active duty military and veterans with qualifying credentials in accordance with current City Ordinance) must stop at the staffed cashiered lanes to exit the parking areas.

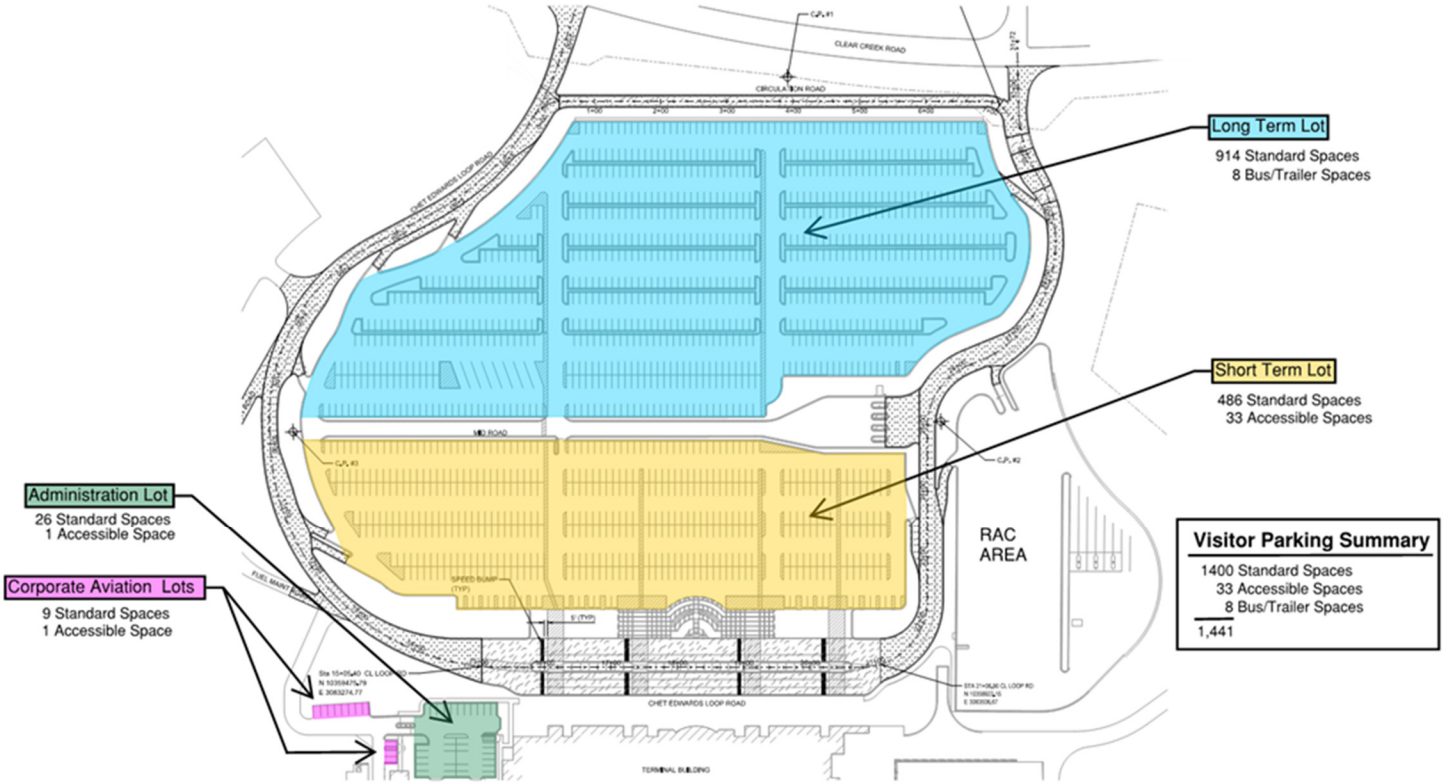


Figure 3E: Public Parking Area

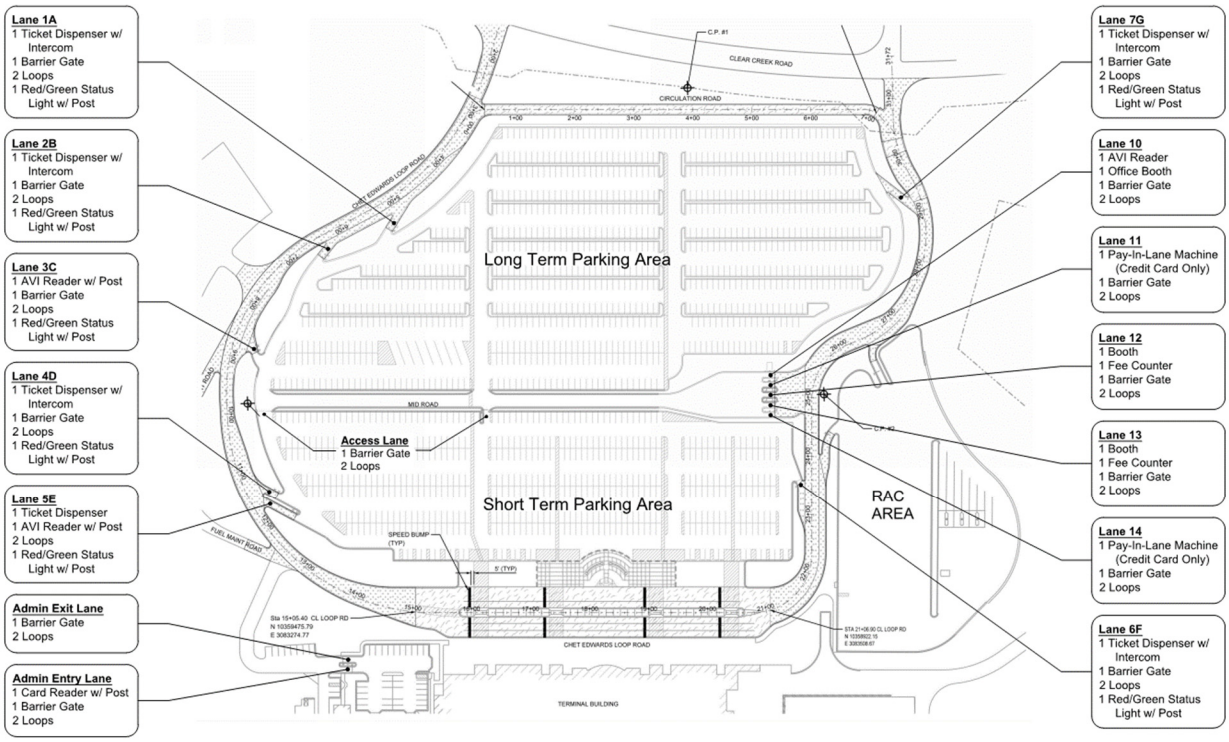


Figure 3F: Parking Access Locations

Parking Demand Model

The parking demand model was created to determine current parking demand and approximate future parking needs based on anticipated changes in airport demand and operations. The model was developed using information provided by the parking operator utilizing late afternoon and evening, targeted daytime peak parking demand counts and general operating conditions.

Peak Vehicle Accumulation

The average number of vehicles recorded in the lots was approximately 350. The number of vehicles recorded fell to under 200 on a few days in January. There were no late afternoon to evening counts with more than 600 vehicles accumulated in the parking areas. The peak parking demand times are around the Thanksgiving and Christmas Holidays and early in March.

Short-Term Parking

The parking pattern for the Short-Term Lot is similar throughout the year, with most days below 200 vehicles accumulated in late afternoon to evening. The daytime peaks manually counted in October 2016 indicated an approximate 29% increase in daytime parking accumulation above the late afternoon to evening counts. This increase is due to three factors: (1) passenger vehicle counts are higher during the daytime than later in the day; (2) the 30-minute free parking in the short-term area creates a pick up and drop off zone considering the ease and speed in which patrons can get in and out of the terminal for flight departures and arrivals; and (3) the ADA Accessible Parking spaces are located in the short-term area. Adjusting the late afternoon to evening count data for the day time increase yields a peak daytime demand estimate for the short-term parking area of 222 vehicles.

Long-Term Parking

Long-term parking has more variation than short-term parking, with slightly higher peaks and more rapid decline in the number of high demand days. In the data set used, there were only four occurrences of late afternoon to evening vehicle counts over 400. The daytime increase in vehicle counts was lower with only a 14% increase in daytime vehicles over the late afternoon to evening counts. Adjusting the late afternoon to evening count data for the day time increase yields a peak daytime demand estimate for the long-term lot of 530 vehicles.

Combined Demand - Public Parking Areas

Combining the demand for both parking areas results in a peak late afternoon to evening count of 594 vehicles. Adjusting the combined vehicle accumulation for short-term and long-term parking facilities and adjusting for daytime peaks yields an estimated daytime peak of 702 vehicles.

Future Parking Requirements

As a matter of daily business, the Killeen-Fort Hood Airport has sufficent parking for current operations. The short-term parking lot and long-term parking lot are operating below 60% occupancy at peak times and below 50% occupancy throughout most of the year. With the enplanement increases projected over the next decade, the parking supply should be adequate to meet demand for the next ten years.

GENERAL AVIATION

General Aviation (GA) traffic must obtain permission from the Army before operating at GRK. General aviation services are also normally reserved for corporate or charter aircraft weighing over 12,500 pounds. Small to medium sized GA aircraft more frequently use Skylark Field. The corporate and charter general aviation that currently operates at GRK is exclusively itinerant. Likewise, the commercial service operations at GRK are exclusively itinerant as well. While the Army has at least 40 aircraft based on the military side of the joint-use airfield, there are currently no civilian-based aircraft at the airport. Civilian-based aircraft are not prohibited under the joint-use agreement; however, with limited services available at GRK, and the GA-focused amenities at Skylark field, only up to 10 civilian aircraft are expected to locate at GRK during the 20-year planning horizon.

Fixed Base Operators

A potential limiter to based GA aircraft at GRK is the lack of fixed base operators. Under the joint-use agreement, most FBO activities are incompatible with the commercial service and military operations occurring at the airfield. There is no intention over the planning horizon to bring any additional FBO operations onto the airport other than those services currently provided by Airport staff.

GA Services

While no civilian aircraft are based at GRK, the airport does support general aviation operations, which are generally corporate or charter type flights. GA services are offered out of the Corporate Aviation building by the airport staff and include Jet A fuel, ground power unit (GPU), airstairs, lavatory service, towing and pushback, de-icing services and overnight parking. No Avgas or self-service fuel options are available to general aviation traffic. The Corporate Aviation building offers limited space for pilot services.

The location of the Corporate Aviation building, depicted in **Figure 3G**, is convenient to the main terminal and automobile parking; however, the Gate 1 boarding bridge and aircraft parking location are located between the Corporate Aviation building and the ramp area where GA aircraft are parked. This arrangement is less than ideal because general aviation pilots and passengers must walk near the Gate 1 boarding bridge and aircraft parking area to access the Corporate Aviation building from the GA parking area

and require an escort to ensure their safety. Relocation of the Corporate Aviation building and operations to a safer, less congested location, better suited to its operations and more attractive to corporate users, will be considered in the development of alternatives.

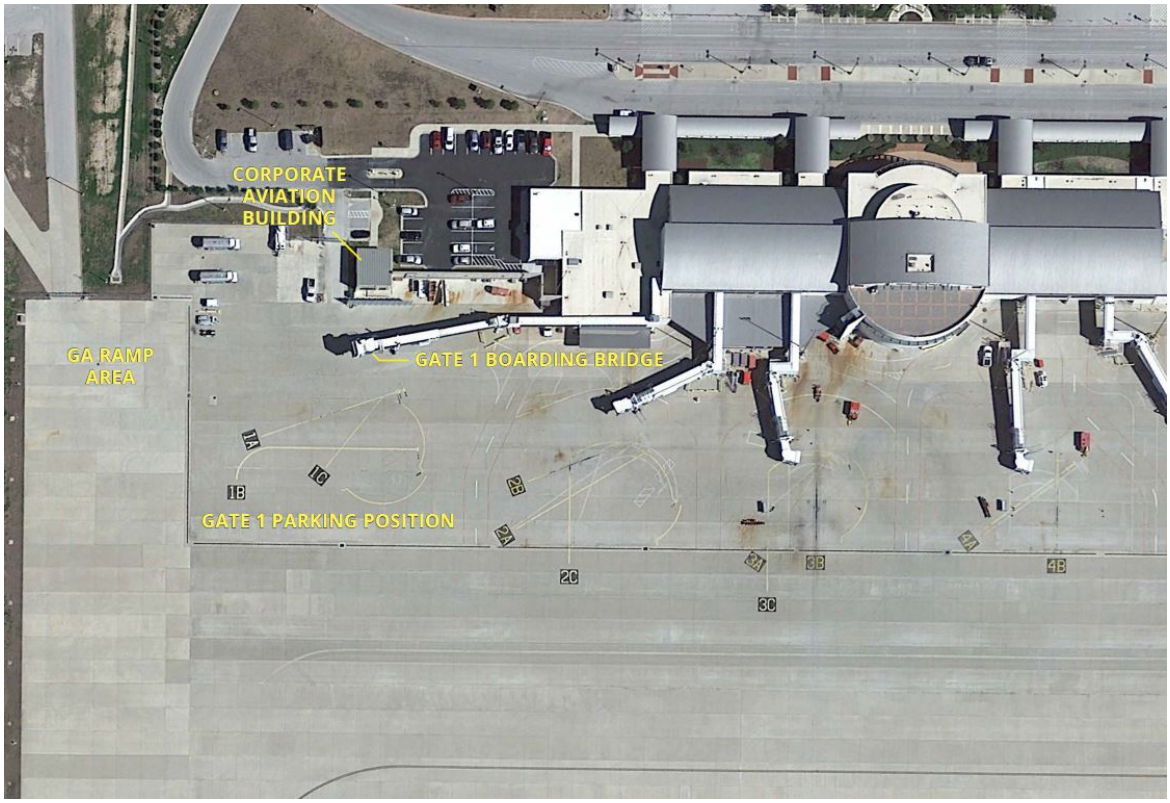


Figure 3G: Corporate Aviation Building vs. Gate 1 Positions

FUEL STORAGE REQUIREMENTS

Under revised 14 CFR Part 139.321, *Handling and Storing of Hazardous Substances and Materials,* the FAA has clarified the airport operator's responsibility for fuel storage areas owned or operated by tenant air carriers. The airport operator is no longer exempt from overseeing Part 121 or 135 air carrier fueling operations to insure compliance with Part 139 fuel fire safety requirements. Accordingly, the FAA holds airport operators responsible for protecting against fire and explosion in air carrier fuel storage facilities. The fuel storage facility at GRK is located safely away from aircraft and vehicular traffic in a controlled area accessible only to Airport personnel. The four 12,000-gallon tanks available for fuel storage and fueling operations are adequate at GRK to serve the type and number of operations expected throughout the planning horizon. However, auto fuel for the rental car operations is located in the same area.

The Airport has a need for additional diesel fuel storage. The current 500-gallon tank is insufficient to support the current demand and requires frequent, small resupply deliveries. Diesel is used by the airport for airfield maintenance equipment, airport owned ground support equipment, and sold to the airlines for use in their ground support equipment. Currently, the location of the diesel fuel tank in the maintenance facility area interferes with efficient use of the covered area at the maintenance facility.

For safety and efficiency of operations, it is preferable to locate the auto fuel storage away from the aircraft storage and nearer to the rental car facility operations. It is recommended the airport alternatives development consider relocating the auto fuel storage to a more favorable location. It is also recommended that additional diesel fuel storage be added to the fuel farm in its existing locations to support current and future airport operations.

AIRCRAFT STORAGE (HANGARS)

While it is not expected for many civilian aircraft to be based at GRK over the planning horizon and while the airport is not currently seeking to base civilian aircraft at the airport, the forecast does include a minimum number of based aircraft for GRK over the planning horizon. If there is a possibility of based civilian aircraft, the development of alternatives should include accommodating those aircraft. The master plan alternatives development should include locations to house up to 10 corporate or charter type aircraft. If that many aircraft are located at GRK, the airport should make provisions to accommodate all of those based aircraft and any itinerant GA traffic that requests hangaring. Since GRK traffic is typically medium to large GA aircraft, at least 2,000 to 3,000 SF of storage space per aircraft should be planned to house the based aircraft. General hangar design considerations include the following:

- Construction of aircraft hangars beyond an established building restriction line (BRL) surrounding the runway and taxiway areas and built beyond the runway OFZ, runway and taxiway OFAs, and remain clear of the FAR Part 77 Surfaces and Threshold Siting Surfaces;
- Construction of hangar space to accommodate 95 percent of the based aircraft forecast need;
- Enclosed hangar storage with bi-fold doors is recommended;
- Locate hangars near general aviation ramp operations areas, corporate aviation services and auto parking for hangar users. Segregate hangar development area from commercial service area as much as possible to promote safe operations.

Forecast demand is shown in **Table 3P**.

TABLE 3P
Aircraft Hangar Storage Demand
Killeen-Fort Hood Regional Airport

Facility	Existing	Phase 1 (0-5 years)	Phase 2 (6-10 years)	Phase 3 (11-20 years)
Based aircraft	0	2	4	10
Common/Box Hangar Demand	0	2	4	10
Common/Box Hangar Area Demand	37,800 ft^2	6,000 ft^2	12,000 ft^2	30,000 ft^2

Source: Garver, 2017.

AIRCRAFT PARKING APRON

COMMERCIAL SERVICE

The regularly scheduled commercial service operating at GRK uses the main terminal ramp. This ramp provides approximately 90,000 square yard of ramp space and is made of concrete. Of that 90,000 square yards, almost 40,000 square yards is dedicated to the six terminal gates and their associated parking areas. The terminal ramp abuts the terminal facility and provides six gates for offloading passengers into the terminal. Over the planning horizon, it is not anticipated that any additional terminal gates will be required to accommodate forecasted demand. However, the remaining 50,000 square feet of ramp space is frequently used for commercial service aircraft parking including diversion parking and oversize or non-gate use aircraft charter parking.

GENERAL AVIATION

To accommodate general aviation operations, paved aircraft parking and tie-down areas should be provided for approximately 40 percent of the peak/design day itinerant aircraft, plus approximately 25 percent of the based aircraft. Currently, the terminal area apron offers less than 6,000 square yards of apron area that is not being used for commercial service terminal area parking at the north end of the apron, and approximately 20,000 square yards of apron area not being used for commercial service parking at the south end of the apron. The existing apron is depicted on **Figure 3H**.

Figure 3H: Aircraft Apron Requirements

Ramp area calculations are based on design-day itinerant operations of non-commercial service operations. Military parking has been removed from this calculation because military aircraft use one of the military aprons around the airfield **Table 3Q** presents the parking apron space requirements.

TABLE 3Q
Aircraft Apron Parking Demand
Killeen-Fort Hood Regional Airport

Operations	Existing	Phase 1 (0-5 years)	Phase 2 (6-10 years)	Phase 3 (11-20 years)
Annual	39,356	36,070	36,790	38,595
Peak Month	4,132	3,787	3,862	4,052
Design Day	138	126	129	135
Itinerant Aircraft/ Design Day	69	63	65	68
Parking Spaces Required	27	25	26	27
Ramp Parking Space Required (SY)	9,720	9,000	9,360	9,720

FAA airport planning criteria recommends 360 square yards (3,240 square feet) per itinerant aircraft space and approximately 400 square yards (3,600 square feet) per based aircraft. Other site specific apron planning and design considerations include:

- Maintaining the apron area beyond all airfield safety areas per airport design requirements (RSA, OFA, RPZ, and OFZ); and,
- Preserving the minimum runway centerline to aircraft parking apron separation of 500 feet.
- Planning for sufficient aircraft taxiing and maneuvering space, for entering and exiting the aircraft parking apron without risk of structural damage;
- Allowing two-way passing of aircraft leading to the runway and taxiway system.
- Configuring the main aircraft apron layout to allow for a continuation of building and hangar expansion.

As reported, GRK has approximately 6,000 SY of apron space at the north end of the ramp and approximately 20,000 SY of ramp space at the south end of the ramp that could be configured to accommodate general aviation parking and provide the space required by the forecasted demand. Additionally, to separate commercial service and general aviation activities, additional general aviation apron area development will be investigated in the alternatives chapter. Apron and taxilane need and layout will be examined during the alternatives evaluation phase of the plan. Additional property may be required to accommodate alternative layouts.

REVENUE OPPORTUNITY

COMMERCIAL DEVELOPMENT AREA

To meet the future demand for revenue to support airport operations, the airport should identify and develop areas dedicated to revenue generation. Additional property acquisition may be required to provide adequate space for commercial development that is properly separated from aviation activities. An additional 200 acres of land adjacent to the airport property has been identified as a potential aviation expansion area that could be developed to support aviation or commercial activities. Future expansion of the commercial terminal, commercial general aviation area, general aviation area development, and commercial area development and appropriate areas for such will all be considered in the alternatives chapter.

SUMMARY OF RECOMMENDATIONS

Airfield for FAA compliance:

- Future runway length of 12,000 feet.
- Parallel runway 5,000+ feet away.
- Control all activities within the RPZs.
- Eliminate taxiways providing direct access from apron to runway.
- Utilize LED lights and signs.

Airport Use and Services:

- Design terminal improvements for storage, restroom, secure circulation, and holdroom utilization.
- Realign restroom locations with current interior usage.
- Relocate corporate aviation activities and parking.
- Separate aviation and automobile fuel storage.
- Add diesel fuel tank capacity.
- Provide box hangar aircraft storage for future demand.
- Provide general aviation dedicated parking.
- Identify future commercial development opportunity areas.

In the next step of the planning process, alternatives will be developed that accommodate these recommendations; these alternatives will be evaluated according to their feasibility. Consideration will be given to cost, environmental concerns, constructability, timing, compatible land use, and level of service for each alternative developed. Those considerations will comprise the positives and negatives of each alternative and will contribute to the development of a decision matrix and the ranking of alternatives to identify a preferred alternative for airport development.

Killeen-Fort Hood
REGIONAL AIRPORT

CHAPTER FOUR

AIRPORT ALTERNATIVES

Killeen-Fort Hood
REGIONAL AIRPORT

CHAPTER FOUR

AIRPORT ALTERNATIVES

Chapter 3 compared the existing facilities at Killeen-Ft. Hood Regional Airport with the forecasted aviation demand over the planning horizon to identify airside and landside facilities required to meet the demand through the planning period. The next step in the planning process is to examine airside and landside development alternatives to meet those demands. The goal of the alternatives development is to provide reasonable ways to meet the facility requirements that also support the airport's and the City of Killeen's (City) long range goals.

Development alternatives can be categorized into two functional areas: airside, which includes the runways, taxiways, navigational aids, lights, etc.; and landside, which address the terminal area, hangars, aprons, and other support facilities. For both landside and airside alternatives, specific functional qualities are desired by the airport to support operations and long-term goals. Additionally, consideration of future economic development and revenue generation will be a focus of each of the alternatives examined.

Alternatives for each functional area will be developed separately with consideration being given to the impact on airport operations. Preferred alternatives for each area will then be coordinated as a whole to create a feasible, reasonable, executable plan. Alternatives will be evaluated for how well facility requirements are met, how executable an alternative is, how costly or cost-effective an alternative is, and how an alternative supports the goals of the City and the Airport. Once these qualities are identified and input is gathered from stakeholders, a preferred alternative can be further developed into a comprehensive development plan in the following chapters.

NON-DEVELOPMENT ALTERNATIVES

Typically in a master plan, non-development alternatives are considered to ensure the planning process is thorough and inclusive. Non-development alternatives typically include a "do nothing" or "status quo" alternative as well as an extreme alternative such as relocating the airfield. With the unique situation of the joint-use agreement between the Army and the City involving the use of Robert Gray Army Airfield (RGAAF) for the Killeen-Ft. Hood Regional Airport operations, development alternatives for GRK will be considered slightly differently. Any development alternatives considered for the airfield, which is owned and controlled by Ft. Hood, will be considered acknowledging that future changes on the airfield will only be executed with approval and agreement from the United States Army.

Conversely, other factors that should be considered before deciding upon development alternatives is that federal development grant funding through the Airport Improvement Program (AIP) requires assurances from the sponsor accepting the funds. One of the grant assurances is that the sponsor maintain the improvement funded for the useful life of the project, which is typically 20 years. Another assurance is that the sponsor is required to maintain the airport as an airport for the useful life of the last project funded. Any airfield development options considered for the joint-use area of the airfield must be carefully coordinated with the Ft. Hood to ensure that projects both meet the Army's mission as well as allow the City to meet the AIP grant assurances.

DO NOTHING/STATUS QUO ALTERNATIVE

Several of the airfield facilities that are a part of the Robert Gray Army Airfield meet or exceed Federal Aviation Administration (FAA) standards for design and safety. Several other elements of the airfield facilities are non-standard from an FAA perspective, but meet Department of Defense safety and design standards. In areas where the airfield facilities meet or exceed the FAA design standards for airports, a do nothing alternative will be considered as a viable and sensible option. In the joint use and airport-owned areas that house the terminal and general aviation operations and commercial development areas however, the do nothing alternative does not adequately address the obligations of the airport to continue to operate as an airport and meet other grant assurances. It also does not adequately protect the City's investment in the Killeen-Ft. Hood Regional Airport facility and provide economic benefit to the community.

Areas of the airfield that are non-standard according to FAA design guidelines will be examined to determine if there are alternatives that increase safety or improve operations for the airport. Those alternatives will then need to be evaluated for their enhancement of the airfield mission and the ability of GRK to meet grant assurances attached to the project. Even though the approval process for development alternatives may prove complex and challenging, it is recommended that airfield alternatives be considered that will enhance safety and airport operations. To protect the investment in the airport and meet the grant assurances obligations, terminal area, general aviation, and commercial development alternatives must be developed and considered as well.

REVIEW OF THE PREVIOUS MASTER PLAN

The last master planning project conducted for the airport was a Draft Terminal Area Master Plan completed in 2008. That planning project dealt with development of the terminal and general aviation areas of the airport and updated the original terminal area master plan from 2001 associated with the opening of the airport. In both terminal area master plans, the planning emphasis was on passenger terminal functions and development alternatives. Another focus of those plans was development of land area at or adjacent to the airport for aeronautical use and commercial development. The aeronautical use areas were focused on accommodating air cargo operations. The terminal development alternatives addressed future expansion plans for the passenger terminal.

The previous plans were reviewed, and the most significant departure from the development alternatives included in those plans is that the demand for air cargo operations has not materialized as expected. Consequently, the areas considered for aeronautical development in the previous plans will be reconsidered as areas to accommodate future growth of general/corporate aviation operations and commercial development areas.

The previous plans also included expansion of the rental car area that is still a valid pursuit for this plan. To accommodate the aims of the facilities requirements, the expansion will include relocation of the auto fuel to the rental car area to allow for the addition of a diesel fuel to the airside fuel farm location.

While passenger enplanements have not increased at the rate included in the previous planning documents, there is a need for reallocation of space within the existing terminal area to accommodate the types and frequency of traffic occurring both now and in the future. There is also the possibility that the terminal building could be expanded to provide the types and sizes of spaces necessary to efficiently accommodate current and future operations. The previous plans were reviewed and expansion areas considered for their ability to meet current and future demand.

Because it is owned by the Army, there are fewer airfield planning documents to review, but, since 2002, plans to construct an additional runway 5,000 feet from the current runway at the airfield have been considered. The Army defines the need for the additional runway as providing "redundancy for air operations when a runway must be closed because of emergency, maintenance, or construction activities." An additional runway would separate civilian and military operations as needed, and enable Ft. Hood to deploy soldiers more quickly and efficiently during a national emergency. It would also support military joint-training opportunities.

In 2005, GRK conducted a New Runway/Extended Runway Site Feasibility Study to explore potential locations for the additional runway, and the preferred location was included on the 2008 Airport Layout plan.

A 2012 Environmental Assessment by the City of Killeen studied construction of both a 10,000-foot runway and a 12,000-foot runway at the offset included in the Airport Layout Plan (ALP), and a Finding of No Significant Impact was determined for the 10,000-foot parallel runway shown on the 2008 ALP at the 5,000-foot offset from the existing runway. Because of the Army's desire for an additional runway to

support its mission, the inclusion of the parallel runway will be maintained in this planning document and the ALP associated with this master plan update.

Figure 4A shows a graphical representation of the parallel runway location and situation from the current ALP.

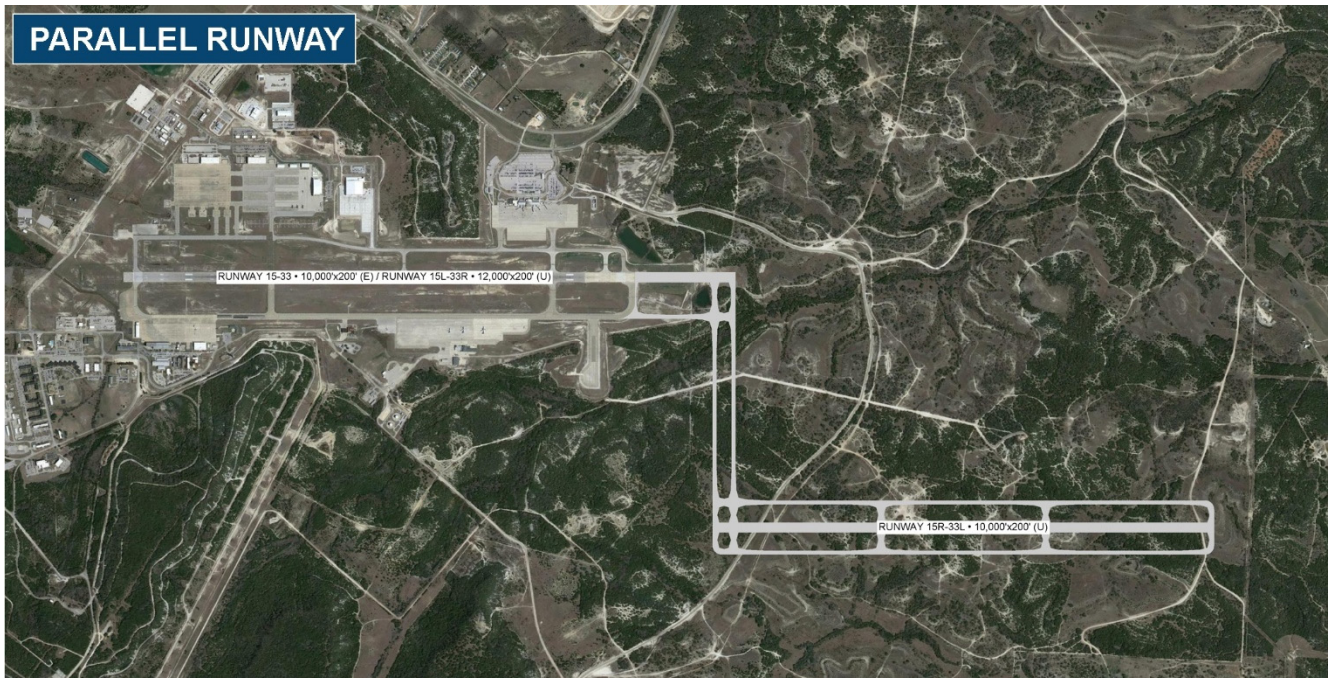


Figure 4A

Since the 2001 master plan, improvements at the airport have been focused on maintaining facilities (taxiway rehabilitation, access road and boarding bridges), improving airfield functions to current design criteria (taxiway construction, drainage construction) and terminal building improvements. No new development projects have been undertaken, leaving room in this planning effort to explore overall development options and provide direction for the next steps in airport development.

AIRFIELD PLANNING CONSIDERATIONS

In the Facilities chapter, a summary of the focus areas of alternative development was included at the end of the chapter. The items included for consideration are shown in **Figure 4B**. The runway, taxiway and terminal area development alternatives that follow will be focused on achieving these objectives.

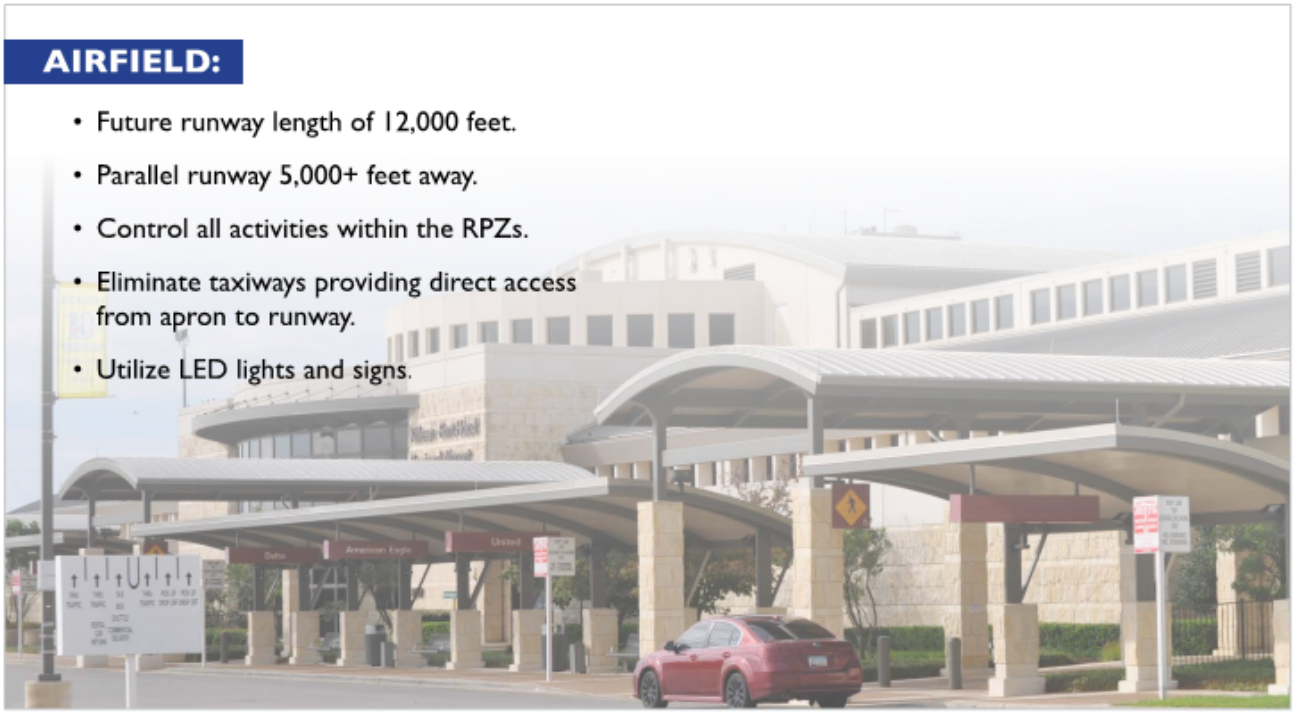


Figure 4B

RUNWAY ALTERNATIVES

The first airfield facility under consideration is the runway because most other alternatives developed will be influenced in some way by the future runway development. As previously mentioned, the joint-

use agreement limits runway changes to what is mutually beneficial to the Airport and the Army, and also requires Army approval. These runway alternatives will take that joint-use agreement into consideration. As shown in Figure 4C and in the previous chapter, the objectives for runway alternatives developed will be to have the ability to restrict activities in the RPZs to those allowed by FAA and to provide 12,000 feet of runway length. **Exhibit 4A** shows the runway alternatives considered for GRK.

RUNWAY ALTERNATIVE 1

The first runway alternative considered to create a 12,000-foot runway and control the RPZ includes extending the runway 2,000 feet on the Runway 33 end and displacing the threshold on the Runway 15 end 1,658 feet. Development of Alternative 1 would move the approach and departure Runway Protection Zones (RPZ)s for Runway 15 completely onto the airfield. The runway length of 12,000 feet would be achieved with the use of declared distances. For Runway 15, Takeoff Run Available (TORA), Takeoff Distance Available (TODA), and Accelerated Stop Distance Available (ASDA) will be 12,000 feet, but the Landing Distance Available (LDA) is reduced to 10,342 feet due to the displaced threshold. For Runway 33, TORA and TODA will be reduced to 11,274 feet, but ASDA and LDA will be 12,000 feet.

This alternative will require a relocation of Ivy Mountain Road to outside the Runway 33 RPZ, relocation of the Runway 33 medium intensity approach lighting system with runway alignment indicator lights (MALSR), and relocation of the MALSR on the Runway 15 end to the displaced threshold. The extension of Runway 33 to the south will require a significant amount of earthwork and the removal of Gray Lake.

The displacement of the Runway 15 threshold would also place the majority of the ramp at the northwest edge of Taxiway A on the Army side (west) of the airfield into the RPZ, as well as the end of Taxiway B that accesses the runway. This would require the installation of hold short markings and signs on each of those taxiways to restrict access to the RPZ area.

In addition to hold short markings, the MALSR relocation on the Runway 15 end would require the installation of in-pavement MALSR lights leading to the threshold to achieve the declared distances in the alternative exhibit. In-pavement MALSR lights are available for distances up to 1,600 feet, and the first flasher light fixture can be very short and possibly in-pavement as well. This alternative would need to be further studied to set the exact location of the threshold and the availability of the in -pavement lights to preserve the end taxiway access. The Unified Facilities Criteria (UFC) 3-535-01 governing military installations doesn't specifically mention this equipment, so use of the FAA guidance to complete the project would be necessary and would require approval through the joint-use agreement.

If in-pavement approach lighting is not available, additional access taxiways to the threshold would have to be constructed on both sides, making this alternative less attractive due to the amount of construction required and the RPZ problems created on the parallel taxiways by moving the threshold.

RUNWAY ALTERNATIVE 2

The second alternative considered eliminates the threshold displacement because the Army controls the airspace over the Runway 15 RPZ, even though the RPZ is not entirely located over the area designated as airfield. This alternative includes extending the runway and associated taxiways 2,000 feet from the

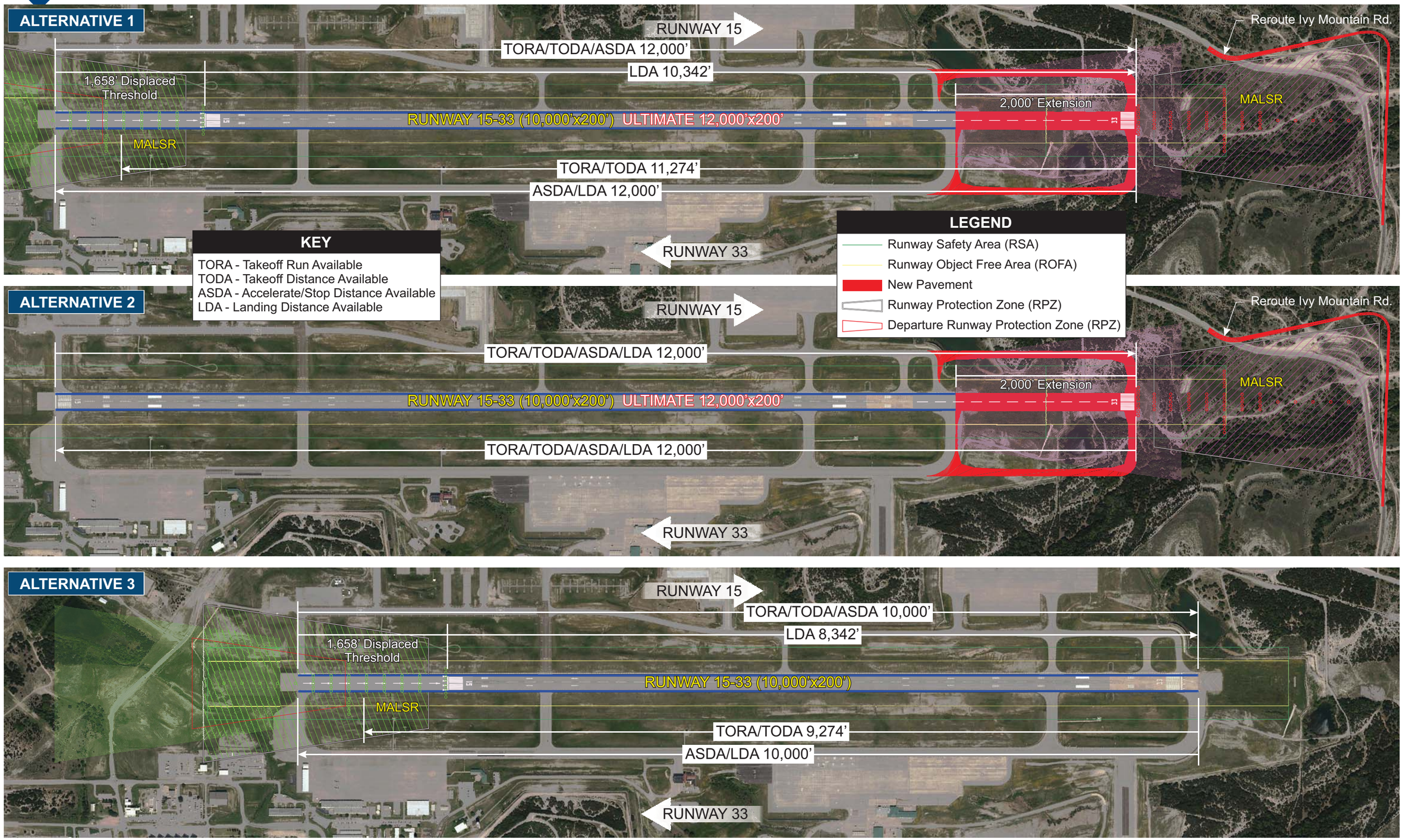


Exhibit 4A
RUNWAY 15-33 EXTENSION DECLARED DISTANCES

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end of Runway 33. With Alternative 2, 12,000 feet of runway length is available for TORA, TODA, ASDA, and LDA.

This alternative, like Alternative 1, requires the relocation of Ivy Mountain Road to outside the Runway 33 RPZ, and the relocation of the Runway 33 MALSR. The associated earthwork and removal of Gray Lake are also included with this alternative as well. This alternative achieves the desired runway length with the least amount of airfield disruption.

RUNWAY ALTERNATIVE 3

The final runway alternative considered included the relocation of the Runway 15 threshold to accommodate the Runway 15 RPZ completely on airfield property. The RWY 33 extension was excluded in this alternative because of the earthwork and environmental process required for its construction. This alternative moves the Runway 15 threshold 1,658 feet to the south and requires relocation of the MALSR for Runway 15.

Alternative 3 does not achieve 12,000 feet of runway length and requires the use of declared distances. On Runway 15, LDA is reduced to 8,342 feet, and on Runway 33, TORA and TODA are reduced to 9,274 feet. While Alternative 3 does address the protection of the RPZ, it does not achieve the desired runway length and is therefore not recommended as an alternative to consider further.

REDUCED RUNWAY WIDTH ALTERNATIVE

An additional runway alternative that can be considered is the reduction of the runway width to 150 feet. The existing and future critical aircraft for the airport only require 150 feet of runway width, according to the FAA standards. A runway 200 feet wide requires more funds to maintain the pavement than a narrower runway. Narrowing the runway would reallocate the outer 25 feet of pavement to become paved shoulders. Paved shoulders are a desirable safety enhancement to a runway; however, the cost to move the runway lights in to the standard distance from the runway edge would need to be considered in the overall decision. If the runway was narrowed to 150 feet, the remaining taxiways and associated pavement would not need to be moved.

TAXIWAY ALTERNATIVES

Once runway alternatives were developed, taxiway alternatives were developed and considered to address non-standard taxiway issues and to consider access and movement needs for future development areas.

RELOCATION OF PARALLEL TAXIWAY B

The first taxiway alternative considered was the relocation of a portion of parallel taxiway B to create a uniform separation from the Runway centerline and eliminate the “jog” in the taxiway. For this alternative layout, the southern portion of Taxiway B is shown relocated to the same distance from the runway

as the northern portion of the taxiway. This option would require construction of over 7,000 feet of new 75 foot wide taxiway pavement and paved shoulders. The additional offset would encroach on the UAS ramp, requiring an access reconfiguration. Construction would also require a large amount of earthwork to remove the hill between the UAS ramp and the main commercial service terminal area ramp. The new taxiway would also take over 7,000 square yards of the terminal ramp area. The taxiway would become contiguous with the ramp area, creating another non-standard taxiway situation. The large amount of construction required for this taxiway alternative coupled with the creation of another non-standard taxiway condition makes this taxiway alternative not recommended. Another alternative lay-out is shown that relocates the northern portion of the taxiway to the same offset distance from the runway as the southern portion of the taxiway. This relocation alternative would require construction of over 5, 500 feet of new taxiway pavement and widening of the existing 60 foot wide southern portion of the parallel taxiway to 74 feet with paved shoulders. The reduced offset would provide a straight parallel runway and possibly allow the existing portion of the parallel taxiway to be used as taxilane access to the military ramp if traffic is limited to ADG IV and smaller. **Figures 4C-1 and 4C-2** show the layout of the relocated parallel taxiway at the two alternative locations.

Figure 4C -1

Figure 4C -2

DIRECT RUNWAY TO RAMP TAXIWAY ACCESS MITIGATION ALTERNATIVES

The latest FAA design guidance labels direct runway to ramp taxiway access as non-standard. Taxiway E provides direct access from the runway to the commercial service ramp. Several options were considered to mitigate this non-standard condition, including removing part of Taxiway E between the parallel Taxiway B and the ramp, removing the portion of the taxiway between the parallel taxiway and the runway, and creating a "no-taxi" island on the ramp. Explanation and discussion of the alternatives follows. If the ramp is expanded, the ground lease with the army would have to be renegotiated.

Taxiway Alternative 1

The first taxiway alternative considered is to remove the portion of Taxiway E between the parallel Taxiway B and the runway and is shown in **Figure 4D**. In Alternative 1, this piece of pavement would be abandoned or removed, and there would no longer be direct taxiway access to the ramp from the runway. Traffic exiting Runway 33 to the ramp would need to go to Taxiway G and then back to the ramp using the parallel taxiway. This portion of Taxiway E was recently reconstructed and is the portion of Taxiway E in the best condition. The taxiway lights on the parallel taxiway would need to be reconfigured. The older portion of Taxiway E is in poor condition and would need to be reconstructed in the future. This alternative does not require any additional pavement construction, but it removes newly constructed pavement.

Figure 4D

Taxiway Alternative 2

The second taxiway alternative **(Figure 4E)** considered is to remove the portion of Taxiway E between the parallel taxiway and the ramp and reconstruct it at a location that would require a turn for the exiting traffic from Runway 33 to access the commercial terminal ramp. The portion of the taxiway to be removed in this alternative is the older pavement in the poorest condition. While new pavement will be constructed at a location to provide ramp access, the taxiway would need to be reconstructed because of its condition. Reconstruction in a different location would not be substantially more expensive than reconstruction of the taxiway in its current location. This alternative rectifies the non-standard situation and would relocate the taxiway to a more standard configuration.

Figure 4E

Taxiway Alternative 3

The final taxiway alternative considered **(Figure 4F)** is to create a "no-taxi" island on the ramp using directional pavement markings that force aircraft coming onto the ramp to make a right turn. An island is painted onto the ramp and signage and taxiway centerline markings are installed to direct aircraft around the island. This island is a low cost way to mitigate the non-standard ramp access situation and might be a feasible way to address the situation in the interim period before the older portion of Taxiway E is rehabilitated and relocated.

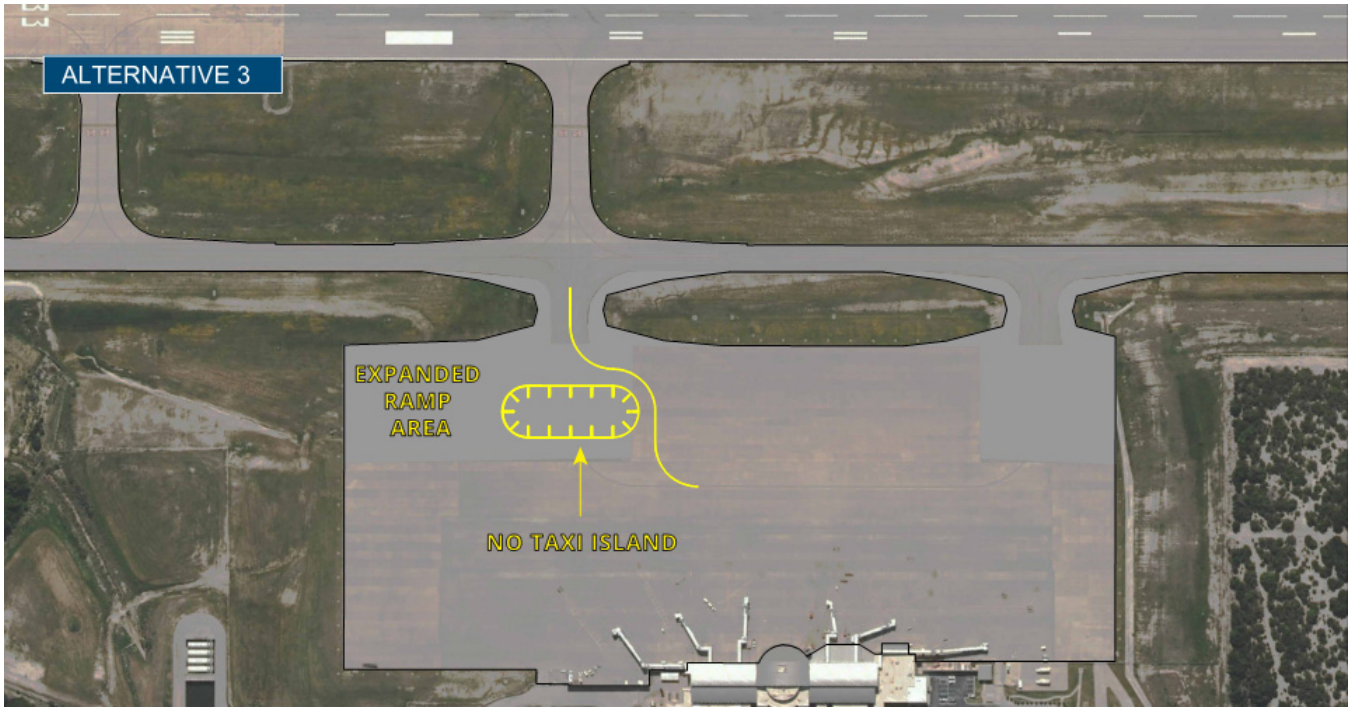

Figure 4F

ADDITIONAL AIRFIELD EQUIPMENT ALTERNATIVES

In recent years, the improvement in technology for airfield equipment has made all elements of airfield lighting equipment available in LED. The LED technology greatly reduces the amount of energy required to power the airfield equipment, and the long life of the lights reduces the amount of maintenance required to change fixture bulbs. Runway lights, taxiway lights, directional signage and PAPIs and obstruction lights are available in LED. It is recommended that future airside lighting projects include the replacement of incandescent fixtures with LED.

LANDSIDE DEVELOPMENT ALTERNATIVE CONSIDERATIONS

GRK has a relatively minor footprint RGAAF. Under lease use agreement, the civilian operations are currently bound to the airfield (runways and taxiways) and the passenger terminal complex as outlined on exhibits in this report. Historically, landside airport facilities considered necessary, or desired, were those designed and intended for the safe and efficient facilitation of commercial passenger airline operations including building spaces, aircraft movement and parking facilities, support facilities, and ground vehicle roadways and parking. The existing lease arrangement does not offer substantial development opportunities for the future, with only areas immediately adjacent to the southern portion of the terminal ramp available. Previous planning efforts included considerations for future development of air cargo, airline, and general aviation facilities. **Exhibit 4B** (previous development concept) depicts the previous landside development plan.

As shown on **Exhibit 4B**, the previous planning effort offered a terminal expansion plan which could allow for an additional four airline gates with passenger loading bridges at the south end of the building. Expansion of the parking lot was proposed to the east of the existing rental car ready/return and long term storage lot. One large conventional hangar with associated parking lot was proposed at the southeastern-most portion of the aircraft ramp for general aviation operations and storage. The ramp was proposed for expansion to the south to connect with a future cargo and general aviation taxiway extending to the east from Taxiway G. The Taxiway G extension could serve a large cargo facility, seven large conventional/maintenance hangars, and a corporate general aviation hangar facility, as depicted. The entire area served by the taxiway is off-airport and not currently under leasehold or ownership by the City. The plan also included the future development of a non-aviation use, commercial/hotel use, along Highway 201 on the only parcel of property owned by the City.

Landside planning alternative analysis in this study will focus on facility locating strategies following a philosophy of separating activity levels. To maximize airport efficiency, it is important to co-locate facilities intended to serve similar functions. As an example, the primary purpose of the airport is to serve commercial airline passengers, and the majority of the airport facilities are aimed at accommodating just that. The majority of leased space on RGAAF is designed, intended, and used for or in support of commercial passenger airline services. A small portion of the area (currently the northern portion of the main ramp) is useable for large (over 12,500 pounds) general aviation activity. The following sections will first outline the alternative development options for improving the existing commercial airline terminal complex. Next, the analysis will outline future development options for general aviation, air cargo, and non-aviation commercial/industrial uses. As previously mentioned, the airport serves as a very important link to the entire region, whether it is for business or pleasure. Consideration to aesthetics should be given high priority in all public areas, as the airport can serve as the first impression a visitor may have of the community. The relatively new terminal complex and parking lot at Killeen-Fort Hood Regional is a good example of providing first-class facilities. This concept should extend to all airport facilities wherever possible into the future.

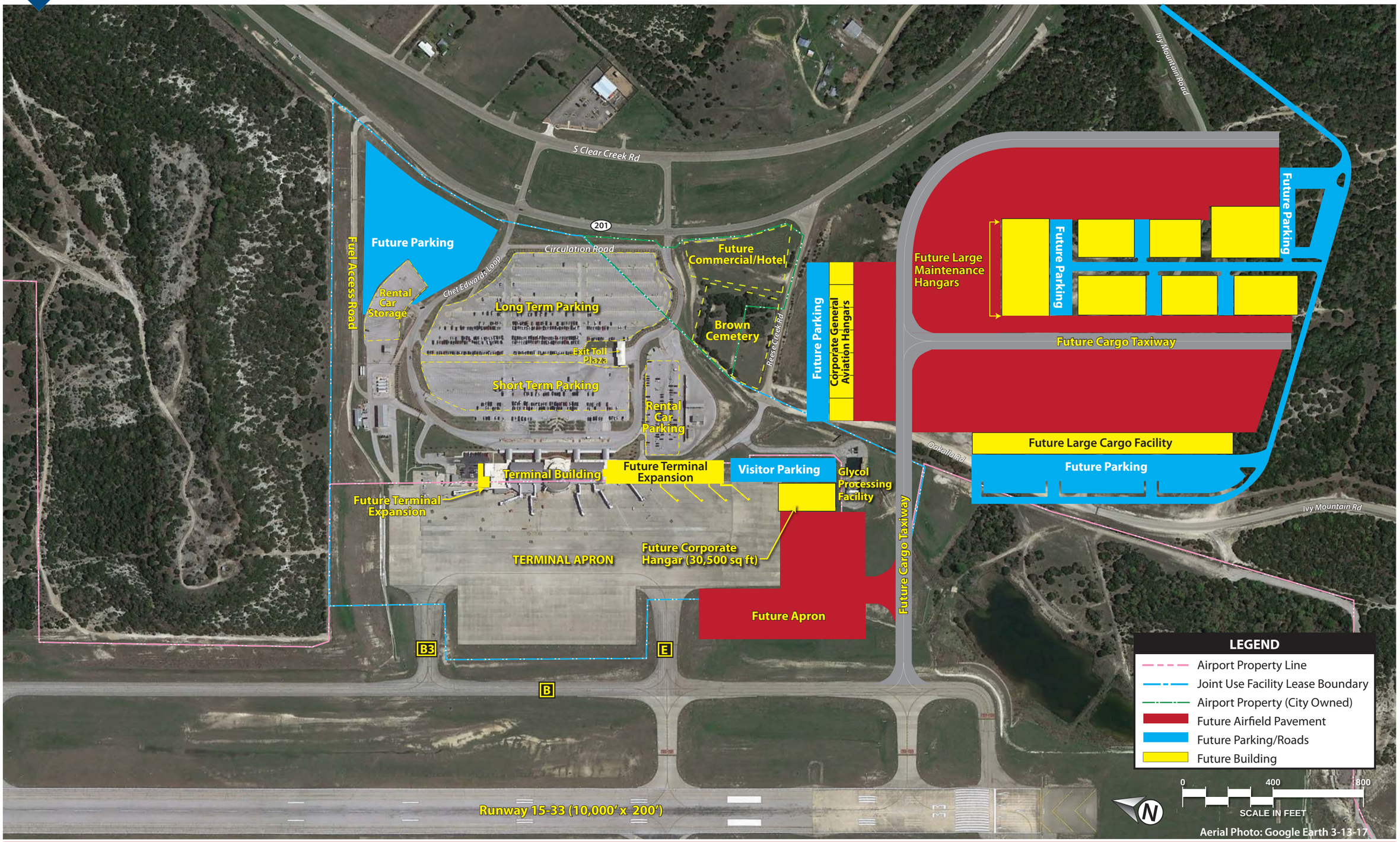

Exhibit 4B
PREVIOUS DEVELOPMENT PLAN

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COMMERCIAL TERMINAL COMPLEX ALTERNATIVES

Concepts for the commercial terminal were explored based on terminal area requirements presented in Chapter 4: Facility Requirements. Due to the age and satisfactory condition of the existing terminal building, all alternatives include expansion of the terminal and do not review new terminal options. The size of expansion for the building is determined using the projected requirements in Scenario 3 (2036).

During the development process, eight alternatives were explored for the Terminal, which include building infill and building expansion options. These alternatives include reallocating existing square footage and increasing square footages not included in the existing terminal building to accommodate Scenario 3 requirements.

CONCEPTUAL SECURITY SCREENING CHECK POINT

As indicated in the facility requirements, the Security Screening Check Point (SSCP) will need to increase from two lanes to four when activity reaches the Scenario 3 level. Due to this modification having a cascading effect on the functions of the terminal building and space requirements, the alternative concepts focus on the layout of the SSCP and their effects on surrounding building programs.

The alternatives include two SSCP variations: four traditional lanes and two high efficiency lanes.

As indicated in Chapter 1: Inventory of Existing Conditions, the Terminal currently includes two traditional SSCP lanes. The traditional lanes include a 1-lane module standard which consists of the body scanner, X-ray machine, walk-through metal detector, passenger containment and a secondary screening area.

The high-efficiency lane is the next generation of passenger screening equipment presented by the TSA in 2017. The high-efficiency SSCP single-lane module includes an automated screening lane, segregated baggage resolution and bin conveyor, as well as the passenger screening devices for the traditional module. The system is intended to eliminate congestion at the divesture and composure areas. Passengers offload their baggage onto the conveyor simultaneously. If a passenger is stalled at the divesture table, the passenger(s) in line waiting to be processed may pass the stalled passenger and progress to the screening area. Due to the higher efficiency of operating the lane, TSA can process twice the throughput of passengers than a single traditional lane. The high efficiency lane is approximately 25% longer than the traditional lane and approximately the same width. The design team's continued coordination with TSA at the time of design will be required to confirm the latest approved TSA guidelines are being followed.

The alternatives presented in **Figure 4G** include:

- Alternative 1.2 – Consolidated SSCP with two high efficiency lanes with north and south building expansion.
- Alternative 2.2 – Consolidated SSCP with two high efficiency lanes with building infill over the baggage claim.
- Alternative 3.2 – Split SSCP with one high efficiency lane at the north and south end of the terminal as well as north and south building expansion.
- Alternative 4.2 – Consolidated SSCP with four traditional lanes with building infill over the baggage claim.
- Alternative 5.2 – Consolidated SSCP with four traditional lanes located in the central node with north and south building expansion.
- Alternative 6.2 – Split SSCP with two traditional lanes at the north and south end of the terminal. The alternative also includes building infill over the baggage claim and ticketing area.
- Alternative 7.2 – Hybrid consolidated SSCP with one high efficiency lane and two traditional lanes. This alternative includes building infill over the baggage claim area.
- Alternative 8.2 – Split hybrid SSCP with one high efficiency lane at the south end of the terminal and two traditional lanes at the north end of the terminal. This alternative includes building infill over the ticketing area.

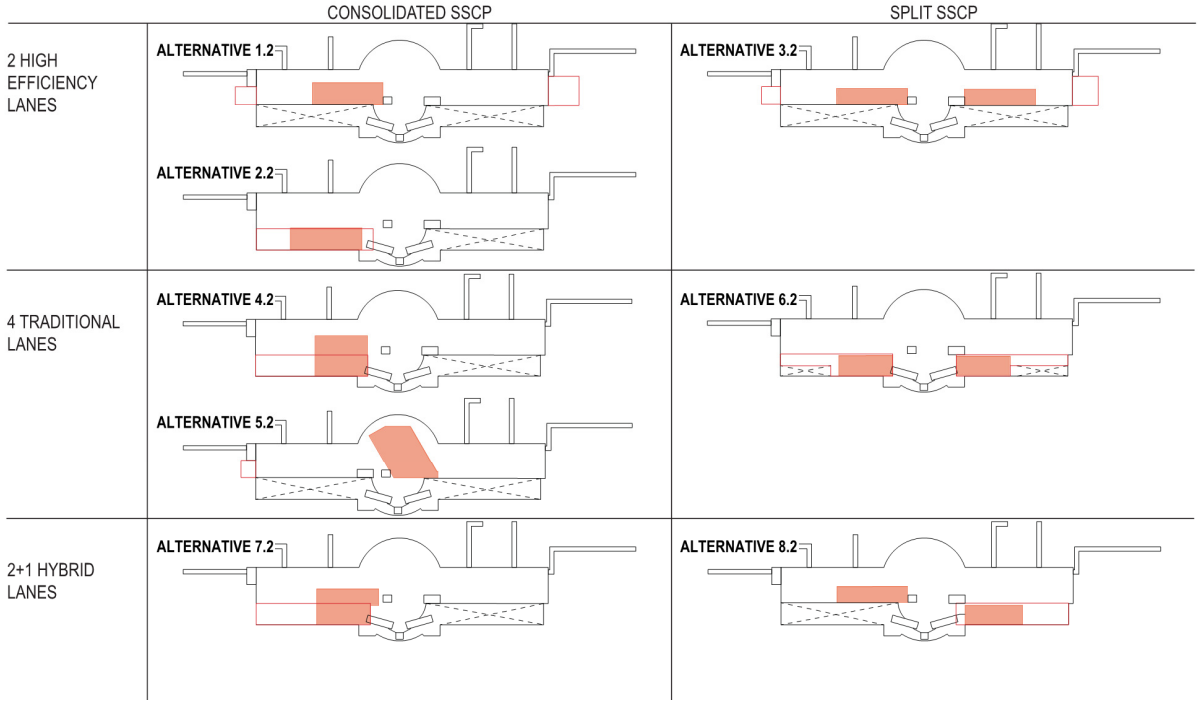


Figure 4G: Initial Alternative Concepts

COMPREHENSIVE COMMERCIAL TERMINAL ALTERNATIVES

After a thorough evaluation of the eight alternatives for each of the terminal area components, they were combined and modified to form five alternatives. Each alternative was designed keeping in mind efficiency of building functions, intuitive wayfinding for passengers, maximization of storage, and land-side amenities for meters and greeters. The plans were developed to a level of detail that allowed comparison of relative pros and cons of each alternative. Refer to **Exhibit 4C** for a comparison of square feet for Scenario 3 requirements listed for each Alternative. The second floor alternatives are referred to as Level Two in the alternatives. The alternatives provided in **Figure 4H** include:

- Alternative 1 – Split SSCP with two high efficiency lanes with north and south building expansion; to be combined with Level One Alternative A
- Alternative 2 – Consolidated SSCP with two high efficiency lanes with north, south and west building expansion; to be combined with Level One Alternative A
- Alternative 3 – Consolidated SSCP with two high efficiency lanes with north, south and partial west building expansion; to be combined with Level One Alternative B
- Alternative 4 – Split SSCP with four traditional lanes with north, south and west building expansion; to be combined with Level One Alternative B
- Alternative 5 – Consolidated SSCP with two high efficiency lanes with north, south and west building expansion; to be combined with Level One Alternative B

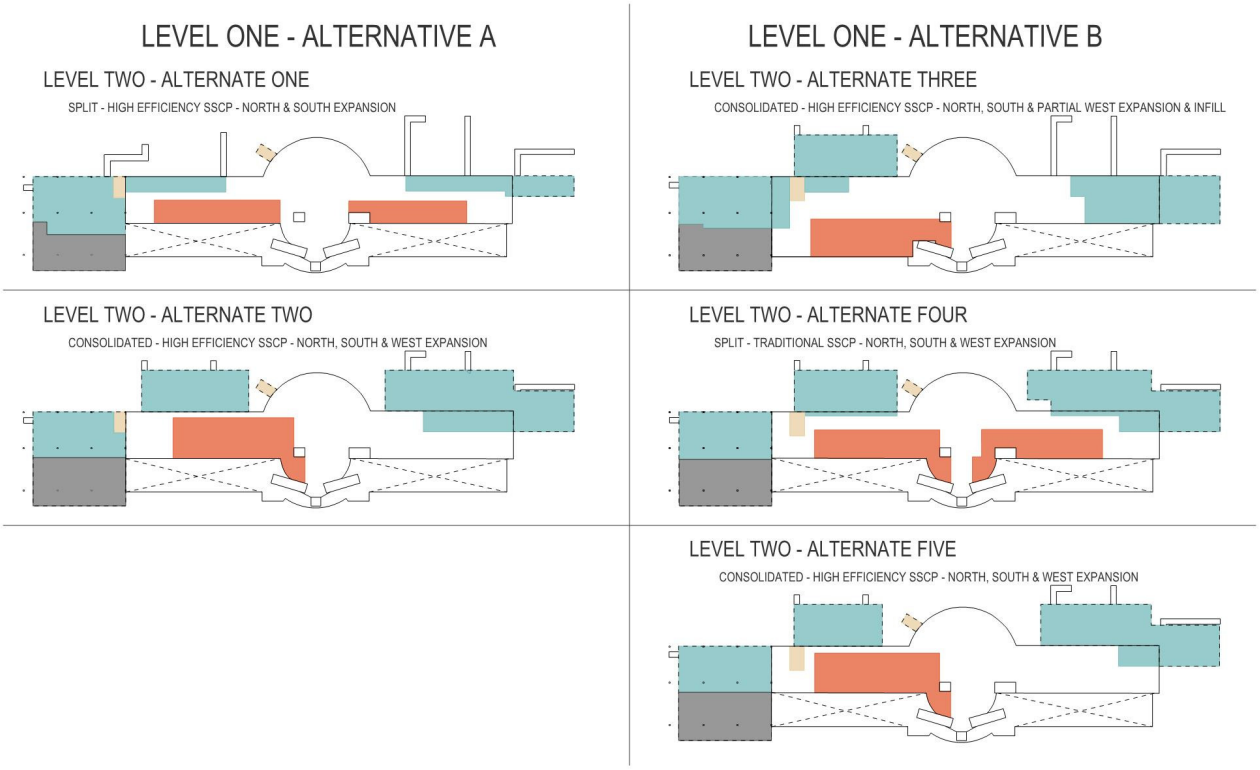


Figure 4H: Comprehensive (4) Terminal Alternatives

TERMINAL BUILDING CONCEPTUAL FACILITY REQUIREMENTS COMPARISON

Description	Existing Terminal	Scenario 3 2036	ALT. 1	ALT. 2	ALT. 3	ALT. 4	ALT. 5
Airline Functions							
Ticket Counter Area	1,719	1,154	1,425	1,425	1,425	1,425	1,425
Ticket Counter Length (10 Positions)	*143*	*118.4*	*118*	*118*	*118*	*118*	*118*
Ticket Counter Queuing	2,335	1,717	2,335	2,335	2,335	2,335	2,335
Curbside Baggage Check	-	249	284	284	284	284	284
Baggage Claim Area / Oddsize Area	4,769	7,375	8,205	8,205	8,255	8,255	8,255
Baggage Claim Frontage	*190*	*413*	*419*	*419*	*413*	*413*	*413*
Oversized Bag Claim	*8*	*8*	*8*	*8*	*8*	*8*	*8*
Baggage Service Office	-	847	852	852	852	852	852
Outbound Baggage	8,643	7,400	8,401	8,401	8,401	8,401	8,401
Inbound Baggage	2,419	3,481	4,392	4,392	4,699	4,699	4,699
Airline Operations / Airline Ticket Office	3,569	4,554	4,775	4,775	4,775	4,775	4,775
Departures Lounges (Holdrooms)	10,604	9,620	10,118	18,186	18,912	19,542	16,926
Jet Gates	*6*	*6*	*6*	*6*	*6*	*6*	*6*
Subtotal Airline Functions	**34,058**	**36,396**	**40,787**	**48,855**	**49,938**	**50,568**	**47,952**
Concessions							
Concessions (Food / Beverage)	1,545	1,069	6,388	6,285	5,679	6,365	6,951
Concessions (News / Gifts / Sundry)	1,847	713	592	641	634	780	622
Concessions (Concession Storage)	169	356	-	-	-	-	-
Concessions (Open Seating)	3,452	-	-	-	-	-	-
Ground Transportation	-	792	-	-	-	-	-
Information	73	-	427	427	427	427	427
Rental Car Counters	2,656	2,970	3,008	3,008	3,008	3,008	3,008
Subtotal Concessions	**9,741**	**5,900**	**10,415**	**10,361**	**9,748**	**10,580**	**11,008**
Secure Public Area							
Security	2,501	4,800	5,918	5,847	6,087	8,718	5,871
Circulation	1,160	5,250	**3,711**	8,904	8,068	7,061	7,688
Restrooms (A202, A203, C202, C203)	978	1,876	2,122	2,055	2,353	1,907	2,443
Bag Screen Room	3,968	3,750	4,601	4,601	4,601	4,601	4,601
TSA Offices/Training/Restrooms (D106, D107)	3,440	414	2,872	2,872	2,872	2,872	2,872
TSA Break	280	870	850	850	850	850	850
Airport Administration/Training	7,251	2,178	7,851	7,851	7,851	7,851	7,851
Other	-	-	-	-	-	-	-
Subtotal Secure Public Area	**19,579**	**19,139**	**27,925**	**32,980**	**32,682**	**33,860**	**32,176**
Non-Secure Public Area							
Circulation - Ticketing	-	2,575	-	-	-	-	-
Circulation - Baggage Claim	-	2,950	-	-	-	-	-
Circulation - General	19,793	3,960	20,693	19,205	19,462	18,118	20,996
Restrooms (B105, B106b, C120, C121, C122, B212, B215)	1,679	1,773	2,333	2,455	2,158	1,889	2,487
Other	-	-	-	-	-	-	-
Subtotal Non-Secure Public Area	**21,472**	**11,258**	**23,026**	**21,660**	**21,620**	**20,007**	**23,483**
Non-Public Area							
Loading Dock	-	218	222	222	222	222	222
Storage	1,600	727	1,931	2,516	2,192	2,192	2,236
Maintenance	392	727	1,576	1,707	1,584	1,669	1,704
Mech. / Elec. / Bldg. Systems	7,849	8,723	9,499	9,494	9,439	9,439	9,439
Restrooms (B311, B312)	282	363	429	429	429	429	429
Subtotal Non-Public Area	**10,122**	**10,759**	**13,657**	**14,368**	**13,866**	**13,951**	**14,030**
Grand Total	**94,972**	**83,452**	**115,810**	**128,224**	**127,854**	**128,966**	**128,649**

The following sections briefly describe the five alternatives for Scenario 3. **Figure 4J** below is the color code used to depict the floor plans and their related functions.

	Ticketing / Airline & Airport Operations
	Baggage Handeling
	Departures Lounges (Holdrooms)
	Concessions
	Security & Queuing
	Secure Circulation
	Secure Restrooms
	TSA Administration & Training
	Non-Secure Circulation
	Non-Secure Restrooms
	Mech. / Elec. / Bldg. Systems / Storage / Maintenance

Figure 4J: Color Legend

COMPREHENSIVE ALTERNATIVES – LEVEL 1

The proposed Level 1 or ground level alternative is similar in all the proposed alternatives. The development of Level 1 addresses the required expansion of the baggage claim to the south, baggage screen and storage expansion to the north. It also provides additional amenities including curbside check-in, an Armed Forces Lounge/USO, a multipurpose room for 25-30 people, a group of self-serve ticketing kiosks, baggage service offices, non-secure public restrooms and concessions with the overall intent of alleviating congestion at the ticketing area, expanding the baggage claim area and maximizing storage where feasible.

The only difference in the Level 1 Alternatives is the continued use of the south egress stair (Alternative A) – used for Alternatives One and Two – or a new south egress stair location (Alternative B) – used for Alternatives Three, Four and Five. The existence of this stair is required for emergency egress, but its location varies based on the SSCP layouts occurring on Level 2. The egress stair impacts the proposed flatbed device, inbound baggage belt, and existing and proposed tug lanes locations. **Exhibit 4D** illustrates the Level 1 Alternative A with the existing south egress stair remaining as is with square foot numbers and area identification. **Exhibit 4E** demonstrates the Level 1 Alternative B with existing south egress stair demolished and a new egress stair provided. Square footage numbers and area identification are also listed on the exhibit for clarification.

LEVEL 1 ALTERNATIVE FEATURES BY FUNCTIONAL AREA

TICKETING

In both first floor alternatives, to relieve congestion in the ticketing counter queuing, a bank of common use kiosks in the ticketing area will be placed at the north end of the ticketing hall for passengers to utilize and bypass the ticket counters. Additionally, the existing airline operations/airline ticket office will need to grow from 3,569 square feet to 4,554 square feet in order to meet Scenario 3 requirements. The relocation of the Airport Security Operations to outside of the terminal building, will allow airlines to be relocated into the space now designated for Security Operations to meet the demand in Scenario 3 requirements.

Curbside check-in is a program function that is not included in the existing terminal design. The proposed alternative has allotted space to be provided at the entrance of the ticketing lobby, south of the existing restrooms, with a curbside check-in kiosk directly under the curbside canopy for direct access to departing passengers. Operations for the curbside check-in will include carts to bring bags from the curbside drop-off to the baggage belt. The belt will not be directly attached to the in-line baggage system. The area adjacent to Vestibule 2 will be filled in similar to the office infills adjacent to the rental counters. The check-in measures 279 square feet and exceeds Scenario 3 requirements.

BAGGAGE SCREENING

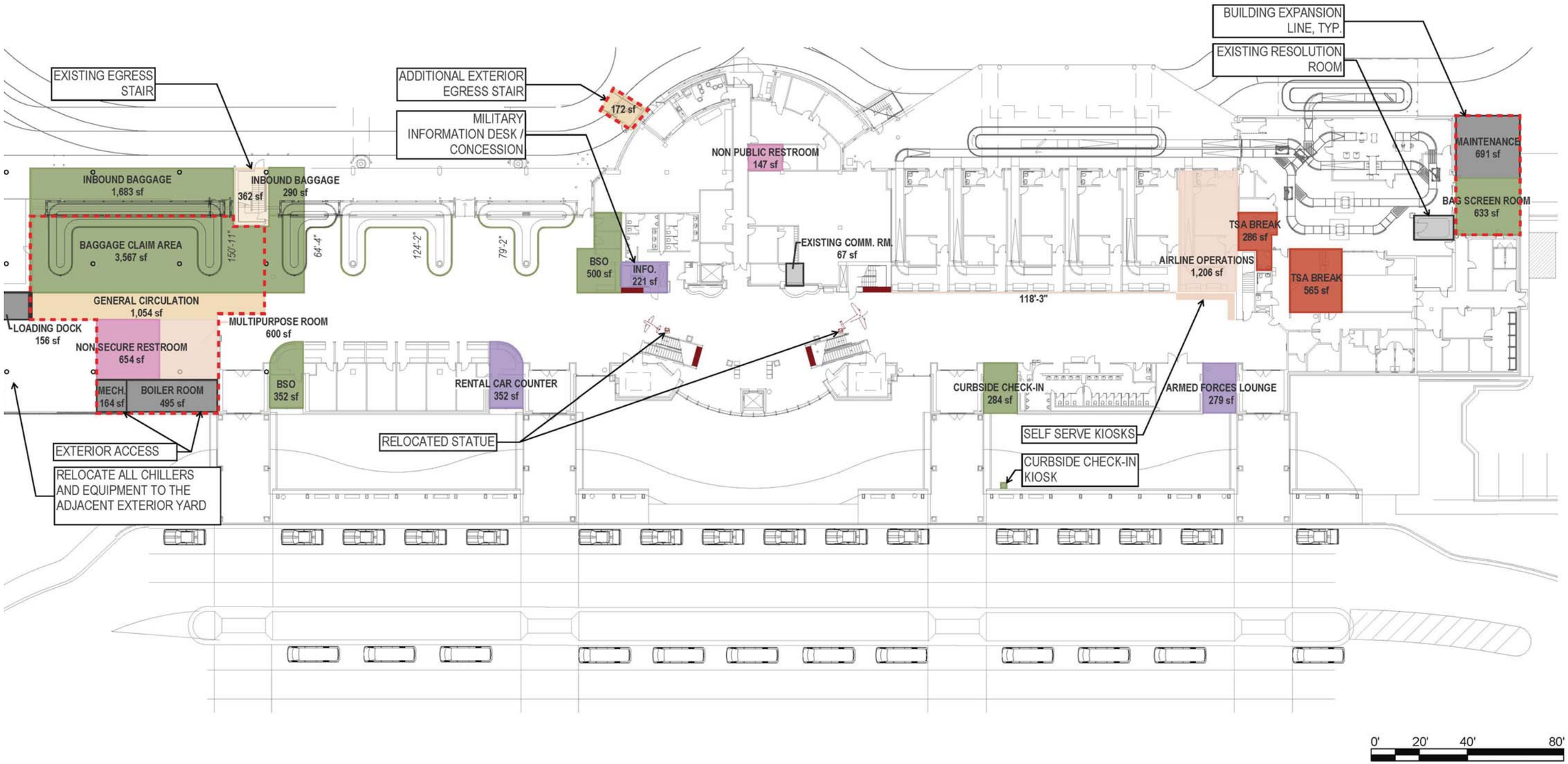
A third EDS machine will be required to meet the demand projected for Scenario 3. The additional equipment will require the room and the building to be expanded. In the first floor alternatives, the existing EDS/CBRA room will expand approximately 600 square feet to the west of the existing TSA Administration area to accommodate the space for a third machine. The existing resolution room will remain as is in its current location.

TSA ADMINISTRATION

TSA Administration includes TSA offices, training rooms, and breakroom. They are located on the southern end of the terminal building east of the baggage screening. In the first floor alternatives, the existing TSA break area will expand into the existing TSA Conference Room, Interview Room, File/Copy Room and will also include a small restroom to a total of 850 square feet.

BAGGAGE CLAIM

In the first floor alternatives, the existing baggage claim is expanded to the south end of the Terminal and adds two new flat-plate baggage claim devices meeting the total linear frontage requirements of 413 feet. The baggage claim requires 4,000 square feet of the building expansion.



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LEVEL ONE - ALTERNATIVE A
EXISTING EGRESS STAIR
NORTH & SOUTH EXPANSION

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Exhibit 4D
EXISTING EGRESS STAIR - NORTH AND SOUTH EXPANSION

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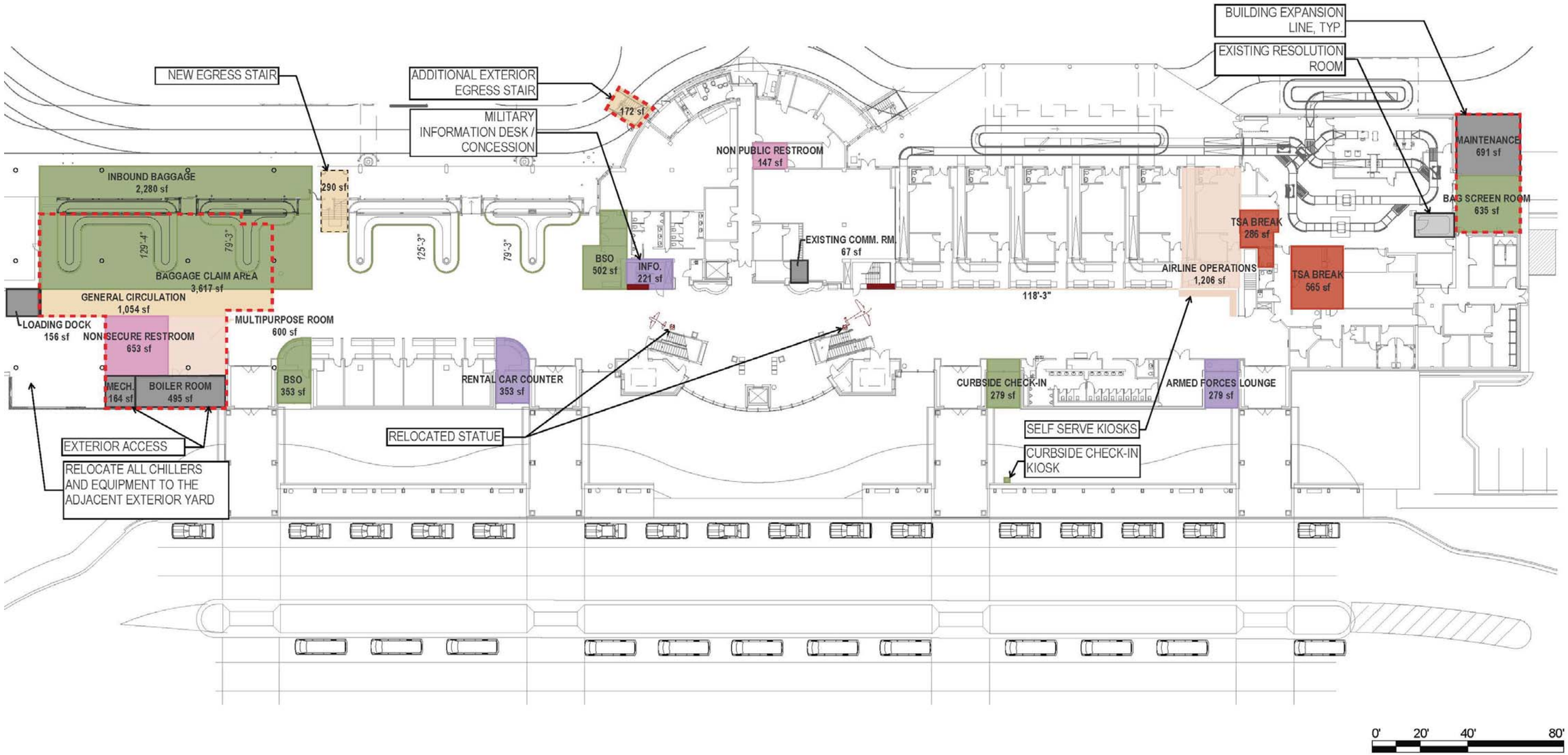

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LEVEL ONE - ALTERNATIVE B
NEW EGRESS STAIR
NORTH & SOUTH EXPANSION

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Exhibit 4E
NEW EGRESS STAIR - NORTH AND SOUTH EXPANSION

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INBOUND BAGGAGE

With the Scenario 3 Baggage Claim growth, expansion of Inbound Baggage to a total of 3,481 square feet is required. This proposed expansion sits behind the existing Baggage Claim between the west edge of the building and existing tug lanes on the exterior. The back length of each new flat-plate bag claim devices is accessed from this area.

BAGGAGE SERVICE OFFICE

A baggage service office is provided in front of the baggage claim area adjacent to the rental car facilities with another office adjacent to the central core. These locations are convenient for arriving passengers to access the office after passing through baggage claim. The area allocated to baggage service totals 852 square feet.

MULTIPURPOSE ROOM

The Airport has requested the current training area on the first level be increased to hold 25-35 occupants and 600 square feet. The Multipurpose Room is one of the programmed functions located in the terminal building expansion to the south.

ARMED FORCES LOUNGE/USO

An Armed Forces Lounge is an amenity suggested by the Airport and located on the first level. The lounge will be approximately 279 square feet and located in the proposed infill area adjacent to the existing restrooms in the ticketing area.

CONCESSIONS

The south egress stair will be removed from the vertical transportation central node to allow 221 square feet for concession opportunities or the military information desk. This removal also reconfigures the space for increased visibility to the existing restrooms and elevators and will allow for additional square footage on the second level for various program requirements. The rental car counters will be expanded into the adjacent retail office for an additional 350 square feet.

AIRPORT ADMINISTRATION

The Airport suggests relocating the security operations center to outside of the terminal footprint in the next 10-20 years into the existing FBO space. The space will require secure access.

NON-PUBLIC RESTROOM

As the Airport Maintenance grows and begins to occupy offices on Level 1 during Scenario 3, additional restrooms are required as a support function. An additional 147 square feet has been repurposed for non-public and non-secure restroom space.

OTHER SUPPORT FUNCTIONS

Other support functions include spaces for loading docks, maintenance, mechanical and electrical systems, maintenance and storage. The loading dock is placed on the south end of the terminal expansion with access to the first and second levels in the alternatives. The footprint of the loading dock is located within the Central Utility Plant (CUP) yard adjacent to the terminal. The second level loading dock space only includes access directly above and does not include actual square footage within the terminal.

An additional 691 square feet of maintenance space has been included in the north terminal expansion, adjacent to the additional bag screen room. This addition allows the Terminal to exceed Scenario 3 requirements.

The mechanical and electrical building systems will need to grow from 7,849 square feet to 8,723 square feet with 660 square feet of the required total located on the first floor building expansion The remainder square footage requirements spread into multiple locations throughout Level Two. The existing equipment in the Central Utility Plant (CUP) Yard, including two chillers and a dumpster, will be relocated further to the south to accommodate the south expansion of the building. Due to infrastructure requirements and allowance for chases, the existing communication rooms will remain in their existing locations close to the central vertical node.

The goal of all alternatives is to maximize storage where possible. Storage has been placed in areas where the building has required expansion on the second level.

LEVEL 1 – ART PROGRAM

Display cases for Ted C. Connell, Robert M. Gray, Okay, Texas and the Doolittle Tokyo Raiders are in the central node. The cases for Ted C. Connell and Robert M. Gray have statues associated with their wall displays. The statues will be relocated adjacent to the opposite escalator/stair, but remain near the associated display cases to alleviate congestion along the west wall in the central node. Currently, the cases for Okay, Texas and the Doolittle Tokyo Raiders do not have associated statues and will remain in their existing locations. The display case for Doolittle Tokyo Raiders corresponds with the Robert M. Gray display case will also remain near the Robert M. Gray display case.

COMPREHENSIVE ALTERNATIVES – LEVEL 2

The second floor alternatives focus on the placement of the SSCP and building expansion or infill as required to accommodate the surrounding functions. Level 2 alternatives include the SSCP, holdrooms, and secure circulation, concessions and restrooms along with other support functions and proposed locations for the art program. The development of the Level 2 alternatives focuses on efficiency for the SSCP, increased secure circulation, maximized storage where feasible, increased holdroom sizes and maintaining landside concessions with a landside restroom on the second floor. The Level 2 existing concessions have been reallocated to accommodate both landside and airside concessions as well as a larger gift shop. In the event growth occurs faster than the forecasted Scenario 3 requirements or the

Airport requires additional square footage based on need, we have provided options for additional capacity for security, secure circulation, holdrooms and storage within the Alternatives.

ALTERNATIVE 1 – LEVEL 2 FEATURES BY FUNCTIONAL AREA

Alternative 1 is a split SSCP with two high efficiency lanes. Alternative 1 includes expansion to the north and south and coincides with Level 1 - Alternative A utilizing the existing south emergency egress stair. Alternative 1 expands the building to the south in order to incorporate the increased square footage for the SSCP. The south terminal wing includes holdrooms, mechanical/electrical, storage, secure circulation and restrooms as required by Scenario 3 activity levels. The north expansion extends over the Level One TSA Administration area and encloses expanded holdrooms. This alternative also allows for the removal of the fixed walkway at Gate 6 and relocates gate podiums at Gate 1, 5 and 6. **Exhibit 4F** indicates the locations of the proposed functions in Alternative 1 – Level 2 along with square footages and area identification.

SECURITY SCREENING CHECKPOINT

As mentioned in the Conceptual Security Screening Check Point section, Alternative 1 progresses the Alternative 3.2 design and includes a split SSCP with one high efficiency lane on the north and south wings of the Terminal. Sufficient queuing area is provided for the check point.

HOLDROOMS & SECURE CIRCULATION

Holdrooms are located on the north and south of the terminal building totaling 10,118 square feet, exceeding the Scenario 3 requirements. The holdrooms located on the south of the terminal will be expanded onto the footprint of the expansion on the first level of the building an additional 5,000 square feet. The expansion will wrap around the egress stairs and will shorten the fixed walkway at Gate 6. The split configuration of the SSCP creates a shorter walking distance for arriving passengers to reach the non-secure area of the Terminal. Due to the existing restroom and atrium spaces, the circulation width is constricted. The south wing circulation is roughly 8’-10”, or about half of the width of the other alternatives, while the north wing circulation is 10’-5”, about two thirds of the desirable circulation width as seen in the other alternatives. The narrow circulation paths are also impeded by existing columns and will serve as the exit lane for a security check point lane. The total area for secure circulation measures 3,711 square feet and does not meet Scenario 3 requirements.

CONCESSIONS

Airside concessions will be an additional amenity to the Terminal in the proposed alternative. The 534 square foot south airside concession is located between the south holdroom expansion and the new security checkpoint. The north airside concession of 955 square feet is located at the end of the SSCP. The unique and expansive existing landside concessions of 3,792 square feet will be retained to continue serving the meeters and greeters. The existing gift shop will maintain landside access and expand to be

592 square feet. The secure area line divides the terminal into the north and south side allowing for the landside concessions and non-secure restrooms to remain as is.

RESTROOMS

The existing secure restrooms on both the north and south wings will remain in their current locations and continue to serve airside passengers. An additional secure men and women's 882 square foot restroom cluster will be located on the secure side of the terminal in the south expansion to meet the Scenario 3 requirements. The existing non-secure public restroom on the second level will remain as is and continue to provide service to the meters and greeters area.

OTHER SUPPORT FUNCTIONS

The location and size of the existing Electrical and Communications rooms will remain as is.

The loading dock added on Level 1 will have direct access to the 1,031 square foot storage room and is included in the south terminal expansion.

Additional maintenance space of 493 square feet is included in the program space allotted in the south expansion, between the new restroom and storage.

An additional 1,486 square feet of mechanical and electrical building systems has been included in the south terminal expansion, directly above the existing boiler room on Level 1.

LEVEL 2 - ART PROGRAM

The Airport currently has artwork stored to be located within the building. The artwork includes a painting on loan from the University of Texas with specific light level requirements as well as various other paintings of varying size. The alternative locates the artwork adjacent to the SSCP queuing on both sides of the central node due to the high visibility to passengers.

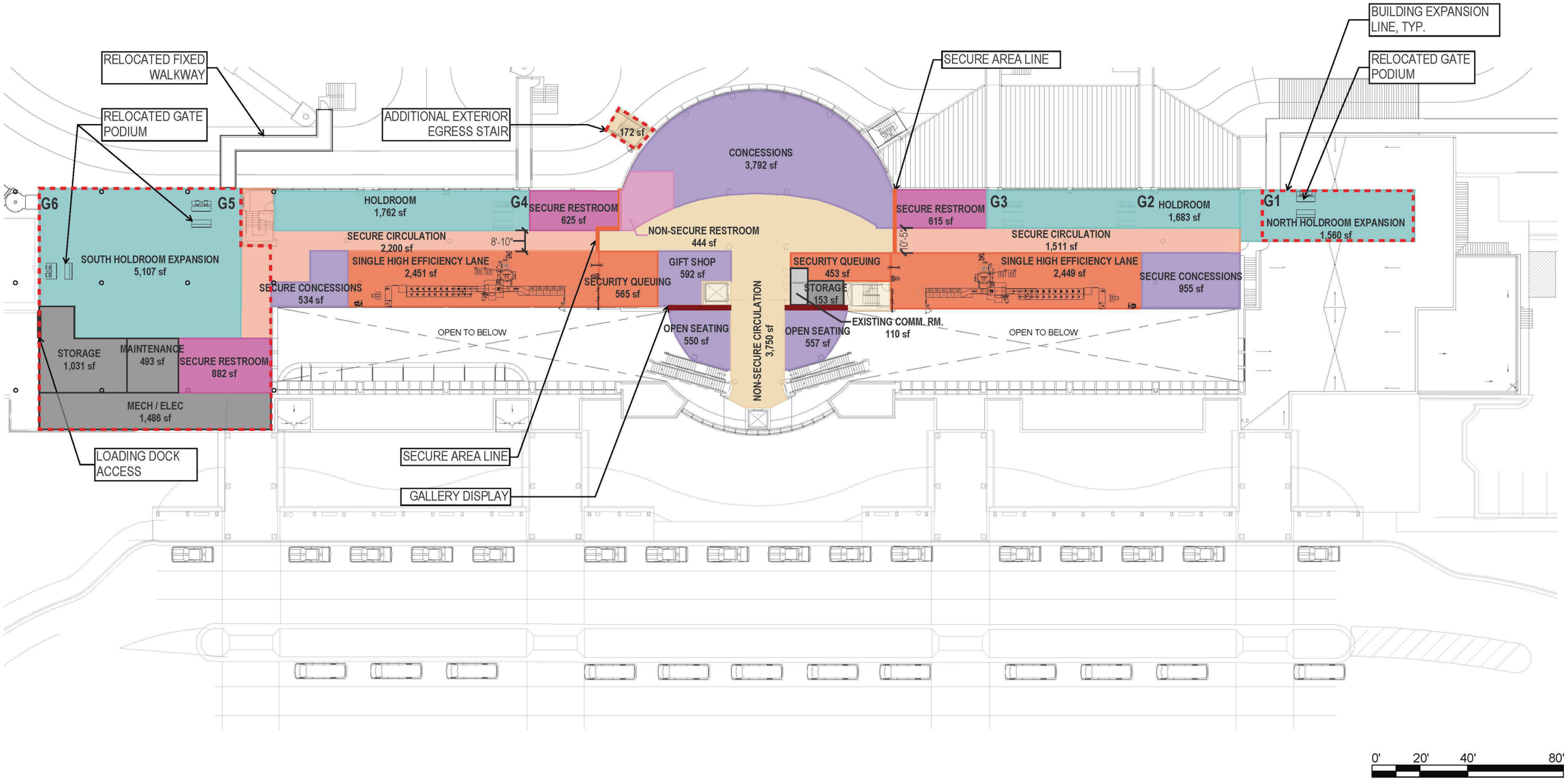
ALTERNATIVE 1 – LEVEL 2 ASSESSMENT

PROS

- Maintains landside concessions and unsecure restroom in central node and utilizes existing infrastructure and utilities.
- High Efficiency Security Lanes allows a higher passenger output with less equipment and TSA employees.
- Maintains south existing egress stair.

CONS

- Maintains split SSCP and limits future flexibility for expansion.
- New amenities to the terminal are split on the secure side including an additional secure restroom and new airside concessions.
- Relocates Gate 5 fixed walkway and holdroom.



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LEVEL TWO - ALTERNATIVE ONE

SPLIT - HIGH EFFICIENCY (2) LANE SSCP
NORTH & SOUTH EXPANSION
(REFER LEVEL ONE - ALTERNATIVE A)

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- Relocates three gate podiums.
- Reduced widths for secure circulation paths bisected by existing structural columns.
- Does not meet Scenario 3 Secure Circulation requirements and is constricted for one-way travel.

ALTERNATIVE 2 – LEVEL 2 FEATURES BY FUNCTIONAL AREA

Alternative 2 is a consolidated SSCP containing two high efficiency lanes with north, south and west building expansion and corresponds to the Level 1 - Alternative A with the existing south emergency egress stair. The west expansion allows reconfiguration of the existing holdrooms, expanded secure circulation widths and relocation of secure restrooms. Expanding to the west also provides the required additional square footage to provide a consolidated SSCP and does not require infill over the existing baggage lobby. The alternative also includes the south expansion with additional space for holdroom, storage, mechanical/electrical space, concessions and restrooms. The north expansion extends over the Level One TSA Administration area and includes expanded holdrooms. **Exhibit 4G** is the colorshape plan for Level 2 – Alternative 2 to represent the functions listed in the following paragraphs. with square footages and area identification.

SECURITY SCREENING CHECKPOINT

Alternative 2 contains a consolidated SSCP with two high efficiency lanes provided on the south end of the terminal. The exit lane is located adjacent to the SSCP, giving the opportunity for the supervisor to observe the SSCP and exit lanes simultaneously as required. The queuing area is relocated to the south balcony removing the open seating area.

HOLDROOMS & SECURE CIRCULATION

The terminal will include north and south expansion per Alternative 1 as well as an additional expansion at the west façades. The north and south expansion gains an additional 2,787 square feet 3,836 square feet respectively and the west façade expansion adds 9,764 square feet of holdrooms. The expansion to the west allows for larger holdrooms with the opportunity for a full glazing wall, increasing visibility of the airfield. The fixed walkways to Gates 4, 5 and 6 may also be shortened or removed with these expansions. Interior ramps at the exterior wall will provide sloped access to the passenger boarding bridges. All gate podiums will be relocated in this alternative. The secure side circulation provides connectivity from the security checkpoint to the holdrooms on both ends of the Terminal and provides access to secure restrooms and airside concessions.

CONCESSIONS

With the fluidity of the secure circulation to all gates, secure concessions, totaling 6,285 square feet, are located in the south, central and north areas of the terminal to serve passengers. The existing landside concession is set back from the glazing to allow for secure airside circulation. The landside concession totals 1,816 square feet and retains 562 square feet of open seating at the north balcony located in the central node overlooking the ticketing hall. The new central concession node can be allocated to provide

services to both landside and airside. A shared kitchen or counter will be placed along the secure area line to serve both meeters and greeters, non-secure and secure passengers. The existing gift shop will relocate to the opposite side of the central node adjacent to the relocated non-secure public restroom and will be 641 square feet. The relocation of the gift shop will cause the existing full kitchen to be removed.

RESTROOMS

An additional secure men and women's restroom cluster consisting of 1,003 square feet will be located on the secure side of the south terminal expansion, adjacent to the existing egress stair to meet the Scenario 3 requirements. The existing south wing secure restroom will be removed to allow for a larger corridor for secure circulation. The existing secure restrooms serving the north terminal will be expanded to be 1,052 square feet. The non-secure public restrooms on the second level will be relocated to the space between the electrical/communications rooms and egress stair. The 566 square foot restrooms will maintain landside access to serve the meeters and greeters and non-secure passengers.

OTHER SUPPORT FUNCTIONS

The location and size of the existing Electrical and Communications rooms will remain as is.

The loading dock added on Level 1 will have direct access to the 1,621 square foot storage room and is included in the south terminal expansion.

Additional maintenance space of 624 square feet is included in the program space allotted in the south expansion, between the new secure concessions and storage.

An additional 1,486 square feet of mechanical and electrical building system have been included in the south terminal expansion, directly above the existing boiler room on Level 1.

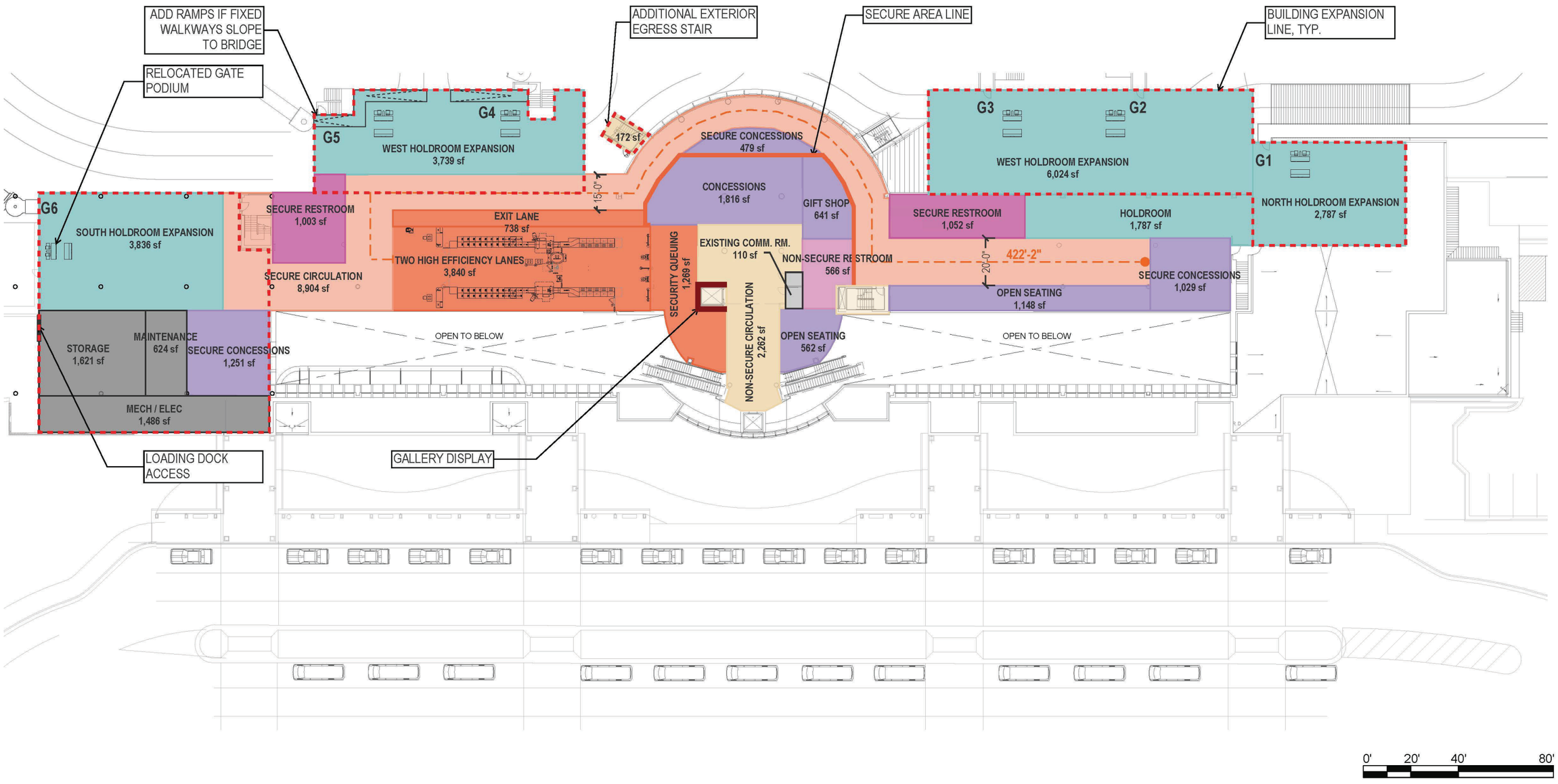
LEVEL 2 - ART PROGRAM

Artwork will be located at the walls adjacent to the SSCP queuing due to the high visibility to passengers.

ALTERNATIVE 2 – LEVEL 2 ASSESSMENT

PROS

- Consolidated SSCP provides more efficient operations for TSA and the Airport.
- High Efficiency Security Lanes allows a higher passenger output with less equipment and TSA employees.
- Connectivity to both north and south sides of the terminal through a singular secure circulation path.
- The landside concessions can be configured to provide service to both landside and airside.
- Wider secure circulation path available for traveling public.
- Shortened or removed fixed walkways at all gates.



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LEVEL TWO - ALTERNATIVE TWO

CONSOLIDATED - HIGH EFFICIENCY (2) LANE SSCP
NORTH, SOUTH & WEST EXPANSION
(REFER LEVEL ONE - ALTERNATIVE A)

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Exhibit 4G: CONSOLIDATED - HIGH EFFICIENCY (2) LANE SSCP - NORTH, SOUTH AND WEST EXPANSION

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- Increased visibility to airfield with west façade expansion.
- Maintains south existing egress stair.

CONS

- Relocates all gate podiums and holdrooms.
- Potentially removes landside visibility to airfield.
- Removes existing full kitchen at concessions.

ALTERNATIVE 3 – LEVEL 2 FEATURES BY FUNCTIONAL AREA

Alternative 3 is a consolidated SSCP with two high efficiency lanes, north, south, partial west building expansion and north infill over the baggage lobby and rental counters. Alternative 3 employs the Level 1 - Alternative B with the relocated south emergency egress stair. Infilling the atrium space over the baggage lobby provides the additional width required at the 2nd level to accommodate the consolidated SSCP while maintaining restroom fucntions and increasing holdroom functions. The double volume space in the ticketing area is the preferred area to remain open to provide an open volume to contribute to the departing passenger's first impression of the terminal with natural light and openness. The functions of a baggage claim allow for a more intimate space that would occur in a single-story baggage claim area.

Alternative 3 also includes the terminal expansion to the north and south. This expansion allows for additional holdroom square footage, storage, mechanical space, secure concessions and restrooms that are required in Scenario 3 and includes the removal of the fixed walkway at Gate 4 and 6 and relocation of the fixed walkway at Gate 5. **Exhibit 4H** is the colorshape plan for Alternative 3 – Level 2 orienting the different functions listed in the following descriptions combined with square footages and area identification.

SECURITY SCREENING CHECKPOINT

The SSCP for Alternative 3 includes two consolidated high efficiency lanes. These two lanes process the same number of passengers as four traditional lanes. The exit lane is located adjacent to the SSCP, giving the opportunity for the supervisor to observe the SSCP and exit lanes simultaneously as required. An additional unmanned exit lane is located on the north wing adjacent to the gift shop to allow arriving passengers a shorter exit distance to the non-secure side. The existing south balcony will extend into the building infill to accommodate the secure queuing space.

HOLDROOMS & SECURE CIRCULATION

The south expansion totals an additional 6,454 square feet of holdrooms. The fixed walkway and holdroom at Gate 5 will be reconfigured to the south. This relocation is to allow for expanded passenger volumes for both Gates 4 and 5. The expansion to the west allows for a larger holdroom at Gate 4 with the opportunity for a full glazing wall, increasing visibility of the airfield. The interior ramps at the exterior wall will provide sloped access to the passenger boarding bridges. The north holdroom is expanded over the Level 1 TSA Administration to 3,139 square feet. The secure circulation provides connectivity and access to all airside amenities to both the north and south ends of the terminal.

CONCESSIONS

The central concession node is provided with the opportunity to provide a vendor access to both landside and airside with the potential to serve increased consumer traffic. A shared kitchen or counter will be placed along the secure area line to serve the meeters and greeters, secure and unsecure passengers. A 766 square foot airside concession is located on the north side of the terminal, overlooking the ticketing atrium. On the south side of the terminal, an airside concession sized 1,792 square feet is located near the SSCP and holdrooms in the south building expansion. The existing gift shop will relocate to the opposite side of the central node adjacent to the relocated non-secure public restroom and will be 634 square feet. The relocation of the gift shop necessitates the removal of the existing full kitchen.

RESTROOMS

The existing north and south wing restroom clusters will be expanded to 1,260 square feet and 1,093 square feet respectively to meet the Scenario 3 requirements. The non-secure public restroom of approximately 270 square feet will be relocated to space between the egress stairs and electrical and communications room to serve the meeters and greeters.

OTHER SUPPORT FUNCTIONS

The location and size of the existing Electrical and Communications rooms will remain as is.

The loading dock added on Level 1 will have direct access to the 1,292 square foot storage room and is included in the south terminal expansion.

Additional maintenance space of 501 square feet is included in the program space allotted in the south expansion, between the new secure concessions and storage.

An additional 1,426 square feet of mechanical and electrical building system have been included in the south terminal expansion, directly above the existing boiler room on Level 1.

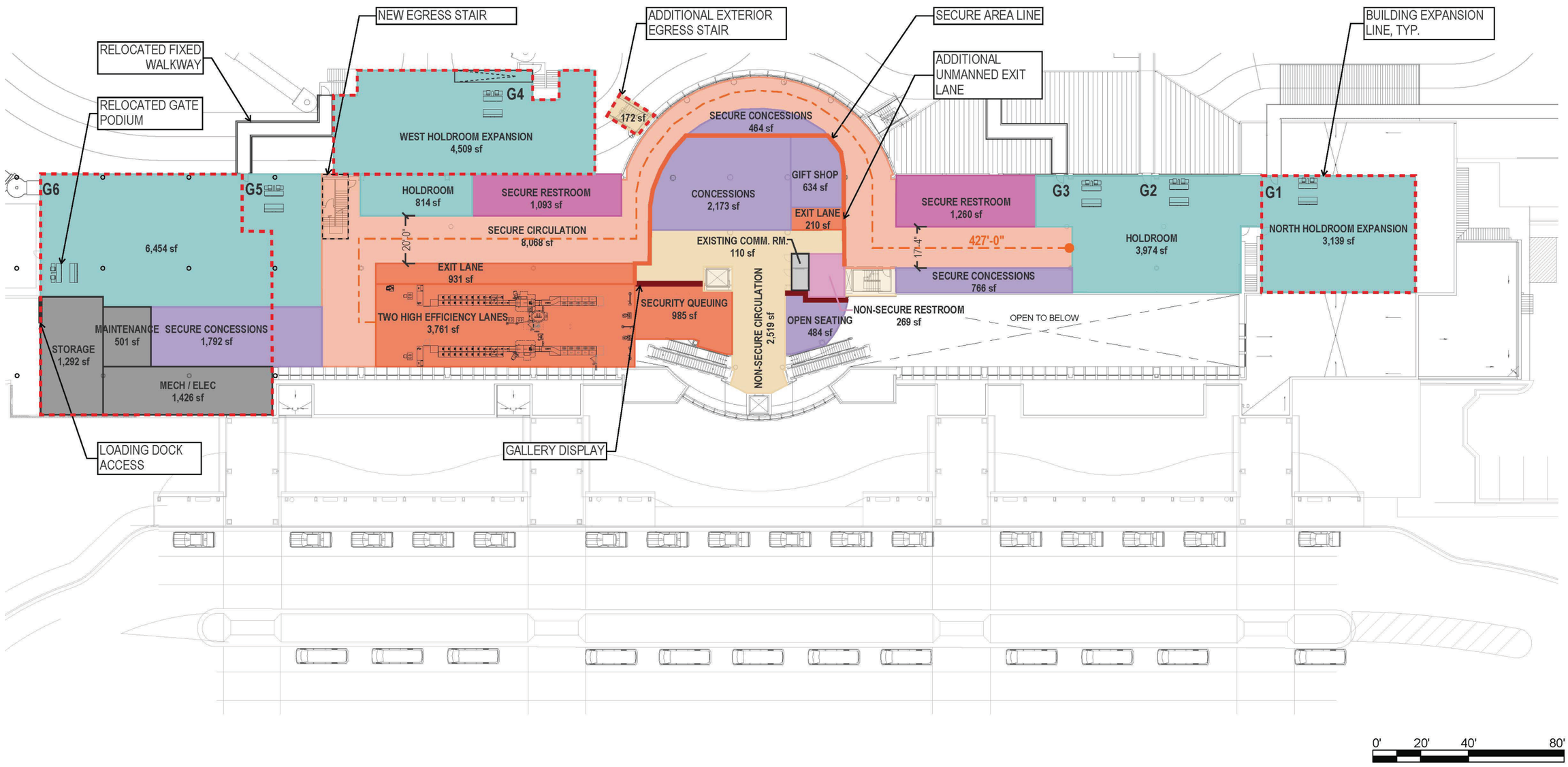
LEVEL 2 - ART PROGRAM

Artwork will be located adjacent to the SSCP queuing at the south side of the terminal and adjacent to the open seating at the balcony of the central node.

ALTERNATIVE 3 – LEVEL 2 ASSESSMENT

PROS

- Consolidated SSCP provides more efficient operations for TSA and the Airport.
- High Efficiency Security Lanes allows a higher passenger output with less equipment and TSA employees.
- Connectivity to both north and south sides of the terminal through a singular secure circulation path.



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LEVEL TWO - ALTERNATIVE THREE

CONSOLIDATED - HIGH EFFICIENCY (2) LANE SSCP
NORTH, SOUTH & PARTIAL WEST EXPANSION & EAST INFILL
(REFER LEVEL ONE - ALTERNATIVE B)

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Exhibit 4H: CONSOLIDATED - HIGH EFFICIENCY (2) LANE SSCP - NORTH, SOUTH AND PARTIAL WEST EXPANSION AND EAST INFILL

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- The landside concession can be allocated to provide service to both landside and airside.
- Wider secure circulation path available for traveling public.
- Secure one-way exit lane for departing passengers not requiring additional employees to supervise.
- Secure one-way exit lane allows for a shorter exit distance to the secure side.
- Shortened or removed fixed walkways at Gate 1 & 4.

CONS

- Relocated south egress stair.
- Relocates Gate 5 fixed walkway and holdroom.
- Relocates all gate podiums.
- Removes double volume space and visible aesthetic at the existing baggage lobby.
- Potentially removes landside visibility to airfield.
- Removes existing full kitchen at Concessions.

ALTERNATIVE 4 – LEVEL 2 FEATURES BY FUNCTIONAL AREA

Alternative 4 is a split SSCP with four traditional lanes with north, south and west building expansion and corresponds to the Level 1 - Alternative B with the relocated south emergency egress stair. The west expansion at both north and south ends of the terminal is required to allow for a split SSCP, provides more flexibility for holdroom reconfiguration, relocation of secure restrooms and airside concessions to serve both north and south wings. This west expansion allows for the double volume atrium spaces on the landside to remain over both the ticketing and baggage lobbies.

Alternative 4 also includes the terminal expansion to the north and south. This expansion allows for additional holdroom square footage, storage, mechanical space and secure concessions as required in the Scenario 3 requirements and includes the removal of the fixed walkway at Gate 6. **Exhibit 4J** is shown to represent the organization of the spaces and SSCP locations listed in the following paragraphs. **Exhibit 4J** also incorporates square footages and area identification for clarification.

SECURITY SCREENING CHECKPOINT

The SSCP in Alternative 4 includes a split security checkpoint comparable to the SSCP the Airport currently utilizes. An additional lane is required on both wings for a total of four traditional lanes overall, to serve the increase in departing passengers projected in Scenario 3. This increase in width is the driving factor for the west façade expansion on both north and south.

HOLDROOMS & SECURE CIRCULATION

The north and south terminal expansion totals an additional 3,182 square feet and 4,980 square feet of holdrooms respectively. The west façade holdroom expansion includes 10,260 square feet. Together, all holdroom expansions total 19,542 square feet. The expansion to the west allows for larger holdrooms at the south side and north side of the terminal with increased opportunities for daylight and visibility

to the airfield. The expansion to the building allows for exterior fixed walkways to be removed for Gates 2 through 6. Interior ramps to each passenger boarding bridge will need to be provided. These expansions will require relocation of all gate podium and holdrooms.

Though the SSCP is split, the secure circulation fluidity throughout Level 2 remains. Once on the secure side, passengers are able to reach the north and south ends of the terminal despite which SSCP they entered. Access to amenities can also be shared with ease between the two sides of the terminal.

CONCESSIONS

The central concessions node of 3,921 square feet will remain, however, be accessible only to airside passengers. An additional 1,479 square feet for secure concessions is included in the south terminal expansion. The north wing concession totals 942 square feet near the SSCP. The gift shop will remain on the landside with direct visibility from the elevator and escalators and expands to 780 square feet.

RESTROOMS

All existing secure restroom clusters will be relocated approximately 15’-0” west of their current location to accommodate the SSCP and secure circulation widths. An additional secure men and women’s restroom cluster consisting of 570 square feet will be located on the secure side in the south terminal expansion, south of the new egress stair, to meet the Scenario 3 requirements. The existing non-secure public restroom has been removed for this option.

OTHER SUPPORT FUNCTIONS

The location and size of the existing Electrical and Communications rooms will remain as is.

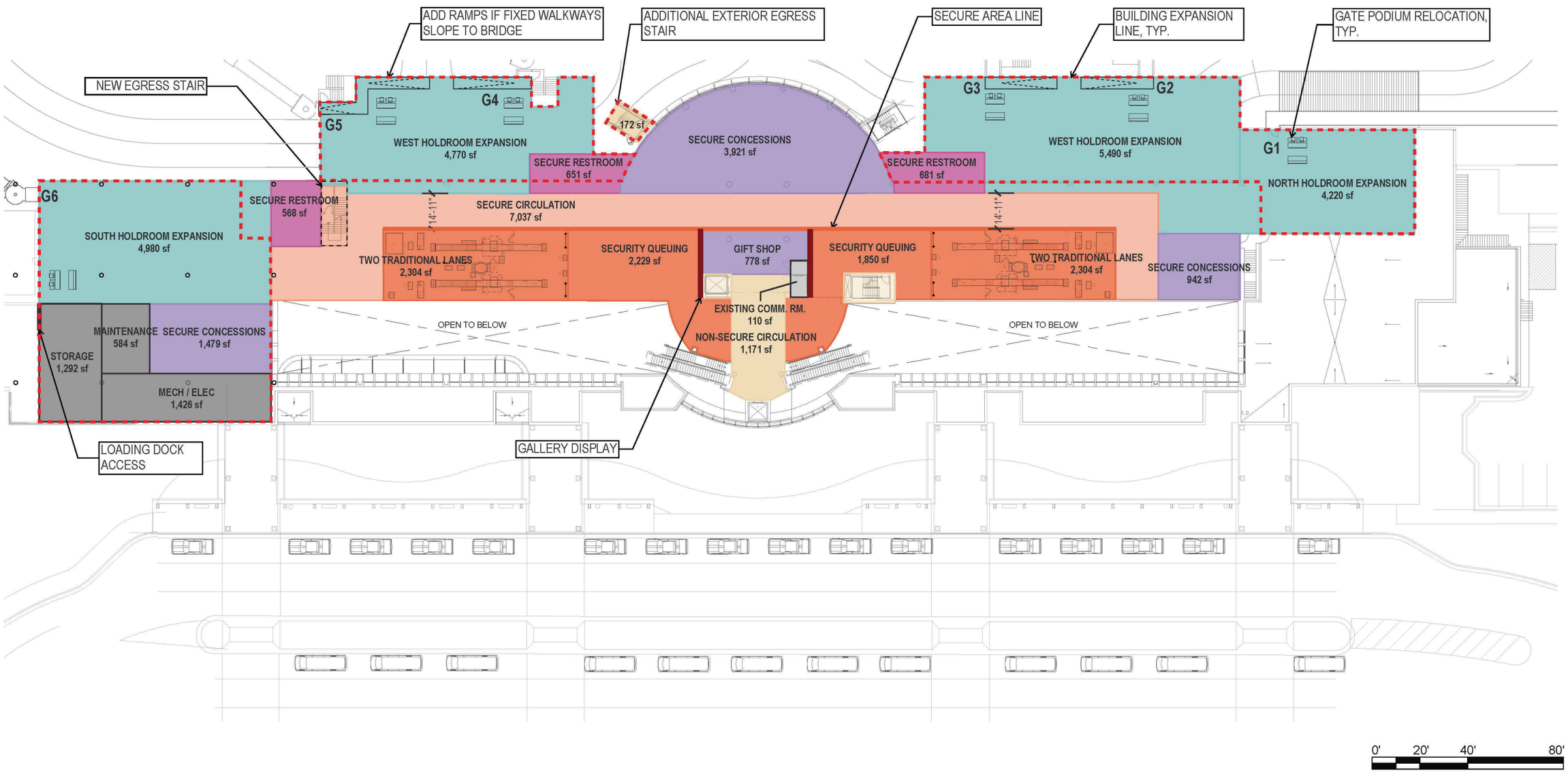
The loading dock added on Level 1 will have direct access to the 1,292 square foot storage room and is included in the south terminal expansion.

Additional maintenance space of 586 square feet is included in the program space allotted in the south expansion, adjacent to the new secure concessions and storage.

An additional 1,426 square feet of mechanical and electrical building system have been included in the south terminal expansion, directly above the existing boiler room on Level 1.

LEVEL 2 - ART PROGRAM

Artwork will be located adjacent to the SSCP queuing on the wall separating the SSCP queuing from the gift shop.



Killeen - Fort Hood Regional Airport

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DISCLAIMER: Nothing contained herein shall be constructed to provide rentable square footages for a particular space as such is only to be provided by the building owner.

LEVEL TWO - ALTERNATIVE FOUR

CONSOLIDATED - TRADITIONAL (4) LANE SSCP
NORTH, SOUTH & WEST EXPANSION
(REFER LEVEL ONE - ALTERNATIVE B)

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ALTERNATIVE 4 – LEVEL 2 ASSESSMENT

PROS

- Repurposes central node concessions to airside and utilizes existing infrastructure and utilities.
- Connectivity to both north and south sides of the terminal through a singular secure circulation path.
- Potential to repurpose of (2) SSCP Traditional lanes.
- Wider secure circulation path available for traveling public.

CONS

- Relocated south egress stair.
- Relocates all gate podiums and holdrooms.
- Maintains split SSCP and limits future flexibility for expansion.
- Queuing is accessed from balconies in central node.
- Relocates all secure restrooms.
- Lack of amenities and waiting areas for meeters and greeters.
- Removal of non-secure restroom.
- Potentially removes landside visibility to airfield.

ALTERNATIVE 5 – LEVEL 2 FEATURES BY FUNCTIONAL AREA

Alternative 5 is a consolidated SSCP with two high efficiency lanes, north, south, and west building expansion and utilizes Level 1 - Alternative B with the relocated south emergency egress stair. The west expansion allows for more flexibility regarding the existing holdroom configuration, expanded secure circulation widths, relocation of secure restrooms and placement of the SSCP. The building expansions allows the terminal to increase its program square footages while maintaining the double volume atrium spaces over the existing baggage and ticketing halls. The alternative also includes the south expansion with additional space for holdroom, storage, mechanical/electrical space, concessions and restrooms. The north expansion extends over the Level One TSA Administration area and includes expanded holdrooms. **Exhibit 4K** is the plan for Level 2 – Alternative 5 to represent the functions listed in the following paragraphs with square footages and area identification.

SECURITY SCREENING CHECKPOINT

The SSCP in Alternative 5 includes a consolidated SSCP with two high efficiency lanes provided on the south end of the terminal. The exit lane is located adjacent to the SSCP, giving the opportunity for the supervisor to observe the SSCP and exit lanes simultaneously as required. The queuing area is relocated to the south balcony removing the open seating area.

HOLDROOMS & SECURE CIRCULATION

The north, south and west terminal expansion all contain holdroom program, totaling 16,926 square feet. The expansion to the west allows for larger holdrooms with the opportunity for a full glazing wall,

increasing visibility of the airfield. The expansion to the building allows for exterior fixed walkways to be removed at all gates. Interior ramps to each passenger boarding bridge will need to be provided for the holdrooms located along the west facade. These expansions will require relocation of all gate podiums and reconfiguration of the holdrooms seating. The secure side circulation provides connectivity from the security checkpoint to the holdrooms on both ends of the terminal and provides access to secure restrooms and airside concessions.

CONCESSIONS

The central concessions node will remain accessible only to airside passengers. An additional 1,527 square feet for secure concessions is included in the south terminal expansion adjacent to the SSCP. The north wing concession totals 2,195 square feet and sits adjacent to the north atrium on the landside to allow meeters and greeters and non-secure passengers to enjoy views over the ticketing hall. The gift shop will maintain its landside function and expand to 622 square feet. The gift shop's new location is between the existing communications room and north egress stair and sits along the path to the landside concessions.

RESTROOMS

All secure restroom clusters will be relocated. Two men's and women's restroom clusters are located in both the south and north wing adjacent to the holdrooms. The secure restrooms total 2,443 square feet exceeding Scenario 3 requirements. The new non-secure men's and women's restroom cluster totaling 598 square feet will maintain its landside functions and is located adjacent to the non-secure concessions.

OTHER SUPPORT FUNCTIONS

The location and size of the existing Electrical and Communications rooms will remain as is.

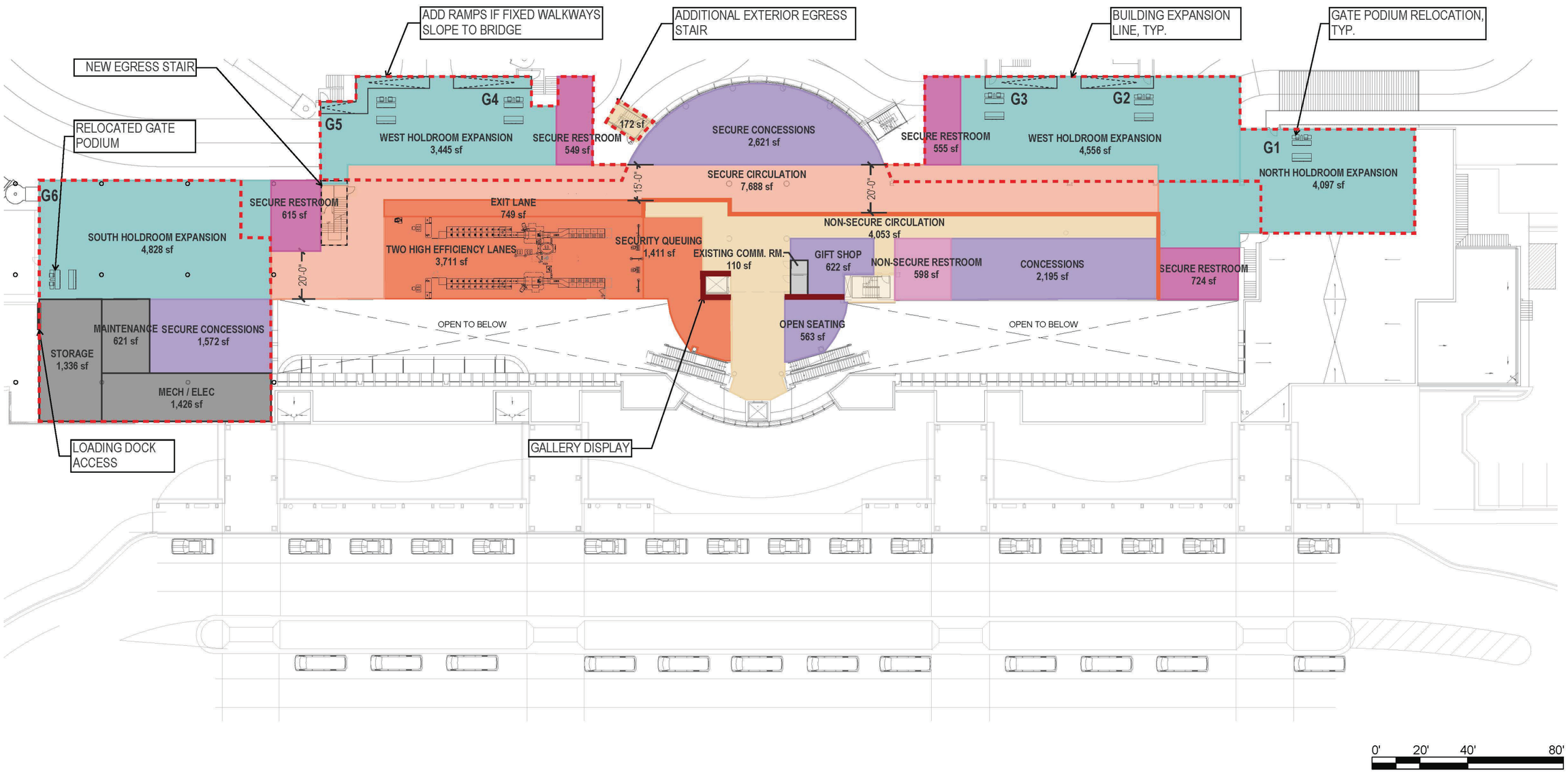
The loading dock added on Level 1 will have direct access to the 1,336 square foot storage room and is included in the south terminal expansion.

Additional maintenance space of 621 square feet is included in the program space allotted in the south expansion, adjacent to the new secure concessions and storage.

An additional 1,426 square feet of mechanical and electrical building system have been included in the south terminal expansion, directly above the existing boiler room on Level 1.

LEVEL 2 - ART PROGRAM

Artwork will be located adjacent to the SSCP queuing on the walls of the elevator core as well as the wall separating the open seating from the gift shop for public viewing.



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LEVEL TWO - ALTERNATIVE FIVE

CONSOLIDATED - HIGH EFFICIENCY (2) LANE SSCP
NORTH, SOUTH & WEST EXPANSION
(REFER LEVEL ONE - ALTERNATIVE B)

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ALTERNATIVE 5 – LEVEL 2 ASSESSMENT

PROS

- Consolidated SSCP provides more efficient operations for TSA and the Airport.
- High Efficiency Security Lanes allows a higher passenger output with less equipment and TSA employees.
- Connectivity to both north and south sides of the terminal through a singular secure circulation path.
- Wider secure circulation path available for traveling public.
- Relocated landside concessions with views overlooking ticketing atrium.
- Shortened or removed fixed walkways at all gates.
- Increased visibility to airfield with west façade expansion.

CONS

- Relocated south egress stair.
- Relocates all gate podiums and holdrooms.
- Relocates all secure restrooms.
- Potentially removes landside visibility to airfield.

WAYFINDING

Wayfinding in the Airport is provided for passengers to effectively navigate their way through the Airport. Wayfinding typically takes on two forms: directional signage and through the use of spatial forms in the architecture of the building. The following sections provide suggestions for the directional signage in the Terminal to point the passenger to specific locations that have been noted as difficult to find.

Central Node

Due to the low ceiling at the central node, it is difficult to locate the elevators to the second floor and landside restrooms. A wall mounted directory sign located at the bulkhead of the central node notifies passengers of areas located inside of the central node and past the central node. **Figure 4J** depicts the proposed wall mounted sign.

Holdroom Restrooms

The wall mounted signage at the secure restrooms competes with the security exit lane and holdroom gate signage. It has been observed by the Airport, the passengers have difficulty locating the secure restrooms due to the location of the FIDS display. A blade signage for the restroom signage will protrude from the wall for passengers to visibly locate the restrooms from the holdrooms. **Figure 4K** represents the proposed blade signage for the secure restrooms in the holdrooms.

Figure 4J

Figure 4K

GENERAL AVIATION, CARGO, AND NON-AVIATION DEVELOPMENT ALTERNATIVES

Current commercial passenger airline facilities and the limited general aviation and support facilities do not, and will not, meet the ultimate development and financial goals of the Airport and its sponsor, the City of Killeen. Due to the limited amount of land available to further develop on the civilian Killeen-Fort Hood Regional Airport, careful consideration will also be given in this analysis to acquiring parcels of land that could be considered for both aviation and non-aviation related uses. The only areas which can be developed at present include the area immediately east of the rental car ready/return lot, the area east of the cemetery along SH 201, and the area along the southern edge and glycol reclamation facility. These properties are usable but are not sufficiently sized to meet long term development needs, demands, and or financial objectives for the City. After thorough examination, the planning done in this effort will consider the acquisition of approximately 160 acres of property generally bound on the north by Reese Creek Road, west by Ogalla and Ivy Mountain Roads, east by SH 201, and south just beyond Ivy Mountain Road.

The goal of this planning effort will be to formulate a long-term plan which can provide additional revenue support to the Airport and support economic development for the City and region as a whole. The plan will require obtaining additional property which will need to be acquired via lease or in some fee simple transaction mechanism from the Department of Defense (RGAAF and/or Fort Hood). Aviation uses proposed in the area will include options for small to large all-cargo airline facilities as well as an array of general aviation facilities conforming to the Airport's large aircraft mission.

Non-aviation uses can range to include light commercial to heavy industrial. Without specific business plans, the analysis in this study will allow all non-aviation uses to be considered. The primary consideration will be for light commercial/industrial uses that are fully compatible with airport operations and will support the local economy. Three specific targeted uses include hotel(s), gas station/convenience store(s), and solar farm array. A business park is another option if enough land is made available.

As a means to quickly examine market opportunities, **Exhibit 4La** presents nearby hotels and **Exhibit 4Lb** presents gas station/convenience stores nearby by brand. As depicted, the City and other nearby communities are amply served with all major hotel chains/brands. These hotels, however, are somewhat inconvenient for airport users. While proximate, travel times can be long due to traffic and/or indirect routes to the facilities. An on-airport site could likely support visitors, especially business travelers via air to the City. Gas station/convenience store options are more sporadically located about the region as depicted on **Exhibit 4Lb**. It is also likely that a gas station/convenience store on-airport could be supported by travelers using rental cars and/or local residents and Fort Hood personnel traversing the area. As such, the planning effort should consider both options.

Exhibit 4Ma and 4Mb (front and back) presents four generalized land use alternative concepts for the land immediately south and southeast of the current airport leasehold as described below. The reserve area would be challenging to develop due to gradient issues. The intent of the analysis in this exhibit is to strategically consider varying uses of the land for aviation and non-aviation development compatible with, and in support of, the airport's mission and financial health. All four alternatives consider the same future property line/acquisition and all include reserving approximately 18 acres immediately east and

southeast of Taxiway B. Each alternative also considers utilizing the city-owned five acres along SH 201 and the area leased to the east of the rental car ready/return lot for commercial uses as the land is not accessible for airside activities. The primary difference in each alternative is the varying sizes of aviation and non-aviation commercial development areas.

LAND USE ALTERNATIVES

Land Use Alternative 1

The first alternative, depicted on **Exhibit 4Ma** considers very little future aviation development area, all of which are inside of current airport boundary denoted with the blue shading. The aviation development area would include 15 acres, approximately half of which would need to be dedicated to apron and could not support raised facilities due to height restrictions in proximity to the runway. The remaining 145 acres proposed for acquisition under this alternative would be dedicated to non-aviation development. In most cases, non-aviation development near airports should consist of compatible uses such as commercial and light to heavy industrial. Business parks are an attractive option as they can generate substantial revenues and offer a good buffer between the airport and nearby incompatible uses. As proposed, the business park would likely produce up to 75 acres of leasable space.

While this alternative would be ideal in generating additional revenue streams, it would limit the airport from long term growth. The proposed aviation development area is not sufficiently sized to accommodate any level of air cargo, if attracted to the airport, or any other sizable general aviation businesses. Moreover, the non-aviation boundary and terrain north and south of the existing terminal would ultimately box the airport in without further options. As such, this option is not considered viable and should not be pursued further.

Land Use Alternatives 2 and 3

Alternatives 2 and 3, depicted on **Exhibit 4Ma and 4Mb** respectively, consider very similar uses with only one distinction. Alternative 3 would effectively split the City-owned five acres along SH 201 into commercial (2+ acres) and aviation (3+). The remainder of both alternatives are the same. The primary goal in these alternatives was to offer more aviation land use than in the previous alternative. As shown on **Exhibit 4Mb**, the aviation development area would extend eastward and include approximately 83 acres. As proposed, the aviation development area in Alternative 2 would be bound on the north by Reese Creek Road and would extend south of Ivy Mountain Road. Alternative 3 is the same, except the aviation area extends north of Reese Creek Road. It is assumed that the roadways would be relocated if implemented.

These alternatives are attractive as they “square” the development lines and offer substantial aviation development use areas. Unfortunately, the non-aviation revenue areas would be diminished and the likelihood of developing all of the aviation use area would extend well into the future. Finally, the plan

Exhibit 4La
HOTELS NEAR GRK

Exhibit 4Lb
GAS STATIONS/CONVENIENCE STORES NEAR GRK

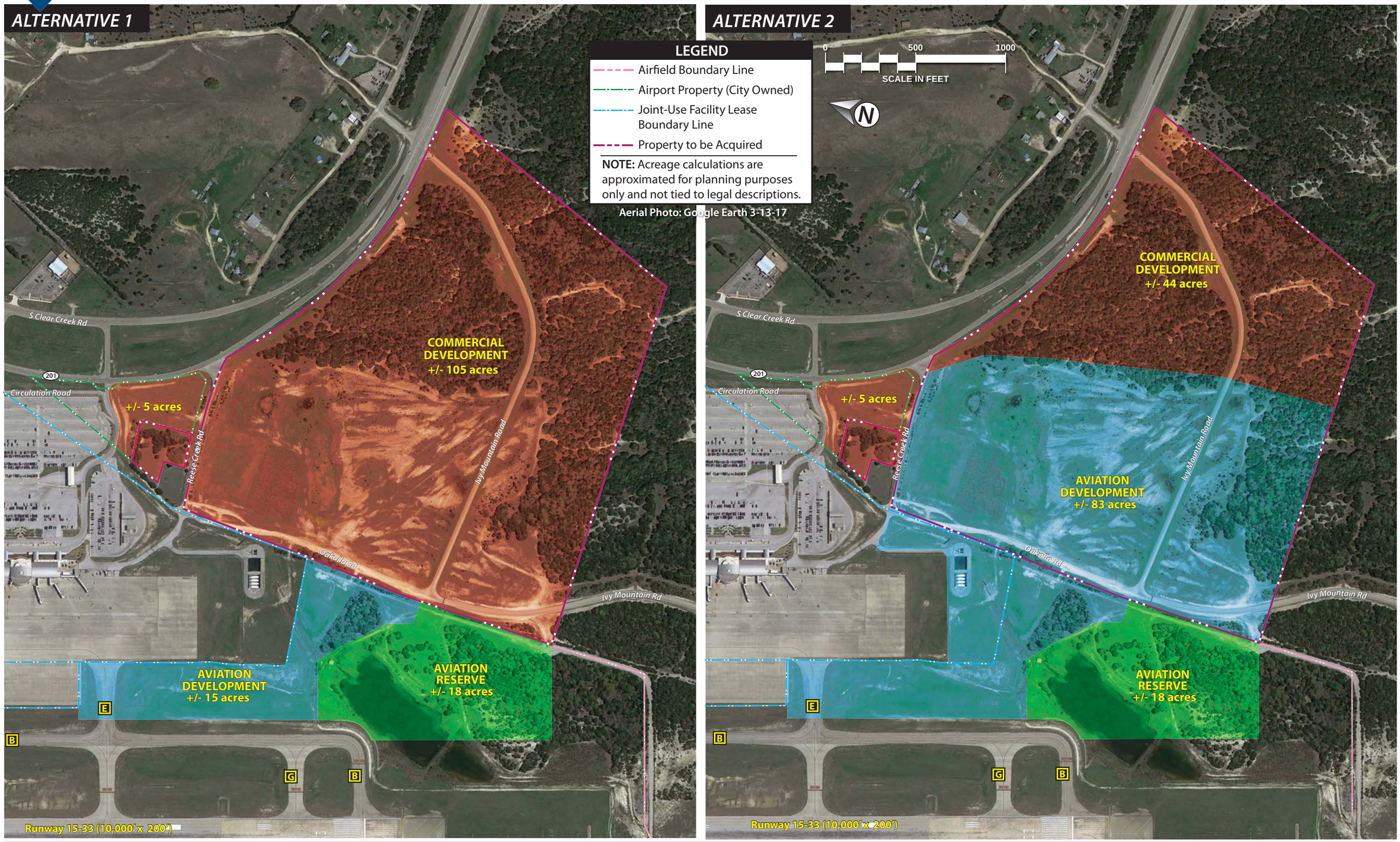

Exhibit 4Ma
LAND USE ALTERNATIVES

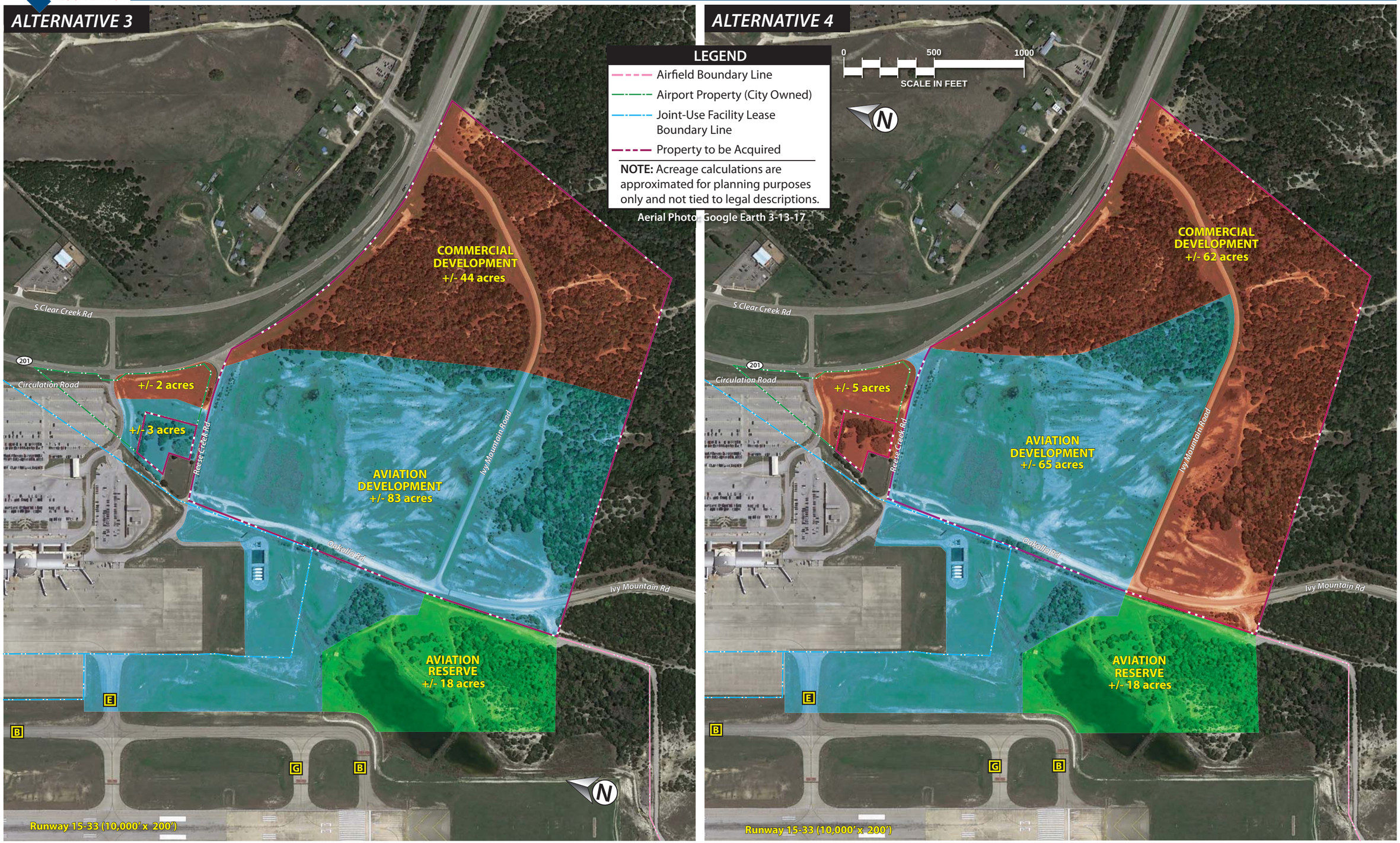

Exhibit 4Mb
LAND USE ALTERNATIVES

would require rerouting Ivy Mountain Road for local users. While Alternatives 2 and 3 offer better options than the first alternative, the drawbacks present unnecessary challenges to future implementation. As such, these alternatives are considered only moderately desirable.

Land Use Alternative 4

The fourth and final land use alternative is considered the preferred alternative as its approach is to maximize both aviation and non-aviation uses while utilizing hard constraints in a positive manner. As shown on **Exhibit 4Mb**, the alternative proposes approximately 65 acres of aviation development spaces bound to the east and south by 62 acres of non-aviation commercial development. The plan would split the two uses by a creek east/west and Ivy Mountain Road north to south. As such, natural constraints will bound the areas. This natural boundary would ideally situate the non-aviation uses for immediate access, making them ready to develop. Moreover, the area would be ready-served by an improved and available vehicular roadway which would not require the expense of relocation to implement. In most cases, only two-thirds of a planned area will become leasable as the remainder is necessary to accommodate roads, other infrastructure, and green spaces. Based upon this alternative, approximately 40 acres of the non-aviation area would be leasable, creating revenue opportunities ranging in the hundreds of thousands of dollars annually depending upon marketable lease rates.

Given earlier targeted development options, **Exhibit 4N** depicts portions of the commercial development areas with potential users. As shown, the area along SH 201could host two hotels and two gas station sites, two hotel sites, and two restaurant sites, similar to others located in the City. The uses could shift to more of one and less of the other, simply shown as an indicator of what is possible. Additional space would remain in the area bounded by Ivy Mountain, SH 201, and Reese Creek Road, as shown. The area south of Ivy Mountain Road could support a limited business park community similar to one also located in town. Finally, the exhibit depicts a sizable solar panel array hemmed in an area along SH 201 and bound on the south by the Chet Edwards Loop and the west by the rental car ready/return lot. The area shown for a solar array location could also support a hotel, restaurant, or a gas station. The solar use is intriguing as its return would not be in dollars, but in energy saved as it is believed the area solar farm could generate enough power to replace up to 60 percent of all energy costs for the Airport.

Land Use Alternative Summary

All alternatives offer varying opportunities which could meet some or all of the City's airport development objectives. Alternative 1 would be the simplest to reject as future aviation development would be throttled. Alternatives 2 and 3 are similar and would offer good space allotments for both aviation and non-aviation development opportunities; however, both would also require reinvestments in road relocations. It is believed that the fourth and final alternative offers the best balanced and measured opportunities for both aviation and non-aviation uses. As such, this alternative will continue forward for land acquisition and specific planning. The following sections will outline specific development options within the general aviation area presented in Land Use Alternative 4.

AVIATION DEVELOPMENT AREA ALTERNATIVES

Aviation Development Area Alternative 1

To allow for maximum development of the airport while keeping with FAA-mandated safety design standards, it is very important to devise a plan that allows for the orderly and cost-effective development of airport facilities. Typically, airports will reserve property adjacent to the runway system for aviation-related activity exclusively. This will allow for the location of taxiways, aprons, and hangars.

The aviation development areas should be divided into high, medium, and low activity levels at the airport. The high activity area should be planned and developed to provide aviation services on the airport. An example of high activity areas is a cargo area and aircraft parking apron, which provides for aircraft parking locations and general circulation for aircraft. In addition, large conventional hangars used for maintenance, repair and overhaul (MRO) facilities, fixed base operators (FBOs), high activity corporate aviation departments, or storing a large number of aircraft would be considered a high activity use area. The best location for high activity areas is along the flight line, for ease of access to all areas on the airfield. All major utility infrastructure would need to be provided to these areas.

The medium activity use category defines the next level of airport use and primarily includes smaller corporate aircraft that may desire their own executive hangar storage on the airport. The best location for medium activity use is off the immediate flight line, but still readily accessible to aircraft including corporate jets. Due to an airport's layout and other existing conditions, if this area is to be located along the flight line, it is best to keep it out of the midfield area of the airport, so as to not cause congestion with transient aircraft utilizing the airport. Parking and utilities, such as water and sewer, should also be provided in this area.

The low activity use category defines the area for storage of smaller single and multi-engine aircraft. Low activity users are personal or small business aircraft owners who prefer individual space in T-hangars. Low activity areas should be located in less conspicuous areas. This use category will require electricity, but generally does not require water or sewer utilities.

When planning landside facilities, consideration must be given to the design standards for separating structures from aircraft movement areas. The separation standards are a function of the critical design aircraft for the future condition. Separation standards are directly related to the wingspan of the critical design aircraft, which varies based on aircraft type. The southwest general aviation area can support the entire range of general aviation aircraft from small single engine aircraft to very large business jets up to and including Gulfstream models, Bombardier models, and even the Boeing Business Jet (BBJ, a Boeing 737 model). Generally, cargo potentials for GRK will be somewhat limited due to substantial operations at other regional hubs in Dallas, Austin, and San Antonio. If large air cargo operators locate to GRK, the typical aircraft could include MD80, Boeing 737, Airbus 320, etc. type aircraft. It is possible that even larger Boeing 757, 767, and or Airbus 300/310 models could be used infrequently.

Exhibit 4N
NON-AVIATION DEVELOPMENT OPTIONS

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The taxiway object free area (TOFA) is the area required to be clear of object penetrations surrounding taxiways. The following TOFA is centered on the taxiway with required dimensions based on the most critical airplane design group (ADG) wing span dimensions using the taxiway(s):

- ADG I (wingspans up to 49 feet) – 89 feet
- ADG II (wingspans up to 79 feet) – 131 feet (ERJ 145)
- ADG III (wingspans up to 118 feet) – 186 feet (CRJ 700 and Boeing 737)
- ADG IV (wingspans up to 171 feet) – 259 feet (Boeing 757 and 767)

The TOFA for the most critical aircraft using the taxiways should be planned to ensure that obstructions to free taxi movements do not occur with regularity. While TOFA design standards should be implemented for all primary movement areas (e.g., parallel taxiways, aprons), facilities not intended to serve the critical design aircraft can be designed to different separation standards. For example, an area that is planned for cargo can be planned to meet up to ADG IV TOFA, but the remainder of the general aviation area meet only up to ADG III TOFA.

Given these parameters, the first aviation area development alternative was developed with the consideration that large air cargo would be the primary driver of the area. As depicted on **Exhibit 4P**, Aviation Development Area Alternative 1 considers the allowance of a large cargo complex complete with a sort/transfer building and apron suitable for ADG IV aircraft. The complex would be made accessible via a taxiway extending from the west connected to Taxiway B, as shown.

General aviation development would consider first the area alongside the southern edge of existing aircraft apron as shown. The area could support the six hangars of varying sizes, offering a total of 95,000 square feet of indoor floor space. The aviation development area could also support another 21 80-foot by 80-foot executive box hangars (210,000 square feet) and eight 200-foot x 150-foot large conventional hangars (240,000 square feet). The corporate hangars would likely serve primarily aircraft storage but could house a specialty aviation service operator (SASO) such as an avionics shop. The larger hangars would likely house FBO, maintenance, and large aircraft operator storage needs. In total, the plan would allow for the large cargo operation as well as for the development of 35 hangar facilities offering over half-million square feet of storage and/or maintenance space.

Aviation Development Area Alternative 2

The second aviation area development alternative factors a regionalized cargo operator with ADG II and/or III type aircraft. As shown on **Exhibit 4Q**, the plan would allow for the taxiway access to be provided as a linkage to an expansion to the main existing ramp. The goal is to not create a “direct access” point between the development area and the runway system.

As shown, the cargo facility would be shifted to the southeastern corner of the aviation area and is smaller than the previous alternative in support of a “regional” cargo carrier. This location would place it directly on Ivy Mountain Road versus the previous alternative on Reese Creek Road. The complex is slightly smaller than the first alternative as it is intended to serve smaller cargo activity. The TOFA planned for this location is 189 feet, specifically up to ADG III.

The general aviation development would support two large hangar complexes offering 69,500 square feet of floor space on the existing south apron as shown. The aviation development area could support an additional nine 200-foot by 150-foot conventional hangars and 13 150-foot by 100-foot conventional hangars. In total, the plan would allow for 26 hangars and 534,500 square feet of space.

Aviation Development Area Alternative 3

The final aviation development alternative differs from the two previous in that it only considers general aviation users and no air cargo facilities. This alternative utilizes a taxiway extension east from Taxiway B meeting ADG III standards. As shown on **Exhibit 4R**, Alternative 3 only shows aircraft hangar facilities on the south ramp and in the proposed development area. As shown, the plan includes:

- 20 – 80-foot by 80-foot executive box hangars;
- 10 – 100-foot by 100-foot conventional hangars;
- 14 – 150-foot by 100-foot conventional hangars;
- 8 – 250-foot by 150-foot conventional hangars;
- 2 – 150-foot by 150-foot conventional hangars;
- 1 – 200-foot by 100-foot conventional hangar; and,
- 1 – 300-foot by 100-foot conventional hangar.

The plan would provide for a total of 56 hangar facilities offering 773,000 square feet of floor space.

Aviation Development Area Alternative Summary

The three aviation development area alternatives presented varying uses of the proposed 62 acres of land immediately south/southeast of the commercial terminal complex at GRK. The first two alternatives offered air cargo complex options with general aviation development, while the final alternative offered only general aviation development opportunities. It should be noted that all alternatives far exceed the demand anticipated within the scope of this planning effort. Moreover, the development options are only a few of those possible and are intended to depict general opportunities. The areas could support differing layouts, but those shown provide reasonable options to maximize the space to meet demand and bolster airport revenue streams.

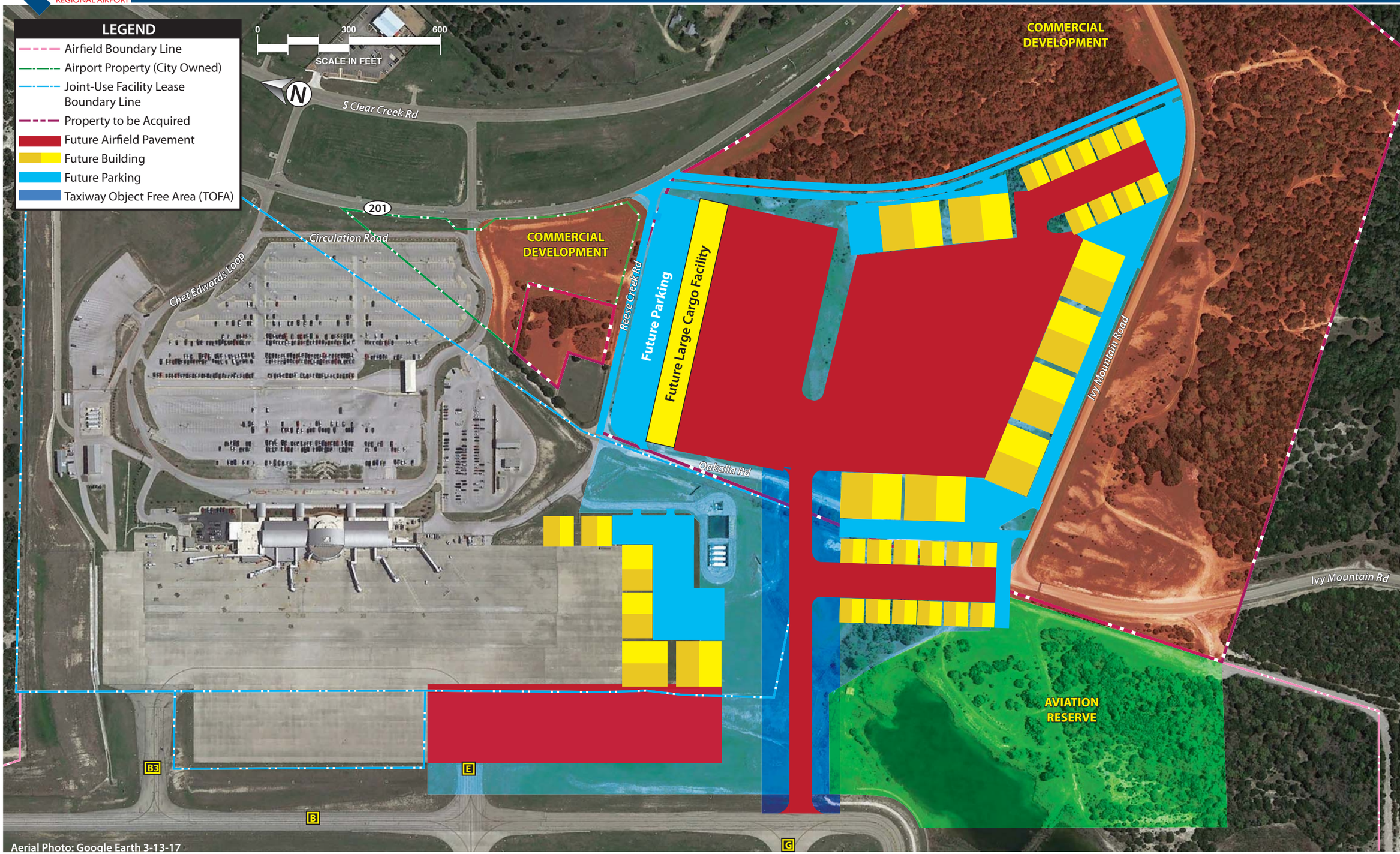

Exhibit 4P
AVIATION DEVELOPMENT AREA ALTERNATIVE I

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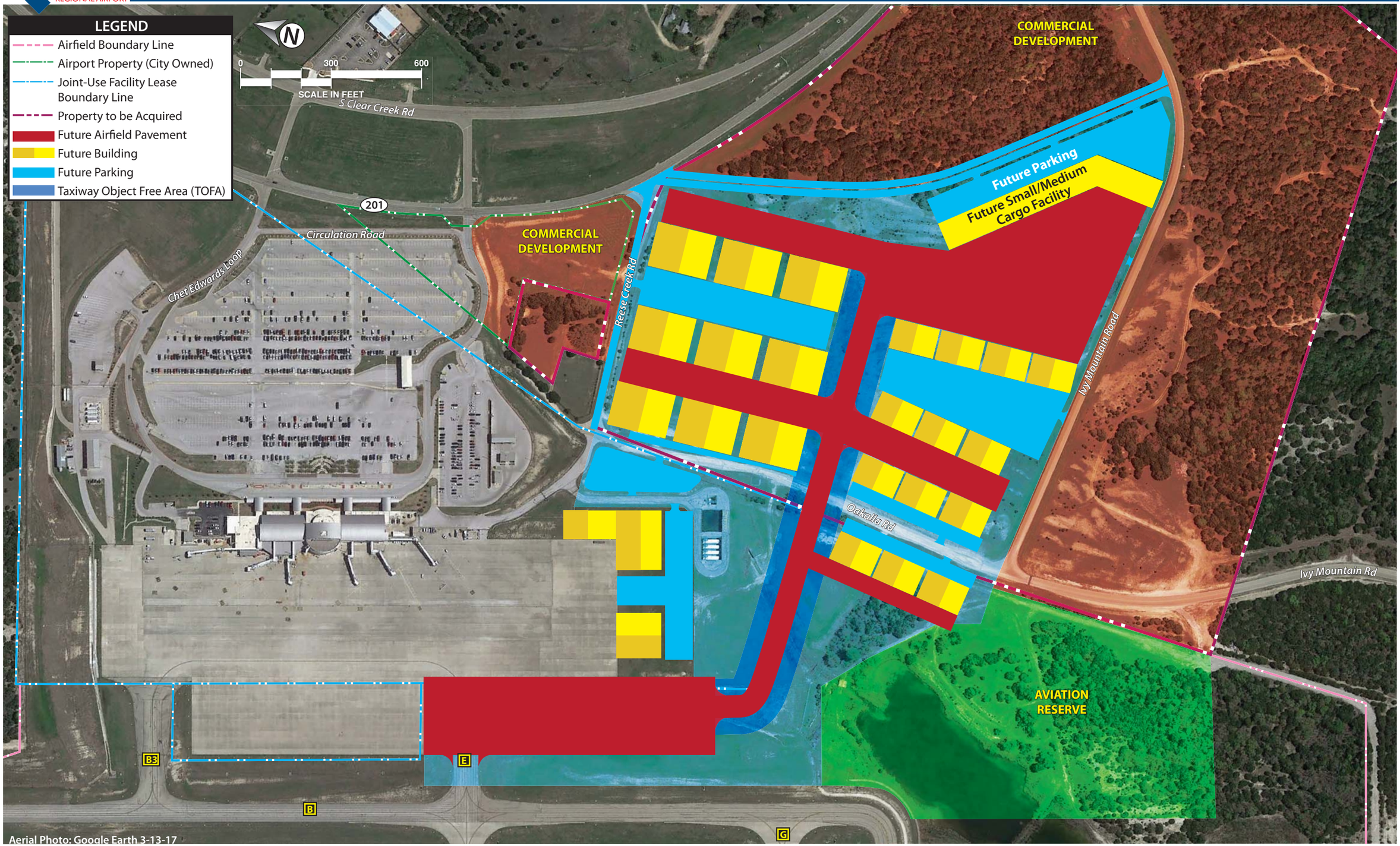

Exhibit 4Q
AVIATION DEVELOPMENT AREA ALTERNATIVE 2

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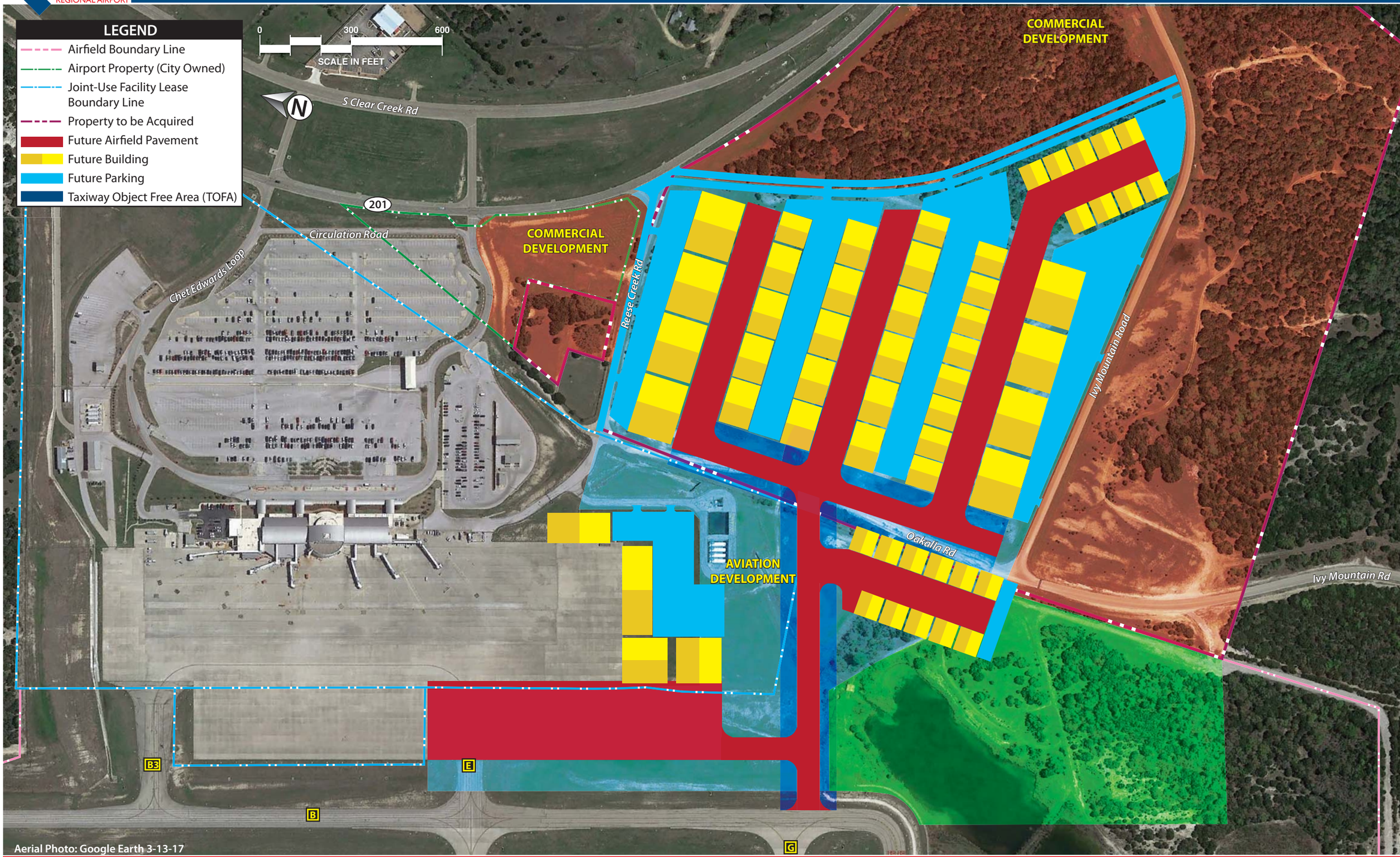

Exhibit 4R
AVIATION DEVELOPMENT AREA ALTERNATIVE 3

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Killeen-Fort Hood
REGIONAL AIRPORT

CHAPTER FIVE

RECOMMENDED DEVELOPMENT PLAN

Killeen-Fort Hood
REGIONAL AIRPORT

CHAPTER FIVE

RECOMMENDED DEVELOPMENT PLAN

Previous chapters of this Airport Master Plan have provided documentation of the existing airfield facilities; forecasted the potential aviation operations and passenger demand; determined airside, terminal, and landside facility requirements; and presented alternatives for improvements that meet the project needs. This chapter explains the recommended development concepts of each airport component for the recommended Master Plan concept for GRK.

RECOMMENDED AIRFIELD CONCEPT

The primary focus of the recommended airfield development concept is to provide for the forecasted aviation demand while maintaining the safe and secure operation of aircraft at GRK. To accomplish this, it is essential the preferred airfield development alternative meet all appropriate FAA design standards and be laid out in a manner that allows aircraft to operate safely and efficiently. Additional considerations for the preferred development concepts include feasibility, cost, constructability, and future flexibility.

Following development of the alternatives in Chapter Four, they were presented to the Master Planning Advisory Committee (MPAC), the Killeen City Council, and the public for input. After review by and collection of input from these stakeholders, the alternatives were screened by the executive committee and evaluated for their conformance to local goals and objectives and fulfillment of the determined future requirements for GRK. To meet these requirements, the recommended development plan for GRK, shown in **Exhibit 5A**, includes the runway and taxiway alternatives discussed in the previous chapter. Aspects of the preferred airfield development alternative and why it was chosen are discussed in the sections which follow.

RUNWAY PLAN

Airfield design centers around the requirements placed on an airport's runway(s). For the ultimate development of GRK, this includes improvements to the existing runway, Runway 15-33, and the proposed off-set parallel runway, Runway 15R-33L.

Existing Runway 15-33

Runway Alternative 2 was selected as the preferred runway development alternative. This alternative includes the extension of Runway 15-33 by an additional 2,000 feet to the south (Runway 33 end), bringing the total runway length to 12,000 feet. The takeoff runway available (TORA), takeoff distance available (TODA), landing distance available (LDA), and accelerate-stop distance available (ASDA) for each runway end would be 12,000 feet in this alternative. It will allow GRK to offer increased range from GRK for the larger aircraft that utilize the airfield. While this alternative does not bring the entire runway protection zone (RPZ) associated with the approach end of Runway 15 onto the designated airfield property, the property contained within the RPZ is owned by the U.S. Army.

This alternative requires the proposed relocation of Ivy Mountain Road to prevent it from penetrating the ultimate RPZ for Runway 33. Additionally, the Runway 33 MALSR system will need to be relocated to the proposed end of Runway 33, and the Runway 15 localizer, the Runway 33 glideslope antenna, and the Runway 33 PAPIs will require adjustments. Overall, this alternative allows the airport to meet its long-term facility requirements in a manner that is fiscally responsible, which is why it was selected as the preferred runway development alternative.

Proposed Parallel Runway 15R-33L

As discussed in the Alternatives Chapter, a New Runway/Extended Runway Site Feasibility Study was conducted in 2005 to explore potential locations for an additional runway. The preferred location of the runway was shown in the GRK 2008 Airport Layout Plan (ALP). The proposed runway is expected to be designated as Runway 15R-33L. It is ultimately planned to be 10,000 feet long and 200 feet wide. The inclusion of the proposed parallel runway will be maintained in this Master Plan and the ALP.

TAXIWAY PLAN

Once the ultimate runway development alternative is established, an airport's taxiway layout can be considered. The two taxiway layout alternatives discussed in Chapter 3 focused on the alignment and width of Taxiway B and the realignment of Taxiway E to prevent an aircraft from being able to taxi from the air carrier ramp directly to Runway 15-33 via Taxiway E without having to make a turn. The selected alternative for each taxiway layout is discussed in the following sections.

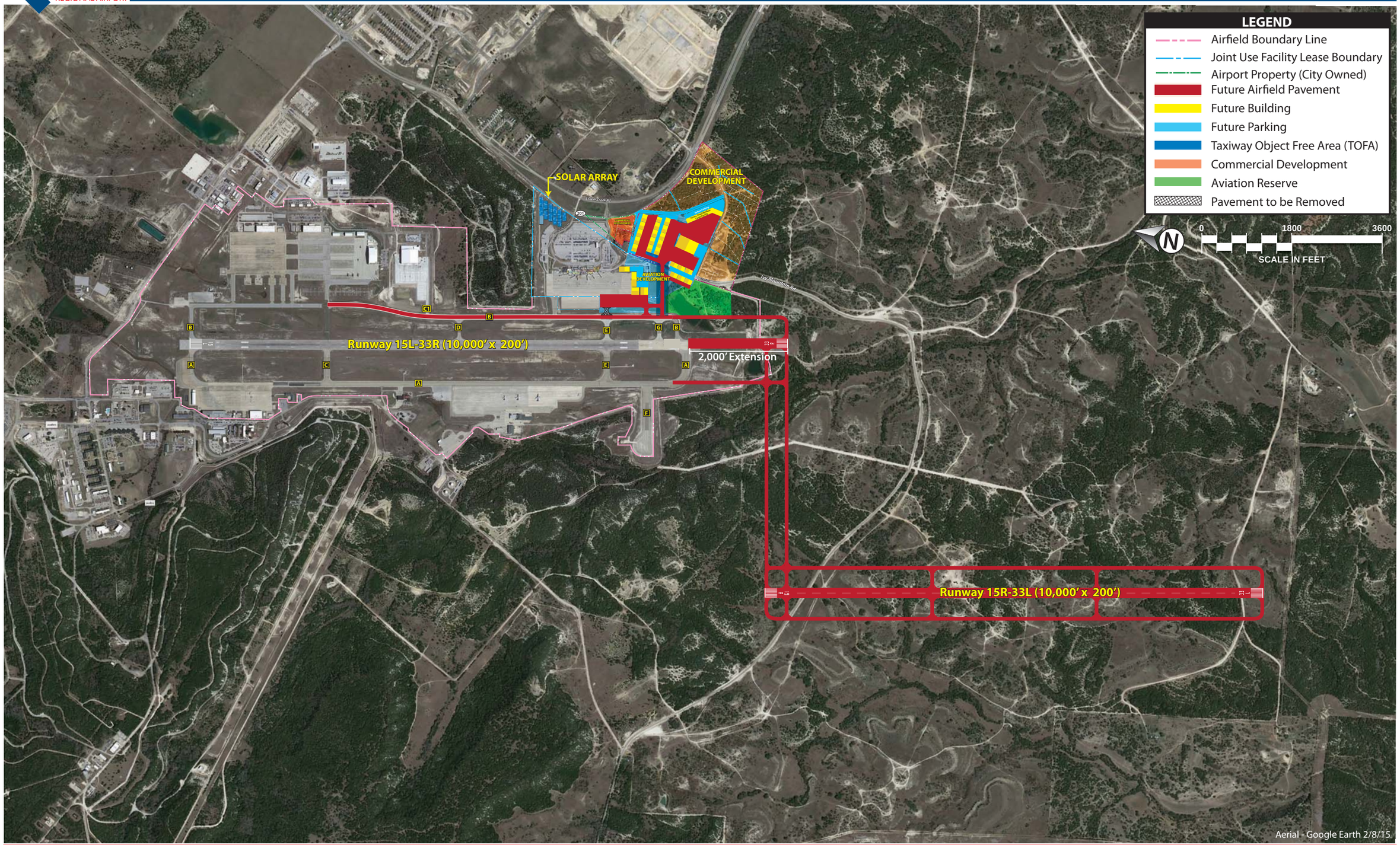

Exhibit 5A
RECOMMENDED DEVELOPMENT

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Taxiway B

Taxiway B extends the full length of Runway 15-33 and is the primary taxiway used by civil aircraft to access the runway. The spacing between Runway 15-33 and Taxiway B is not uniform. South of Taxiway D, the Taxiway B centerline is 540 feet from the Runway 15-33 centerline. North of Taxiway D, Taxiway B gradually curves farther away from Runway 15-33 before turning parallel to the runway centerline at a spacing of 775 feet. In the Alternatives chapter, two potential realignment options were analyzed that would give Taxiway B a consistent distance of separation from Runway 15-33. However, since the current spacing between Runway 15-33 and Taxiway B meets the FAA's runway to parallel taxiway separation standards, the net benefits of a realignment project are considered minor. Consequently, given the estimated cost of construction and the minor benefits of the project, both of the realignment alternatives were not selected. Taxiway B's alignment will not be changed.

As discussed previously, Taxiway B is not uniform in width for its entire length; it is 60 feet wide south of Taxiway C and 80 feet wide north of Taxiway C. Since the taxiway is not uniform in width, it is recommended Taxiway B be reconstructed to a uniform width of 75 feet with paved shoulders added to meet the FAA's current taxiway design standards.

Taxiway E

Several alternatives were considered for the realignment of Taxiway E to prevent aircraft from taxiing directly from the air carrier ramp to Runway 15-33. Alternative 2 was selected as the preferred alternative. This alternative relocates the portion of Taxiway E between Taxiway B and the air carrier ramp to a location south of its existing location and leaves the portion of Taxiway E between Runway 15-33 and Taxiway B in its current location. The portion of Taxiway E relocated will be re-designated as a new taxiway as part of a comprehensive redesignation of the GRK taxiways after completion of the project.

This realignment option resolves the direct ramp to runway access issue and allows for a more efficient utilization of the air carrier ramp by moving the ramp entrance and exit taxiways to the far ends of the ramp, providing more open ramp space between the taxiways for aircraft movement and parking. It is recommended this taxiway relocation occur in conjunction with the planned expansion of the air carrier ramp to minimize design, mobilization, and construction costs.

With this realignment, it is also recommended that consideration be given to redesignation of all taxiway on Taxiway B.

AIRFIELD EQUIPMENT PLAN

As pavement or lighting rehabilitation projects are planned, it is preferred that LED lights be used to replace any remaining existing incandescent fixtures. LED lights reduce maintenance costs and the amount of power needed to operate GRK's airfield lighting systems. Runway lights, taxiway lights, airfield signage, windsocks, PAPIs, and obstruction lights are all available using LED lights. Projects to

incorporate any additional LED upgrades will be included in the capital improvement and financial plan in Chapter 6.

COMMERCIAL PASSENGER TERMINAL PLAN

This section describes the recommended commercial terminal concept plan and supporting rationale for the final refinement of concepts, costs, and scheduling for the Airport Master Plan.

In the *Commercial Terminal Complex Alternatives* section, two alternatives were explored for the first level and five alternatives for the second level. These alternatives included a split and consolidated security checkpoint, building expansion, and building infill options. Pros and cons for each alternative were assessed and evaluated. After a detailed assessment, Level one, alternative A shown in Exhibit 4D in Chapter Four, Airport Alternatives was chosen to preserve the existing egress stair at the inbound baggage area with additional amenities in the baggage claim and reconfiguration of existing spaces.

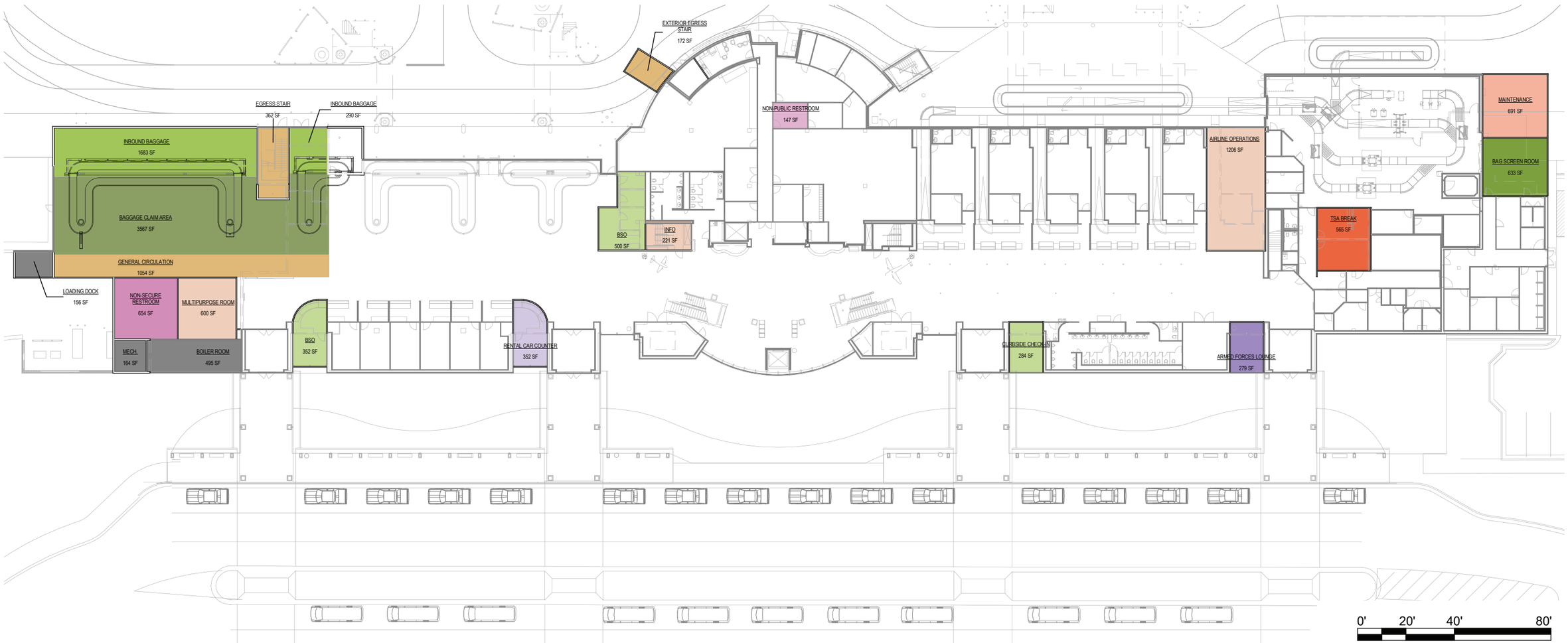
Level two, alternative 2 shown in Exhibit 4G in Chapter Four is recommended to consolidate the security checkpoint and provide a secure concessions program, additional restrooms, and enlarged holdroom seating. Henceforth, these alternatives will be labeled as Level One and Level Two. The following sections describe the rationale for the recommended levels.

The passenger terminal facilities space requirements are based on future passenger scenarios. As defined in the forecasts section, Scenario I considers changes in the regional airline fleet mix and will result in 148,200 enplanements. Scenario II considers changes to the regional airline fleet mix with the addition of a narrow body airline operation per day which will increase expected traffic to 162,500 enplanements. Scenario III builds on Scenario II and provides a second daily narrow body airline departure daily and yields 198,000 enplanements. The individual projects that comprise the overall concept will be triggered by either increased passenger demand levels, end of life of equipment, or changes in use of functional areas. These trigger points were assumed to occur in specific future years for the purpose of the financial analysis, but actual development of projects will be driven by realization of the forecasted increased activity. A summary of the forecasted activity levels that will trigger short-, intermediate-, and long-term development is shown in **Table 5A**. When each trigger point is reached for the corresponding scenario, appropriate elements of the following terminal concept will be activated.

TERMINAL CONCEPT LEVEL ONE

As depicted on **Exhibit 5B**, the south expansion of Level One will increase the size of the south baggage claim and inbound baggage claim area along with the addition of a new public non-secure restroom. A new 35-person multipurpose room will allow the Airport to provide training, stage military deployments, and address media as necessary. The existing spaces in the interior of the first level will be reconfigured to develop baggage service offices and an additional rental car counter.

- AIRLINE FUNCTIONS
- CIRCULATION - BAGGAGE CLAIM
- CIRCULATION
- CONCESSIONS
- BAGGAGE CLAIM
- INBOUND BAGGAGE
- BAG SCREEN ROOM
- BHS
- INFORMATION
- MAINTENANCE
- MECH. / ELEC. / BLDG. SYSTEMS
- RENTAL CAR COUNTERS
- RESTROOMS - NON-PUBLIC
- RESTROOMS - PUBLIC
- SECURE OTHER



Killeen - Fort Hood Regional Airport

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LEVEL 01 - RECOMMENDED TERMINAL CONCEPT

1" = 40'-0"

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The south stair from the second level will be removed to provide space for a new concession. The display cases at the central node of the Airport will remain; however, the statues will be relocated across the corridor from their current display area to relieve congestion and improve passenger flow to the central node. The north side of the terminal will expand the TSA break room and airline operations, add a new building expansion to house maintenance, and extend the baggage screening room for an additional EDS machine. Expansion of the first level responds to the facility requirements for increased baggage screening times and additional flights added that increase enplanements to greater than 196,000.

TABLE 5A
Planning Horizon Activity Levels
Killeen-Fort Hood Regional Airport

		PLANNING HORIZONS		
	Base Year	Short Term	Intermediate Term	Long Term
PASSENGER ENPLANEMENTS				
Civilian Airline Passenger Enplanements				
Regularly Scheduled	135,345	147,000	161,000	196,000
Charter	663	1,200	1,500	2,000
Total Civilian Enplanements	136,008	148,200	162,500	198,000
Military Charter Enplanements	32,182	29,000	29,000	29,000
Total Airport Enplanements	168,190	177,200	191,500	227,000
AIRCRAFT OPERATIONS				
Itinerant Operations				
Commercial Passenger Airline				
Air Carrier (60 seats or more)	2,644	4,414	5,508	6,568
Air Taxi (Less than 60 seats)	4,842	2,206	906	0
Total Airline	7,486	6,620	6,414	6,568
Other Air Taxi	2,264	2,300	2,500	3,000
General Aviation	2,270	2,670	3,140	4,345
Military	21,881	23,700	23,700	23,700
Total Itinerant Operations	33,901	35,290	35,754	37,613
Local Operations				
General Aviation	0	0	0	0
Military	34,500	30,800	30,800	30,800
Total Local Operations	34,500	30,800	30,800	30,800
Total Airport Operations	**68,401**	**66,090**	**66,554**	**68,413**
BASED GENERAL AVIATION AIRCRAFT				
Turboprop	0	2	3	6
Turbojet	0	0	1	4
Total Based Aircraft	**0**	**2**	**4**	**10**

TERMINAL CONCEPT LEVEL TWO

Exhibit 5C illustrates the proposed Level Two concept. As proposed, improvements on Level Two heightens the passenger experience by expanding the west holdroom at Gates 2-4 to allow for widened secure circulation, connectivity to both the north and south sides of the terminal, and increased visibility of the apron as well as meeting the projected Scenario 3 requirements for increased security and secure

circulation. The consolidated security checkpoint with two high efficiency lanes provides higher passenger output and increased efficiency of security operations.

The concessions program includes secure and nonsecure concessions with open seating. The large nonsecure concession is configured to have access to both landside and airside. This configuration allows for one vendor to increase the potential amount of traffic to be served. The nonsecure concession remains in the central node for families to wait prior to departure of loved ones. The design of the nonsecure concession will maintain visibility of the apron level. All restrooms on Level Two are expanded. Support function rooms have increased to accommodate building systems, maintenance areas, and storage.

LANDSIDE DEVELOPMENT PLAN

The primary goal of landside facility planning is to provide adequate space for existing and forecast aviation users, while maximizing operational efficiencies and land uses. Achieving this goal yields a development scheme which segregates aircraft activity levels while maximizing the Airport's revenue potential. The Killeen-Fort Hood Regional Airport is a civilian facility located on a much larger military installation, Robert Gray Army Airfield. The GRK current property extents offer limited expansion opportunities for future commercial airline and general aviation users.

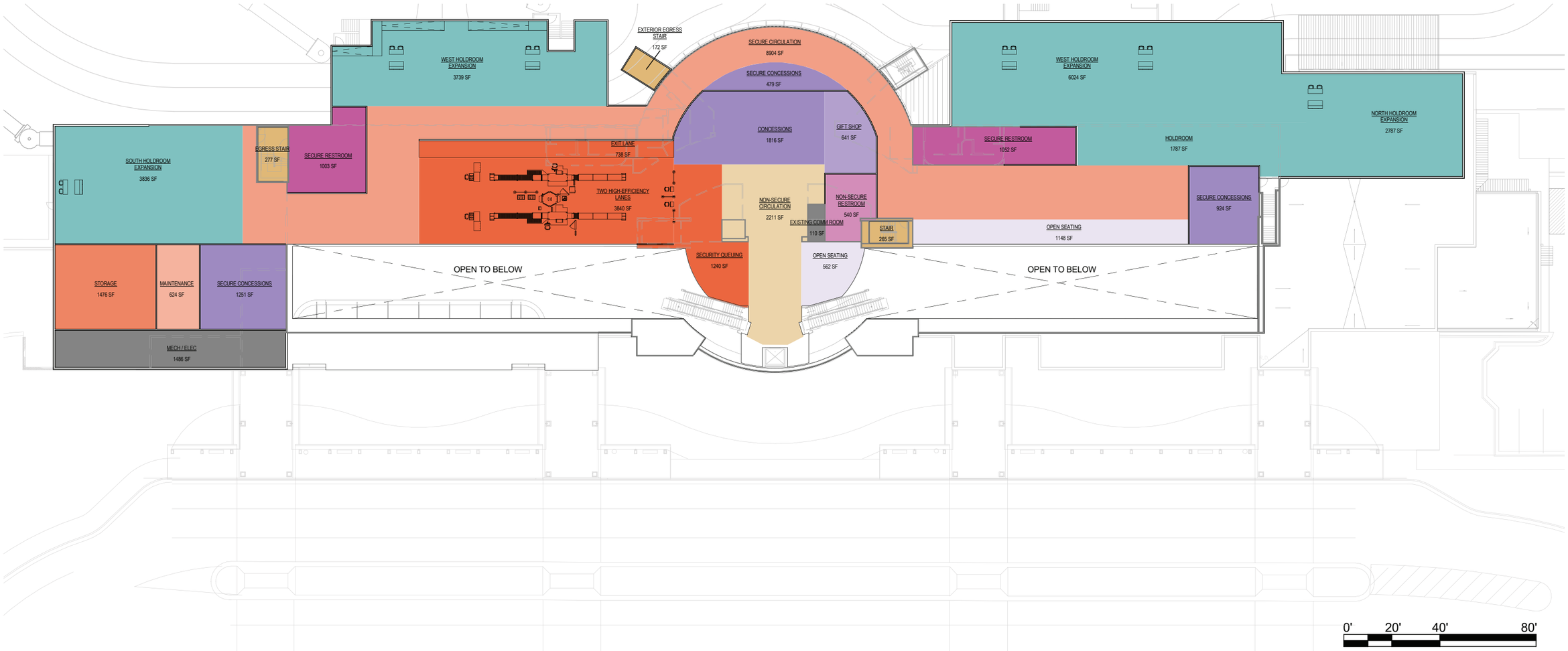
Under current lease and ownership boundaries, the Airport's only expansion opportunities exist in the southern apron area and in two areas along State Highway 201/Clear Creek Road. Expansion of the terminal could include an additional gate position or two; moving south, the existing ramp could also support general aviation hangar facilities. These concepts were presented in Chapter Four.

The current joint-use lease and City ownership boundaries present a rigid and finite limitation for both future aviation expansion and future revenue growth opportunities. Revenue diversity is crucial for all airports to limit or remove any local funding support requirements. As such, the goal of this plan is to offer additional revenue enhancement opportunities. This can be achieved through the acquisition of additional property to foster aviation and non-aviation development opportunities. **Exhibit 5D** presents the recommended development plan land acquisition. As depicted, the proposed land acquisition would include approximately 160 acres immediately south of the current leasehold boundary fronting State Highway 201 and extending just beyond Ivy Mountain Road. The land acquisition plan would be achieved in three parts:

1. Land Evaluation
2. Phase I Development
3. Phase II Development

The first part would include land evaluation. Acquiring land will include all associated legalities and real estate measures; however, the most important item would be a targeted acquisition plan. The plan will need to outline the most advantageous means of acquiring the proposed 160 acres as well as a financial pro forma to outline projected revenues from acquisition. While the simplest means of acquiring the property would be capital outlay, or fee simple acquisition via financial transaction, the Army will require

- CIRCULATION
- CIRCULATION - GENERAL
- CONCESSIONS
- CONCESSIONS (NEWS / GIFTS / SUNDRY)
- CONCESSIONS - OPEN SEATING
- DEPARTURES LOUNGES (HOLDROOMS)
- MAINTENANCE
- MECH. / ELEC. / BLDG. SYSTEMS
- RESTROOMS - PUBLIC
- RESTROOMS - SECURE PUBLIC
- SECURITY
- STORAGE
- SECURE CIRCULATION



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LEVEL 02 - RECOMMENDED TERMINAL CONCEPT

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Exhibit 5C
LEVEL TWO RECOMMENDED TERMINAL CONCEPT

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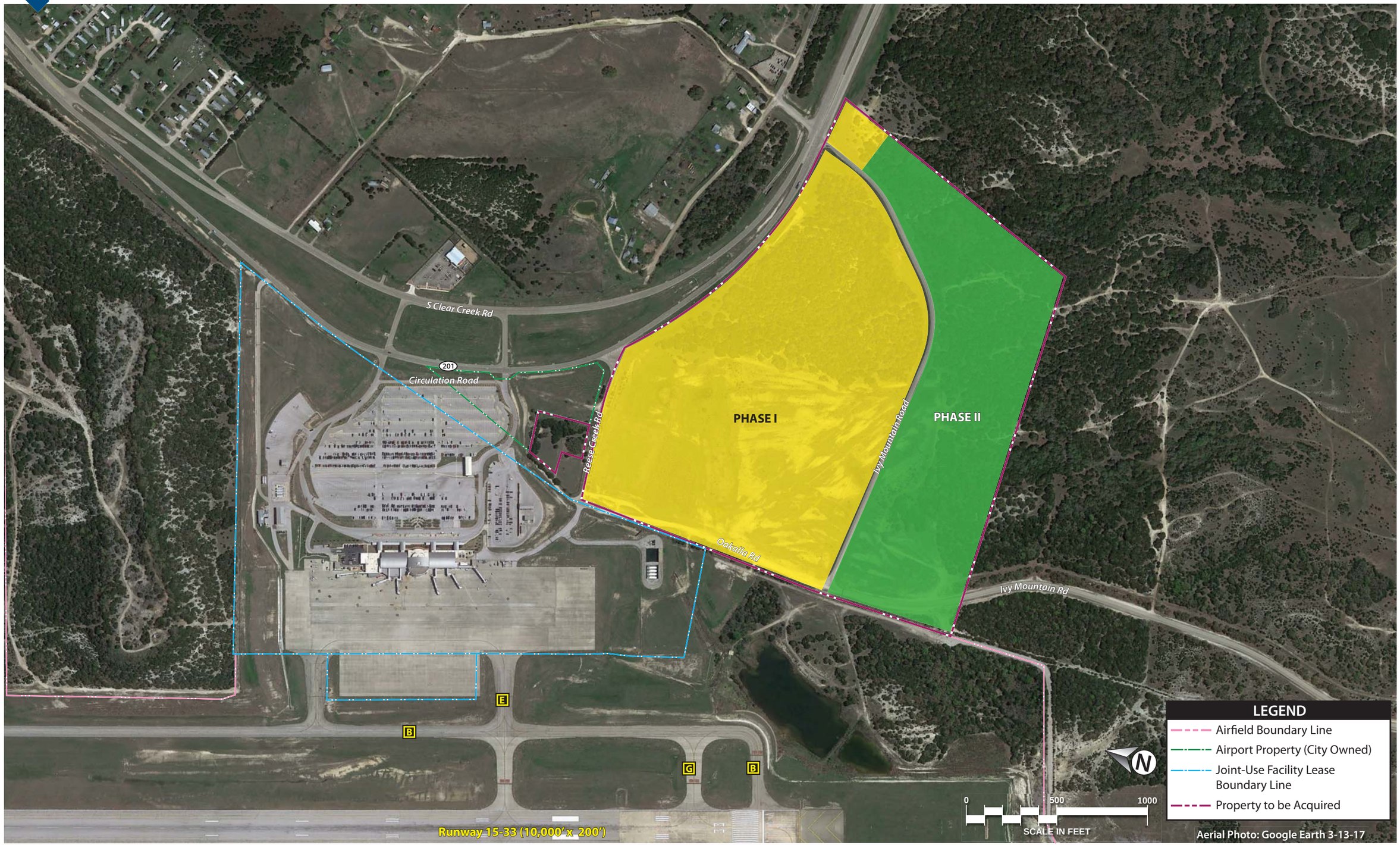

Exhibit 5D
PROPERTY ACQUISITION STAGING

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a land swap between the owner (Fort Hood) and the City. The military may have the need for property in and around its operating areas not currently within its boundaries to better support training and operating functions. As such, the plan proposes a land swap be explored, and if not possible, other financial methods then be considered.

Phases I and II of the plan indicate timing of land development. As depicted on **Exhibit 5D**, Phase I (in yellow) would be land first developed. The largest portion of the Phase I property would be utilized for aviation purposes with the remainder for non-aviation property development. Phase II development, located along and south of Ivy Mountain Road, would be developed later as opportunities present.

Exhibit 5E presents a more specific plan for developing the proposed 160-acre land acquisition. Also shown is the proposed development of general aviation facilities along the southern portion of the existing ramp. As depicted, the southern ramp could support the development of four large conventional hangars and associated support facilities (roads and parking lots). The south apron plan includes expansion of the terminal apron to the west and south in order to offer greater ramp depth and circulation spaces. The taxiway plan will eventually allow for a taxiway to extend east into the proposed Phase I development area. As planned, the taxiway would be designed for airplane design group (ADG) IV aircraft. The area could support all sized general aviation aircraft as well as larger commercial aircraft if air cargo or for maintenance, repair, and overhaul (MRO) operations. As proposed, the plan is highly flexible, allowing the City and aviation staff to attract all aviation segments as a means to bolster future revenue streams.

The remainder of land in the Phase I development area would be ideal to support non-aviation uses. **Exhibit 5E** presents a simplified parcel outline which would allow for commercial operations along State Highway 201 including restaurants, hotels, convenience store gas stations, strip mall, etc. The plan includes renewable energy options with a solar array bound by State Highway 201 and Chet Edwards Loop Road. The Phase II property could be developed for a light industrial/commercial business park.

ENVIRONMENTAL OVERVIEW

Analysis of the potential environmental impacts of recommended airport development projects is a key component of the Master Plan. This Environmental Overview will identify significance thresholds for the various resource categories contained in FAA Order 1050.1F, *Environmental Impacts: Policies and Procedures*, Exhibit 4-1 and FAA Order 5050.4B, *National Environmental Policy Act* (NEPA) *Implementation Instructions for Airport Actions*, Table 7.1 and then evaluate the development concept to determine whether the proposed actions could individually or collectively significantly affect the quality of the environment.

The construction of any improvements depicted on the recommended development concept plan would require compliance with NEPA to receive federal financial assistance or to obtain a federal approval (i.e., a federal action). For projects not "categorically excluded" under FAA Order 1050.1F, compliance with NEPA is generally satisfied through the preparation of an Environmental Assessment (EA). An EA is prepared when the initial review of the proposed action indicates that it is not categorically excluded,

involves at least one extraordinary circumstance, or the action is not one known normally to require an Environmental Impact Statement (EIS). If none of the potential impacts are likely to be significant, then the responsible FAA official prepares a Finding of No Significant Impact (FONSI), which briefly presents, in writing, the reasons why an action, not otherwise categorically excluded, would not have a significant impact on the environment and the approving official may approve it. Issuance of a FONSI signifies that FAA would not prepare an EIS and has completed the NEPA process for the proposed action.

In instances where significant environmental impacts are expected, an EIS may be required. An EIS is a clear, concise, and appropriately detailed document that provides agency decision-makers and the public with a full and fair discussion of significant environmental impacts of the proposed action and reasonable alternatives and implements the requirement in NEPA §102(2)(C) for a detailed written statement.

NEPA ANALYSIS OF PREFERRED DEVELOPMENT CONCEPT

Analysis under NEPA includes direct, indirect, and cumulative impacts. Direct impacts are those caused by the actions that occur at the same time and place (see 40 CFR § 1508.8[a]). Examples of direct impacts include:

- Construction of a facility or runway in a wetland which results in the loss of a portion of the wetland; or
- Noise generated by the proposed action or alternative(s) which adversely affects noise-sensitive land uses.

Indirect impacts are those impacts caused by the action and are later in time or farther removed in distance but are still reasonably foreseeable (see 40 Code of Federal Regulations [CFR] § 1508.8(b)). Indirect impacts may include growth-inducing impacts and other effects related to induced changes in the pattern of land use, population density or growth rate, and related impacts on air and water and other natural systems, including ecosystems (see 40 CFR § 1508.8[b]). Cumulative impacts are those that take into consideration the environmental impact of past, present, and future actions.

The NEPA analysis of the various resource categories for this Environmental Overview focus only on areas of the airport that are used for civilian purposes. This includes the 150-acre area that presently comprises the commercial terminal building, parking areas, hangars, as well as Runway 15-33 and its associated taxiways. The Master Plan preferred development concept depicts several updates to the airport, including additional hangars/buildings, airfield pavement, parking areas, and commercial development. A 2,000-foot extension to Runway 15L-33R is included in the Master Plan concept. This extension would extend beyond the airfield boundary line depicted on **Exhibit 5F**. While the extension is not contained within the airfield boundary line, it is still on military-owned and operated land. Therefore, land acquisition will not be necessary. The Master Plan concept also shows a potential parallel runway (Runway 15R-33L) and taxiway connection to Runway end 15; however, this improvement will not be considered in this Environmental Overview as it would not be used for civilian purposes. The proposed parallel runway, if developed, would be funded by the military, would be for military use primarily, and would not occur until much further in the future. Additionally, this parallel runway and associated

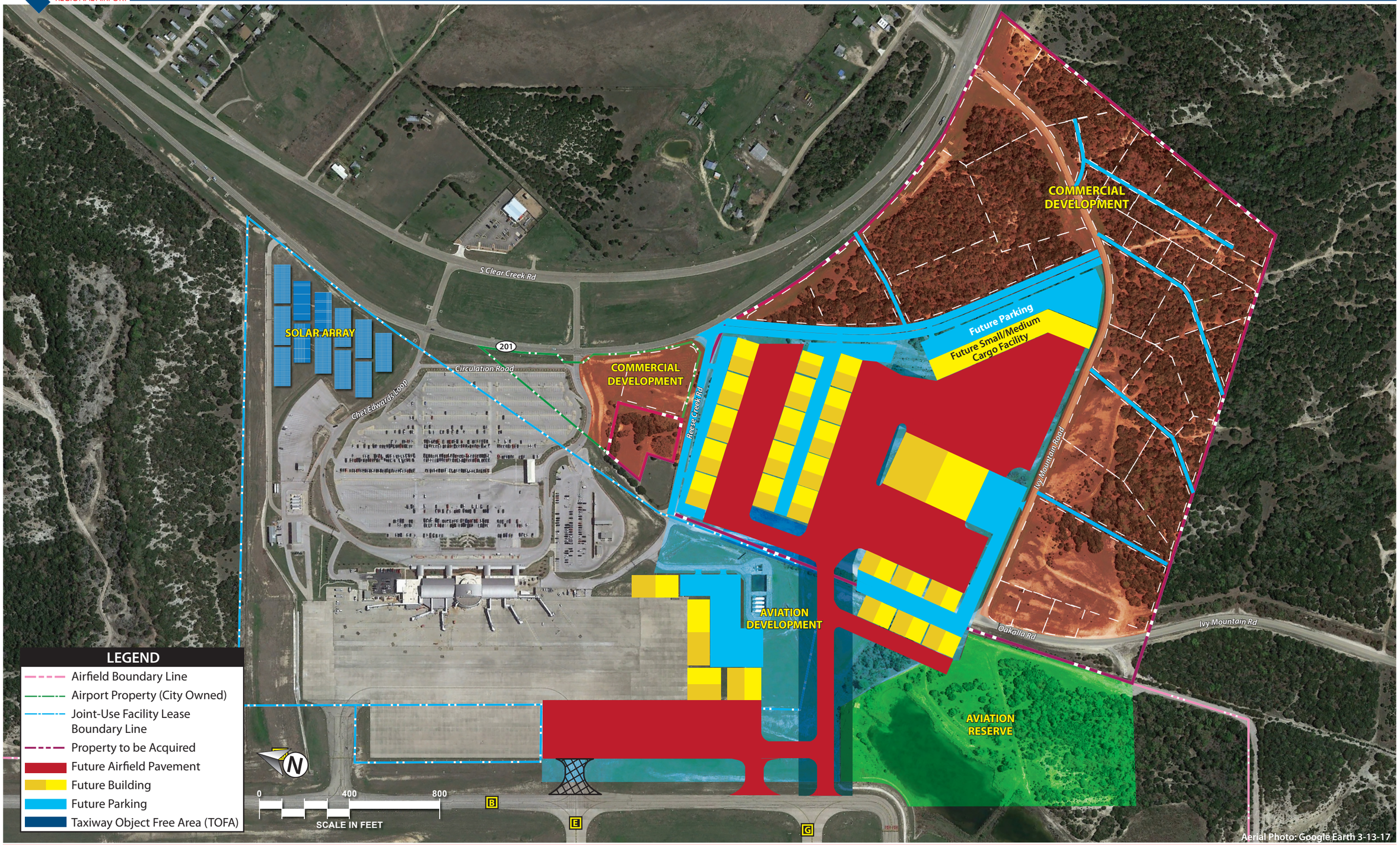

Exhibit 5E
AVIATION DEVELOPMENT AREA

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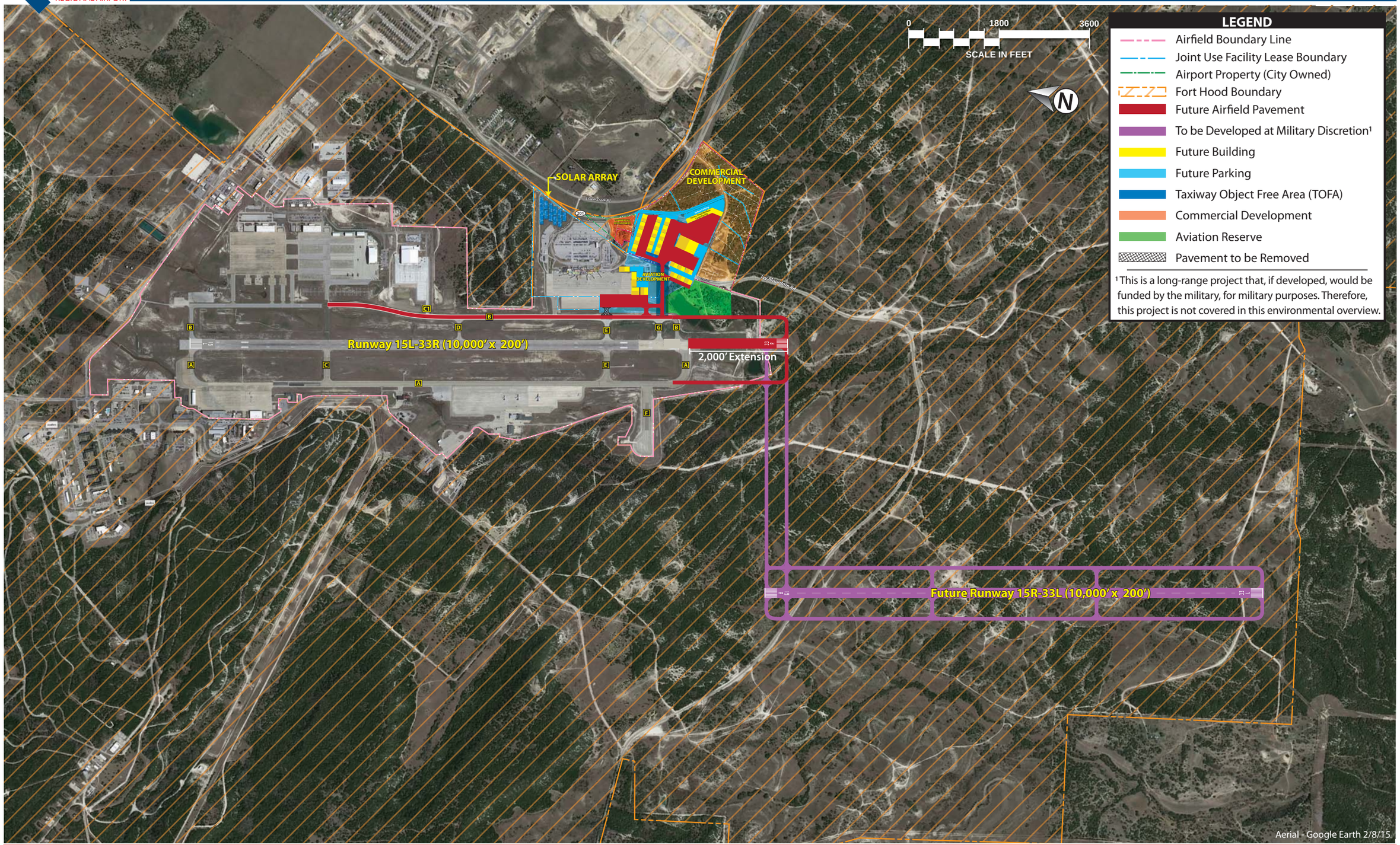

Exhibit 5F
FORT HOOD BOUNDARY

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taxiway has had an EA performed for its construction (2010). Thus, the Environmental Overview will focus on all components of the Master Plan concept, except for the proposed parallel runway and associated taxiway connection. **Exhibit 5F** illustrates Fort Hood-owned land, as well as the projects covered by this Environmental Overview.

Following is an analysis of each NEPA environmental resource category. At the beginning of each category, a definition is given of the threshold of significance for that resource category which would require additional environmental analysis. Then the preferred development concept is discussed in relation to that threshold to determine if the resource category is likely to be significantly impacted by development of the preferred Master Plan concept.

AIR QUALITY

Threshold of Significance Definition: *The action would cause pollutant concentrations to exceed one or more of the National Ambient Air Quality Standards (NAAQS), as established by the United States (U.S.) Environmental Protection Agency (EPA) under the Clean Air Act, for any of the time periods analyzed, or to increase the frequency or severity of any such existing violations*.

Preferred Development Alternative Evaluation: Although the projected increase in operations over the 20-year planning horizon of the Master Plan would result in additional emissions, Bell County, where the Airport is located, is in attainment for all federally regulated criteria pollutants.[1] Thus, general conformity review per the *Clean Air Act* is not required. According to the most recent FAA *Aviation Emissions and Air Quality Handbook* (2015), an emissions inventory under NEPA may be necessary for any proposed action that would result in a reasonable, foreseeable increase in emissions due to its implementation. For construction emissions, a qualitative or quantitative emissions inventory under NEPA may be required, depending on the type of environmental review required for the project.

BIOLOGICAL RESOURCES

Threshold of Significance Definition: *The U.S. Fish and Wildlife Service (USFWS) or the National Marine Fisheries Service (NMFS) determines that the action would be likely to jeopardize the continued existence of a federally listed threatened or endangered species or would result in the destruction or adverse modification of federally designated critical habitat*.

Preferred Development Alternative Evaluation: FAA has not established a significance threshold for non-listed species. However, factors to consider are if an action would have the potential for:

- Long-term or permanent loss of unlisted plant or wildlife species;
- Adverse impacts to special status species or their habitats;

[1] U.S. EPA 2018. *Texas Nonattainment/Maintenance Status for Each County by Year for All Criteria Pollutants*, June 30. Available at: https://www3.epa.gov/airquality/greenbook/anayo_tx.html.

- Substantial loss, reduction, degradation, disturbance, or fragmentation of native species' habitats or their populations; or
- Adverse impacts on a species' reproductive rates, non-natural mortality, or ability to sustain the minimum population levels required for population maintenance.

The Texas Ecosystem Mapper indicates a variety of habitats around the Airport, including: savanna grassland, ashe juniper-live oak shrubland, mesquite shrubland, shin oak shrubland, ashe juniper motte and woodland, deciduous oak-evergreen motte woodland, oak-ashe juniper slope forest, and oak-hardwood motte and woodland. There are also barren lands around the Airport, as well as varying intensities of urban use (i.e., high and low). There is no designated critical habitat located on or near airport property.

There are six species protected by the *Endangered Species Act* with the potential to be affected by airport projects. **Table 5B** summarizes these species, their habitat preferences, and their potential to occur based on the habitat present on and around the Airport. It is possible that some of these federally protected species are existing near the Airport given the juniper and oak tree species that are present, as well as the wetland/marsh conditions along Reese Creek and in the woods on the west side of the Airport. Presence of any of the species listed in **Table 5B** with potential to occur on or near Airport property should be evaluated prior to any development to ensure no harm to these protected species occur. Section 7 consultation with the USFWS under the *Endangered Species Act* may be required.

TABLE 5B
Protected Species Status, Habitat, and Potential to Occur
Killeen-Fort Hood Regional Airport

Species Name	Status	Habitat Preference	Potential to Occur
Birds			
Golden-cheeked warbler	Endangered	Junipers, oaks; streamside trees	Possible
Least tern	Endangered	Sea beaches, bays, large rivers, salt flats; rivers with exposed sandbars, lakes with salt flats nearby	Unlikely
Piping plover	Threatened	Sandy beaches, tidal flats; sandbars along major rivers; gravel or sand flats near alkali lakes	Unlikely
Red knot	Threatened	Tidal flats, shores; open sandy beaches; high and barren lands inland from coast, near a pond or stream	Unlikely
Whooping crane	Endangered	Muskeg (swamp-like); prairie pools, marshes; remote northern forest with muskeg (swampy coniferous woods)	Unlikely
Amphibian			
Salado salamander	Threatened	Strictly aquatic; found only in two springs in Bell County	Unlikely

Sources:
USFWS 2018 (https://ecos.fws.gov/ipac/)
Audubon Bird Guide 2018 (https://www.audubon.org/bird-guide)
Herps of Texas 2018 (http://www.herpsoftexas.org/content/salado-salamander)

Non-listed species of concern include those protected by the *Migratory Birds Treaty Act* and the *Bald and Golden Eagle Protection Act*. There are large concentrations of trees and some water bodies near the Airport that could provide roosting and/or foraging habitat for migratory birds protected under these acts. Conducting bird surveys prior to development may be required to identify mitigation for potential harm to nests and/or ground-dwelling birds.

CLIMATE

The FAA has not established a significance threshold for Climate. Refer to FAA Order 1050.1F's, *Desk Reference*, and/or the most recent FAA *Aviation Emissions and Air Quality Handbook* for the most up-to-date methodology for examining impacts associated with climate change.

Preferred Development Alternative Evaluation: An increase in greenhouse gases (GHG) would occur over the 20-year planning horizon of the Master Plan based on the projected increase in operations. Project-specific analysis may be required per FAA Order 1050.1F, *Desk Reference*, based on the parameters of individual airport projects.

COASTAL RESOURCES

FAA has not established a significance threshold for Coastal Resources.

This threshold is not applicable to the Airport as the closest coastal resource is over 200 miles to the south.

DEPARTMENT OF TRANSPORTATION (DOT) ACT: SECTION 4(f)

Threshold of Significance Definition*: The action involves more than a minimal physical use of a Section 4(f) resource or constitutes a "constructive use" based on an FAA determination that the aviation project would substantially impair the Section 4(f) resource. Resources that are protected by Section 4(f) are publicly owned land from a public park, recreation area, or wildlife and waterfowl refuge of national, state, or local significance; and publicly or privately-owned land from an historic site of national, state, or local significance. Substantial impairment occurs when the activities, features, or attributes of the resource that contribute to its significance or enjoyment are substantially diminished.*

Preferred Development Alternative Evaluation: There are no historic properties, recreation areas, wildlife refuges, or wilderness areas within five miles of the Airport. The closest public park is Clear Creek Park, located approximately three miles north of the Airport. No Section 4(f) resources would be impacted by proposed development.

FARMLANDS

Threshold of Significance Definition: *The total combined score on Form AD-1006, Farmland Conversion Impact Rating, ranges between 200 and 260. Form AD-1006 is used by the U.S. Department of Agriculture (USDA), Natural Resources Conservation Service (NRCS) to assess impacts under the Farmland Protection Policy Act (FPPA).*

Preferred Development Alternative Evaluation: Based on the USDA NRCS Web Soil Survey, portions of the military reservation property are considered farmland of statewide importance. Airport property contains no soils considered unique or prime farmland. Development proposed would likely not be subject to regulation under the FPPA as this is an active airport that is previously developed and considered to be an urban land use. In addition, development shown outside of airport property limits is in land owned by Fort Hood. Therefore, it is unlikely that coordination with NRCS would be necessary since all development is proposed within existing airport property limits.

HAZARDOUS MATERIALS, SOLID WASTE, AND POLLUTION PREVENTION

FAA has not established a significance threshold for Hazardous Materials, Solid Waste, and Pollution Prevention. However, factors to be considered are if an action would have the potential to:

- Violate applicable federal, state, tribal, or local laws or regulations regarding hazardous materials and/or solid waste management;
- Involve a contaminated site;
- Produce an appreciably different quantity or type of hazardous waste;
- Generate an appreciably different quantity or type of solid waste or use a different method of collection or disposal and/or would exceed local capacity; or
- Adversely affect human health and the environment.

Preferred Development Alternative Evaluation: According to the U.S. EPA's Environmental Justice Screening (EJSCREEN) and Mapping Tool (Version 2017), there are no Superfund[2] sites or brownfields[3] within five miles of the Airport. The recommended development concept does not anticipate land uses that would produce an appreciably different quantity or type of hazardous waste. However, should this type of land use be proposed, further NEPA review and/or permitting may be required. In addition to hazardous waste, construction and demolition waste would be generated because of development proposed in the Master Plan concept. Construction and demolition waste, along with all other types of non-

[2] A **brownfield** is a property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutants, or contaminant (U.S. EPA).
[3] A **Superfund** site is any land in the U.S. that has been contaminated by hazardous waste and identified by the EPA as a candidate for cleanup as it poses a human health risk and/or the environment (U.S. Department of Health and Human Services).

hazardous solid waste, would be hauled to the City of Temple Landfill,[4] located approximately 30 miles east of the Airport.[5]

HISTORICAL, ARCHITECTURAL, ARCHAEOLOGICAL, AND CULTURAL RESOURCES

The FAA has not established a significance threshold for Historical, Architectural, Archaeological, and Cultural Resources. Factors to consider are if an action would result in a finding of "adverse effect" through the Section 106 process. However, an adverse effect finding does not automatically trigger preparation of an EIS (i.e., a significant impact).

Preferred Development Alternative Evaluation: As mentioned previously, there are no sites listed on the National Register of Historic Places (NRHP) within five miles of the Airport. Proposed construction would not impact any known historical resources; however, there are areas of proposed development at the Airport that are previously undisturbed and could contain cultural resources. Specifically, areas reserved for future commercial development are currently undeveloped, forested areas. If these undisturbed areas of the Airport should be subject to ground disturbance, a cultural resources survey may be necessary to determine the potential presence of historic artifacts.

There are no tribal lands that would be impacted by construction as the closest such area is over 70 miles southeast of the Airport.

LAND USE

FAA has not established a significance threshold for Land Use. There are also no specific independent factors to consider. The determination that significant impacts exist is normally dependent on the significance of other impacts.

Preferred Development Alternative Evaluation: The Airport is in a primarily rural area on the southwestern side of the City of Killeen (see Exhibit 1K in Chapter One). Land surrounding the Airport is within two jurisdictions: Killeen and Fort Hood. A large majority of existing land use adjacent to the north, west, and south of the Airport is owned by Fort Hood. The areas owned by Fort Hood are unpopulated, vacant, open space. The Airport is zoned as rural; however, immediately to the east, land use is primarily zoned as suburban commercial and suburban residential, where both these land use types occur.

The Master Plan concept only proposed development within existing airport property or land owned by Fort Hood and there are no areas planned for acquisition. The commercial development area proposed at the Airport is approximately one-half mile west of a residential development and approximately one-

[4] The City of Temple Landfill is a Type 1 municipal solid waste landfill, meaning it is a facility that can accept all types of municipal solid waste, including putrescible waste (waste that can cause foul odors when decomposing), household waste, construction and demolition waste, household hazardous waste, special waste, and some industrial wastes (Texas Commission on Environmental Quality 2018).
[5] TCEQ, Active Municipal Solid Waste Landfills in Texas, https://www.tceq.texas.gov/assets/public/permitting/waste/msw/msw-landfills-active.pdf (accessed July 3, 2018).

quarter mile west of single-family residences along Reese Creek Road; however, these residential areas are separated from the airport by Texas State Highway 201/South Clear Creek Road, providing a barrier between the residences and Airport. There would be no impacts to the surrounding community due to the implementation of the proposed Master Plan concept.

NATURAL RESOURCES AND ENERGY SUPPLY

FAA has not established a significance threshold for Natural Resources and Energy Supply. However, factors to consider are if an action would have the potential to cause demand to exceed available or future supplies of these resources.

Preferred Development Alternative Evaluation: Planned development projects at the Airport could increase demands on energy utilities, water supplies and treatment, and other natural resources during construction and through the long-term planning period. Specifically, the additional buildings and hangars, as well as commercial development area and future aviation reserve area would demand resources greater than what the Airport currently requires. However, there are several solar energy projects under design which will offset future airport energy costs. The energy production capabilities of these systems are not currently known; however, once implemented, the solar solutions will provide the Airport with additional energy, potentially offsetting the energy demand associated with the Master Plan concept.

Additionally, the Airport is transitioning older existing facility lighting to LED to further reduce the energy footprint while increasing security and safety for its customers.

NOISE AND NOISE-COMPATIBLE LAND USE

Threshold of Significance Definition: *The action would increase noise by Day-Night Average Sound Level (DNL) 1.5 decibel (dB) or more for a noise-sensitive area that is exposed to noise at or above the DNL 65 dB noise exposure level, or that will be exposed at or above the DNL 65 dB level due to a DNL 1.5 dB or greater increase, when compared to the no action alternative for the same timeframe*.

A factor to consider is that special consideration needs to be given to the evaluation of the significance of noise impacts on noise-sensitive areas within Section 4(f) properties where the land use compatibility guidelines in Title 14 CFR Part 150 are not relevant to the value, significance, and enjoyment of the area in question.

Preferred Development Alternative Evaluation: Noise contours were not mapped as part of this Airport Master Plan. Therefore, discussions of noise impacts will focus on nearby noise-sensitive land uses and the potential impact of the proposed development concept on the noise emissions from the Airport. Existing and future noise contours from the 2010 EA that were analyzed at the Airport for the proposed parallel runway are shown on **Exhibits 5G** (existing) and **5H** (future). These are the most recent noise contours that have been generated for the Airport, and, therefore, are used for the analysis in this Environmental Overview.

As previously discussed in the Land Use section, the closest noise-sensitive uses to the proposed development area are single-family residences one-quarter mile east of the Airport along Reese Creek Road. Dr. Joseph A. Fowler Elementary School is the closest educational facility, which is approximately one mile to the east. The nearest religious institution, West Side Church of Christ, is greater than two miles to the east.

The Master Plan concept depicts a 2,000-foot extension to Runway 15L-33R. This extension would extend to the south into vacant, undeveloped land. Other development includes areas reserved for commercial and aviation uses, a potential cargo facility, parking, roads, and buildings/hangars. These features would not cause a significant shift in the noise environment as it currently exists. Further, Fort Hood's ownership of land to the north, west, and south of the Airport ensures incompatible uses would not be developed (i.e., noise-sensitive uses).

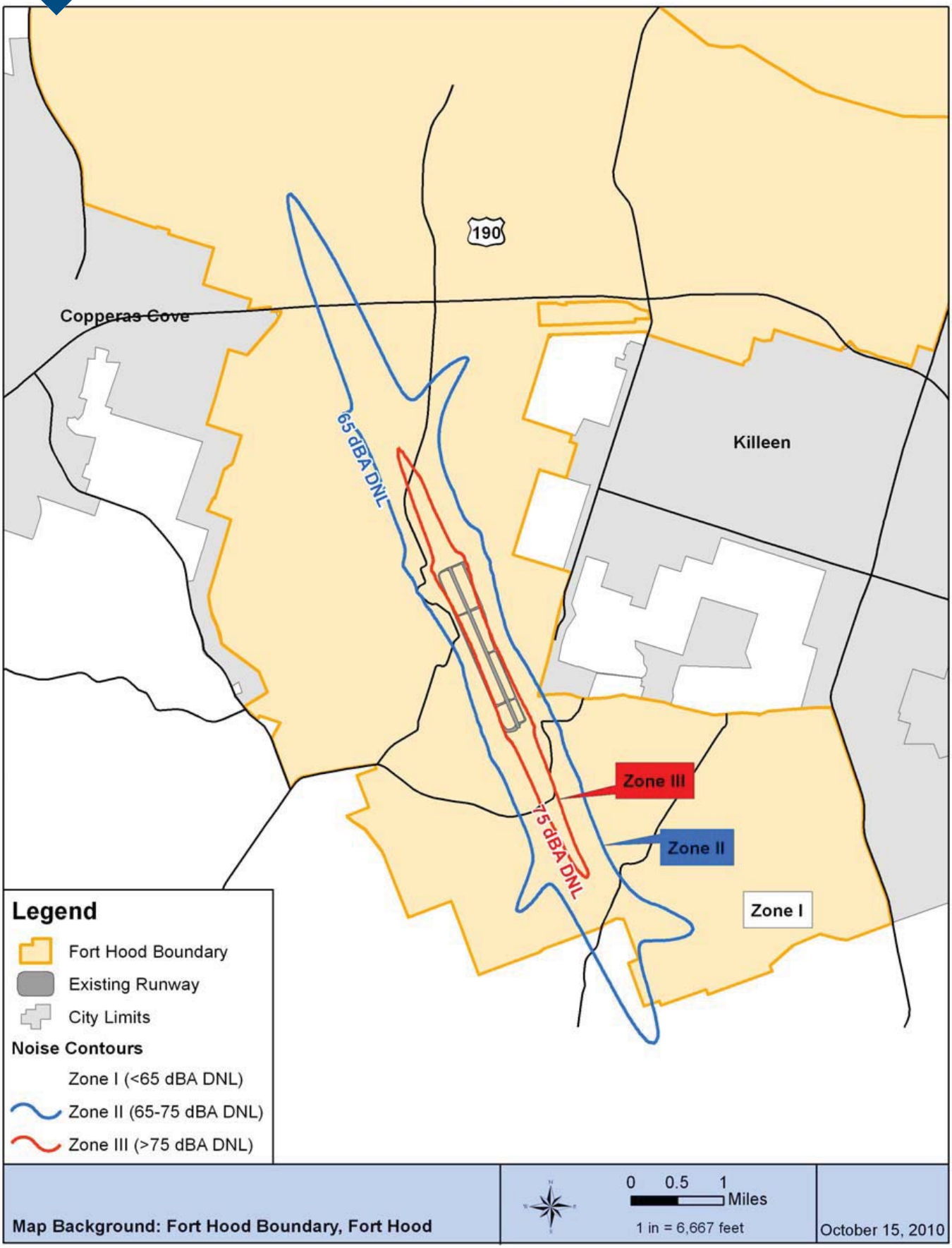
In the existing noise condition (**Exhibit 5G**), the 65-75 DNL noise contour remains almost entirely within Fort-Hood owned land. To the south, this contour extends onto non-military land that is vacant and undeveloped open space. In the future condition (**Exhibit 5H**), the parallel runway is considered. The contours for Runway 15L-33R are similar to the existing condition. Although the exhibit shows the contours for Runway 15L-33R encompassing some residential land, this area is actually undeveloped and vacant. The contours for the proposed Runway 15R-33L remain within Fort Hood-owned land to the north. To the south, the 65-75 DNL noise contour encompasses the Parrie Haynes Ranch, as well as agricultural lands, undeveloped land, and some single-family homes. As previously stated, the proposed parallel runway is not being considered as part of this Environmental Overview, and potential noise impacts related to its construction would be analyzed in the future by Fort Hood. For any future development projects, an updated noise analysis would be necessary.

SOCIOECONOMIC IMPACTS, ENVIRONMENTAL JUSTICE, AND CHILDREN'S ENVIRONMENTAL HEALTH AND SAFETY RISKS

Socioeconomic Impacts

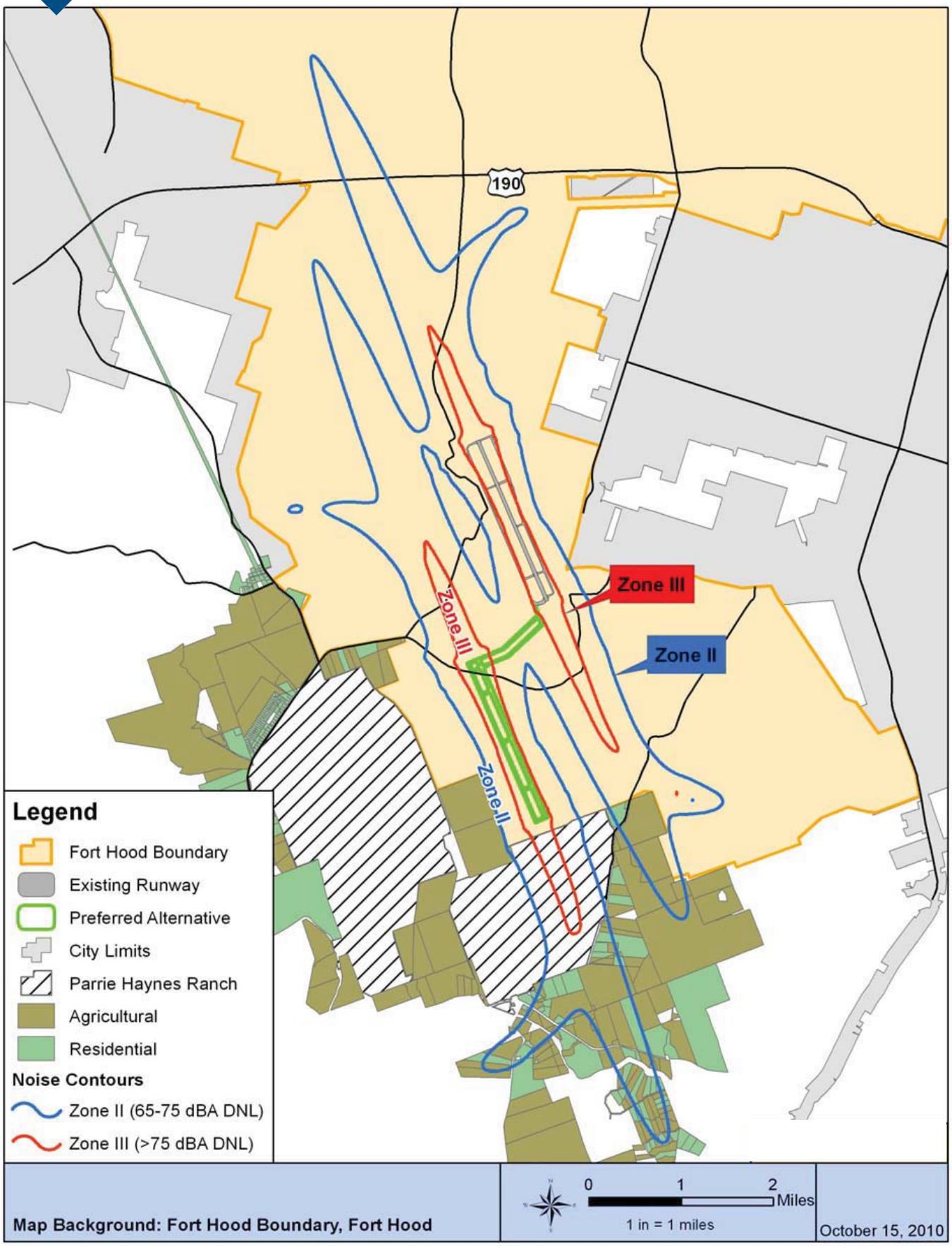
The FAA has not established a significance threshold for socioeconomics. However, factors to consider are if an action would have the potential to:

- Induce substantial economic growth in an area, either directly or indirectly (e.g., through establishing projects in an undeveloped area);
- Disrupt or divide the physical arrangement of an established community;
- Cause extensive relocation when sufficient replacement housing is unavailable;
- Cause extensive relocation of community businesses that would cause severe economic hardship for affected communities;
- Disrupt local traffic patterns and substantially reduce the levels of service of roads serving the airport and its surrounding communities; or
- Produce a substantial change in the community tax base.



Source: Environmental Assessment for Runway Expansion at Robert Gray Army Airfield/Killeen-Fort Hood Regional Airport (Draft) July 2012.

Exhibit 5G
EXISTING AIRCRAFT NOISE CONTOURS



Source: Environmental Assessment for Runway Expansion at Robert Gray Army Airfield/Killeen-Fort Hood Regional Airport (Draft) July 2012.

Exhibit 5H
FUTURE AIRCRAFT NOISE CONTOURS

Preferred Development Alternative Evaluation: Proposed development projects would occur within existing Airport property boundaries or within land owned by Fort Hood. Some on-Airport projects could cause disruption of local traffic patterns as construction vehicles would be entering and exiting certain areas of the Airport frequently during the construction phase. However, congestion caused by construction would be temporary in nature and would not have long-term impacts.

There is potential for increased economic activity given the additional hangar complexes and commercial and aviation development areas, as well as the possible cargo facility. As these projects are approved, evaluation of the changes that could occur to the community's tax base may be necessary.

Environmental Justice

The FAA has not established a significance threshold for Environmental Justice. However, factors to consider are if an action would have the potential to lead to a disproportionately high and adverse impact to an environmental justice population (i.e., a low-income or minority population) due to:

- Significant impacts in other environmental impact categories; or
- Impacts on the physical or natural environment that affect an environmental justice population in a way that FAA determines is unique to the environmental justice population and significant to that population.

Preferred Development Alternative Evaluation: The closest residences are approximately one-quarter mile east of the Airport; however, none of these are considered environmental justice populations. The closest public or subsidized housing development is approximately four miles northwest of the Airport. Construction activity and long-term development would, therefore, not result in disproportionately high and/or adverse impacts to environmental justice populations.

Children's Environmental Health and Safety Risks

The FAA has not established a significance threshold for Children's Environmental Health and Safety Risks. However, factors to consider are if an action would have the potential to lead to a disproportionate health or safety risk to children.

Preferred Development Alternative Evaluation: As mentioned previously, the closest facility with children is the Dr. Joseph A. Fowler Elementary School, approximately one mile to the east. At this distance, disproportionate health or safety risks to children would not occur.

VISUAL EFFECTS (Light Emissions and Visual Resources/Visual Character)

Light Emissions

The FAA has not established a significance threshold for Light Emissions. However, a factor to consider is the degree to which an action would have the potential to:

- Create annoyance or interfere with normal activities from light emissions; and
- Affect the visual character of the area due to the light emissions, including the importance, uniqueness, and aesthetic value of the affected visual resources.

Preferred Development Alternative Evaluation: Changes in lighting that would occur due to the implementation of the Master Plan concept include the lighting associated with the proposed buildings/hangars, Taxiway B extension, runway extension, commercial development, and parking areas. In addition, a solar parking array is proposed. These lighting additions would be within airport property boundaries or within land owned by Fort Hood; however, given the proximity of residences along Texas State Highway 201/South Clear Creek Road, lighting could emit beyond airport property limits. Further study at the time of project implementation may be necessary to determine the impact of the additional lighting.

Visual Resources/Visual Character

The FAA has not established a significance threshold for Visual Resources/Visual Character. However, a factor to consider is the extent an action would have the potential to:

- Affect the nature of the visual character of the area, including the importance, uniqueness, and aesthetic value of the affected visual resources;
- Contrast with the visual resources and/or visual character in the study area; and
- Block or obstruct the views of the visual resources, including whether these resources would still be viewable from other locations.

Preferred Development Alternative Evaluation: Full buildout of the proposed development concept would not change the visual character of the Airport, nor are there any scenic resources near the Airport that could be impacted by proposed development. Further, all development proposed is within existing property limits, and thus any changes would occur in areas already developed as an airport.

WATER RESOURCES

Water resources are shown on Exhibit 1L in Chapter One.

Wetlands

Threshold of Significance Definition: *The action would:*

- *Adversely affect a wetland's function to protect the quality or quantity of municipal water supplies, including surface waters and sole source and other aquifers;*
- *Substantially alter the hydrology needed to sustain the affected wetland system's values and functions or those of a wetland to which it is connected;*
- *Substantially reduce the affected wetland's ability to retain floodwaters or storm runoff, thereby threatening public health, safety or welfare (the term welfare includes cultural, recreational, and scientific resources or property important to the public);*
- *Adversely affect the maintenance of natural systems supporting wildlife and fish habitat or economically important timber, food, or fiber resources of the affected or surrounding wetlands.*
- *Promote development of secondary activities or services that would cause the circumstances listed above to occur; or*
- *Be inconsistent with applicable state wetland strategies.*

Preferred Development Alternative Evaluation: Per the USFWS National Wetlands Inventory, there are no wetlands on Airport property; however, there are wetlands adjacent to Airport property. There are two freshwater forested/shrub wetlands along Reese Creek west of the Airport, as well as a wetland north of Runway end 15. Given the location of these wetlands, they would not be impacted by any proposed projects in the Master Plan concept.

Floodplains

Threshold of Significance Definition: *The action would cause notable adverse impacts on natural and beneficial floodplain values. Natural and beneficial floodplain values are defined in Paragraph 4.k of DOT Order 5650.2, Floodplain Management and Protection.*

Preferred Development Alternative Evaluation: There is a 100-year floodplain along Reese Creek and one of its tributaries along the west and south sides of the Airport. The Master Plan concept does not propose development within this floodplain, and, therefore, no impacts would occur to the natural and beneficial values of the floodplain.

Surface Waters

Threshold of Significance Definition: *The action would:*

- *Exceed water quality standards established by federal, state, local, and tribal regulatory agencies; or*
- *Contaminate public drinking water supply such that public health may be adversely affected.*

Factors to consider are when a project would have the potential to:

- Adversely affect natural and beneficial water resource values to a degree that substantially diminishes or destroys such values;
- Adversely affect surface water such that the beneficial uses and values of such waters are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated; or
- Present difficulties based on water quality impacts when obtaining a permit or authorization.

Preferred Development Alternative Evaluation: There are two waterbodies on Airport property near Runway end 33, Gray Lake, and Lake Bratcher, as well as Reese Creek along the western side of the Airport, which flows south. Gray Lake may be impacted by the proposed runway extension, and thus would require further study at the time of this project development. In addition, the proposed buildings/hangars, parking areas, and commercial development would increase the impervious surfaces at the Airport. The proposed development could, therefore, result in additional runoff from the Airport that would enter these nearby water bodies.

Groundwater

Threshold of Significance Definition: *The action would:*

- *Exceed groundwater quality standards established by federal, state, local, and tribal regulatory agencies: or*
- *Contaminate an aquifer used for public water supply such that public health may be adversely affected.*

Factors to consider are when a project would have the potential to:

- Adversely affect natural and beneficial groundwater values to a degree that substantially diminishes or destroys such values;
- Adversely affect groundwater quantities such that the beneficial uses and values of such groundwater are appreciably diminished or can no longer be maintained and such impairment cannot be avoided or satisfactorily mitigated; or
- Present difficulties based on water quality impacts when obtaining a permit or authorization.

Preferred Development Alternative Evaluation: According to the Texas Water Development Board, Bell County, and thus, the Airport, is within the Clearwater Groundwater Conservation District. The Airport is within Groundwater Management Area 8 and lies atop several major aquifers, including Trinity aquifer and Edward aquifer. The closest sole source aquifer is over 100 miles away from the Airport. Given the addition of impermeable surfaces, groundwater recharge could be impacted. Further study would be required prior to project implementation.

Wild and Scenic Rivers

The FAA has not established a significance threshold for Wild and Scenic Rivers.

Preferred Development Alternative Evaluation: There are no designated Wild and Scenic River segments within 100 miles of the Airport. The closest river feature included in the National River Inventory is the Colorado River, approximately 35 miles west of the Airport. Proposed development on Airport property would not impact this designated river segment. There would be no impact to this resource due to the implementation of the development concept.

RECYCLING PLAN

The *FAA Modernization and Reform Act of 2012* (FMRA), which amended Title 49, United States Code (U.S.C.), included several changes to the Airport Improvement Program (AIP). Two of these changes are related to recycling, reuse, and waste reduction at airports.

- Section 132 (b) of the FMRA expanded the definition of airport planning to include "developing a plan for recycling and minimizing the generation of airport solid waste, consistent with applicable State and local recycling laws, including the cost of a waste audit."

- Section 133 of the FMRA requires airports that have, or plan to prepare, a master plan and that receive AIP funding for an eligible project, to ensure that the new or updated master plan addresses issues relating to solid waste recycling at the airport. This includes:
    - The feasibility of solid waste recycling at the airport;
    - Minimizing the generation of solid waste at the airport;
    - Operation and maintenance requirements;
    - A review of waste management contracts; and,
    - The potential for cost savings or the generation of revenue.

The terminal building is the only facility where the Airport has purview over waste and recycling practices. Waste and recycling for all other Airport facilities is handled independently by those entities/tenants that lease space. While the focus of this plan is on Airport-operated facilities, the Airport should work to incorporate strategies that create consistency in waste disposal mechanisms Airport-wide. This would ultimately result in the reduction or diversion of materials sent to the landfill.

To fully understand how an airport can reduce its waste generation, it is important to know what types of wastes are typically encountered. Generally, waste from airports can be divided into eight categories.[6]

1. **Municipal Solid Waste** consists of everyday items, like packaging material or food scraps.
2. **Construction and Demolition Waste** is usually categorized as municipal solid waste but can be such a significant source of waste at airports that it is classified as its own category. Construction

[6] FAA 2014. *Recycling, Reuse and Waste Reduction at Airports*, April 24.

and demolition waste is considered non-hazardous waste resulting from land clearing, excavation, demolition, renovation or repair of structures, roads, and utilities, including concrete, wood, metals, drywall, carpet, plastic, pipe, cardboard, and salvaged building components.

3. **Green Waste** is yard waste consisting of tree, shrub and grass clippings, leaves, weeds, small branches, seeds, and pods. Green waste is considered municipal solid waste.
4. **Food Waste** is food not consumed or waste generated and discarded during food preparation. Food waste is also considered part of the municipal solid waste stream.
5. **Deplaned Waste** is a specific type of municipal solid waste that is removed from passenger aircraft. These materials include bottles and cans, newspapers and mixed paper, plastic cups and service ware, food waste, food soiled paper, and paper towels.
6. **Lavatory Waste** is considered a special waste that is emptied via hose and pumped into a lavatory service vehicle, which is then transported to a triturator facility, generally located airside, near airline operations, for pretreatment prior to discharge to the sanitary sewage system. Due to the chemicals contained in lavatory waste, it can present environment and human health risks if mishandled and, therefore, caution must be taken to ensure lavatory waste is not released to the public sanitary sewage system prior to pretreatment.
7. **Spill Clean and Remediation Wastes** are also a special waste generated during cleanup of spills and/or the remediation of contamination from various types of sites on an airport.
8. **Hazardous Wastes** are governed by the *Resource Conservation and Recovery Act* (RCRA), as well as the regulations in 40 CFR Subtitle C, Parts 260 – 270. The Environmental Protection Agency (EPA) developed less stringent regulations for certain hazardous waste, known as universal waste, described in 40 CFR part 273 – The Universal Waste Rule.

As shown on **Exhibit 5J**, there are seven typical inputs into an airport's waste stream, which include terminals, airfields, aircraft maintenance hangars, cargo hangars, flight kitchens, offices, and airport construction projects. To create a comprehensive waste reduction and recycling plan for the Airport, all the potential inputs must be considered. Small- and non-hub airports in the U.S. handle more than 80 million passenger enplanements annually. Passengers generate approximately 20,000 tons of waste onboard aircraft.[7] This represents a large opportunity for small- and non-hub airports to increase waste diversion rates through coordinated waste management programs.

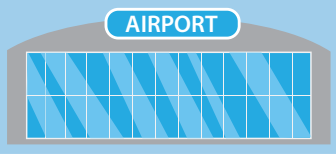
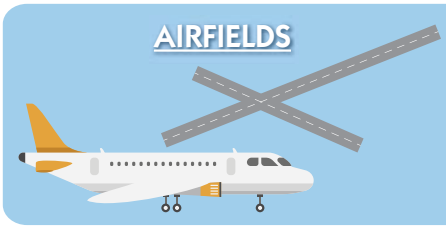
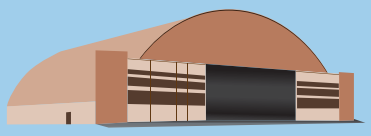
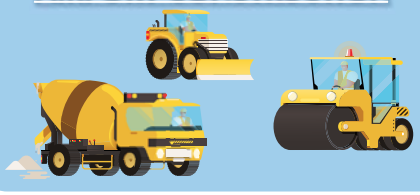
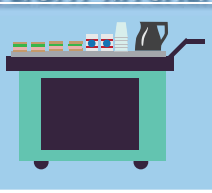
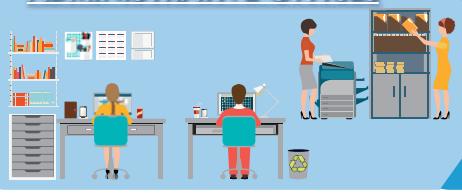
For guidance purposes, the U.S. EPA (2009) developed a ten-step program to aid airports in implementing a successful airport recycling program. The FAA's Airport Cooperative Research Program (ACRP) modified this multi-step plan to better reflect the needs of small- and non-hub airports, like GRK. This report, *Recycling Best Practices – A Guidebook for Advancing Recycling from Aircraft Cabins* (2014), outlines five best practices for an airport to consider increasing recycling rates.

ACRP's Recycling Best Practices

1. ***Secure top-down and bottom-up commitment within the airport for recycling efforts***
2. ***Develop consistent recycling procedures and infrastructure***
3. ***Increase the efficiency of existing systems***
4. ***Track, evaluate, and share data on program performance***
5. ***Make recycling a part of everyday business***

[7] ACRP 2013. *Recycling Best Practices – A Guidebook for Advancing Recycling from Aircraft Cabins*.

AIRPORT WASTE STREAMS

AIRPORT AREA	POTENTIAL INPUTS	POTENTIAL OUTPUTS
TERMINALS 	Restaurants Shops Passengers Employees	Food Waste, Paper Plastic, Aluminum Cans Trash, Grease & Oil Green Waste Deplaned Waste
AIRFIELDS 	Aircraft Operations	Runway Rubber Green Waste
CARGO HANGERS 	Goods Movements	Plastic Wood Vehicle Waste (Tires & Fluids)
AIRCRAFT	Aircraft Ground Support Equipment (GSE)	Vehicle Waste Plastic Wastewater Hazmat
AIRPORT CONSTRUCTION 	Construction Re-Construction Demolition	Reused Concrete Reused Asphalt Vehicle Waste Soils, Building Materials Wood, General Waste
FLIGHT KITCHENS 	Aircraft Food Services	Food Waste Waste Water Plastic Wood
ADMINISTRATIVE OFFICES 	Employees	Food Waste Paper, Plastic Aluminum Cans Trash

Source: Recycling, Reuse, and Waste Reduction at Airports, FAA (April 24, 2013)

Exhibit 5J
AIRPORT WASTE STREAM INPUTS

The GRK staff supports and oversees the Airport's recycling program. It is also crucial to gain the participation of tenants to ensure buy-in of the Airport's recycling efforts. The Airport must also establish consistent internal procedures so that there are no unacceptable items contaminating the recycling containers, or recyclables thrown in the trash. Clearly marked signage of what is and is not accepted placed near the solid waste and recycling containers is a key part of a consistent, effective recycling system throughout the airport. The Airport has recycling bins that state what can be recycled (i.e., cans and plastic bottles).

Recycling container markings at GRK

The Airport should ensure that waste and recycling containers are right-sized to the existing operation, as well as on a collection schedule that picks up only when the containers are full. They should also track airline-specific recycling rates and waste quantities to identify cost-saving measures that are currently unidentified simply based on the lack of quantitative data. Lastly, the Airport should make recycling a part of everyday business by providing training, education, and support to personnel, concessionaires, and others who conduct business at the Airport. In-person meetings with airline station managers should be held to create mutual understanding of solid waste and recycling goals, and how tenants play a critical part in the Airport's overall success.

The implementation of an effective program requires accurate data of current waste and recycling rates. There are several ways an airport can gain insight to their waste stream. The waste audit is the most comprehensive and intensive way to assess waste stream composition, opportunities for waste reduction, and capture of recyclables. This plan is based on information obtained using an examination of records and information provided by the airport.

- **Examination of records**
  - Waste hauling and disposal records and contracts
  - Supply and equipment invoices
  - Other waste management costs (commodity rebates, container costs, etc.)
- **Facility Walk-Through**
  - Qualitative waste information through observation of staff and customers, and first-hand observation of waste handling practices
  - Understanding waste pickup and hauling practices
- **Waste Audit**
  - Collection and analysis of the types of waste produced at the airport

SOLID WASTE

Currently, the City of Killen collects the Airport's solid waste, which is then hauled to the City of Temple Landfill. Items accepted by the landfill include:[8]

- Asbestos – friable and non-friable
- Construction and demolition debris
- Industrial and special waste
- Municipal Solid Waste
- Tires
- Yard waste

The Airport has four dumpsters for municipal solid waste that are collected by the City of Killeen's Solid Waste Division.

- **Terminal Building**
  - Eight-cubic yard (CY) dumpster collected on Tuesday and Friday
- **Employee Parking Lot**
  - Four-CY dumpster collected on Tuesday and Friday
- **Rental Car Area**
  - Four-CY dumpster collected on Friday
- **Airfield Maintenance Facility**
  - Two-CY dumpster collected on Tuesday and Friday

Table 5C shows the monthly fees associated with the dumpster container size and frequency of weekly collection. Additional dumpster sizes and collection frequency options are shown in the event the Airport increases service or dumpster size in the future. Boxes in dark gray indicate the monthly fee the airport is currently responsible for given the above container sizes and pickup frequencies. Based on the figures in **Table 5C**, as well as airport records, the Airport spends approximately $700 per month on solid waste services.

TABLE 5C
Monthly Dumpster Container Rates Based on Container Size and Collection Frequency [1]

Dumpster Size	Collections per Week			
	1	2	3	4
2CY	$78.72	**$120.06**	$167.91	$215.76
3CY	$96.07	$149.04	$209.89	$270.77
4CY	**$112.37**	**$177.00**	$250.89	$324.77
6CY	$147.77	$234.92	$334.87	$434.81
8CY	$181.85	**$292.69**	$418.81	$544.82

[1] Rates are adjusted annually on October 1
Source: City of Killeen Code of Ordinances, Chapter 24, Article II, Division 6. Sec. 24-116 (November 2016).

[8] Waste Management 2018. Temple Landfill. Available at: https://www.wmsolutions.com/locations/details/id/99.

RECYCLING

The terminal building has three 56-gallon blue bins in the mechanical area for the collection of recyclables exclusively for staff. In the public areas of the terminal building, there are additional recycling collection bins. There is also a 4-foot by 6-foot chain-link fence containment area for the collection and storage of cardboard materials. The recycling bins and cardboard are collected twice weekly on Tuesdays and Fridays by the City's Recycling Operations staff and hauled to the Killeen Recycling Center, located seven miles northeast from the Airport at 111 East Avenue F.

Trash and recycling containers in Terminal Building

Airport management is reviewing a waste reduction program that would recycle all airport and vendor light bulbs, ballasts, fluorescent bulbs, and batteries. The Killeen Recycling Center, which accepts recyclables from commercial entities, does not accept light bulbs, but does accept rechargeable batteries, including those containing nickel-cadmium, lithium ion, nickel-metal hydride, and sealed lead. The Airport could, therefore, use the Killeen Recycling Center as one area to responsibly dispose of batteries. **Exhibit 5K** lists all accepted materials at the Killeen Recycling Center. To recycle fluorescent bulbs, vendor bulbs, vendor light bulbs, and ballasts (i.e., hazardous materials), the Airport would have to contract with a separate entity, as the hazardous waste collection events hosted by the City of Killeen are exclusively for residents.

SOLID WASTE MANAGEMENT SYSTEM

Waste management services at the Airport are managed independently by various tenants and entities, which is considered a decentralized waste management system. To maximize recycling efforts, the Airport should actively engage tenants and transition to a centralized waste management system. **Exhibit 5L** summarizes the differences between a decentralized and a centralized airport waste management system. Centralized waste management systems provide greater opportunity for participation from airport tenants who may not be incentivized to recycle on their own. The centralized system is advantageous in that it has less players involved in the overall management of the solid waste and recycling efforts. This management style allows greater control by the Airport over the type, placement, and maintenance of compactors and dumpsters, saving space and eliminating the need for each airline to have its own containers. However, this waste management style can be inefficient for some airports because it requires more effort and oversight on the part of airport management. Ultimately, a centralized waste management system will streamline waste and recycling collection, maximizing the opportunity to reduce municipal solid waste generation and increase the diversion of recyclables from the City of Temple Landfill.

Killeen Recycling Center Guidelines

PLASTIC

BOTTLES, JUGS, CANS/JARS

- Look for #1 or #2 on container
- Mouth must be equal to or smaller than the base
- Remove and discard all plastic lids
- Crush when possible
- NO motor oil containers

PAPER

NEWSPAPERS, MAGAZINES, SHOPPING CATALOGS, CARDBOARD, COLOR AD INSERTS, MIXED PAPERS

(includes junk mail, office paper, school paper, envelopes and computer paper)

- Flatten or break down cardboard boxes
- Must be clean and dry

STEEL, TIN & ALUMINUM CANS

- Labels may remain on cans
- Rinse cans of food residue
- Flatten cans to conserve space in your bin
- Aerosol cans MUST be empty

GLASS

BOTTLES AND JARS ONLY

(that contained food or beverages)

- Clear, green and brown color only
- Remove plastic lids and caps
- Drain all liquids and rinse
- NO broken or treated glass (mirrors, window panes, ceramics or drinking glasses)
- NO light bulbs

CELL PHONES & RECHARGEABLE BATTERIES

- Nickel-Cadmium (Ni-Cad), Lithium Ion, Nickel-Metal Hydride and Sealed Lead

USED COOKING OIL

- Cooking oil of all types. May contain small amounts of food particles, such as flour or breadcrumbs, but may not be mixed with other types of oil, lubricants or water

ADDRESS:
111 E. Avenue F
Killeen, TX 76541

CONTACT INFORMATION:
P: (254) 554-7572

HOURS OF OPERATION:

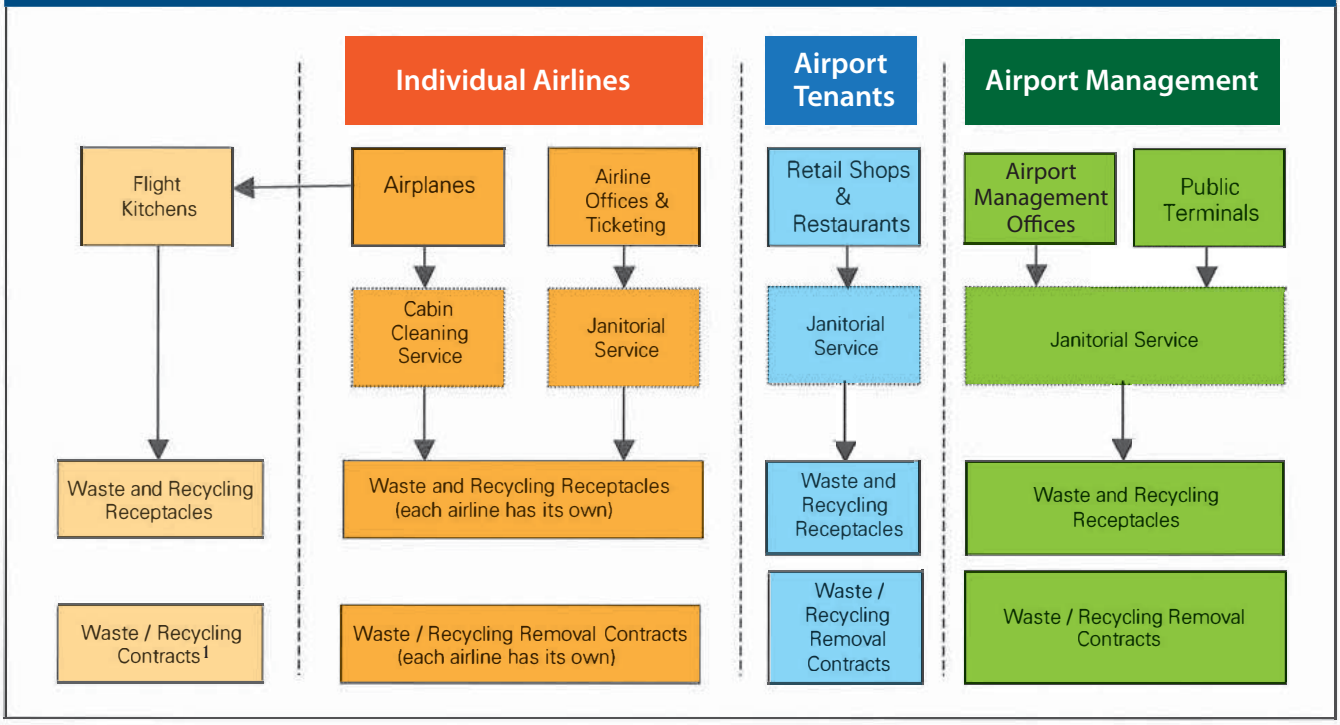
Monday, Tuesday, Friday
11:00 a.m. – 6:00 p.m.

Wednesday & Thursday
11:00 a.m. – 5:00 p.m.

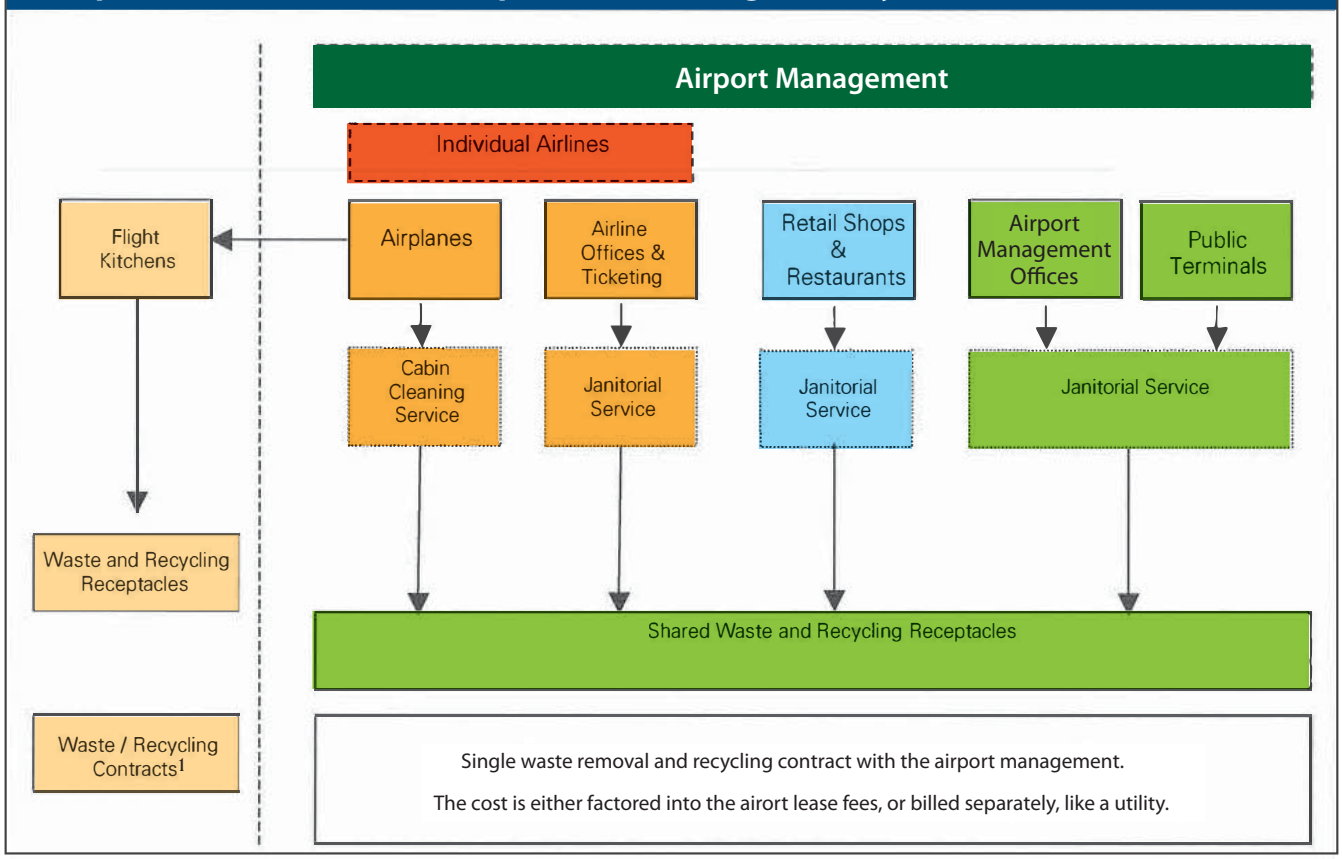
Even dated Saturdays
8:00 a.m. – Noon

Source: www.killeentexas.gov

Components of a Decentralized Airport Waste Management System



Components of a Centralized Airport Waste Management System



[1] Flight kitchens usually manage their own waste even if an airport relies on a centralized system

Source: Natural Resources Defense Council, Trash Landings: How Airlines and Airports Can Clean Up Their Recycling Programs, December 2006.

SOLID WASTE AND RECYCLING GOALS

While the Airport may or may not pursue the implementation of a centralized waste management system, there are other opportunities for improvement. **Table 5D** outlines objectives that could help reduce municipal solid waste generation and increase recycling efforts throughout the Airport. To increase the effectiveness of tracking progress at the Airport, a baseline state of all suggested metrics should be established to provide a comparison over time.

TABLE 5D
Waste Management and Recycling Goals
Killeen-Fort Hood Regional Airport

Goals	Objectives to Meet Goals	Metrics
Reduce amount of solid waste generated	Encourage airlines & concessionaires to donate unused snack items	Number of airlines & concessionaires donating unused snacks
	Provide liquid collection vessels at security	Waste per passenger rate and/or percent of total waste diverted from landfill
	Switch to online bill pay to eliminate monthly paper bills	No longer receiving monthly paper bills
	Conduct a waste audit to identify most common types	Identification of most common wastes
	Eliminate purchase of items that are not recyclable (i.e., Styrofoam, plastic bags)	Number of items purchased that are not recyclable
Increase amount of material recycled	Collect fluorescent bulbs, vendor light bulbs, and ballasts	Number of light fixtures diverted from the landfill (or recycled with a third-party contractor)
	Improve recycling tracking and data management	Monthly data reports
	Increase the number of recycling bins in public areas of the terminal building	Number of recycling bins available to the public
	Incorporate recycling requirements/recommendations into tenant lease agreements	Number of tenant contracts with recycling requirements and/or recommendations
	Expand recycling marketing & promotion efforts in the terminal building	Number of marketing & promotional materials
	Require contractors to implement strategies to reduce, reuse, & recycle construction & demolition waste	Incorporation of waste reduction, reuse & recycling language into construction contracts

Killeen-Fort Hood
REGIONAL AIRPORT

CHAPTER SIX

FINANCIAL ANALYSIS

Killeen-Fort Hood
REGIONAL AIRPORT

CHAPTER SIX

FINANCIAL ANALYSIS

FINANCIAL IMPLEMENTATION ANALYSIS

FINANCIAL ANALYSIS OBJECTIVES

The primary objective of the Financial Implementation Analysis for the Killeen-Fort Hood Regional Airport (GRK) Master Plan is to evaluate the Airport's capability to fund the Capital Improvement Program and to finance Airport operations. The program is planned for implementation through three phases of development including a five-year Short Term – Phase I period (2018-2022), a five-year Mid Term – Phase II period (2023-2027), and a ten-year Long Term – Phase III period (2028-2037). The analysis includes development of a detailed Financial Implementation Plan. Objectives for developing the Financial Implementation Plan include presenting the results of the implementation evaluation and providing practical guidelines for matching an appropriate amount and timing of financial sources with the planned use of funds.

OVERALL APPROACH

The overall approach for conducting the Financial Implementation Analysis included the following steps:

- Gathering and reviewing key Airport documents related to historical financial results, capital improvement plans, operating budgets, regulatory requirements, City policies, airline agreements, and other operating agreements with Airport users

- Interviewing key Airport officials to gain an understanding of the existing operating and financial environment, relationships with the airlines, and overall management philosophy

- Reviewing the Aviation Activity Forecast previously developed in the Master Plan
- Reviewing the Capital Improvement Program project cost estimates and development schedules anticipated for the planning period and projecting the overall financial requirements for the program
- Determining and analyzing the sources and timing of capital funds available to meet the financial requirements for operating the Airport and financing the Capital Improvement Program
- Analyzing historical operations and maintenance expenses, developing operations and maintenance expense growth assumptions, reviewing assumptions with Airport management, and projecting future operations and maintenance expenses for the planning period
- Analyzing historical revenue sources, developing revenue growth assumptions, reviewing assumptions with Airport management and projecting future airline and non-airline revenues for the planning period
- Completing results of the review in a Financial Analysis Summary that evaluates the financial reasonableness of the Capital Improvement Program.

CAPITAL FUNDING SOURCES

In the past, the Airport has used a combination of FAA Airport Improvement Program (AIP) entitlement and discretionary grants (including the Military Airport Program), passenger facility charges, customer facility charges, and cash reserves/net operating revenues to fund capital improvements. They have also received grant funds from the Department of Homeland Security and the Office of the Governor – Texas Military Preparedness Commission to fund specific capital projects. These funding sources, as well as additional sources of capital funding, will continue to be important to finance the Airport's Master Plan Capital Improvement Program (CIP) during the future twenty-year planning period.

Airport Improvement Grants

The Airport receives grants from the Federal Aviation Administration (FAA) to finance the eligible costs of certain capital improvements. These federal grants are allocated to commercial passenger service airports through the AIP. AIP grants include passenger entitlement grants, which are allocated among airports by a formula that is based on passenger enplanements and discretionary grants which are awarded in accordance with FAA guidelines. On October 5, 2018, after several years of continuing budget resolutions and other short-term legislative measures implemented by Congress, the FAA Reauthorization Act of 2018 was enacted and authorized funding for the AIP through September 30, 2023.

Under current AIP authorization legislation, eligible projects are funded on a 90% AIP grant/10% local match basis for small and non-hub airports. Under this authorization, the Airport is projected to receive

current entitlements of about $1.6 million in 2018 and future annual grants which are projected to grow to $1.9 million by 2037 - the end of the planning period. Non-hub airports (those with annual enplanements between 10,000 passengers and approximately 428,000 passengers) can accumulate and carryover up to three years of unspent entitlements plus the current year before the awards are revoked. In 2017, the Airport had $5,264,080 unspent entitlements to carryover for use in 2018. The implementation analysis estimates the application of annual AIP passenger entitlement funds will be about $13.5 million during the Phase I planning period, $8.7 million during Phase II, and $18.6 million during Phase III.

The approval of AIP discretionary funding is based on a project eligibility ranking method the FAA uses to award grants, at their discretion, based on a project's priority and importance to the national air transportation system. Additionally, the FAA administers the Military Airport Program (MAP), which is a grant set-aside from the Airport Improvement Program. Through this program, FAA awards grant funds to the civil sponsor of a joint-use (military/civilian) airport for the development of aviation facilities for the public. In the past, Killeen has received discretionary and MAP funding support for various eligible capital projects. It is reasonable to assume the Airport will receive additional discretionary and MAP funding during the planning period for higher priority eligible projects. The implementation analysis estimates that $3.4 million of AIP discretionary funds will be required during Phase I for Taxiway B and Associated Taxiways Rehabilitation. Additionally, MAP funds in the amount of $3.4 million for corporate hangar/terminal development are assumed during Phase I. The implementation analysis also assumes that AIP discretionary grants of about $2.0 million will be available for the airline ramp expansion during the five-year Phase II period. No discretionary funds are assumed to be required for the ten-year Phase III period. Since the future availability of AIP discretionary grants, including MAP funding, is not certain until an actual grant is awarded, it should be noted that any CIP projects which have discretionary funds indicated as a funding source in the implementation plan may need to be delayed until such funds actually become available.

Of additional note, the FY 2018 omnibus appropriations bill included an additional amount for ''Grants-In-Aid for Airports'' of $1 billion to remain available through September 30, 2020. This "supplemental" $1 billion is funded through the General Fund of the Federal Government, not the Airports & Airways Trust Fund. Congress directed the FAA to give priority to non-primary airports that are not located within OMB-determined Metropolitan or Micropolitan areas. Congress also gives priority to projects at small and non-hub airports. The Airport has been working with the FAA to identify projects included in its CIP which may be candidates for funding from this additional supplemental appropriation. As the award of such funds remains undetermined, this implementation analysis does not recognize the receipt of any such funds. However, should the Airport be awarded funding for projects through this supplemental appropriation, it is likely that AIP entitlement funds identified to fund those projects would be replaced with supplemental funds and made available to fund other eligible projects in the CIP.

The implementation analysis further assumes the current AIP program will continue to be extended through 2037 and that future program authorizations will provide substantially similar funding levels as it does currently and has historically provided since the program was established in 1982.

Passenger Facility Charges

The Aviation Safety and Capacity Expansion Act of 1990 established the authority for commercial service airports to apply to the FAA for imposing and using a Passenger Facility Charge (PFC) of up to $3.00 per eligible enplaned passenger. With the passage of AIR-21 in June 2000, airports could apply for an increase in the PFC collection amount from $3.00 per eligible enplaned passenger to $4.50. The proceeds from PFCs are eligible to be used for AIP eligible projects and for certain additional projects that preserve or enhance capacity, safety, or security; mitigate the effects of aircraft noise; or, enhance airline competition. PFCs may also be used to pay debt service on bonds (including principal, interest, and issue costs) and other indebtedness incurred to carry out eligible projects. In addition to funding future planned projects, the legislation permits airports to collect PFCs to reimburse the eligible costs of projects that began on or after November 5, 1990.

GRK currently collects PFC revenues in an approved open application at the $4.50 collection level. Current collections at the $4.50 collection level are approximately $500,000 per year. The implementation analysis assumes the Airport will submit additional PFC applications and amendments, as required, to ensure the collection of PFC revenues continues beyond the authorized expiration date through the end of the twenty-year planning period in 2037. The implementation analysis further assumes that PFCs will be used on a pay-as-you-go basis to fund approximately $2.1 million in eligible project costs during Phase I, $4.2 million in Phase II and $7.3 million in Phase III.

Rental Car Customer Facility Charges (CFC)

In the last several years, rental car Customer Facility Charges (CFCs) have become common financing tools for landside improvements at airports in the U.S. Such charges are collected by rental car companies that provide services to commercial passengers at the airports they serve. CFCs are collected by the rental car companies on behalf of, and for the benefit of, the airports where they operate. The charge is typically based on a fee per rental car transaction day which is added to rental car contracts.

The Airport currently charges its rental car tenants a fee per rental car day to support capital expenditures for improving/expanding rental car facilities. The Master Plan CIP includes projects to improve the rental car service facility car wash, provide covering for the rental car parking lot and to expand the rental car parking area and fuel facility relocation. It also includes some rental car related areas in the terminal expansion project. The implementation analysis assumes that CFCs will be used on a pay-as-you-go basis to fund approximately $2.6 million in project costs during Phase I, $3.6 million in Phase II, and over $330 thousand in Phase III.

Existing language in the rental car agreements pertaining to CFCs places limitations on the use of CFC funds to fund only rental car related capital projects. Therefore, the rental car CFC projection is discontinued in Phase III of the implementation analysis when sufficient revenues are collected to fund the identified rental car related capital projects. The Airport is currently considering revisions to its CFC policy which would allow greater flexibility of the use of CFCs in funding the Airport's Capital Improvement Program, including the use of CFCs for various Airport infrastructure projects and maintenance

costs. Should the limitation be lifted, approximately $3.4 million in additional CFCs could be generated and available in Phase III to fund other capital development.

City Contribution

GRK is a municipally-owned facility, enterprise fund of the City of Killeen. The City, on occasion, may provide funding to the Airport for capital projects from its general fund budget or, as a temporary short-term loan from other City enterprise funds. The implementation analysis assumes the City will provide approximately $232,000 in Phase I to fund the local match on the land acquisition and runway/taxiway maintenance projects.

Department of Defense

The Killeen-Fort Hood Regional Airport is a joint-use airport. The FAA defines "joint use airport" as an airport owned by the Department of Defense (DOD), at which both military and civilian aircraft make shared use of the airfield. As described in Chapter One, the City has approximately 80 acres of land for the civilian commercial service airport by virtue of a fifty (50) year lease and joint-use agreement with the Department of the Army. Based on the agreement with the Army and coordination among the Airport, FAA, and Department of the Army, certain capital expenditures may be funded through the Airport Improvement Program (AIP) and others may require funding from the Department of Defense. The funding source may depend on the ultimate user driving the need for the capital improvement. During the 20-year planning period, it is anticipated that DOD funds will be required for runway lighting and airport signage upgrades, a rehabilitation of Runway 15-33, extension of Runway 15-33, and ultimately the construction of a new offset parallel runway with parallel and connecting taxiways. The implementation analysis assumes that DOD funds will be required to fund approximately $2.0 million in eligible project costs during Phase I, $10.9 million in Phase II, and $480.1 million in Phase III.

Other Unidentified Funding

The traditional airport capital funding sources described in the preceding paragraphs are insufficient in amount and timing to finance a number of capital projects planned for implementation during the planning period. These projects include airside and landside development for future general aviation facilities, expansion of the passenger terminal building, and the widening of Taxiway B. Consequently, non-traditional funding sources will be needed to finance the cost of projects totaling approximately $45.1 million during the Phase II planning period and $36.9 million during the Phase III planning period. The source of this non-traditional "other" funding has not yet been determined and represents a shortfall for the capital project implementation plan. This funding may potentially include sources such as future private third-party funding, federal economic stimulus grants, City and local economic development funding, and other possible sources that are not identified at this time. If other funding sources cannot be identified and obtained in the time frame needed, the associated projects will be modified, delayed,

or cancelled until such funding can be obtained. Consequently, this source of capital funding has been referenced in the Financial Implementation Analysis as "Other Unidentified Funding."

Cash Reserves/Airport Net Operating Revenue

At the beginning of 2018, the Airport had no unrestricted cash reserves available for capital project funding because recent years of declining enplanements have depleted the Airport's cash reserves. The Airport and the City are working to reverse this trend by generating additional revenue from existing operating revenue sources and by identifying new sources of operating revenue for the Airport through the development of new lines of business. Revenue and expense projections included in the Financial Implementation Analysis indicate the operating deficit may continue through the Phase I planning period. The City accounts for both the Killeen-Fort Hood Regional Airport and Skylark Field Airport (the City's general aviation airport) in a combined Aviation Fund, which has an accumulated fund balance of approximately $558,000 as of fiscal year end 2017. Contributions from the Aviation Fund Balance of approximately $374,000 will be required through the Phase I planning period before such time that operating revenues once again exceed operating expenses. Once this point is reached, however, prudent financial practices dictate the Airport and City accumulate net operating revenues to build an unrestricted cash balance in the Airport fund to an established minimum balance. This analysis recommends a financial stabilization goal of three months operating expenses. Therefore, the Financial Implementation Analysis assumes very limited net operating revenue available for capital development.

CAPITAL IMPROVEMENT PLAN (CIP)

The CIP and phased implementation plan establishes an orderly series of improvements intended to support the growth and development of GRK in alignment with the recommended development concepts of each airport component outlined in the Recommended Development Plan chapter.

It is important to note that market demand, instead of timing, will be the driver for initiating construction of facilities. Consequently, "trigger mechanisms" have been established to help guide the City on when they should consider implementing these various improvement projects. These "trigger mechanisms" should be reviewed annually by the City, U.S. Army, FAA and the Airport Management Team to determine if any of the triggers could feasibly be reached in the next 1-5 years. This exercise will aid the City and FAA in building and updating the rolling 5-year Airport Improvement Program CIP for GRK based on aviation demand.

In developing GRK's CIP and phased implementation plan, the following guidelines apply:

- The scheduling of projects is prioritized to permit improvements in a coordinated approach. The phasing and priority of each project has been determined with respect to airport safety, demand, compatibility with other airport projects, and FAA programming schedules;

- The CIP has been structured to provide the flexibility to meet short and long-range goals. Therefore, individual projects should not be considered as a single improvement, but as part of a project series that arrive at the ultimate concept;
- The implementation plan does not represent an obligation of local funds, nor does it require funding without justification of demand levels by the City, TxDOT, or Federal Aviation Administration (FAA); and,
- The expressed desire, intent, and ability of the City to achieve airport land use compatibility, coupled with favorable aesthetics transition, remains important planning and funding considerations.

The Phased Implementation Plan is divided into the following phases:

- Phase I (2018 – 2022) – Short-term implementation projects
- Phase II (2023 – 2027) – Mid-term implementation projects
- Phase III (2028 – 2037) – Long-term implementation projects

Each phase consists of projects and improvements categorized by the following areas: 1) airside improvements and 2) terminal/landside improvements. The airside and terminal/landside implementation projects within each phase and their associated trigger mechanisms are shown in **Table 6A** through **Table 6C**.

TABLE 6A
Phase I (0-5 Years) Projects and Improvements

Project Reference #	Project Name/Description	Trigger Mechanism	Has Trigger Already Been Reached?
AIRSIDE PROJECTS			
S2	Apron Rehabilitation	Condition Required	Yes
S5	Taxiway B and Associated Taxiways Rehabilitation, Addition of Paved Shoulders	Regular use by larger aircraft	Yes
S6	Airline Ramp Expansion and Relocation of Taxiway E East of Taxiway Bravo to prevent direct ramp to runway access	Design standards	Yes
S7	Relocation of Taxiway E East of Taxiway Bravo to prevent direct ramp to runway access	Design standards	Yes
TERMINAL/LANDSIDE PROJECTS			
S1	Corporate Hangar/Terminal Development on the southern edge of the airline ramp; includes vehicle parking lot and access	Corporate demand	Yes
S3	BMU 1 Baggage System Replacement	End of life of mechanical system	Yes
S4	Commercial Development Property Acquisition	Area needed for commercial development	Yes

TABLE 6B
Phase II (6-10 Years) Projects and Improvements

Project Reference #	Project Name/Description	Trigger Mechanism	Has Trigger Already Been Reached?
AIRSIDE PROJECTS			
M5	Airline Ramp Expansion – Phase 2	Demand (Airline/RON/or GA)	No
M6	Taxiway G Extension East	MRO/FBO demand or GA demand greater than accommodated by south GA area	No
TERMINAL/LANDSIDE PROJECTS			
M1	Rental Car Parking Area Expansion and Fuel Relocation	Tenant Demand – Signed Lease	No
M2	Airline Ramp Corporate Aviation Development – Phase 2	Corporate Demand – Based Aircraft	No
M3	Relocate Corporate Aviation to South Ramp Area		
M4	Relocate Ops to Former Corporate Aviation Building		
M7	MRO/FBO/SASO/GA Hangar Apron – Phase 1	MRO/FBO demand or GA demand greater than accommodated by south GA area	No
M8	MRO/FBO/SASO/GA Phase 2 – Parking and Access	MRO/FBO demand or GA demand greater than accommodated by south GA area	No
M9	Level 02 – Modify the South SSCP Lane to a High-Efficiency Lane	TSA/flight reduction	
M10	Level 01 – Bag Claim Area Expansion/Inbound Baggage/General Circulation/New Loading Dock, Multipurpose Room/Non-secure Public Area Restrooms/Building Systems Expansion Level 02 – South Holdroom Expansion, Storage, Maintenance, Secure Concessions, Mech/Elec on the Second Level	Scenario 2 enplanements	No
S8	Level 01 – BSO Office	Scenario 2 enplanements, additional airline, new markets added	No

TABLE 6C
Phase III (11-20 Years) Projects and Improvements

Project Reference #	Project Name/Description	Trigger Mechanism	Has Trigger Already Been Reached?
AIRSIDE PROJECTS			
L7	2,000 ft. Extension of Runway 15/33 to the South. Includes parallel taxiways on each side of the runway (75 ft. wide with paved shoulders). Relocation of MALSR system. Reroute of Ivy Mountain Road.	Regular use by larger aircraft – Army need	No
L8	Taxiway B Widening	Regular use by larger aircraft	Yes
L9	New Offset Parallel Runway (10,000 ft. x 200 ft.) to the west and south of the existing runway. Includes dual parallel taxiways extending between the runways and a single parallel taxiway for the new runway.	Army need	No
TERMINAL/LANDSIDE PROJECTS			
L1	Level 01 – Rental Car Counters/BSO Office, Rental Car Counter, Concession, Non-Public Restroom, Curbside Check-in, Armed Forces Lounge, Statue Relocation, Airline Operations, TSA Break Renovation	Scenario 3 enplanements	No
L2	Level 01 – Addition of Maintenance, Bag Screen Room/Egress Stair	Scenario 3 enplanements	No
L3	Level 02 – Consolidate security checkpoint to accommodate two high-efficiency lanes, relocate and expand secure restrooms, holdroom expansion to the west and north, new secure concessions with open seating	Scenario 3 enplanements	No
L4	GA Hangar Spur Taxiway/Apron	No space available in terminal ramp corporate development area	No
L5	GA Hangar Road and Parking	No space available in terminal ramp corporate development area	No
L6	GA Hangar Apron	No space available in terminal ramp corporate development area	No

Short-Term Implementation Program

The short-term implementation period is the only planning horizon separated into single years. This is to allow the CIP to be coordinated with the planning cycle of the FAA. Specific timing of the projects will be reviewed against and ordered according to available funding in the financial analysis portion of this chapter.

Projects called out during this timeframe are very specific in terms of actual design and construction. Several projects in the short-term may also need to be addressed in a CatEx or an EA. As such, some projects are initially put through an environmental and/or design phase and then followed with actual construction.

The short-term implementation program considers 14 projects for the planning period as shown in **Exhibit 6A**. The following provides a detailed breakdown of each project within FY 2018 through 2022.

FY 2018 Projects

Project #1: Corporate Hangar/Terminal Development

Description: Development of corporate hangar and finished office area for airport tenant adjacent to the south end of the existing terminal apron area.
Cost Estimate: $3,750,000
Funding Eligibility: AIP MAP Grants and Cash Reserves

Project #2: Terminal Building Boarding Bridges, Phase 3

Description: Replacement of the boarding bridges for gates 2 through 4 and improvements to components of bridges for gates 1 and 6.
Cost Estimate: $5,496,985
Funding Eligibility: AIP Entitlement Funding and PFC

Project #3: Car Wash Facility Improvements

Description: Project to add an automatic wash bay to the existing manual car wash facility. Also includes installing a water recycling system to capture and reuse water used in washing and replacing the existing vacuum system with new equipment.
Cost Estimate: $750,000
Funding Eligibility: Rental Car CFC

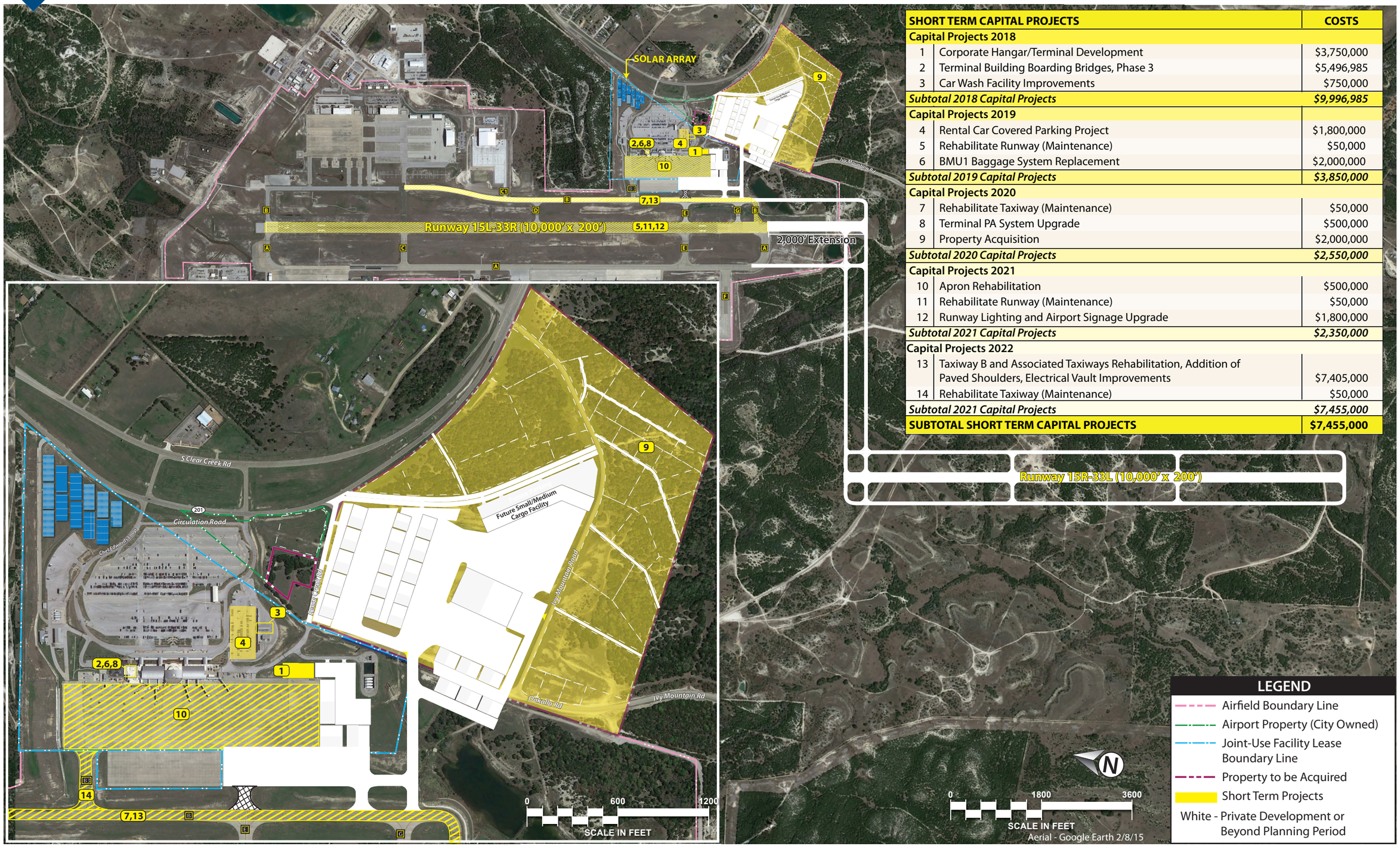
FY 2019 Projects

Project #4: Rental Car Covered Parking Project

Description: There currently is no covered parking at the airport. This project will add covered parking for the rental car ready return lot. The airport is also seeking to include roof-mounted solar panels and an additive alternate may include covered parking for a portion of the short-term lot.
Cost Estimate: $1,854,000
Funding Eligibility: Rental Car CFC

Project #5: Rehabilitate Runway (Maintenance)

Description: This project includes pavement maintenance of the runway. The runway requires regular maintenance to maintain safe operations.
Cost Estimate: $50,000
Funding Eligibility: AIP Entitlement Funding and City Contribution



SHORT TERM CAPITAL PROJECTS		COSTS
Capital Projects 2018		
1	Corporate Hangar/Terminal Development	$3,750,000
2	Terminal Building Boarding Bridges, Phase 3	$5,496,985
3	Car Wash Facility Improvements	$750,000
Subtotal 2018 Capital Projects		***$9,996,985***
Capital Projects 2019		
4	Rental Car Covered Parking Project	$1,800,000
5	Rehabilitate Runway (Maintenance)	$50,000
6	BMU1 Baggage System Replacement	$2,000,000
Subtotal 2019 Capital Projects		***$3,850,000***
Capital Projects 2020		
7	Rehabilitate Taxiway (Maintenance)	$50,000
8	Terminal PA System Upgrade	$500,000
9	Property Acquisition	$2,000,000
Subtotal 2020 Capital Projects		***$2,550,000***
Capital Projects 2021		
10	Apron Rehabilitation	$500,000
11	Rehabilitate Runway (Maintenance)	$50,000
12	Runway Lighting and Airport Signage Upgrade	$1,800,000
Subtotal 2021 Capital Projects		***$2,350,000***
Capital Projects 2022		
13	Taxiway B and Associated Taxiways Rehabilitation, Addition of Paved Shoulders, Electrical Vault Improvements	$7,405,000
14	Rehabilitate Taxiway (Maintenance)	$50,000
Subtotal 2021 Capital Projects		***$7,455,000***
SUBTOTAL SHORT TERM CAPITAL PROJECTS		**$7,455,000**

Exhibit 6A
SHORT TERM PROJECTS

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Project #6: BMU1 Baggage System Replacement

Description: The existing outbound baggage handling system is in frequent need of repair and maintenance. This project will replace the conveyors and carousel from the ticket counters to the TSA screening room.
Cost Estimate: $2,080,000
Funding Eligibility: AIP Entitlement Funding and PFC

FY 2020 Projects

Project #7: Rehabilitate Taxiway (Maintenance)

Description: The existing taxiways require regular pavement maintenance to continue safe operations.
Cost Estimate: $50,000
Funding Eligibility: AIP Entitlement Funding and City Contribution

Project #8: Terminal PA System Upgrade

Description: The existing PA system has exceeded its useful life. The new PA system will provide better communication throughout the airport.
Cost Estimate: $500,000
Funding Eligibility: PFC

Project #9: Property Acquisition

Description: To serve potential tenants that have expressed interest in operating from the Airport and be able to expand the Airport to accommodate growth, land acquisition is essential. The Airport has very limited space for any expansion or growth. This project will plan to acquire land to accommodate the anticipated growth within this planning period.
Cost Estimate: $2,121,800
Funding Eligibility: AIP Entitlement Funding and City Contribution

FY 2021 Projects

Project #10: Apron Rehabilitation

Description: This project will include rehabilitation of the primary airport apron. The apron is essential to the continued safe operation of the airport. This will include sealing the pavement, repair, re-marking, and associated improvements.
Cost Estimate: $546,364
Funding Eligibility: AIP Entitlement Funding and PFC

Project #11: Rehabilitate Runway (Maintenance)

Description: This project includes pavement maintenance of the runway. The runway requires regular maintenance to maintain safe operations.
Cost Estimate: $50,000
Funding Eligibility: AIP Entitlement Funding and City Contribution

Project #12: Runway Lighting and Airport Signage Upgrade

Description: The existing runway lighting and associated signage at the airport has neared the end of its useful life; this project will include a replacement of the lighting and signage for the primary runway.
Cost Estimate: $1,966,909
Funding Eligibility: Department of Defense

FY 2022 Projects

Project #13: Taxiway B and Associated Taxiway Rehabilitation, Addition of Paved Shoulders, Electrical Vault Improvements

Description: This project will include a rehabilitation of Taxiway B along with the associated crossing taxiways as required. It is anticipated that this project will include an overlay of the taxiway and additional paved shoulders.
Cost Estimate: $8,334,393
Funding Eligibility: AIP Entitlement, AIP Discretionary and PFC

Project #14: Rehabilitate Runway (Maintenance)

Description: This project includes pavement maintenance of the runway. The runway requires regular maintenance to maintain safe operations.
Cost Estimate: $50,000
Funding Eligibility: AIP Entitlement Funding and City Contribution

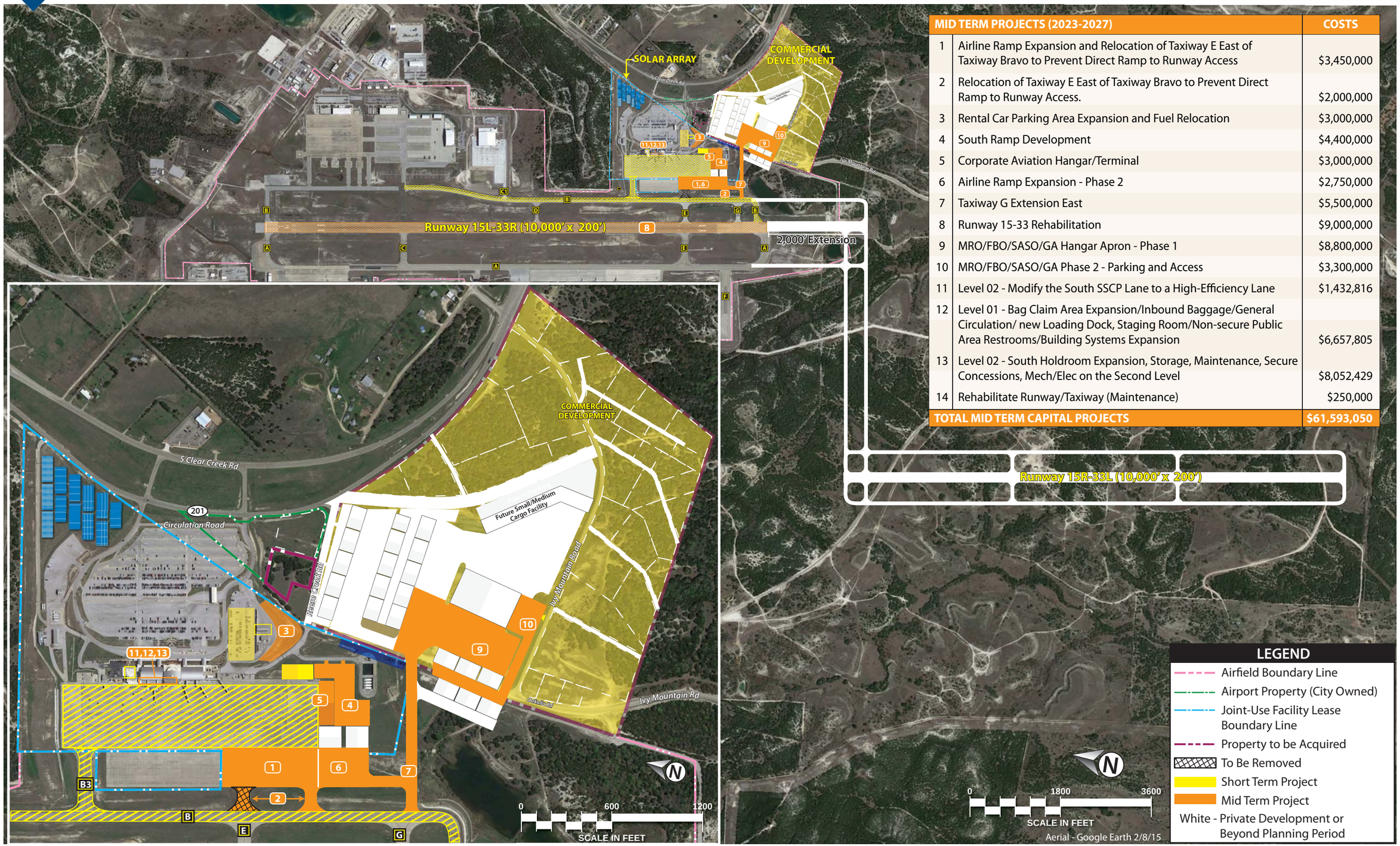
Short-Term CIP Summary

The short-term CIP includes projects that enhance the overall safety, efficiency, and maintenance of the airfield, while also implementing landside improvements. The total investment necessary for the short-term CIP is approximately $27.6 million.

Mid-Term Implementation Program

The mid-term covers the period 6 through 10 years and includes 14 projects. These projects are shown on **Exhibit 6B**; terminal building improvements for the mid-term program are detailed further on **Exhibits 6C and 6D**. Planning new projects beyond the short-term timeframe can be challenging; thus, due to the fluid nature of funding availability and the possibility of changing priorities, these projects have been grouped together into a single project list and not prioritized by year. Further evaluation of these projects should occur during this planning horizon to determine their order of importance based on airport safety, demand, and efficiency.

The following section includes a description of each project.



MID TERM PROJECTS (2023-2027)		COSTS
1	Airline Ramp Expansion and Relocation of Taxiway E East of Taxiway Bravo to Prevent Direct Ramp to Runway Access	$3,450,000
2	Relocation of Taxiway E East of Taxiway Bravo to Prevent Direct Ramp to Runway Access.	$2,000,000
3	Rental Car Parking Area Expansion and Fuel Relocation	$3,000,000
4	South Ramp Development	$4,400,000
5	Corporate Aviation Hangar/Terminal	$3,000,000
6	Airline Ramp Expansion - Phase 2	$2,750,000
7	Taxiway G Extension East	$5,500,000
8	Runway 15-33 Rehabilitation	$9,000,000
9	MRO/FBO/SASO/GA Hangar Apron - Phase 1	$8,800,000
10	MRO/FBO/SASO/GA Phase 2 - Parking and Access	$3,300,000
11	Level 02 - Modify the South SSCP Lane to a High-Efficiency Lane	$1,432,816
12	Level 01 - Bag Claim Area Expansion/Inbound Baggage/General Circulation/ new Loading Dock, Staging Room/Non-secure Public Area Restrooms/Building Systems Expansion	$6,657,805
13	Level 02 - South Holdroom Expansion, Storage, Maintenance, Secure Concessions, Mech/Elec on the Second Level	$8,052,429
14	Rehabilitate Runway/Taxiway (Maintenance)	$250,000
TOTAL MID TERM CAPITAL PROJECTS		$61,593,050

Exhibit 6B
MID TERM PROJECTS

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LONG TERM PROJECTS
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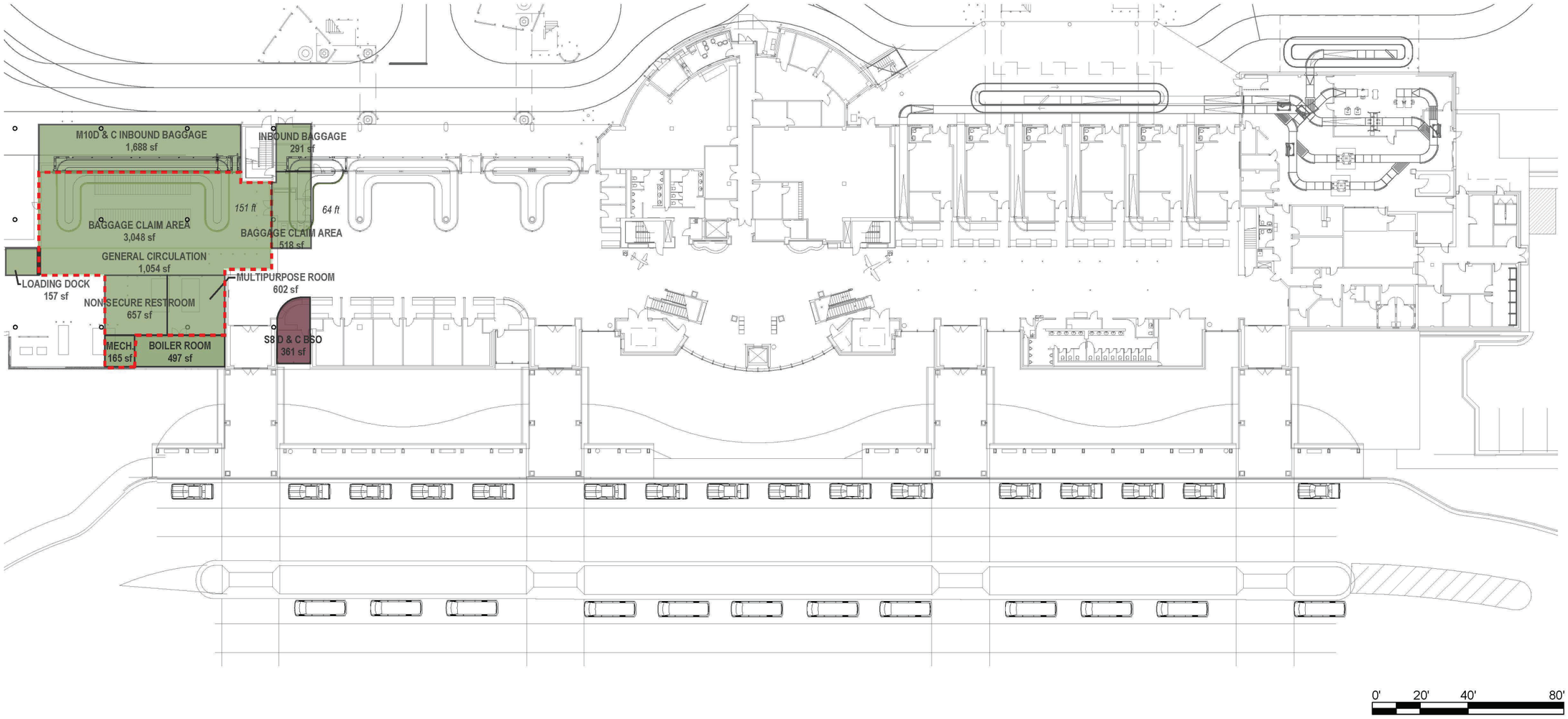

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LEVEL ONE - MID TERM PROJECTS

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LONG TERM PROJECTS
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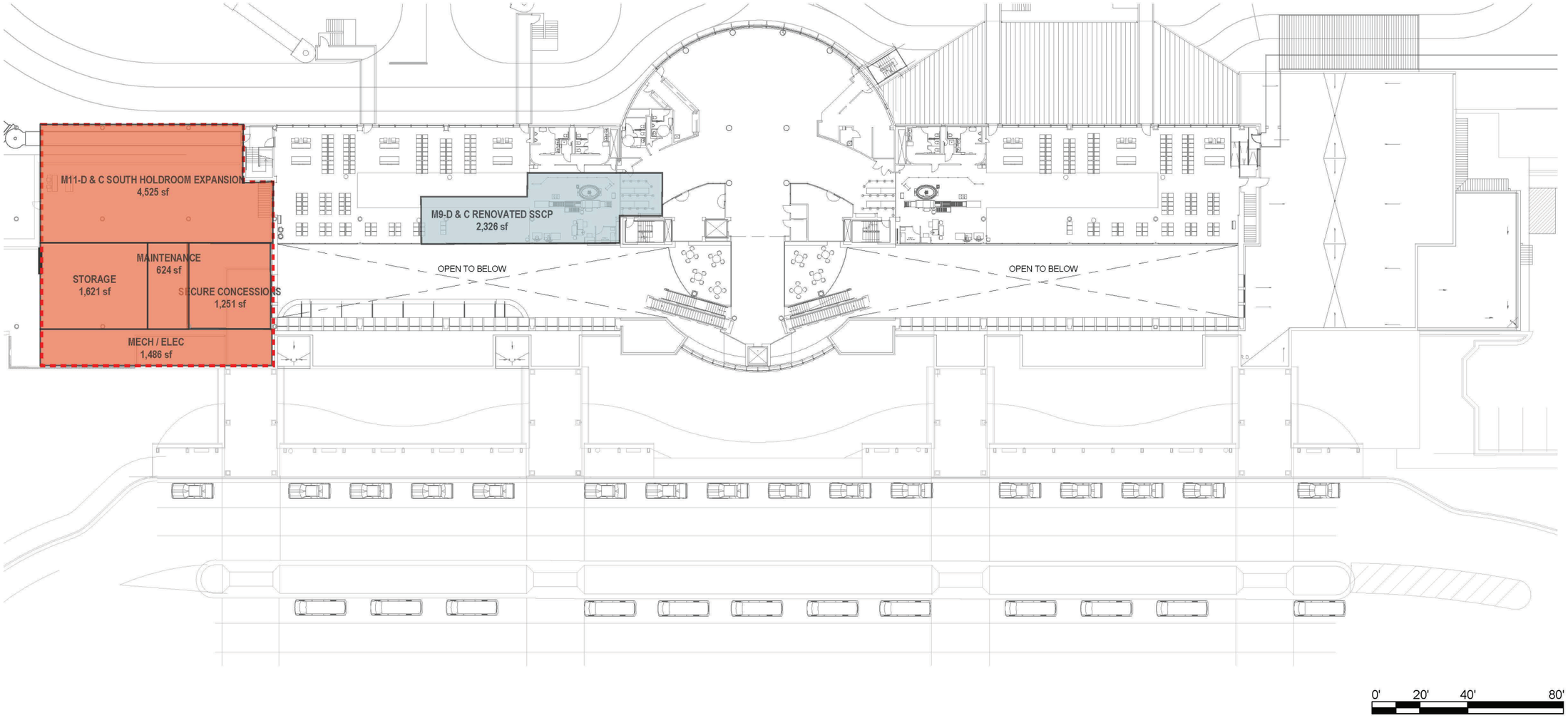

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LEVEL TWO - MID TERM PROJECTS

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Project #1: Airline Ramp Expansion

Description: This project will expand the existing airport ramp to the south to accommodate growth.
Cost Estimate: $4,180,816
Funding Eligibility: AIP Entitlement, AIP Discretionary and PFC

Project #2: Relocation of Taxiway E East of Taxiway Bravo to Prevent Direct Ramp to Runway Access

Description: The existing taxiway provides direct access to the runway from the apron. Per the FAA's new design standard, this project would relocate taxiway E to eliminate direct access.
Cost Estimate: $2,423,661
Funding Eligibility: AIP Entitlement and PFC

Project #3: Rental Car Parking Area Expansion and Fuel Relocation

Description: To accommodate growth and increased rental operations, this project will include the expansion of the rental parking lot and relocate the fueling station to a more efficient location to better serve the rental car companies.
Cost Estimate: $3,635,492
Funding Eligibility: Rental Car CFC

Project #4: South Ramp Development

Description: This project would include taxilanes, apron, and infrastructure required for corporate hangar development.
Cost Estimate: $5,332,055
Funding Eligibility: Other Unidentified Funding

Project #5: Corporate Aviation Hangar/Terminal

Description: This project will develop a corporate aviation hangar and terminal for corporate aviation operations.
Cost Estimate: $3,635,492
Funding Eligibility: Other Unidentified Funding

Project #6: Airline Ramp Expansion – Phase 2

Description: This is phase 2 of a project to expand the existing airport ramp to accommodate growth.
Cost Estimate: $3,332,535
Funding Eligibility: AIP Entitlement and PFC

Project #7: Taxiway G Extension East

Description: Taxiway G is the primary access to the commercial development area. This project will extend Taxiway G from Taxiway B to the commercial development area.
Cost Estimate: $6,665,069
Funding Eligibility: Other Unidentified Funding

Project #8: Runway 15-33 Rehabilitation

Description: A rehabilitation of the Runway 15-33 pavement will extend its life and reduce life cycle costs. This will be more substantial than regular pavement maintenance.
Cost Estimate: $10,906,477
Funding Eligibility: Department of Defense

Project #9: MRO/FBO/SASO/GA Hangar Apron – Phase 1

Description: This project will include construction of apron infrastructure for the new commercial area.
Cost Estimate: $10,664,111
Funding Eligibility: Other Unidentified Funding

Project #10: MRO/FBO/SASO/GA Phase 2 – Parking and Access

Description: The new commercial development will require landside improvements including parking and access. This project will include pavements, utilities, and other infrastructure to accommodate land-side operations.
Cost Estimate: $3,999,041
Funding Eligibility: Other Unidentified Funding

Project #11: Level 02 – Modify the South SSCP Lane to a High-Efficiency Lane

Description: The South Security Checkpoint lane will be renovated from a typical 1-lane module to a high efficiency lane including automated equipment for simultaneous passenger divestiture and higher throughput capacity.
Cost Estimate: $1,736,330
Funding Eligibility: AIP Entitlement and PFC

Project #12: Level 01 – Bag Claim Area Expansion/Inbound Baggage/General Circulation/New Loading Dock, Staging Room/Non-secure Public Area Restrooms/Building Systems Expansion

Description: This project will include an enlarged baggage claim area with a new baggage claim device providing more presentation length for passengers to retrieve baggage. The project also includes construction of larger non-secure restrooms, a new loading dock, and expanded building systems space.
Cost Estimate: $8,068,133
Funding Eligibility: AIP Entitlement and PFC

Project #13: Level 02 – South Holdroom Expansion, Storage, Maintenance, Secure Concessions, Mech/Elec on the Second Level

Description: This project will include expansion of the south hold room for increased passenger circulation space, construction of secure concessions area, additional storage, a multipurpose/staging room, and increased mechanical/electrical storage space on the second floor.
Cost Estimate: $9,758,181
Funding Eligibility: PFC and Other Unidentified Funding

Project #14: Rehabilitate Runway/Taxiway (Maintenance)

Description: This project includes pavement maintenance of the runway and taxiway. The pavements require regular maintenance to maintain safe operations.
Cost Estimate: $250,000 (5-year total)
Funding Eligibility: AIP Entitlement and Other Unidentified Funding

Mid-Term CIP Summary

Projects included in the mid-term continue to improve the overall safety and efficiency of the airfield as well as expand landside facility capacities. The total investment necessary for the mid-term CIP is approximately $74.6 million.

Long-Term Implementation Program

The long-term project list covers the period beyond 2027. This planning horizon includes 9 projects for the timeframe as shown on **Exhibit 6E**; terminal building improvements for the long-term program are detailed further on **Exhibits 6F and 6G**. .

The following section includes a description of each project.

Project #1: Level 01 – Rental Car Counters/BSO Office, Rental Car Counter, Concession, Non-Public Restroom, Curbside Check-in, Armed Forces Lounge, Statue Relocation, Airline Operations, TSA Break Renovation

Description: This project includes remodeling of the first floor of the terminal to provide new amenities for passengers including an additional rental car counter, baggage service offices, information desk, curbside check-in and an Armed Forces Lounge. This project also includes reconfiguration of the airline and back-of-house secure functions to provide additional airline operations space, an expanded TSA break area as well as expanded baggage screening room and maintenance area space.
Cost Estimate: $3,311,459
Funding Eligibility: Rental Car CFC and Other Unidentified Funding

Project #2: Level 01 – Addition of Maintenance, Bag Screen Room/Egress Stairs

Description: This project includes construction of a maintenance room and bag screen room as additions to the first floor of the terminal and construction of egress stairs from the second floor of the terminal.
Cost Estimate: $1,916,620
Funding Eligibility: PFC and Other Unidentified Funding

Project #3: Level 02 – Consolidate security checkpoint to accommodate two high-efficiency lanes, relocate and expand secure restrooms, holdroom expansion to the west and north, new secure concessions with open seating

Description: This project includes expansion of the second floor holdrooms to the west and north of the Terminal providing relocated and enlarged secure restroom space and additional secure concessions with open seating. The project includes renovation of the passenger processing function to a consolidated security checkpoint with two high efficiency lanes. The landside concessions will be reconfigured to include both landside and secure functionality.
Cost Estimate: $20,494,690
Funding Eligibility: AIP Entitlement, PFC and Other Unidentified Funding

Project #4: GA Hangar Spur Taxiway/Apron

Description: This project provides taxiway and apron infrastructure for hangars in the new GA area.
Cost Estimate: $4,991,546
Funding Eligibility: Other Unidentified Funding

Project #5: GA Hangar Road and Parking

Description: This project includes addition of landside improvements to accommodate GA airside development.
Cost Estimate: $4,991,546
Funding Eligibility: Other Unidentified Funding

Project #6: GA Hangar Apron

Description: This project is design and construction of additional apron area in the GA area.
Cost Estimate: $9,983,092
Funding Eligibility: Other Unidentified Funding

Project #7: 2,000 ft. Extension of Runway 15/33 to the South.

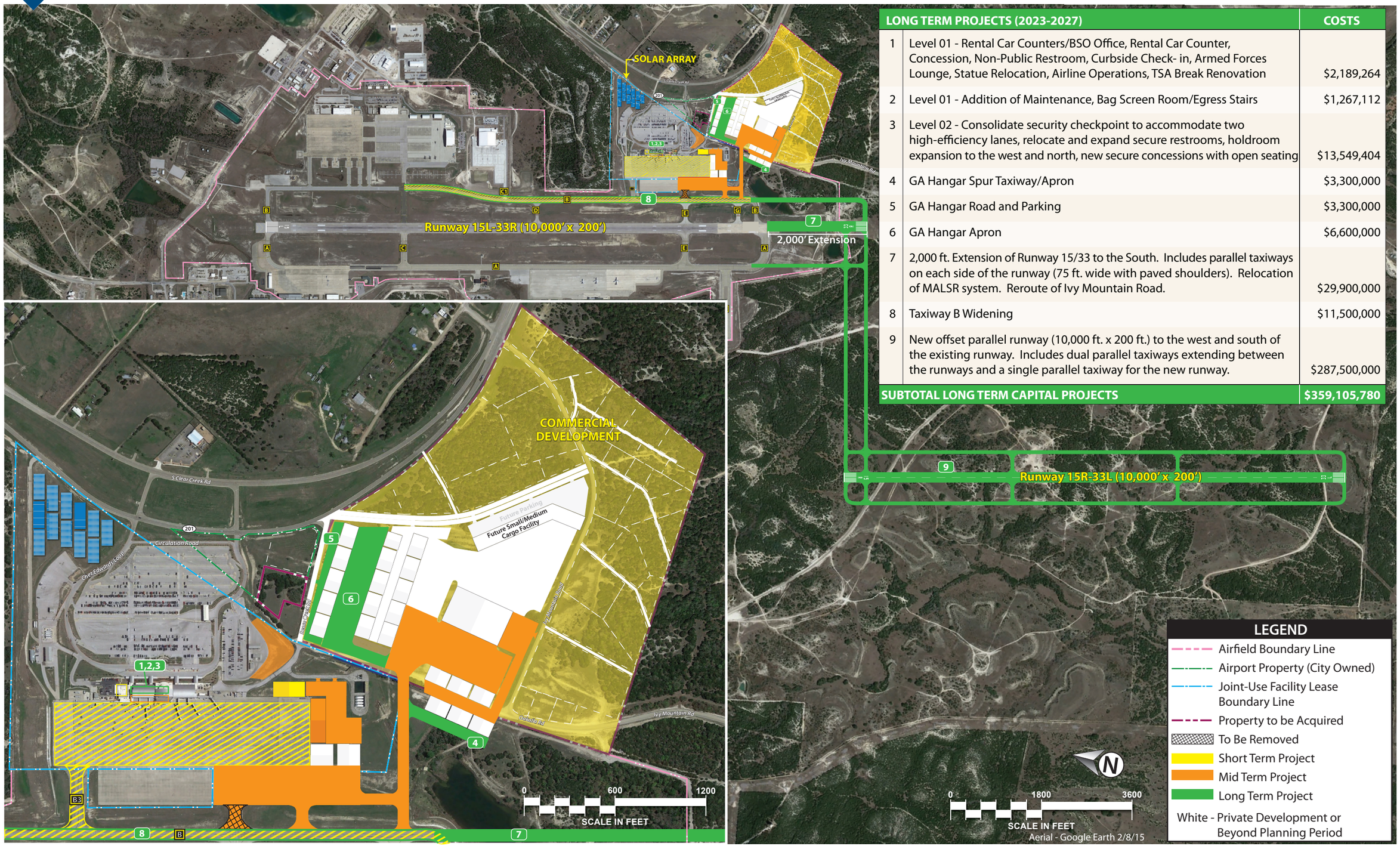
Description: This project includes extending the runway and parallel taxiway, relocation of a road, shoulder pavements, relocated NAVAIDs and all associated improvements.
Cost Estimate: $45,226,433
Funding Eligibility: Department of Defense

Project #8: Taxiway B Widening

Description: This project widens Taxiway B to accommodate a critical aircraft with an increased Taxiway Design Group. It will include paved shoulders, lighting, drainage, and other associated improvements.
Cost Estimate: $17,394,782
Funding Eligibility: AIP Entitlement, PFC and Other Unidentified Funding

Project #9: New offset parallel runway (10,000 ft. x 200 ft.) to the west and south of the existing runway. Includes dual parallel taxiways extending between the runways and a single parallel taxiway for the new runway.

Description: An additional runway, if warranted, is proposed to be parallel, but offset to the southwest of existing Runway 15-33. This project includes an access taxiway from the existing runway to the new



	LONG TERM PROJECTS (2023-2027)	COSTS
1	Level 01 - Rental Car Counters/BSO Office, Rental Car Counter, Concession, Non-Public Restroom, Curbside Check- in, Armed Forces Lounge, Statue Relocation, Airline Operations, TSA Break Renovation	$2,189,264
2	Level 01 - Addition of Maintenance, Bag Screen Room/Egress Stairs	$1,267,112
3	Level 02 - Consolidate security checkpoint to accommodate two high-efficiency lanes, relocate and expand secure restrooms, holdroom expansion to the west and north, new secure concessions with open seating	$13,549,404
4	GA Hangar Spur Taxiway/Apron	$3,300,000
5	GA Hangar Road and Parking	$3,300,000
6	GA Hangar Apron	$6,600,000
7	2,000 ft. Extension of Runway 15/33 to the South. Includes parallel taxiways on each side of the runway (75 ft. wide with paved shoulders). Relocation of MALSR system. Reroute of Ivy Mountain Road.	$29,900,000
8	Taxiway B Widening	$11,500,000
9	New offset parallel runway (10,000 ft. x 200 ft.) to the west and south of the existing runway. Includes dual parallel taxiways extending between the runways and a single parallel taxiway for the new runway.	$287,500,000
	SUBTOTAL LONG TERM CAPITAL PROJECTS	**$359,105,780**

Exhibit 6E
LONG TERM PROJECTS

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LONG TERM PROJECTS
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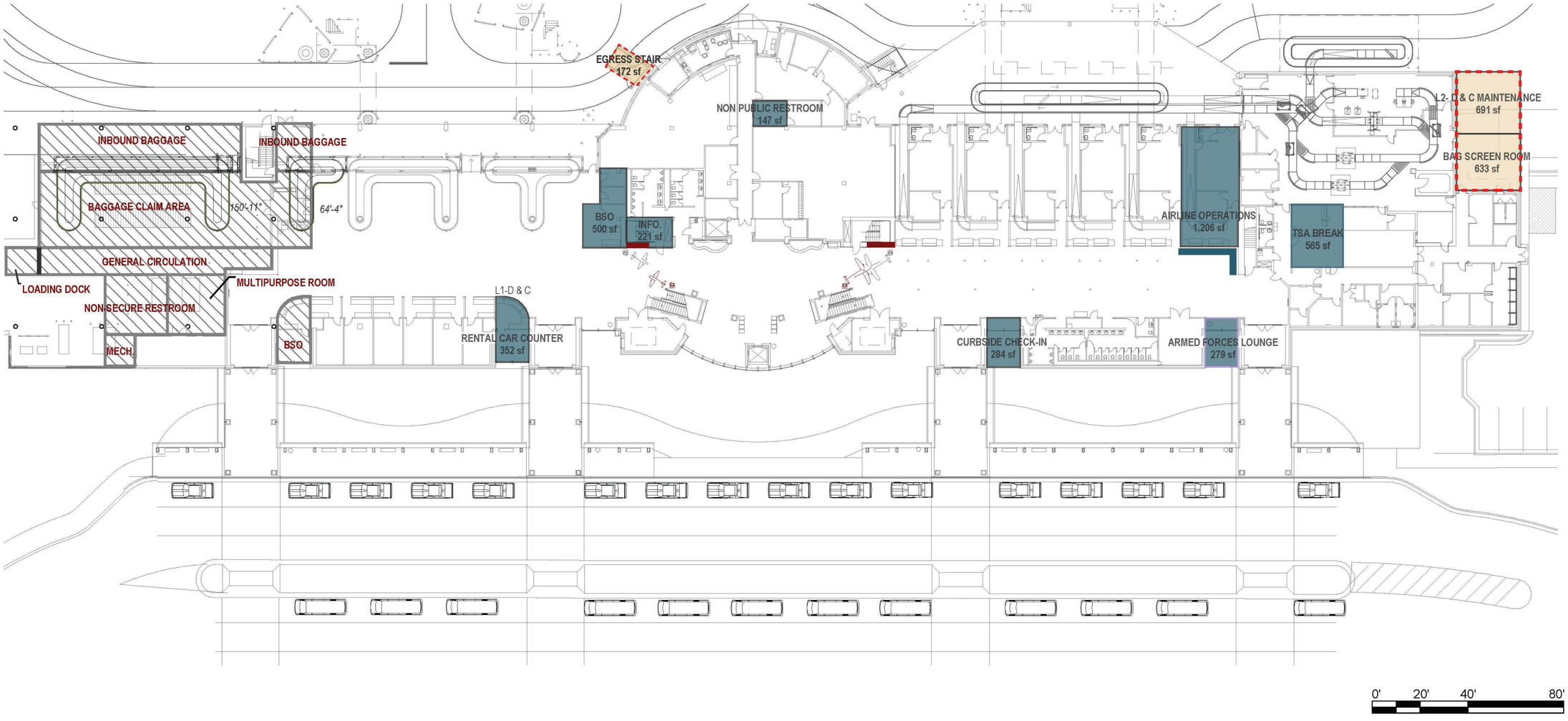

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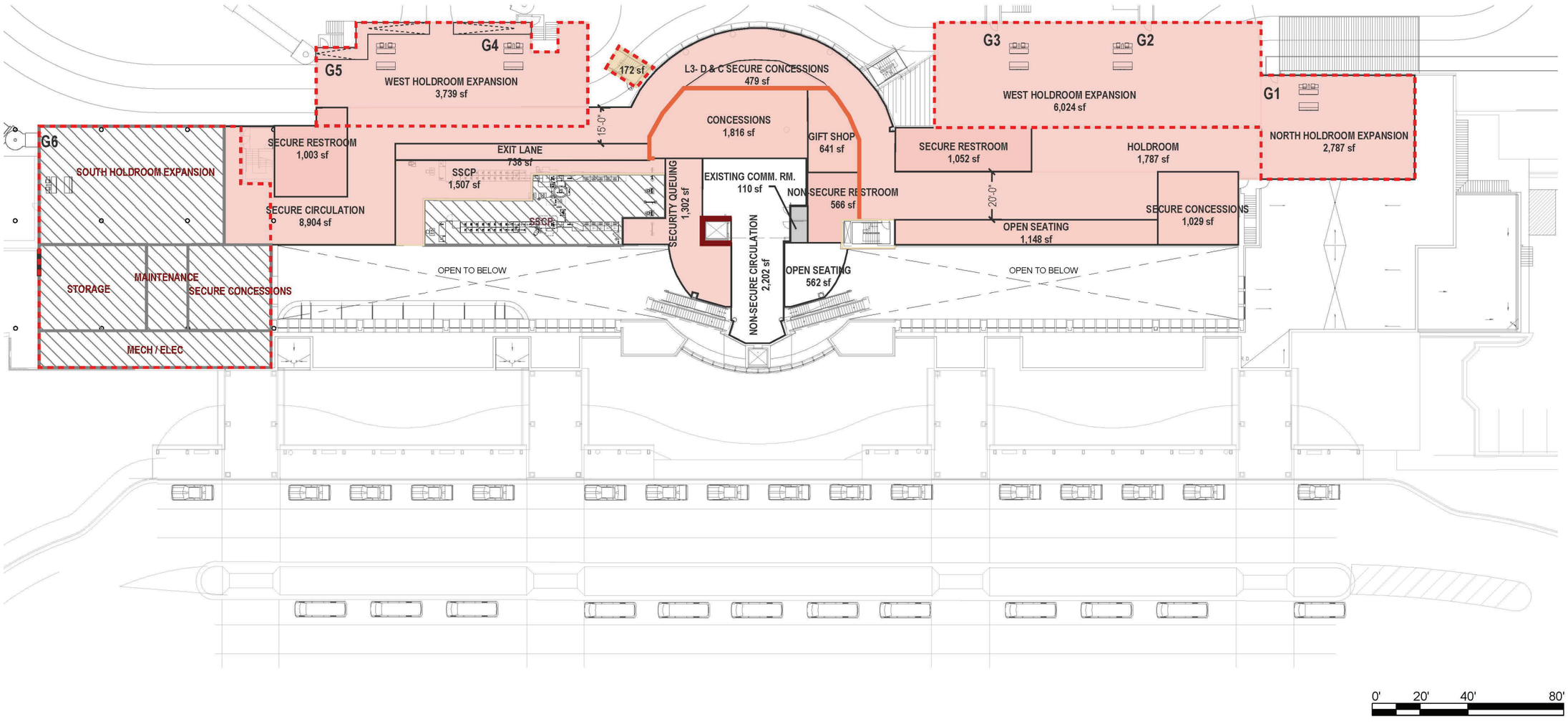

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LEVEL TWO - LONG TERM PROJECTS

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Exhibit 6G:
LONG TERM TERMINAL PROJECTS - LEVEL TWO

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runway along with a new parallel taxiway, connector taxiways, security fencing, and all associated improvements.
Cost Estimate: $434,869,546
Funding Eligibility: Department of Defense

Long-Term CIP Summary

The total cost associated with the long-term program are estimated at $543.2 million.

CAPITAL IMPROVEMENT SUMMARY

The CIP is intended as a road map of airport improvements to help guide the City, TxDOT Aviation Division and the FAA. The plan as presented will help accommodate increases in forecast demand at GRK over the next 20 years and beyond.

FINANCIAL ANALYSIS AND IMPLEMENTATION PLAN FOR THE MASTER PLAN CAPITAL IMPROVEMENT PROGRAM

This analysis, along with the Schedules presented in **Appendix C**, provides the results of evaluating the financial reasonableness of implementing the Master Plan Capital Improvement Program during the planning period from 2018 through 2037.

Estimated Project Costs and Development Schedule

The Capital Improvement Program (CIP) Estimated Project Costs and Development Schedule as presented in **Appendix C** is derived from previous results of the Master Plan analysis. The CIP for capital expansion and improvement projects is projected on an annual basis for the Phase I planning period from 2018 through 2022, in total for the Phase II planning period from 2023 through 2027, and in total for the Phase III planning period from 2028 through 2037. For each of these planning periods, Schedule 6-1 presents the Capital Improvement Program including estimated costs and anticipated development schedule for the identified projects.

As shown in Schedule 6-1, the total estimated cost of projects is $446,900,815 in 2018 dollars. The estimated costs for projects scheduled during the period 2018 through 2037 are adjusted by a 3% rate of annual inflation. The resulting total project costs escalated for inflation are $645,347,556. **Table 6D** presents a summary of the Schedule and provides a comparison of 2018 base year costs with escalated costs adjusted for inflation for each of the planning periods.

Table 6D
Summary of 2018 Base Year and Total Escalated Costs for the Master Plan Capital Improvement Program

Planning Periods	2018 Base Year Costs	Total Escalated Costs
Phase I Projects (2018-2022)	$26,201,985	$27,580,450
Phase II Projects (2023-2027)	61,593,050	74,587,393
Phase III Projects (2028-2037)	359,105,780	543,179,713
Total Project Costs	$446,900,815	$645,347,556

Note: Addition errors are due to rounding of calculated amounts.
Source: Leibowitz & Horton AMC analysis

Sources and Uses of Capital Funding

Funding sources for the CIP depend on many factors, including AIP and PFC project eligibility, the ultimate type and use of facilities to be developed, management's current and desired levels of the Airport's airline cost per enplaned passenger, the availability of other financing sources, and the priorities for scheduling project completion. For master planning purposes, assumptions were made related to the funding source of each capital improvement.

Schedule 6-2 lists each of the CIP projects, their estimated costs (escalated annually for inflation), and the planned funding sources and amounts. During the 20-year planning period, it was assumed that AIP entitlement grants would partially fund runway/taxiway rehabilitation and maintenance, taxiway relocation, taxiway shoulders and taxiway widening; aircraft parking apron rehabilitation and expansion; terminal expansion and improvements; and property acquisition. It was assumed that AIP discretionary grants would partially fund the Taxiway B and Associated Taxiways Rehabilitation, Addition of Paved Shoulders, Electrical Vault Improvements, and Airline Ramp Expansion. Additional discretionary funds provided through the Military Airport Program are assumed for the Corporate Hangar/Terminal Development project. PFC pay-as-you-go revenues were assumed to fund a portion of the AIP eligible projects and the terminal public address system upgrade. Rental Car Customer Facility Charge funds have been identified for the car wash facility improvements, rental car covered parking lot project, rental car parking expansion and fuel farm relocation, and terminal expansion related to rental car facilities. City contributions were assumed to fund local match requirements on AIP projects for runway/taxiway maintenance and land acquisition. Department of Defense funding is assumed for large airfield related projects including the runway lighting and airport signage upgrade, rehabilitation of Runway 15-33, the extension of Runway 15-33 and associated parallel taxiways, and the ultimate construction of a new offset parallel Runway 15-33 with associated parallel and connecting taxiways. Projects for which funding has not been identified, reflected as “Other Unidentified Funding” include airside and landside development for future general aviation facilities, expansion of the passenger terminal building, and the widening of Taxiway B. Cash reserves and Aviation Fund Balance were assumed to fund the internal inter-fund loan required for the local match toward AIP funding for the Corporate Hangar/Terminal Development project.

A summary of the sources of capital funding by type and uses of capital funding by planning period for the CIP is presented in **Table 6E**.

Table 6E
Summary of Sources and Uses of Capital Funding for the Master Plan Capital Improvement Program

Sources of Capital Funding	Phase I (2018-2022)	Phase II (2023-2027)	Phase III (2028-2037)	Totals
AIP Entitlement Grants	$13,453,671	$8,653,612	$18,562,813	$40,670,096
AIP Discretionary Grants	3,429,916	2,050,000	0	5,479,916
AIP Military Airport Program Grants	3,375,000	0	0	3,375,000
Passenger Facility Charges	2,143,774	4,200,656	7,312,018	13,656,449
Rental Car Customer Facility Charges	2,604,000	3,635,492	331,146	6,570,638
City Capital Contribution	232,180	0	0	232,180
Department of Defense Funding	1,966,909	10,906,477	480,095,979	492,969,364
Other Unidentified Funding	0	45,141,156	36,877,757	82,018,913
Cash Reserves/Net Ops Cash Flow	375,000	0	0	375,000
Total Sources of Capital Funding	$27,580,450	$74,587,393	$543,179,713	$645,347,556
Uses of Capital Funding				
Runway/Taxiway Improvements	10,501,301	20,245,207	497,490,761	$528,237,269
Terminal Apron Improvements	546,364	7,513,351	0	8,059,714
Terminal Building	8,056,985	19,562,644	25,722,768	53,342,397
General Aviation Facility Improvements	3,750,000	23,630,699	19,966,184	47,346,884
Land Acquisition	2,121,800	0	0	2,121,800
Other Improvements	2,604,000	3,635,492	0	6,239,492
Total Uses of Capital Funding	$27,580,450	$74,587,393	$543,179,713	$645,347,556

Note: Addition errors are due to rounding of calculated amounts.
Source: Leibowitz & Horton AMC analysis

Projected Operations and Maintenance Expenses

Operations and maintenance expense projections for the Phase I (2018 to 2022), the Phase II (2023 to 2027), and the Phase III (2028 to 2037) planning periods are based on the Airport's 2018 budget, the anticipated impacts of inflation, aviation traffic increases, facility improvements, and the recent experience of other airports with similar levels of aviation activity.

Operations and Maintenance Expense Projection Assumptions

Operations and maintenance expense growth assumptions, reflected in **Schedule 6-3**, were developed to project the Airport's operating expenses during the planning period. Actual amounts for 2015, 2016, and 2017 and budgeted amounts for 2018 provide a comparison with expenses that are projected for the period 2019 through 2037. For each of the following expense categories listed below, projections are based on 2018 budgeted amounts with a 3% annual rate of inflation beginning in 2019.

- Salaries
- Supplies
- Maintenance
- Repairs
- Support Services
- Benefits
- Minor Capital Outlay
- Professional Services
- Information Technology
- Human Resources
- Insurance
- Support Services – General Fund

Projection of Operations and Maintenance Expenses and Operating Expenses Per Enplaned Passenger

The projection of operations and maintenance expenses is provided in **Schedule 6-3**. As shown in the Schedule, total expenses are expected to grow from $2,548,147 budgeted in 2018 to $2,911,055 in 2022, reflecting an overall growth rate of 3% per year and a total of $13,731,735 during the Phase I planning period. Phase II expenses are projected to total $15,918,844, reflecting a 3% annual growth rate for the five-year period 2023-2027, and Phase III expenses are projected to total $39,847,898, reflecting a 3% annual growth rate for the ten-year period 2028-2037.

Schedule 6-3 also provides a comparison of the Airport's total operating expenses per enplaned passenger versus non-hub airports with similar levels of aviation activity. The Airport's operating expenses per enplaned passenger are projected to increase from $18.99 budgeted for 2018 to an average of $21.53 during the Phase III planning period. Over the same period of time, the overall non-hub industry average grows from $48.25 in 2018 to $61.39 during Phase III (Source: Non-Hub airports, FAA Operating and Financial Summary Report #127 with inflation adjustments after 2016 and FAA Air Carrier Activity Information System enplanement database). These comparisons show that budgeted and projected operating expenses at the Airport are substantially lower than other non-hub airports of similar size during all three phases of the 20-year planning period. This is partially attributable to operating costs traditionally borne by airports being provided by the U.S. Army, such as Air Traffic Control services, Aircraft Rescue and Fire Fighting services, and a shared portion of airfield maintenance. This also implies the Airport currently manages operations in a very cost-efficient manner and is expected to continue management practices that will yield cost-efficient results in future years.

The Airport is different from most airports when it comes to the calculation of enplaned passengers. The U.S. Army moves personnel to and from Fort Hood through the Airport on special military charters. Typically, the passengers on these charters do not use the civilian airport terminal, thus they are not subject to Passenger Facility Charges. However, they are included in the FAA's calculation of passenger enplanements when calculating the Airport's Airport Improvement Program entitlement grants. For purposes of calculating operating expenses per enplaned passenger, as well as calculating operating revenues per enplaned passenger and airline cost per enplaned passenger in the following section, the calculation does not include passenger enplanements associated with military charters to provide ratios which are more comparable with other non-hub airports.

Projected Operating Revenues

Operating revenue projections for the Phase I (2018 to 2022), Phase II (2023 to 2027), and Phase III (2028 to 2037) planning periods are based on the Airport's 2018 budget, current rates and charges methodology, current leasing practices, the anticipated impacts of inflation, aviation traffic increases, facility expansions, and the recent experience of other airports with similar levels of aviation activity.

Operating Revenue Projection Assumptions

Operating revenue growth assumptions, reflected in **Schedule 6-4**, were developed to project the Airport's operating revenues during the planning period. Actual amounts for 2015, 2016, and 2017 and budgeted amounts for 2018 provide a comparison with revenues that are projected for the period 2019 through 2037. This analysis organizes revenues into categories for airline revenues, non-airline revenues, and non-operating revenues. Annual revenue growth assumptions for the period 2019 through 2037 are provided in the following sections.

- <u>Airline Revenues</u>

  Landing fees. For 2019, the landing fee projection is based on multiple factors: the decrease experienced by the market exit of Delta Air Lines, a 5% increase in the landing fee rate, increases in aircraft landed weight adopted in the Airport's FY19 annual budget, and one half the annual growth rate of the Master Plan forecast of passenger enplanements. For the period 2020 through 2037, projections for landing fees are based on the 2019 projection with growth thereafter at a 3% annual rate of inflation plus increases in aircraft landed weight at one-half the annual growth rate of the Master Plan forecast for passenger enplanements.

  Air Carrier Operations/Rent. For 2019, the air carrier operations/rent projection is based on multiple factors: the decrease anticipated by the market exit of Delta Air Lines, a 5% increase in various rental rates included in this revenue line item adopted in the Airport's FY19 annual budget. For the period 2020 through 2037, projections for air carrier operations/rent are based on the 2019 projection with growth thereafter at a 3% annual rate of inflation.

- <u>Non-Airline Revenues</u>

  For the period 2019 through 2037, projections for rents and concessions derived from rental car, food and beverage, and retail concessions are based on the 2018 budget with growth thereafter at a 3% annual rate of inflation plus the annual growth rate of the Master Plan forecast of passenger enplanements. Projections for revenues from Airport parking lot fees are based on the annual growth rate of the Master Plan forecast of passenger enplanements, with no annual inflation rate, given the Airport's current rate structure and parking policies.

  For the period 2019 through 2037, projections for fuel sales, the associated cost of fuel sales, other terminal services, into plane fees, and other miscellaneous revenues are based on the 2018 budget with growth thereafter at a 3% annual rate of inflation.

Future projections of the TxDOT Routine Airport Maintenance Program (RAMP) funds are fixed at $50,000 based on the current maximum grant award. Additionally, hangar rent anticipated to begin in fiscal year 2021 is expected to remain level throughout the planning period.

- Non-Operating Revenues - The analysis has no investment income during the planning period.

Projection of Operating Revenues, Airline Cost Per Enplaned Passenger and Operating Revenues Per Enplaned Passenger

The projection of operating revenues is provided in **Schedule 6-4**. As shown in the Schedule, airline revenues are expected to decrease from $470,570 budgeted for 2018 to $444,689 projected for 2022 with a total of $2,161,507 during the five-year Phase I planning period. During the five-year Phase II period, airline revenues are projected to total $2,457,497, and during the ten-year Phase III period, revenues are projected to total $6,332,094. The overall annual growth rate for airline revenues is 3.4% during the twenty-year planning period. Non-Airline revenues are expected to increase from $2,011,977 budgeted for 2018 to $2,480,891 projected for 2022, for a total of $11,217,818 during the Phase I period. For the Phase II period, non-airline revenues are projected to total $13,712,064, and for the Phase III period, non-airline revenues are projected to total $35,777,611. The overall annual growth rate for non-airline revenues is 3.9%. Total Airport revenues (including non-operating revenues) are expected to increase from $2,482,547 budgeted for 2018 to $2,925,580 projected for 2022 with a total of $13,379,325 during the Phase I period. During the Phase II period, revenues are projected to total $16,169,561; during the Phase III period, revenues are projected to total $42,109,705. The overall annual growth rate for total Airport revenues is 3.7%.

Schedule 6-4 also provides a comparison of the Airport's airline cost per enplaned passenger (CPEP) versus non-hub airports with similar levels of aviation activity. The airline CPEP (all airline fees and rentals divided by enplaned passengers) is a measure airlines use to compare their cost of operations among the airports they serve. Killeen-Fort Hood's airline CPEP is projected to decrease from $3.51 in 2018 to $3.42 by the end of the twenty-year planning period. Over the same period, the overall non-hub industry average grows from $9.44 in 2018 to $12.01 during Phase III (Source: Non-Hub airports, FAA Operating and Financial Summary Report #127 with inflation adjustments after 2016 and FAA Air Carrier Activity Information System enplanement database).

This comparison indicates that airline rates and charges at Killeen are lower than the industry average and are projected to remain below the industry during the Phase III period. In its recent airline agreement renewals, the Airport increased airline rates and charges approximately 5%-8% for fiscal year 2019. Management expects to continue this process to improve the Airport's revenue position and is considering a more aggressive approach to increase fees in a shorter time frame since the current cost per enplaned passenger is below industry averages.

Despite the rate increase recently implemented in the air carrier agreements, the analysis reflects a decrease in Landing Fees and Air Carrier Operations/Rent in 2019. This is the result of Delta Air Lines exiting the Killeen market in January 2018. American Airlines and United Airlines both added flights following the departure of Delta from Killeen. While the Airport believes these additional flights will absorb the

passenger enplanements previously handled by Delta, the departure still results in a negative impact to landing fees, terminal rents, and other revenues generated from Delta.

Schedule 6-4 also provides a comparison of Killeen-Fort Hood's total operating revenue per enplaned passenger versus an average for other non-hub airports. The Airport's total operating revenue per enplaned passenger is projected to grow from $18.50 budgeted for 2018 to an average of $22.75 during the Phase III planning period. Over the same period, the overall non-hub industry average grows from $48.64 in 2018 to $61.90 during Phase III (Source: Non-Hub airports, FAA Operating and Financial Summary Report #127 with inflation adjustments after 2016 and FAA Air Carrier Activity Information System enplanement database). The difference between the Airport's operating revenue per enplaned passenger and the non-hub industry average is reflective of the Airport's low airline revenues and resulting low cost per enplaned passenger but indicates that the Airport's non-airline revenues are also below those of comparable non-hub airports.

The Airport and the City are actively working to generate additional revenue from existing operating revenue sources and by identifying new sources of operating revenue for the Airport. For example, the Airport is currently renegotiating its concession agreements with the rental car service providers and anticipates increased revenues will result. Additionally, the Airport is working with the U.S. Army on an opportunity to provide airfield maintenance services to areas of the airfield under the Army's responsibility. By achieving improved economies of scale, the Airport anticipates it can provide these services at a savings to the Army while generating additional revenue for the Airport.

Another area in which the Airport differs from other non-hub airports relates to its relationship with the U.S. Army and the opportunities for general aviation and non-aeronautical activities at the Airport. The joint use agreement between the U.S. Army and the City of Killeen requires all aircraft other than regularly scheduled air carriers to obtain prior permission (PPRs) to use the facility. Aircraft with a maximum certified take-off weight of less than 12,500 pounds are not allowed to utilize the facility without special consideration. As previously mentioned, the City leases approximately 80 acres from the U.S. Army for the civilian commercial service facilities at the Airport. This is a significantly smaller land "footprint" compared to most non-hubs who own the entire airport and the land surrounding the airfield. As a result, the Airport has very limited general aviation facilities and, unlike other non-hub airports, is unable to generate significant amounts of revenues from general aviation activities such as land leases, hangar rentals, and aviation fuel sales. The Airport is currently working on the acquisition of additional land adjacent to its current leasehold with the Army. This additional land will provide the space for the construction of expanded general aviation facilities which are reflected in the CIP of the Master Plan. The land would also provide the opportunity for the development of non-aeronautical activities by third-party developers. These initiatives would provide for new revenue opportunities at the Airport.

One such opportunity is the project to construct a corporate hangar reflected in year 2018 of the CIP. The Airport has an existing aeronautical tenant committed to rent these facilities upon completion which is anticipated in fiscal year 2021. The Airport estimates it can generate $93,300 per year from the hangar and office rental of this facility. This new source of revenue is reflected in the financial analysis beginning in 2021.

Financial Plan Summary for the Master Plan Capital Improvement Program

The Financial Plan Summary presented in **Schedule 6-5** includes a Capital Cash Flow section which presents a summary of projected capital funding (from **Schedule 6-2**) and scheduled capital expenditures (from **Schedule 6-1**) with the cash flow that results from implementing the Master Plan Capital Improvement Program. **Schedule 6-5** also includes an Operating Cash Flow section that summarizes totals for operating revenues (from **Schedule 6-4**) and operating expenses (from **Schedule 6-3**).

It should be noted that the 2018 operating budget reflects operating expenses in excess of operating revenues resulting in negative net operating cash flow. This analysis assumes this budget deficit in 2018 and future years will be balanced through Aviation Fund Balance, if necessary, or revenue rate adjustments to fund the operating deficit without requiring the use of fund balance.

In **Schedule 6-1** of the Financial Implementation Analysis, practical approaches were provided for scheduling capital expenditures to match the availability of capital funding. **Schedule 6-2** provided practical approaches for matching specific capital funding sources with each of the identified projects. As shown in **Schedule 6-5**, positive year end cash reserves are projected to occur by the end of the twenty-year planning period 2018 to 2037.

Based on the assumptions underlying the Financial Implementation Analysis summarized in the Capital Cash Flow section of **Schedule 6-5**, implementation of projects in the Master Plan CIP scheduled during the Phase I 2018 to 2022 planning period are reasonable, subject to partial funding support provided by the Aviation Fund Balance. Funding support of about $374,000 is projected to be needed to cover operating cash flow shortfalls and debt service on the inter-fund loan over the five-year short-term period. If these funding sources cannot provide this level of support, then the capital plan will need to be reduced by that much in Phase I. A number of projects planned for implementation in Phases II and III can be reasonably funded with traditional capital funding sources. However, significant portions of the capital program in those later phases have funding sources which are not currently identified. If funding cannot be identified for the indicated projects in the time frames needed, these projects will be delayed or cancelled.

Additionally, implementation of capital projects during the 2018-2037 planning period that have AIP discretionary grant funds indicated as a funding source are subject to the availability of those grants which are provided at the sole discretion of the FAA. If the identified portion of discretionary funding is not awarded by the FAA, these projects will need to be delayed until funding is available. Similarly, implementation of projects programmed with Department of Defense funding are subject to the availability of those funds provided at the sole discretion of the DOD. If the identified portion of DOD funding is not available, these projects will need to be delayed until funding is available.

The Financial Implementation Analysis relies on achievement of the aviation activity and passenger enplanement forecast. Actual aviation traffic may temporarily vary from the projected levels of activity without a significant adverse impact on the capital program. If decreased traffic levels occur and persist, implementation of all the proposed projects may not be financially feasible. It should also be noted,

however, that if the forecast activity levels are not met, a number of the planned capital improvements may not be necessary.

FINANCIAL ANALYSIS SCHEDULES

Financial analysis Schedules 6-1 through 6-5 are provided in **Appendix C**.

Killeen-Fort Hood
REGIONAL AIRPORT

APPENDIX A

GLOSSARY OF TERMS

Glossary of Terms

A

ABOVE GROUND LEVEL: The elevation of a point or surface above the ground.

ACCELERATE-STOP DISTANCE AVAILABLE (ASDA): See declared distances.

ADVISORY CIRCULAR: External publications issued by the FAA consisting of nonregulatory material providing for the recommendations relative to a policy, guidance and information relative to a specific aviation subject.

AIR CARRIER: An operator which: (1) performs at least five round trips per week between two or more points and publishes flight schedules which specify the times, days of the week, and places between which such flights are performed; or (2) transports mail by air pursuant to a current contract with the U.S. Postal Service. Certified in accordance with Federal Aviation Regulation (FAR) Parts 121 and 127.

AIRCRAFT: A transportation vehicle that is used or intended for use for flight.

AIRCRAFT APPROACH CATEGORY: A grouping of aircraft based on 1.3 times the stall speed in their landing configuration at their maximum certificated landing weight. The categories are as follows:

- Category A: Speed less than 91 knots.
- Category B: Speed 91 knots or more, but less than 121 knots.
- Category C: Speed 121 knots or more, but less than 141 knots.
- Category D: Speed 141 knots or more, but less than 166 knots.
- Category E: Speed greater than 166 knots.

AIRCRAFT OPERATION: The landing, takeoff, or touch-and-go procedure by an aircraft on a runway at an airport.

AIRCRAFT OPERATIONS AREA (AOA): A restricted and secure area on the airport property designed to protect all aspects related to aircraft operations.

AIRCRAFT OWNERS AND PILOTS ASSOCIATION: A private organization serving the interests and needs of general aviation pilots and aircraft owners.

AIRCRAFT RESCUE AND FIRE FIGHTING: A facility located at an airport that provides emergency vehicles, extinguishing agents, and personnel responsible for minimizing the impacts of an aircraft accident or incident.

AIRFIELD: The portion of an airport which contains the facilities necessary for the operation of aircraft.

AIRLINE HUB: An airport at which an airline concentrates a significant portion of its activity and which often has a significant amount of connecting traffic.

AIRPLANE DESIGN GROUP (ADG): A grouping of aircraft based upon wingspan. The groups are as follows:

- Group I: Up to but not including 49 feet.
- Group II: 49 feet up to but not including 79 feet.
- Group III: 79 feet up to but not including 118 feet.
- Group IV: 118 feet up to but not including 171 feet.
- Group V: 171 feet up to but not including 214 feet.
- Group VI: 214 feet or greater.

AIRPORT AUTHORITY: A quasi-governmental public organization responsible for setting the policies governing the management and operation of an airport or system of airports under its jurisdiction.

AIRPORT BEACON: A navigational aid located at an airport which displays a rotating light beam to identify whether an airport is lighted.

AIRPORT CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

AIRPORT ELEVATION: The highest point on the runway system at an airport expressed in feet above mean sea level (MSL).

AIRPORT IMPROVEMENT PROGRAM: A program authorized by the Airport and Airway Improvement Act of 1982 that provides funding for airport planning and development.

AIRPORT LAYOUT DRAWING (ALD): The drawing of the airport showing the layout of existing and proposed airport facilities.

AIRPORT LAYOUT PLAN (ALP): A scaled drawing of the existing and planned land and facilities necessary for the operation and development of the airport.

AIRPORT LAYOUT PLAN DRAWING SET: A set of technical drawings depicting the current and future airport conditions. The individual sheets comprising the set can vary with the complexities of the airport, but the FAA-required drawings include the Airport Layout Plan (sometimes referred to as the Airport Layout Drawing (ALD), the Airport Airspace Drawing, and the Inner Portion of the Approach Surface Drawing, On-Airport Land Use Drawing, and Property Map.

AIRPORT MASTER PLAN: The planner's concept of the long-term development of an airport.

AIRPORT MOVEMENT AREA SAFETY SYSTEM: A system that provides automated alerts and warnings of potential runway incursions or other hazardous aircraft movement events.

AIRPORT OBSTRUCTION CHART: A scaled drawing depicting the Federal Aviation Regulation (FAR) Part 77 surfaces, a representation of objects that penetrate these surfaces, runway, taxiway, and ramp areas, navigational aids, buildings, roads and other detail in the vicinity of an airport.

AIRPORT REFERENCE CODE (ARC): A coding system used to relate airport design criteria to the operational (Aircraft Approach Category) to the physical characteristics (Airplane Design Group) of the airplanes intended to operate at the airport.

AIRPORT REFERENCE POINT (ARP): The latitude and longitude of the approximate center of the airport.

AIRPORT SPONSOR: The entity that is legally responsible for the management and operation of an airport, including the fulfillment of the requirements of laws and regulations related thereto.

AIRPORT SURFACE DETECTION EQUIPMENT: A radar system that provides air traffic controllers with a visual representation of the movement of aircraft and other vehicles on the ground on the airfield at an airport.

AIRPORT SURVEILLANCE RADAR: The primary radar located at an airport or in an air traffic control terminal area that receives a signal at an antenna and transmits the signal to air traffic control display equipment defining the location of aircraft in the air. The signal provides only the azimuth and range of aircraft from the location of the antenna.

AIRPORT TRAFFIC CONTROL TOWER (ATCT): A central operations facility in the terminal air traffic control system, consisting of a tower, including an associated instrument flight rule (IFR) room if radar equipped, using air/ground communications and/or radar, visual signaling and other devices to provide safe and expeditious movement of terminal air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER: A facility which provides en route air traffic control service to aircraft operating on an IFR flight plan within controlled airspace over a large, multi-state region.

AIRSIDE: The portion of an airport that contains the facilities necessary for the operation of aircraft.

AIRSPACE: The volume of space above the surface of the ground that is provided for the operation of aircraft.

AIR TAXI: An air carrier certificated in accordance with FAR Part 121 and FAR Part 135 and authorized to provide, on demand, public transportation of persons and property by aircraft. Generally operates small aircraft "for hire" for specific trips.

AIR TRAFFIC CONTROL: A service operated by an appropriate organization for the purpose of providing for the safe, orderly, and expeditious flow of air traffic.

AIR ROUTE TRAFFIC CONTROL CENTER (ARTCC): A facility established to provide air traffic control service to aircraft operating on an IFR flight plan within controlled airspace and principally during the en route phase of flight.

AIR TRAFFIC CONTROL SYSTEM COMMAND CENTER: A facility operated by the FAA which is responsible for the central flow control, the central altitude reservation system, the airport reservation position system, and the air traffic service contingency command for the air traffic control system.

AIR TRAFFIC HUB: A categorization of commercial service airports or group of commercial service airports in a metropolitan or urban area based upon the proportion of annual national enplanements existing at the airport or airports. The categories are large hub, medium hub, small hub, or non-hub. It forms the basis for the apportionment of entitlement funds.

AIR TRANSPORT ASSOCIATION OF AMERICA: An organization consisting of the principal U.S. airlines that represents the interests of the airline industry on major aviation issues before federal, state, and local government bodies. It promotes air transportation safety by coordinating industry and governmental safety programs and it serves as a focal point for industry efforts to standardize practices and enhance the efficiency of the air transportation system.

ALERT AREA: See special-use airspace.

ALTITUDE: The vertical distance measured in feet above mean sea level.

ANNUAL INSTRUMENT APPROACH (AIA): An approach to an airport with the intent to land by an aircraft in accordance with an IFR flight plan when visibility is less than three miles and/or when the ceiling is at or below the minimum initial approach altitude.

APPROACH LIGHTING SYSTEM (ALS): An airport lighting facility which provides visual guidance to landing aircraft by radiating light beams by which the pilot aligns the aircraft with the extended centerline of the runway on his final approach and landing.

APPROACH MINIMUMS: The altitude below which an aircraft may not descend while on an IFR approach unless the pilot has the runway in sight.

APPROACH SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 which is longitudinally centered on an extended runway centerline and extends outward and upward from the primary surface at each end of a runway at a designated slope and distance based upon the type of available or planned approach by aircraft to a runway.

APRON: A specified portion of the airfield used for passenger, cargo or freight loading and unloading, aircraft parking, and the refueling, maintenance and servicing of aircraft.

AREA NAVIGATION: The air navigation procedure that provides the capability to establish and maintain a flight path on an arbitrary course that remains within the coverage area of navigational sources being used.

AUTOMATED TERMINAL INFORMATION SERVICE (ATIS): The continuous broadcast of recorded non-control information at towered airports. Information typically includes wind speed, direction, and runway in use.

AUTOMATED SURFACE OBSERVATION SYSTEM (ASOS): A reporting system that provides frequent airport ground surface weather observation data through digitized voice broadcasts and printed reports.

AUTOMATIC WEATHER OBSERVATION STATION (AWOS): Equipment used to automatically record weather conditions (i.e. cloud height, visibility, wind speed and direction, temperature, dew point, etc.)

AUTOMATIC DIRECTION FINDER (ADF): An aircraft radio navigation system which senses and indicates the direction to a non-directional radio beacon (NDB) ground transmitter.

AVIGATION EASEMENT: A contractual right or a property interest in land over which a right of unobstructed flight in the airspace is established.

AZIMUTH: Horizontal direction expressed as the angular distance between true north and the direction of a fixed point (as the observer's heading).

B

BASE LEG: A flight path at right angles to the landing runway off its approach end. The base leg normally extends from the downwind leg to the intersection of the extended runway centerline. See "traffic pattern."

BASED AIRCRAFT: The general aviation aircraft that use a specific airport as a home base.

BEARING: The horizontal direction to or from any point, usually measured clockwise from true north or magnetic north.

BLAST FENCE: A barrier used to divert or dissipate jet blast or propeller wash.

BLAST PAD: A prepared surface adjacent to the end of a runway for the purpose of eliminating the erosion of the ground surface by the wind forces produced by airplanes at the initiation of takeoff operations.

BUILDING RESTRICTION LINE (BRL): A line which identifies suitable building area locations on the airport.

C

CAPITAL IMPROVEMENT PLAN: The planning program used by the Federal Aviation Administration to identify, prioritize, and distribute Airport Improvement Program funds for airport development and the needs of the National Airspace System to meet specified national goals and objectives.

CARGO SERVICE AIRPORT: An airport served by aircraft providing air transportation of property only, including mail, with an annual aggregate landed weight of at least 100,000,000 pounds.

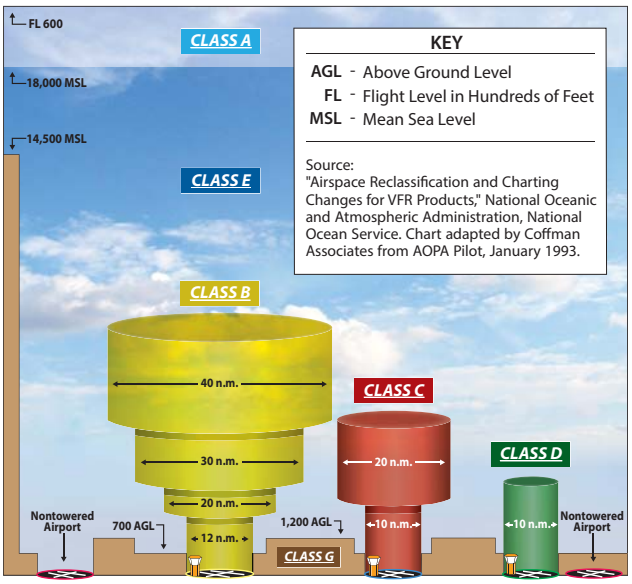
CATEGORY I: An Instrument Landing System (ILS) that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 200 feet above the horizontal plane containing the runway threshold.

CATEGORY II: An ILS that provides acceptable guidance information to an aircraft from the coverage limits of the ILS to the point at which the localizer course line intersects the glide path at a decision height of 100 feet above the horizontal plane containing the runway threshold.

CATEGORY III: An ILS that provides acceptable guidance information to a pilot from the coverage limits of the ILS with no decision height specified above the horizontal plane containing the runway threshold.

CEILING: The height above the ground surface to the location of the lowest layer of clouds which is reported as either broken or overcast.

CIRCLING APPROACH: A maneuver initiated by the pilot to align the aircraft with the runway for landing when flying a predetermined circling instrument approach under IFR.



CLASS A AIRSPACE: See Controlled Airspace.

CLASS B AIRSPACE: See Controlled Airspace.

CLASS C AIRSPACE: See Controlled Airspace.

CLASS D AIRSPACE: See Controlled Airspace.

CLASS E AIRSPACE: See Controlled Airspace.

CLASS G AIRSPACE: See Controlled Airspace.

CLEAR ZONE: See Runway Protection Zone.

COMMERCIAL SERVICE AIRPORT: A public airport providing scheduled passenger service that enplanes at least 2,500 annual passengers.

COMMON TRAFFIC ADVISORY FREQUENCY: A radio frequency identified in the appropriate aeronautical chart which is designated for the purpose of transmitting airport advisory information and procedures while operating to or from an uncontrolled airport.

COMPASS LOCATOR (LOM): A low power, low/medium frequency radio-beacon installed in conjunction with the instrument landing system at one or two of the marker sites.

CONICAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that extends

from the edge of the horizontal surface outward and upward at a slope of 20 to 1 for a horizontal distance of 4,000 feet.

CONTROLLED AIRPORT: An airport that has an operating airport traffic control tower.

CONTROLLED AIRSPACE: Airspace of defined dimensions within which air traffic control services are provided to instrument flight rules (IFR) and visual flight rules (VFR) flights in accordance with the airspace classification. Controlled airspace in the United States is designated as follows:

- **CLASS A**: Generally, the airspace from 18,000 feet mean sea level (MSL) up to but not including flight level FL600. All persons must operate their aircraft under IFR.

- **CLASS B**:
  Generally, the airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports. The configuration of Class B airspace is unique to each airport, but typically consists of two or more layers of air space and is designed to contain all published instrument approach procedures to the airport. An air traffic control clearance is required for all aircraft to operate in the area.

- **CLASS C**: Generally, the airspace from the surface to 4,000 feet above the airport elevation (charted as MSL) surrounding those airports that have an operational control tower and radar approach control and are served by a qualifying number of IFR operations or passenger enplanements. Although individually tailored for each airport, Class C airspace typically consists of a surface area with a five nautical mile (nm) radius and an outer area with a 10 nautical mile radius that extends from 1,200 feet to 4,000 feet above the airport elevation. Two-way radio communication is required for all aircraft.

- **CLASS D**: Generally, that airspace from the surface to 2,500 feet above the air port elevation (charted as MSL) surrounding those airports that have an operational control tower. Class D airspace is individually tailored and configured to encompass published instrument approach procedure. Unless otherwise authorized, all persons must establish two-way radio communication.

- **CLASS E**: Generally, controlled airspace that is not classified as Class A, B, C, or D. Class E airspace extends upward from either the surface or a designated altitude to the overlying or adjacent controlled airspace. When designated as a surface area, the airspace will be configured to contain all instrument procedures. Class E airspace encompasses all Victor Airways. Only aircraft following instrument flight rules are required to establish two-way radio communication with air traffic control.

- **CLASS G**: Generally, that airspace not classified as Class A, B, C, D, or E. Class G airspace is uncontrolled for all aircraft. Class G airspace extends from the surface to the overlying Class E airspace.

CONTROLLED FIRING AREA: See special-use airspace.

CROSSWIND: A wind that is not parallel to a runway centerline or to the intended flight path of an aircraft.

CROSSWIND COMPONENT: The component of wind that is at a right angle to the runway centerline or the intended flight path of an aircraft.

CROSSWIND LEG: A flight path at right angles to the landing runway off its upwind end. See "traffic pattern."

D

DECIBEL: A unit of noise representing a level relative to a reference of a sound pressure 20 micro newtons per square meter.

DECISION HEIGHT/ DECISION ALTITUDE: The height above the end of the runway surface at which a decision must be made by a pilot during the ILS or Precision Approach Radar approach to either continue the approach or to execute a missed approach.

DECLARED DISTANCES: The distances declared available for the airplane's takeoff runway, takeoff distance, accelerate-stop distance, and landing distance requirements. The distances are:

- **TAKEOFF RUNWAY AVAILABLE (TORA):** The runway length declared available and suitable for the ground run of an airplane taking off.

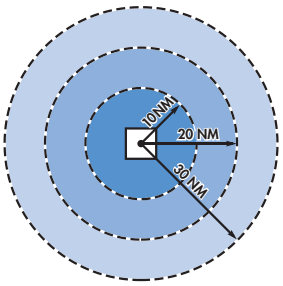
- **TAKEOFF DISTANCE AVAILABLE (TODA):** The TORA plus the length of any remaining runway and/or clear way beyond the far end of the TORA.
- **ACCELERATE-STOP DISTANCE AVAILABLE (ASDA):** The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff.
- **LANDING DISTANCE AVAILABLE (LDA):** The runway length declared available and suitable for landing.

DEPARTMENT OF TRANSPORTATION: The cabinet level federal government organization consisting of modal operating agencies, such as the Federal Aviation Administration, which was established to promote the coordination of federal transportation programs and to act as a focal point for research and development efforts in transportation.

DISCRETIONARY FUNDS: Federal grant funds that may be appropriated to an airport based upon designation by the Secretary of Transportation or Congress to meet a specified national priority such as enhancing capacity, safety, and security, or mitigating noise.

DISPLACED THRESHOLD: A threshold that is located at a point on the runway other than the designated beginning of the runway.

DISTANCE MEASURING EQUIPMENT (DME): Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.



DNL: The 24-hour average sound level, in Aweighted decibels, obtained after the addition of ten decibels to sound levels for the periods between 10 p.m. and 7 a.m. as averaged over a span of one year. It is the FAA standard metric for determining the cumulative exposure of individuals to noise.

DOWNWIND LEG: A flight path parallel to the landing runway in the direction opposite to landing. The downwind leg normally extends between the crosswind leg and the base leg. Also see "traffic pattern."

E

EASEMENT: The legal right of one party to use a portion of the total rights in real estate owned by another party. This may include the right of passage over, on, or below the property; certain air rights above the property, including view rights; and the rights to any specified form of development or activity, as well as any other legal rights in the property that may be specified in the easement document.

ELEVATION: The vertical distance measured in feet above mean sea level.

ENPLANED PASSENGERS: The total number of revenue passengers boarding aircraft, including originating, stop-over, and transfer passengers, in scheduled and nonscheduled services.

ENPLANEMENT: The boarding of a passenger, cargo, freight, or mail on an aircraft at an airport.

ENTITLEMENT: Federal funds for which a commercial service airport may be eligible based upon its annual passenger enplanements.

ENVIRONMENTAL ASSESSMENT (EA): An environmental analysis performed pursuant to the National Environmental Policy Act to determine whether an action would significantly affect the environment and thus require a more detailed environmental impact statement.

ENVIRONMENTAL AUDIT: An assessment of the current status of a party's compliance with applicable environmental requirements of a party's environmental compliance policies, practices, and controls.

ENVIRONMENTAL IMPACT STATEMENT (EIS): A document required of federal agencies by the National Environmental Policy Act for major projects are legislative proposals affecting the environment. It is a tool for decision-making describing the positive and negative effects of a proposed action and citing alternative actions.

ESSENTIAL AIR SERVICE: A federal program which guarantees air carrier service to selected small cities by providing subsidies as needed to prevent these cities from such service.

F

FEDERAL AVIATION REGULATIONS: The general and permanent rules established by the executive departments and agencies of the Federal Government for aviation, which are published in the Federal Register. These are the aviation subset of the Code of Federal Regulations.

FEDERAL INSPECTION SERVICES: The provision of customs and immigration services including passport inspection, inspection of baggage, the collection of duties on certain imported items, and the inspections for agricultural products, illegal drugs, or other restricted items.

FINAL APPROACH: A flight path in the direction of landing along the extended runway centerline. The final approach normally extends from the base leg to the runway. See "traffic pattern."

FINAL APPROACH AND TAKEOFF AREA (FATO). A defined area over which the final phase of the helicopter approach to a hover, or a landing is completed and from which the takeoff is initiated.

FINAL APPROACH FIX: The designated point at which the final approach segment for an aircraft landing on a runway begins for a non-precision approach.

FINDING OF NO SIGNIFICANT IMPACT (FONSI): A public document prepared by a Federal agency that presents the rationale why a proposed action will not have a significant effect on the environment and for which an environmental impact statement will not be prepared.

FIXED BASE OPERATOR (FBO): A provider of services to users of an airport. Such services include, but are not limited to, hangaring, fueling, flight training, repair, and maintenance.

FLIGHT LEVEL: A measure of altitude used by aircraft flying above 18,000 feet. Flight levels are indicated by three digits representing the pressure altitude in hundreds of feet. An airplane flying at flight level 360 is flying at a pressure altitude of 36,000 feet. This is expressed as FL 360.

FLIGHT SERVICE STATION: An operations facility in the national flight advisory system which utilizes data interchange facilities for the collection and dissemination of Notices to Airmen, weather, and administrative data and which provides pre-flight and in-flight advisory services to pilots through air and ground based communication facilities.

FRANGIBLE NAVAID: A navigational aid which retains its structural integrity and stiffness up to a designated maximum load, but on impact from a greater load, breaks, distorts, or yields in such a manner as to present the minimum hazard to aircraft.

G

GENERAL AVIATION: That portion of civil aviation which encompasses all facets of aviation except air carriers holding a certificate of convenience and necessity, and large aircraft commercial operators.

GENERAL AVIATION AIRPORT: An airport that provides air service to only general aviation.

GLIDESLOPE (GS): Provides vertical guidance for aircraft during approach and landing. The glideslope consists of the following:

1. Electronic components emitting signals which provide vertical guidance by reference to airborne instruments during instrument approaches such as ILS; or

2. Visual ground aids, such as VASI, which provide vertical guidance for VFR approach or for the visual portion of an instrument approach and landing.

GLOBAL POSITIONING SYSTEM (GPS): A system of 48 satellites used as reference points to enable navigators equipped with GPS receivers to determine their latitude, longitude, and altitude.

GROUND ACCESS: The transportation system on and around the airport that provides access to and from the airport by ground transportation vehicles for passengers, employees, cargo, freight, and airport services.

H

HELIPAD: A designated area for the takeoff, landing, and parking of helicopters.

HIGH INTENSITY RUNWAY LIGHTS: The highest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

HIGH-SPEED EXIT TAXIWAY: A long radius taxiway designed to expedite aircraft turning off the runway after landing (at speeds to 60 knots), thus reducing runway occupancy time.

HORIZONTAL SURFACE: An imaginary obstruction-limiting surface defined in FAR Part 77 that is specified as a portion of a horizontal plane surrounding a runway located 150 feet above the established airport elevation. The specific horizontal dimensions of this surface are a function of the types of approaches existing or planned for the runway.

I

INITIAL APPROACH FIX: The designated point at which the initial approach segment begins for an instrument approach to a runway.

INSTRUMENT APPROACH PROCEDURE: A series of predetermined maneuvers for the orderly transfer of an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing may be made visually.

INSTRUMENT FLIGHT RULES (IFR): Procedures for the conduct of flight in weather conditions below Visual Flight Rules weather minimums. The term IFR is often also used to define weather conditions and the type of flight plan under which an aircraft is operating.

INSTRUMENT LANDING SYSTEM (ILS): A precision instrument approach system which normally consists of the following electronic components and visual aids:

1. Localizer.
2. Glide Slope.
3. Outer Marker.
4. Middle Marker.
5. Approach Lights.

INSTRUMENT METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions that are less than the minimums specified for visual meteorological conditions.

ITINERANT OPERATIONS: Operations by aircraft that are not based at a specified airport.

K

KNOTS: A unit of speed length used in navigation that is equivalent to the number of nautical miles traveled in one hour.

L

LANDSIDE: The portion of an airport that provides the facilities necessary for the processing of passengers, cargo, freight, and ground transportation vehicles.

LANDING DISTANCE AVAILABLE (LDA): See declared distances.

LARGE AIRPLANE: An airplane that has a maximum certified takeoff weight in excess of 12,500 pounds.

LOCAL AREA AUGMENTATION SYSTEM: A differential GPS system that provides localized measurement correction signals to the basic GPS signals to improve navigational accuracy integrity, continuity, and availability.

LOCAL OPERATIONS: Aircraft operations performed by aircraft that are based at the airport and that operate in the local traffic pattern or within sight of the airport, that are known to be departing for or arriving from flights in local practice areas within a prescribed distance from the airport, or that execute simulated instrument approaches at the airport.

LOCAL TRAFFIC: Aircraft operating in the traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from the local practice areas, or aircraft executing practice instrument approach procedures. Typically, this includes touch and-go training operations.

LOCALIZER: The component of an ILS which provides course guidance to the runway.

LOCALIZER TYPE DIRECTIONAL AID (LDA): A facility of comparable utility and accuracy to a localizer, but is not part of a complete ILS and is not aligned with the runway.

LONG RANGE NAVIGATION SYSTEM (LORAN): Long range navigation is an electronic navigational aid which determines aircraft position and speed by measuring the difference in the time of reception of synchronized pulse signals from two fixed transmitters. Loran is used for en route navigation.

LOW INTENSITY RUNWAY LIGHTS: The lowest classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

M

MEDIUM INTENSITY RUNWAY LIGHTS: The middle classification in terms of intensity or brightness for lights designated for use in delineating the sides of a runway.

MICROWAVE LANDING SYSTEM (MLS): An instrument approach and landing system that provides precision guidance in azimuth, elevation, and distance measurement.

MILITARY OPERATIONS: Aircraft operations that are performed in military aircraft.

MILITARY OPERATIONS AREA (MOA): See special-use airspace

MILITARY TRAINING ROUTE: An air route depicted on aeronautical charts for the conduct of military flight training at speeds above 250 knots.

MISSED APPROACH COURSE (MAC): The flight route to be followed if, after an instrument approach, a landing is not affected, and occurring normally:

1. When the aircraft has descended to the decision height and has not established visual contact; or
2. When directed by air traffic control to pull up or to go around again.

MOVEMENT AREA: The runways, taxiways, and other areas of an airport which are utilized for taxiing/hover taxiing, air taxiing, takeoff, and landing of aircraft, exclusive of loading ramps and parking areas. At those airports with a tower, air traffic control clearance is required for entry onto the movement area.

N

NATIONAL AIRSPACE SYSTEM: The network of air traffic control facilities, air traffic control areas, and navigational facilities through the U.S.

NATIONAL PLAN OF INTEGRATED AIRPORT SYSTEMS: The national airport system plan developed by the Secretary of Transportation on a biannual basis for the development of public use airports to meet national air transportation needs.

NATIONAL TRANSPORTATION SAFETY BOARD: A federal government organization established to investigate and determine the probable cause of transportation accidents, to recommend equipment and procedures to enhance transportation safety, and to review on appeal the suspension or revocation of any certificates or licenses issued by the Secretary of Transportation.

NAUTICAL MILE: A unit of length used in navigation which is equivalent to the distance spanned by one minute of arc in latitude, that is, 1,852 meters or 6,076 feet. It is equivalent to approximately 1.15 statute mile.

NAVAID: A term used to describe any electrical or visual air navigational aids, lights, signs, and associated supporting equipment (i.e. PAPI, VASI, ILS, etc.)

NAVIGATIONAL AID: A facility used as, available for use as, or designed for use as an aid to air navigation.

NOISE CONTOUR: A continuous line on a map of the airport vicinity connecting all points of the same noise exposure level.

NON-DIRECTIONAL BEACON (NDB): A beacon transmitting nondirectional signals whereby the pilot of an aircraft equipped with direction finding equipment can determine his or her bearing to and from the radio beacon and home on, or track to, the station. When the radio beacon is installed in conjunction with the Instrument Landing System marker, it is normally called a Compass Locator.

NON-PRECISION APPROACH PROCEDURE: A standard instrument approach procedure in which no electronic glide slope is provided, such as VOR, TACAN, NDB, or LOC.

NOTICE TO AIRMEN: A notice containing information concerning the establishment, condition, or change in any component of or hazard in the National Airspace System, the timely knowledge of which is considered essential to personnel concerned with flight operations.

O

OBJECT FREE AREA (OFA): An area on the ground centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by having the area free of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.

OBSTACLE FREE ZONE (OFZ): The airspace below 150 feet above the established airport elevation and along the runway and extended runway centerline that is required to be kept clear of all objects, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function, in order to provide clearance for aircraft landing or taking off from the runway, and for missed approaches.

ONE-ENGINE INOPERABLE SURFACE: A surface emanating from the runway end at a slope ratio of 62.5:1. Air carrier airports are required to maintain a technical drawing of this surface depicting any object penetrations by January 1, 2010.

OPERATION: The take-off, landing, or touch-and-go procedure by an aircraft on a runway at an airport.

OUTER MARKER (OM): An ILS navigation facility in the terminal area navigation system located four to seven miles from the runway edge on the extended centerline, indicating to the pilot that he/she is passing over the facility and can begin final approach.

P

PILOT CONTROLLED LIGHTING: Runway lighting systems at an airport that are controlled by activating the microphone of a pilot on a specified radio frequency.

PRECISION APPROACH: A standard instrument approach procedure which provides runway alignment and glide slope (descent) information. It is categorized as follows:

- **CATEGORY I (CAT I)**: A precision approach which provides for approaches with a decision height of not less than 200 feet and visibility not less than 1/2 mile or Runway Visual Range (RVR) 2400 (RVR 1800) with operative touchdown zone and runway centerline lights.
- **CATEGORY II (CAT II)**: A precision approach which provides for approaches with a decision height of not less than 100 feet and visibility not less than 1200 feet RVR.
- **CATEGORY III (CAT III)**: A precision approach which provides for approaches with minima less than Category II.

PRECISION APPROACH PATH INDICATOR (PAPI): A lighting system providing visual approach slope guidance to aircraft during a landing approach. It is similar to a VASI but provides a sharper transition between the colored indicator lights.

PRECISION APPROACH RADAR: A radar facility in the terminal air traffic control system used to detect and display with a high degree of accuracy the direction, range, and elevation of an aircraft on the final approach to a runway.

PRECISION OBJECT FREE AREA (POFA): An area centered on the extended runway centerline, beginning at the runway threshold and extending behind the runway threshold that is 200 feet long by 800 feet wide. The POFA is a clearing standard which requires the POFA to be kept clear of above ground objects protruding above the runway safety area edge elevation (except for frangible NAVAIDS). The POFA applies to all new authorized instrument approach procedures with less than 3/4 mile visibility.

PRIMARY AIRPORT: A commercial service airport that enplanes at least 10,000 annual passengers.

PRIMARY SURFACE: An imaginary obstruction limiting surface defined in FAR Part 77 that is specified as a rectangular surface longitudinally centered about a runway. The specific dimensions of this surface are a function of the types of approaches existing or planned for the runway.

PROHIBITED AREA: See special-use airspace.

PVC: Poor visibility and ceiling. Used in determining Annual Service Volume. PVC conditions exist when the cloud ceiling is less than 500 feet and visibility is less than one mile.

R

RADIAL: A navigational signal generated by a Very High Frequency Omni-directional Range or VORTAC station that is measured as an azimuth from the station.

REGRESSION ANALYSIS: A statistical technique that seeks to identify and quantify the relationships between factors associated with a forecast.

REMOTE COMMUNICATIONS OUTLET (RCO): An unstaffed transmitter receiver/facility remotely controlled by air traffic personnel. RCOs serve flight service stations (FSSs). RCOs were established to provide ground-to-ground communications between air traffic control specialists and pilots at satellite airports for delivering en route clearances, issuing departure authorizations, and acknowledging instrument flight rules cancellations or departure/ landing times.

REMOTE TRANSMITTER/RECEIVER (RTR): See remote communications outlet. RTRs serve ARTCCs.

RELIEVER AIRPORT: An airport to serve general aviation aircraft which might otherwise use a congested air-carrier served airport.

RESTRICTED AREA: See special-use airspace.

RNAV: Area navigation - airborne equipment which permits flights over determined tracks within prescribed accuracy tolerances without the need to overfly ground-based navigation facilities. Used en route and for approaches to an airport.

RUNWAY: A defined rectangular area on an airport prepared for aircraft landing and takeoff. Runways are normally numbered in relation to their magnetic direction, rounded off to the nearest 10 degrees. For example, a runway with a magnetic heading of 180 would be designated Runway 18. The runway heading on the opposite end of the runway is 180 degrees from that runway end. For example, the opposite runway heading for Runway 18 would be Runway 36 (magnetic heading of 360). Aircraft can takeoff or land from either end of a runway, depending upon wind direction.

RUNWAY ALIGNMENT INDICATOR LIGHT: A series of high intensity sequentially flashing lights installed on the extended centerline of the runway usually in conjunction with an approach lighting system.

RUNWAY DESIGN CODE: A code signifiying the design standards to which the runway is to be built.

RUNWAY END IDENTIFICATION LIGHTING (REIL): Two synchronized flashing lights, one on each side of the runway threshold, which provide rapid and positive identification of the approach end of a particular runway.

RUNWAY GRADIENT: The average slope, measured in percent, between the two ends of a runway.

RUNWAY PROTECTION ZONE (RPZ): An area off the runway end to enhance the protection of people and property on the ground. The RPZ is trapezoidal in shape. Its dimensions are determined by the aircraft approach speed and runway approach type and minima.

RUNWAY REFERENCE CODE: A code signifying the current operational capabilities of a runway and associated taxiway.

RUNWAY SAFETY AREA (RSA): A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion from the runway.

RUNWAY VISIBILITY ZONE (RVZ): An area on the airport to be kept clear of permanent objects so that there is an unobstructed line of- site from any point five feet above the runway centerline to any point five feet above an intersecting runway centerline.

RUNWAY VISUAL RANGE (RVR): An instrumentally derived value, in feet, representing the horizontal distance a pilot can see down the runway from the runway end.

S

SCOPE: The document that identifies and defines the tasks, emphasis, and level of effort associated with a project or study.

SEGMENTED CIRCLE: A system of visual indicators designed to provide traffic pattern information at airports without operating control towers.

SHOULDER: An area adjacent to the edge of paved runways, taxiways, or aprons providing a transition between the pavement and the adjacent surface; support for aircraft running off the pavement; enhanced drainage; and blast protection. The shoulder does not necessarily need to be paved.

SLANT-RANGE DISTANCE: The straight line distance between an aircraft and a point on the ground.

SMALL AIRCRAFT: An aircraft that has a maximum certified takeoff weight of up to 12,500 pounds.

SPECIAL-USE AIRSPACE: Airspace of defined dimensions identified by a surface area wherein activities must be confined because of their nature and/or wherein limitations may be imposed upon aircraft operations that are not a part of those activities. Special-use airspace classifications include:

- **ALERT AREA**: Airspace which may contain a high volume of pilot training activities or an unusual type of aerial activity, neither of which is hazardous to aircraft.
- **CONTROLLED FIRING AREA**: Airspace wherein activities are conducted under conditions so controlled as to eliminate hazards to nonparticipating aircraft and to ensure the safety of persons or property on the ground.
- **MILITARY OPERATIONS AREA (MOA)**: Designated airspace with defined vertical and lateral dimensions established outside Class A airspace to separate/segregate certain military activities from instrument flight rule (IFR) traffic and to identify for visual flight rule (VFR) traffic where these activities are conducted.
- **PROHIBITED AREA**: Designated airspace within which the flight of aircraft is prohibited.
- **RESTRICTED AREA**: Airspace designated under Federal Aviation Regulation (FAR) 73, within which the flight of aircraft, while not wholly prohibited, is subject to restriction. Most restricted areas are designated joint use. When not in use by the using agency, IFR/VFR operations can be authorized by the controlling air traffic control facility.
- **WARNING AREA:** Airspace which may contain hazards to nonparticipating aircraft.

STANDARD INSTRUMENT DEPARTURE (SID): A preplanned coded air traffic control IFR departure routing, preprinted for pilot use in graphic and textual form only.

STANDARD INSTRUMENT DEPARTURE PROCEDURES: A published standard flight procedure to be utilized following takeoff to provide a transition between the airport and the terminal area or en route airspace.

STANDARD TERMINAL ARRIVAL ROUTE (STAR): A preplanned coded air traffic control IFR arrival routing, preprinted for pilot use in graphic and textual or textual form only.

STOP-AND-GO: A procedure wherein an aircraft will land, make a complete stop on the runway, and then commence a takeoff from that point. A stop-and-go is recorded as two operations: one operation for the landing and one operation for the takeoff.

STOPWAY: An area beyond the end of a takeoff runway that is designed to support an aircraft during an aborted takeoff without causing structural damage to the aircraft. It is not to be used for takeoff, landing, or taxiing by aircraft.

STRAIGHT-IN LANDING/APPROACH: A landing made on a runway aligned within 30 degrees of the final approach course following completion of an instrument approach.

T

TACTICAL AIR NAVIGATION (TACAN): An ultrahigh frequency electronic air navigation system which provides suitably-equipped aircraft a continuous indication of bearing and distance to the TACAN station.

TAKEOFF RUNWAY AVAILABLE (TORA):
See declared distances.

TAKEOFF DISTANCE AVAILABLE (TODA):
See declared distances.

TAXILANE: The portion of the aircraft parking area used for access between taxiways and aircraft parking positions.

TAXIWAY: A defined path established for the taxiing of aircraft from one part of an airport to another.

TAXIWAY DESIGN GROUP: A classification of airplanes based on outer to outer Main Gear Width (MGW) and Cockpit to Main Gear (CMG) distance.

TAXIWAY SAFETY AREA (TSA): A defined surface alongside the taxiway prepared or suitable for reducing the risk of damage to an airplane unintentionally departing the taxiway.

TERMINAL INSTRUMENT PROCEDURES: Published flight procedures for conducting instrument approaches to runways under instrument meteorological conditions.

TERMINAL RADAR APPROACH CONTROL: An element of the air traffic control system responsible for monitoring the en-route and terminal segment of air traffic in the airspace surrounding airports with moderate to high levels of air traffic.

TETRAHEDRON: A device used as a landing direction indicator. The small end of the tetrahedron points in the direction of landing.

THRESHOLD: The beginning of that portion of the runway available for landing. In some instances the landing threshold may be displaced.

TOUCH-AND-GO: An operation by an aircraft that lands and departs on a runway without stopping or exiting the runway. A touch-and go is recorded as two operations: one operation for the landing and one operation for the takeoff.

TOUCHDOWN: The point at which a landing aircraft makes contact with the runway surface.

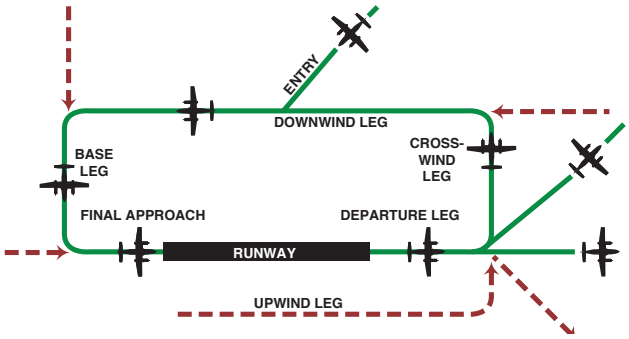
TOUCHDOWN AND LIFT-OFF AREA (TLOF): A load bearing, generally paved area, normally centered in the FATO, on which the helicopter lands or takes off.

TOUCHDOWN ZONE (TDZ): The first 3,000 feet of the runway beginning at the threshold.

TOUCHDOWN ZONE ELEVATION (TDZE): The highest elevation in the touchdown zone.

TOUCHDOWN ZONE (TDZ) LIGHTING: Two rows of transverse light bars located symmetrically about the runway centerline normally at 100- foot intervals. The basic system extends 3,000 feet along the runway.

TRAFFIC PATTERN: The traffic flow that is prescribed for aircraft landing at or taking off from an airport. The components of a typical traffic pattern are the upwind leg, crosswind leg, downwind leg, base leg, and final approach.



U

UNCONTROLLED AIRPORT: An airport without an air traffic control tower at which the control of Visual Flight Rules traffic is not exercised.

UNCONTROLLED AIRSPACE: Airspace within which aircraft are not subject to air traffic control.

UNIVERSAL COMMUNICATION (UNICOM): A nongovernment communication facility which may provide airport information at certain airports. Locations and frequencies of UNICOM's are shown on aeronautical charts and publications.

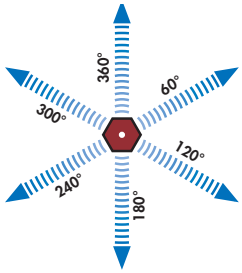
UPWIND LEG: A flight path parallel to the landing runway in the direction of landing. See "traffic pattern."

V

VECTOR: A heading issued to an aircraft to provide navigational guidance by radar.

VERY HIGH FREQUENCY/ OMNIDIRECTIONAL RANGE (VOR): A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north. Used as the basis for navigation in the national airspace system. The VOR periodically identifies itself by Morse Code and may have an additional voice identification feature.

VERY HIGH FREQUENCY OMNI-DIRECTIONAL RANGE/ TACTICAL AIR NAVIGATION (VORTAC): A navigation aid providing VOR azimuth, TACAN azimuth, and TACAN distance-measuring equipment (DME) at one site.



VICTOR AIRWAY: A control area or portion thereof established in the form of a corridor, the centerline of which is defined by radio navigational aids.

VISUAL APPROACH: An approach wherein an aircraft on an IFR flight plan, operating in VFR conditions under the control of an air traffic control facility and having an air traffic control authorization, may proceed to the airport of destination in VFR conditions.

VISUAL APPROACH SLOPE INDICATOR (VASI): An airport lighting facility providing vertical visual approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that he is on path if he sees red/ white, above path if white/white, and below path if red/red. Some airports serving large aircraft have three-bar VASI's which provide two visual guide paths to the same runway.

VISUAL FLIGHT RULES (VFR): Rules that govern the procedures for conducting flight under visual conditions. The term VFR is also used in the United States to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.

VISUAL METEOROLOGICAL CONDITIONS: Meteorological conditions expressed in terms of specific visibility and ceiling conditions which are equal to or greater than the threshold values for instrument meteorological conditions.

VOR: See "Very High Frequency Omnidirectional Range Station."

VORTAC: See "Very High Frequency Omnidirectional Range Station/Tactical Air Navigation."

W

WARNING AREA: See special-use airspace.

WIDE AREA AUGMENTATION SYSTEM: An enhancement of the Global Positioning System that includes integrity broadcasts, differential corrections, and additional ranging signals for the purpose of providing the accuracy, integrity, availability, and continuity required to support all phases of flight.

Abbreviations

AC: advisory circular

ADF: automatic direction finder

ADG: airplane design group

AFSS: automated flight service station

AGL: above ground level

AIA: annual instrument approach

AIP: Airport Improvement Program

AIR-21: Wendell H. Ford Aviation Investment and Reform Act for the 21st Century

ALS: approach lighting system

ALSF-1: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT I configuration)

ALSF-2: standard 2,400-foot high intensity approach lighting system with sequenced flashers (CAT II configuration)

AOA: Aircraft Operation Area

APV: instrument approach procedure with vertical guidance

ARC: airport reference code

ARFF: aircraft rescue and fire fighting

ARP: airport reference point

ARTCC: air route traffic control center

ASDA: accelerate-stop distance available

ASR: airport surveillance radar

ASOS: automated surface observation station

ATCT: airport traffic control tower

ATIS: automated terminal information service

AVGAS: aviation gasoline - typically 100 low lead (100LL)

AWOS: automatic weather observation station

BRL: building restriction line

CFR: Code of Federal Regulation

CIP: capital improvement program

DME: distance measuring equipment

DNL: day-night noise level

DWL: runway weight bearing capacity of aircraft with dual-wheel type landing gear

DTWL: runway weight bearing capacity of aircraft with dual-tandem type landing gear

FAA: Federal Aviation Administration

FAR: Federal Aviation Regulation

FBO: fixed base operator

FY: fiscal year

GPS: global positioning system

GS: glide slope

HIRL: high intensity runway edge lighting

IFR: instrument flight rules (FAR Part 91)

ILS: instrument landing system

IM: inner marker

LDA: localizer type directional aid

LDA: landing distance available

LIRL: low intensity runway edge lighting

LMM: compass locator at middle marker

LOM: compass locator at outer marker

LORAN: long range navigation

MALS: medium intensity approach lighting system with indicator lights

MIRL: medium intensity runway edge lighting

MITL: medium intensity taxiway edge lighting

MLS: microwave landing system

MM: middle marker

MOA: military operations area

MSL: mean sea level

NAVAID: navigational aid

NDB: nondirectional radio beacon

NM: nautical mile (6,076.1 feet)

NPES: National Pollutant Discharge Elimination System

NPIAS: National Plan of Integrated Airport Systems

NPRM: notice of proposed rule making

ODALS: omnidirectional approach lighting system

OFA: object free area

OFZ: obstacle free zone

OM: outer marker

PAC: planning advisory committee

PAPI: precision approach path indicator

PFC: porous friction course

PFC: passenger facility charge

PCL: pilot-controlled lighting

PIW public information workshop

PLASI: pulsating visual approach slope indicator

POFA: precision object free area

PVASI: pulsating/steady visual approach slope indicator

PVC: poor visibility and ceiling

RCO: remote communications outlet

RRC: Runway Reference Code

RDC: Runway Design Code

REIL: runway end identification lighting

RNAV: area navigation

RPZ: runway protection zone

RSA: runway safety area

RTR: remote transmitter/receiver

RVR: runway visibility range

RVZ: runway visibility zone

SALS: short approach lighting system

SASP: state aviation system plan

SEL: sound exposure level

SID: standard instrument departure

SM: statute mile (5,280 feet)

SRE: snow removal equipment

SSALF: simplified short approach lighting system with runway alignment indicator lights

STAR: standard terminal arrival route

SWL: runway weight bearing capacity for aircraft with single-wheel tandem type landing gear

TACAN: tactical air navigational aid

TAF: Federal Aviation Administration (FAA) Terminal Area Forecast

TDG: Taxiway Design Group

TLOF: Touchdown and lift-off

TDZ: touchdown zone

TDZE: touchdown zone elevation

TODA: takeoff distance available

TORA: takeoff runway available

TRACON: terminal radar approach control

VASI: visual approach slope indicator

VFR: visual flight rules (FAR Part 91)

VHF: very high frequency

VOR: very high frequency omni-directional range

VORTAC: VOR and TACAN collocated

Killeen-Fort Hood
REGIONAL AIRPORT

APPENDIX B

AIRPORT TERMINAL AND PARKING LAYOUT PACKAGE

TABLE i
Existing Terminal Building Functional Area Square Footage
Killeen-Fort Hood Regional Airport

Description	Existing Terminal	Percentage of S.F.
AIRLINE & AIRPORT SUPPORT		
Accounting	305	
Airport Archives	295	
Airport Ticketing Office	3,400	
Assistant Director	195	
Badging Office	116	
Baggage Office	250	
Booking	296	
Break Room	767	
Closet	8	
Conference Rooms	986	
Containment Room	146	
Custodial	41	
Director/Conference	321	
Engineering/Plans	205	
Evidence Locker	26	
Executive Assistant	209	
Facilities Manager	198	
Future Airport Office	436	
Information Desk	73	
Interview	45	
Investigations	210	
Janitor Closets	138	
Locker Room	132	
Men's Restroom	168	
Operations Center	369	
Operations Equipment	121	
Operations Manager	179	
Operations Supervisor	157	
Security	126	
Security Operations	542	
Storage	860	
Training Room	430	
Women's Restroom	230	
Work/Storage Room	191	
SUBTOTAL AIRLINE & AIRPORT SUPPORT	**12,171**	**13.65%**
AIRSIDE CIRCULATION		
Concourse Circulation	2,752	
Corridor	1,050	
Hallway	645	
Security Vestibules	337	
Stair	998	
Vestibule	192	
SUBTOTAL AIRSIDE CIRCULATION	**5,974**	**6.70%**
BAGGAGE LOBBY		
Baggage Claim	2,817	
SUBTOTAL BAGGAGE LOBBY	**2,817**	**3.16%**

BAGGAGE SCREENING		
CBRA Room	1,200	
EDS Room	3,293	
SUBTOTAL BAGGAGE SCREENING	**4,493**	**5.04%**
BAGGAGE HANDLING SYSTEM (BHS)		
Inbound Baggage	2,419	
Outbound Baggage	7,294	
SUBTOTAL BHS	**9,713**	**10.89%**
CIRCULATION		
Reception/Seating/Corridor	1444	
Stairs	490	
SUBTOTAL CIRCULATION	**1,934**	**2.17%**
CONCESSIONS		
Bar (Green Beans Coffee Company, Inc.)	281	
Car Rental	2234	
Deli	256	
Dry Storage	89	
Food Court	2,695	
Janitor Closet	43	
Kitchen	519	
Patio	1140	
Retail	1695	
Vending	30	
SUBTOTAL CONCESSIONS	**8,982**	**10.07%**
HOLDROOM		
Holdroom A	2,831	
Holdroom C	2,977	
SUBTOTAL HOLDROOM	**5,808**	**6.51%**
LANDSIDE CIRCULATION		
Baggage Lobby	4,542	
Concourse B	2,631	
Foyer	917	
Hallway	215	
Lobby	1,836	
Main Lobby	5,287	
Stair	970	
Ticketing Lobby	4,568	
Vestibules	1,487	
SUBTOTAL LANDSIDE CIRCULATION	**22,453**	**25.18%**
MECHANICAL/ELECTRICAL/COMMUNICATIONS		
Boiler Room	532	
Communication Room	295	
Electrical	685	
Elevator Machine Room	198	
Janitor Closet	55	
Mechanical	5,072	
SUBTOTAL MECH/ELEC/COMM	**6,837**	**7.67%**
PUBLIC RESTROOMS		
Men's Restroom	1,269	
Unisex Restroom	75	
Women's Restroom	1,215	
SUBTOTAL PUBLIC RESTROOMS	**2,559**	**2.87%**

SSCP/TSA		
Break room	280	
File/Copy	137	
Interview	88	
Kennels	150	
Offices	483	
OSR Room	186	
Security	3,201	
Storage	457	
Training	327	
TSA Director	360	
SUBTOTAL SSCP/TSA	**5,669**	**6.36%**
TICKET COUNTER/QUEUING		
Ticketing Counters	1,718	
SUBTOTAL TICKET COUNTER/QUEUING	**1,718**	**1.93%**
GRAND TOTAL	**89,164**	

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- DEPARTURES
- ARRIVALS
- OUTBOUND BAGGAGE
- INBOUND BAGGAGE

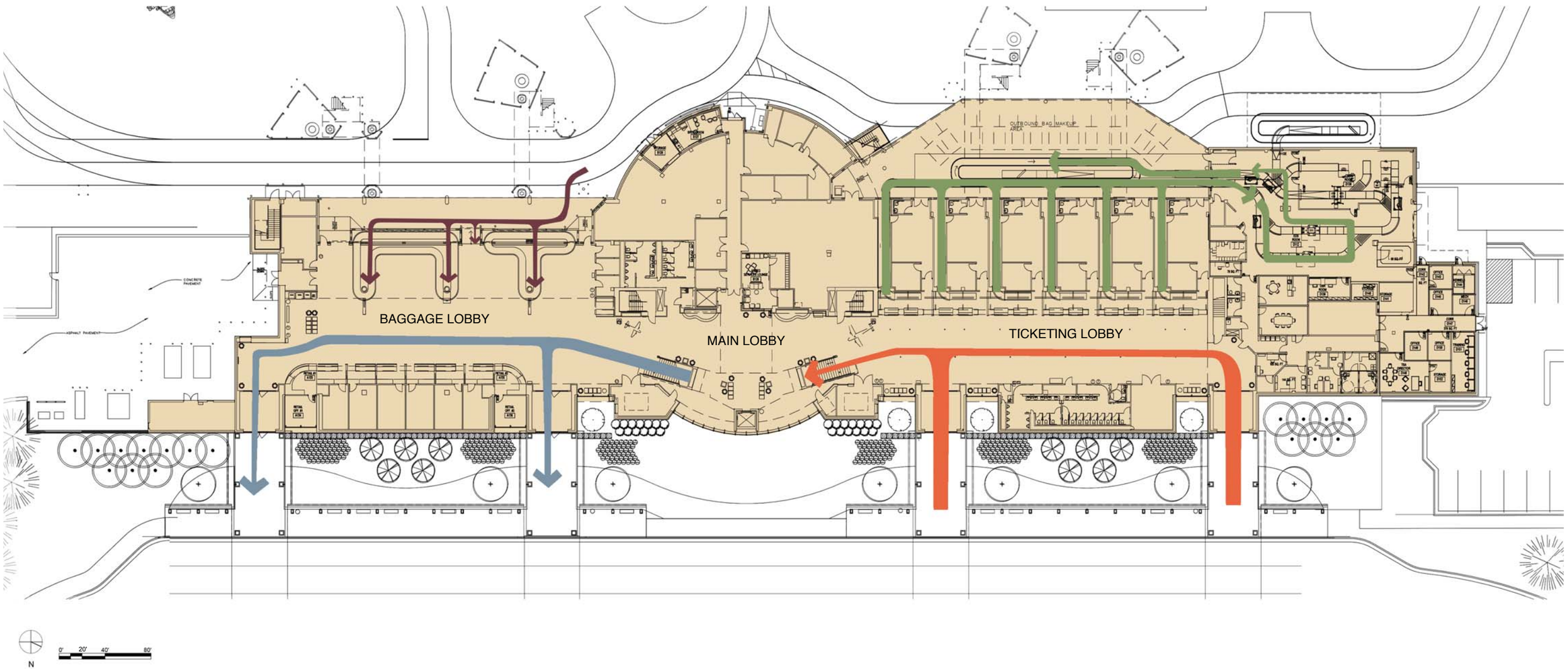

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Exhibit i
LEVEL ONE - EXISTING PASSENGER FLOW

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- DEPARTURES
- ARRIVALS
- OUTBOUND BAGGAGE
- INBOUND BAGGAGE

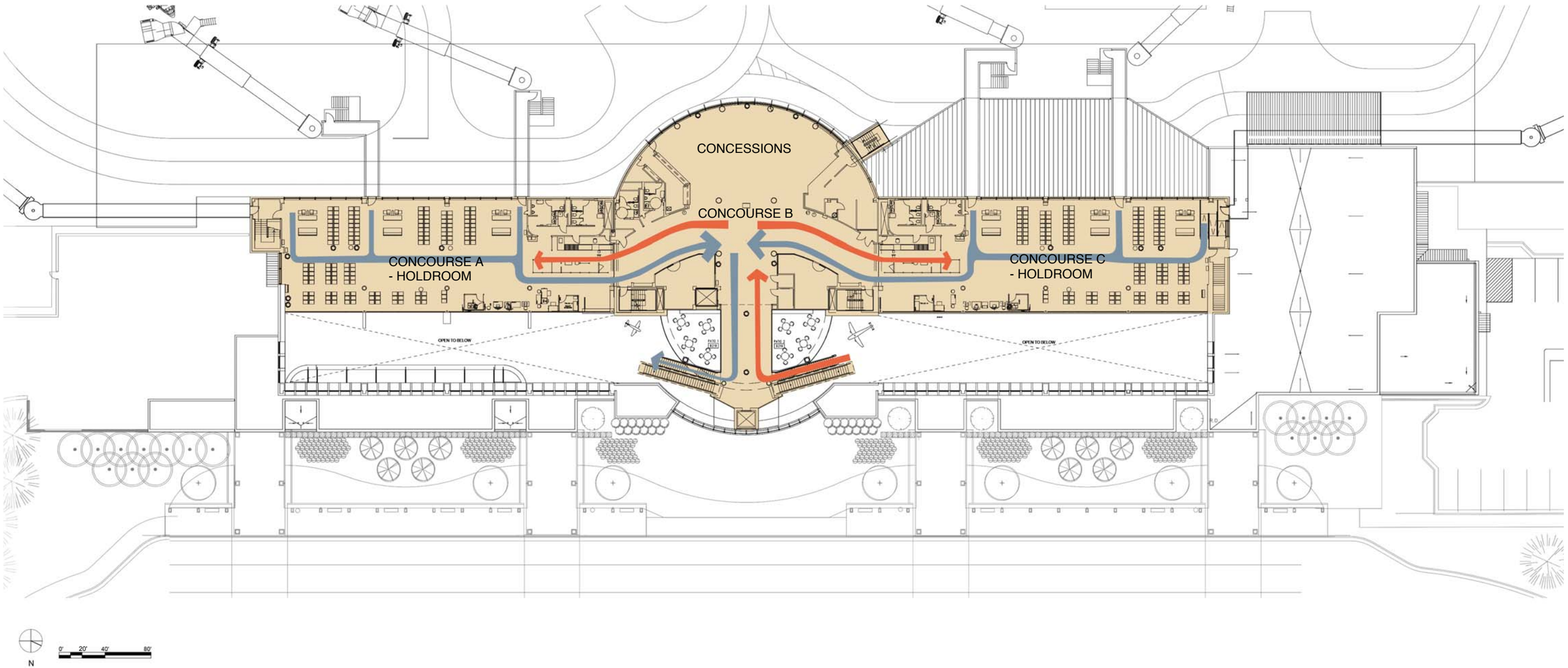

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Exhibit ii
LEVEL TWO - EXISTING PASSENGER FLOW

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- TICKET COUNTER AREA
- TICKET COUNTER QUEUING
- BAG SCREEN ROOM
- BAGGAGE CLAIM
- OUTBOUND BAGGAGE
- INBOUND BAGGAGE
- OPERATIONS / AIRLINE TICKET OFFICE
- CONCESSIONS (FOOD/ BEVERAGE)
- CONCESSIONS (NEWS / GIFTS / SUNDRY)
- CONCESSIONS (CONCESSION STORAGE)
- INFORMATION
- RENTAL CAR COUNTERS
- TSA OFFICES
- TSA BREAK
- SECURE CIRCULATION
- AIRPORT ADMINISTRATION
- CIRCULATION - GENERAL
- RESTROOMS - PUBLIC
- STORAGE
- MAINTENANCE
- MECH. / ELEC. / BLDG. SYSTEMS
- RESTROOMS - NON-PUBLIC

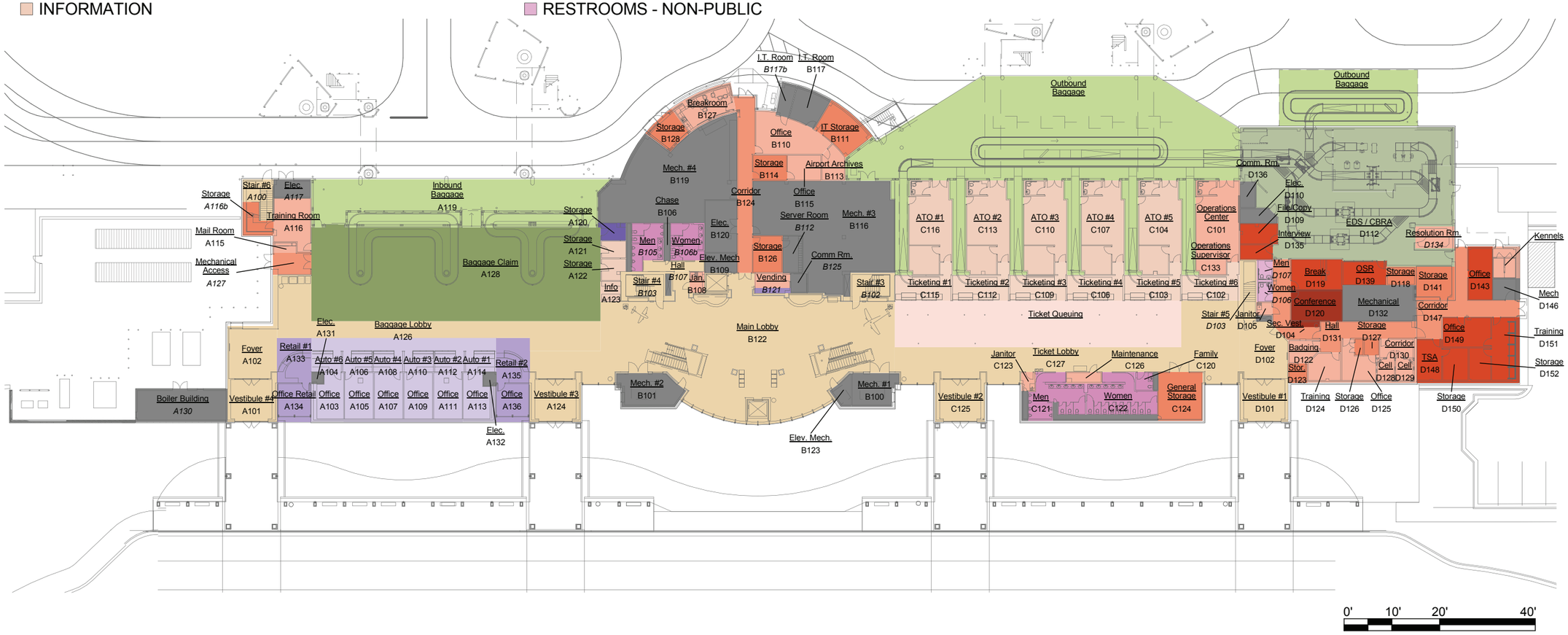

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EXHIBIT iii - LEVEL ONE - EXISTING FLOOR PLAN

1" = 40'-0"

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- DEPARTURES LOUNGES (HOLDROOMS)
- CONCESSIONS (FOOD/ BEVERAGE)
- CONCESSIONS (NEWS / GIFTS / SUNDRY)
- CONCESSIONS (CONCESSION STORAGE)
- CONCESSIONS - OPEN SEATING
- SECURITY
- RESTROOMS - SECURE PUBLIC
- SECURE CIRCULATION
- CIRCULATION - GENERAL
- RESTROOMS - PUBLIC
- STORAGE
- MAINTENANCE
- MECH. / ELEC. / BLDG. SYSTEMS

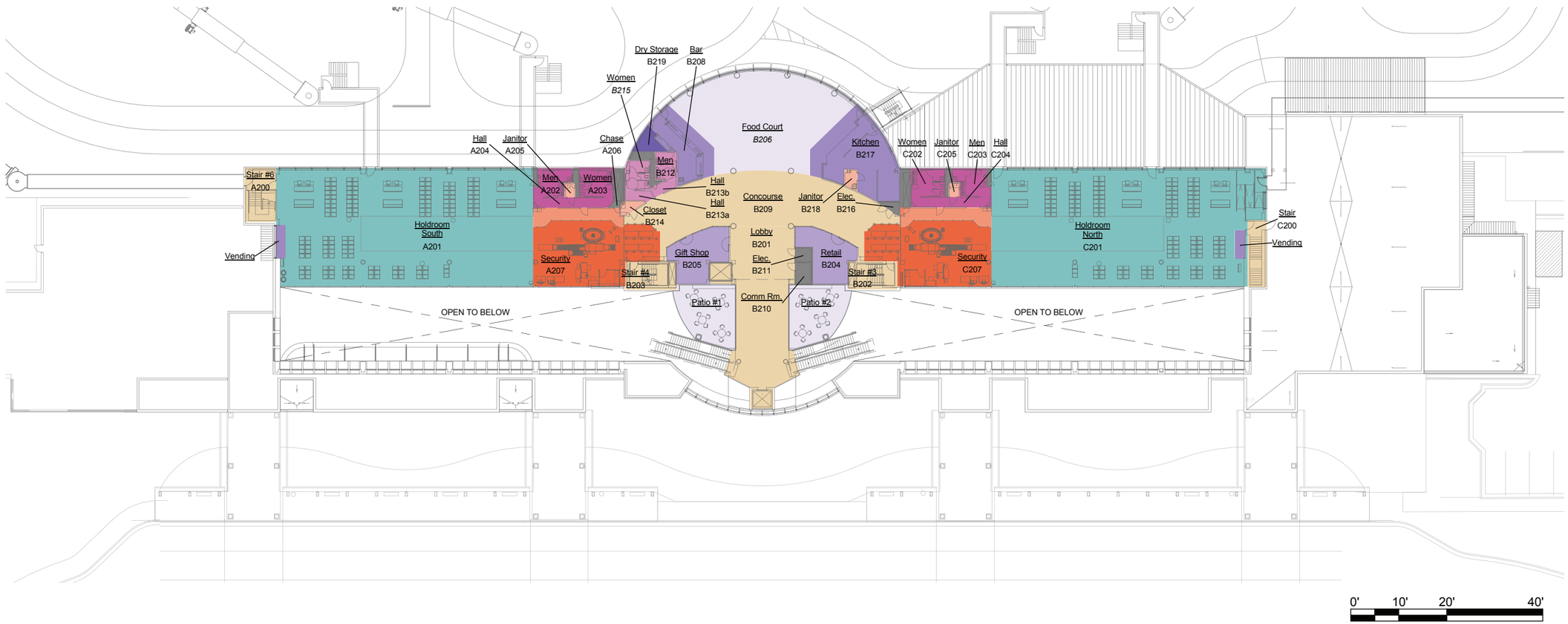

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EXHIBIT iv - LEVEL TWO - EXISTING FLOOR PLAN

1" = 40'-0"

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- AIRPORT ADMINISTRATION
- CIRCULATION - GENERAL
- STORAGE
- MAINTENANCE
- MECH. / ELEC. / BLDG. SYSTEMS
- RESTROOMS - NON-PUBLIC

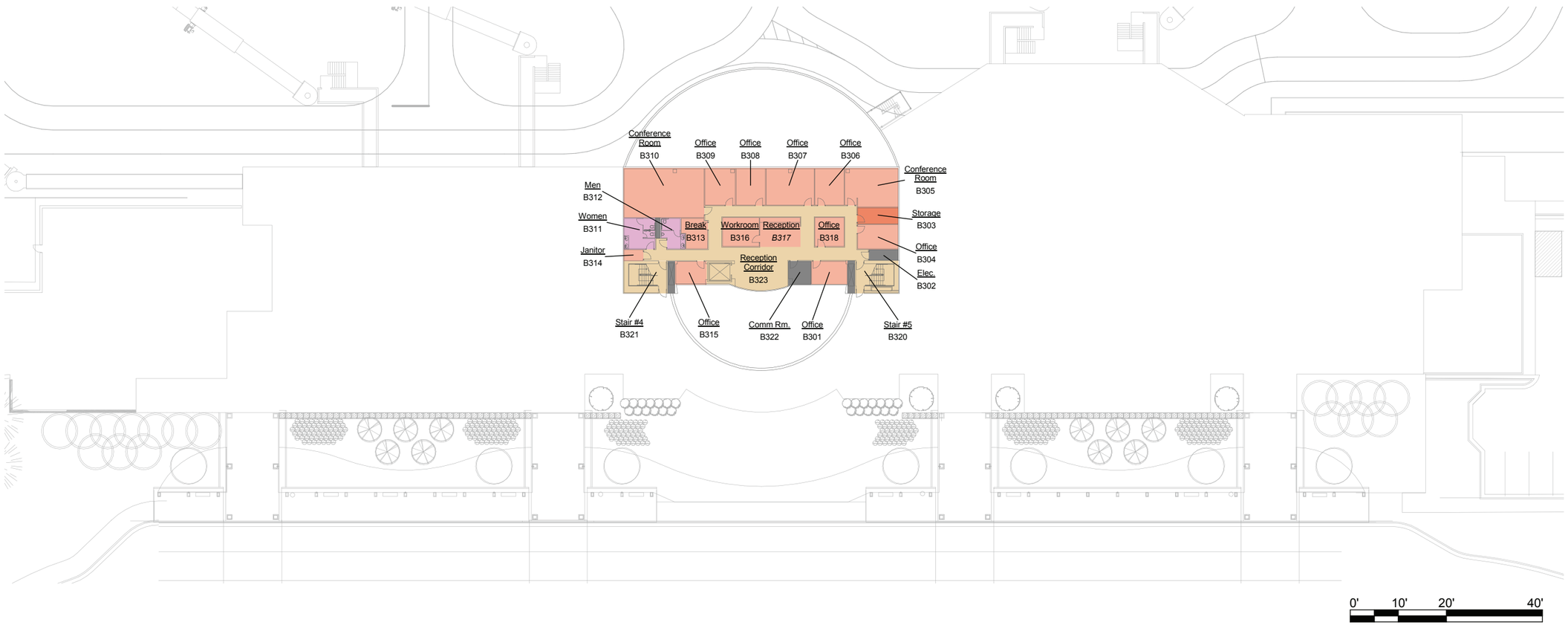

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EXHIBIT v - LEVEL THREE - EXISTING FLOOR PLAN

1" = 40'-0"

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DEPARTURES
ARRIVALS

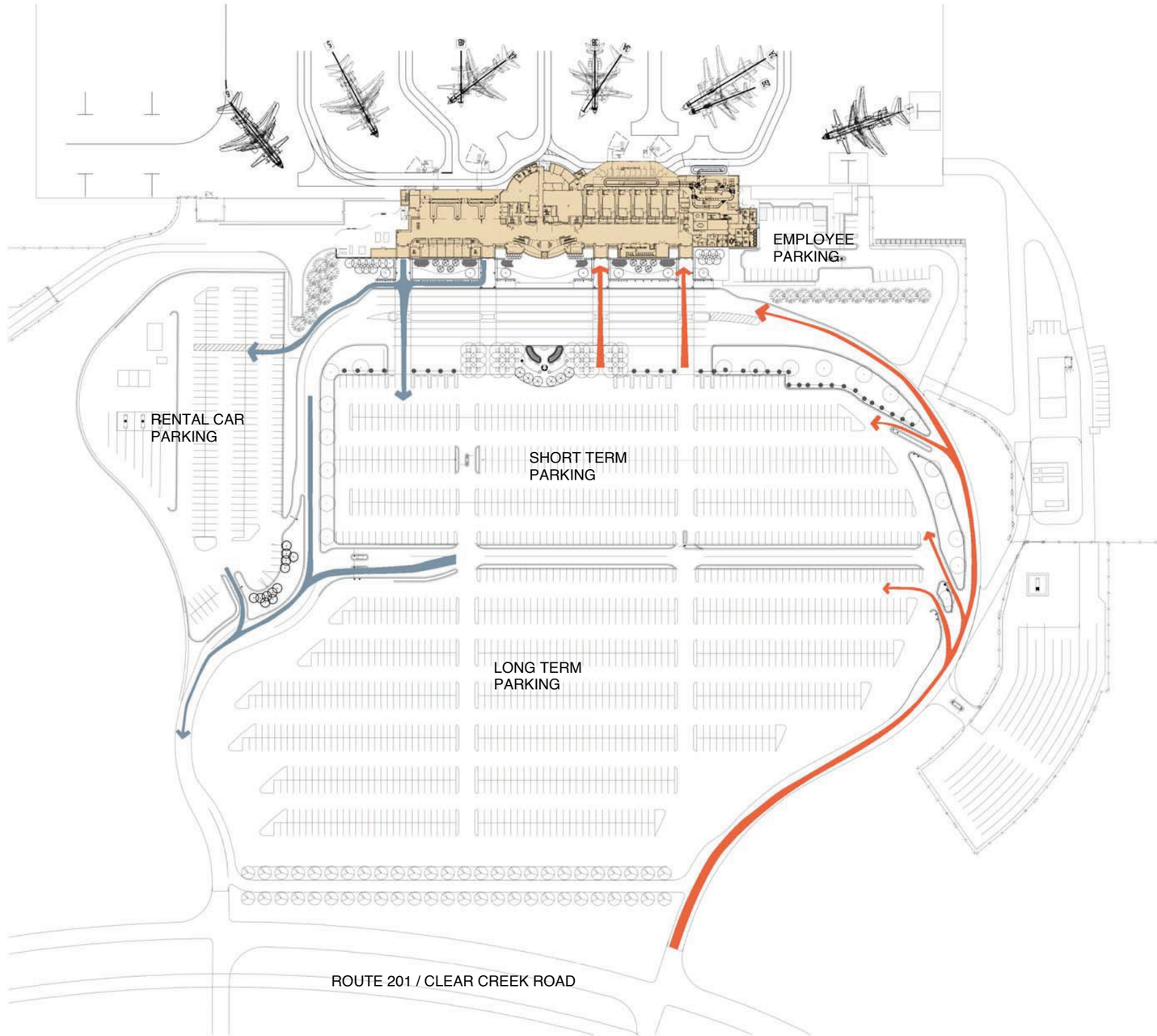

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Exhibit vi
PEDESTRIAN AND VEHICULAR ACCESS

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Lane 1A
1 Ticket Dispenser w/ Intercom
1 Barrier Gate
2 Loops
1 Red/Green Status Light w/ Post

Lane 2B
1 Ticket Dispenser w/ Intercom
1 Barrier Gate
2 Loops
1 Red/Green Status Light w/ Post

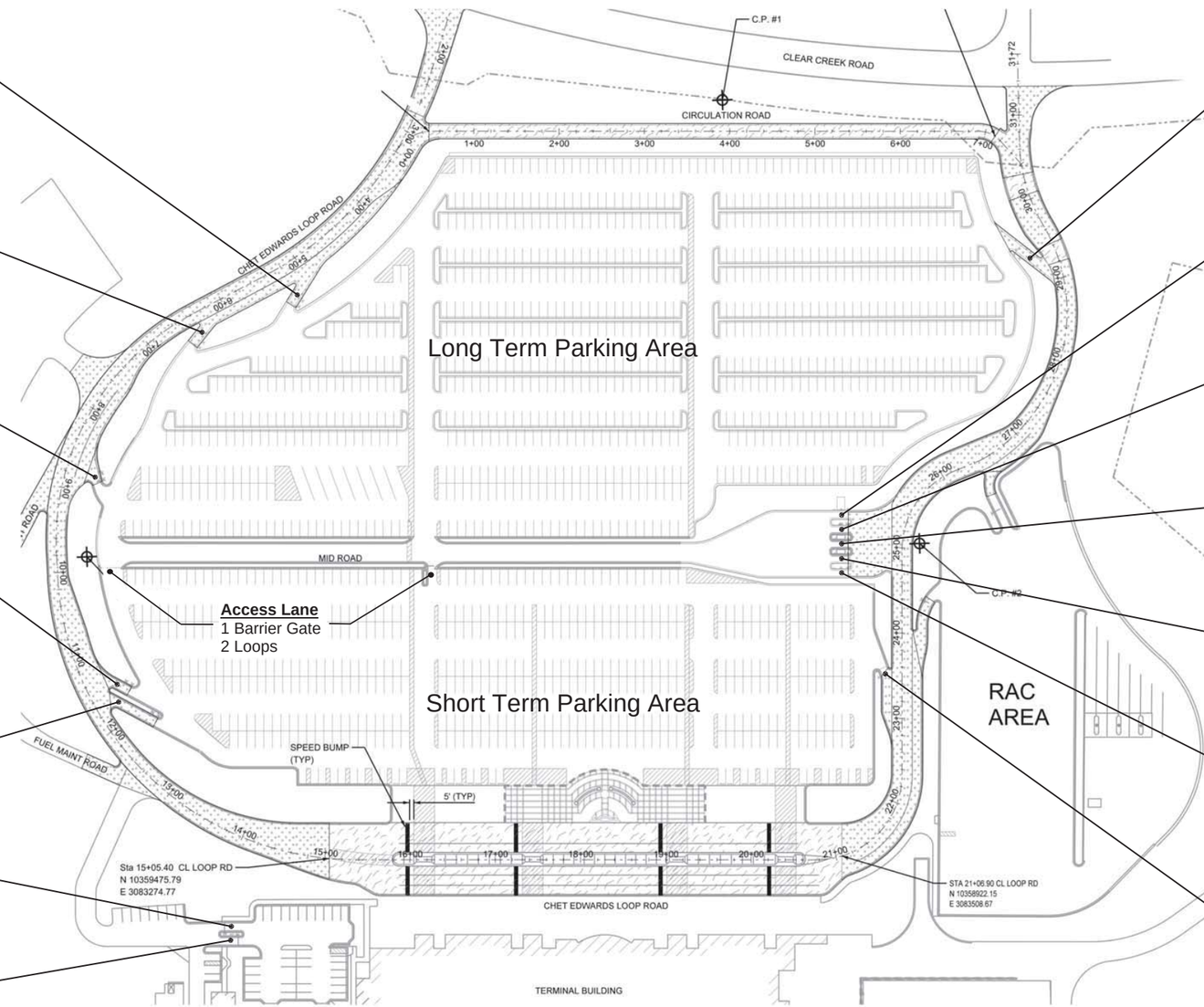
Lane 3C
1 AVI Reader w/ Post
1 Barrier Gate
2 Loops
1 Red/Green Status Light w/ Post

Lane 4D
1 Ticket Dispenser w/ Intercom
1 Barrier Gate
2 Loops
1 Red/Green Status Light w/ Post

Lane 5E
1 Ticket Dispenser
1 AVI Reader w/ Post
2 Loops
1 Red/Green Status Light w/ Post

Admin Exit Lane
1 Barrier Gate
2 Loops

Admin Entry Lane
1 Card Reader w/ Post
1 Barrier Gate
2 Loops



Lane 6G
1 Ticket Dispenser w/ Intercom
1 Barrier Gate
2 Loops
1 Red/Green Status Light w/ Post

Lane 10
1 AVI Reader
1 Office Booth
1 Barrier Gate
2 Loops

Lane 11
1 Pay-In-Lane Machine (Credit Card Only)
1 Barrier Gate
2 Loops

Lane 12
1 Booth
1 Fee Counter
1 Barrier Gate
2 Loops

Lane 13
1 Booth
1 Fee Counter
1 Barrier Gate
2 Loops

Lane 14
1 Pay-In-Lane Machine (Credit Card Only)
1 Barrier Gate
2 Loops

Lane 6F
1 Ticket Dispenser w/ Intercom
1 Barrier Gate
2 Loops
1 Red/Green Status Light w/ Post

Oct. 7, 2016

Carl Walker
CHARLOTTE
CHICAGO
CLEVELAND
DALLAS
INDIANAPOLIS
KALAMAZOO
PHILADELPHIA

Carl Walker, Inc.
3211 Internet Blvd.
Suite 220
Frisco, TX 75034
P - 469.777.5140

NORTH

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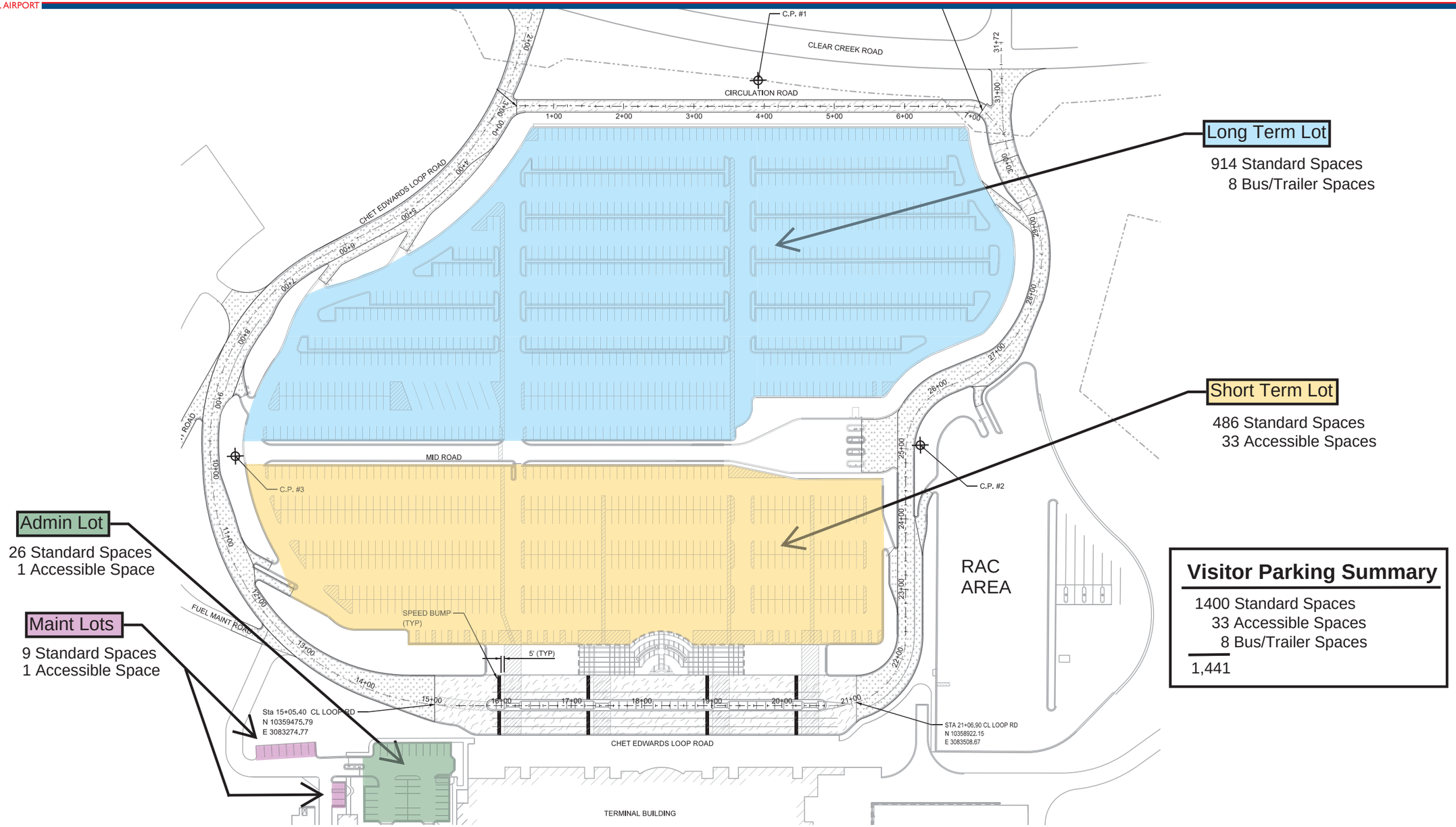

Oct. 7, 2016

Carl Walker
CHARLOTTE
CHICAGO
CLEVELAND
DALLAS
INDIANAPOLIS
KALAMAZOO
PHILADELPHIA

Carl Walker, Inc.
3211 Internet Blvd.
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NORTH

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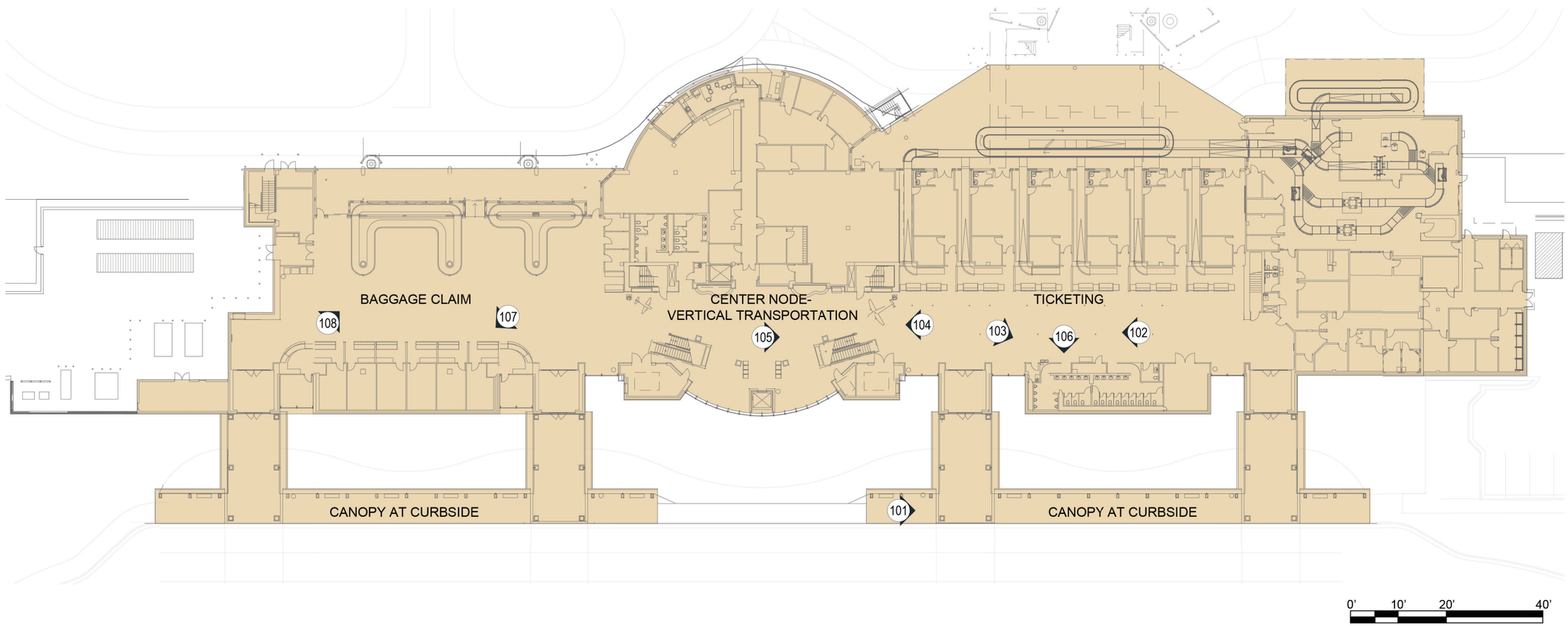

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EXHIBIT ix - WAYFINDING - LEVEL ONE

1" = 40'-0"

APRIL 2017

PLAN N N

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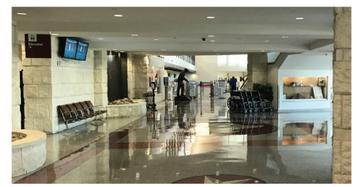
101
Canopy mounted Airline signage at depatures

102
Wall-mounted airline signage

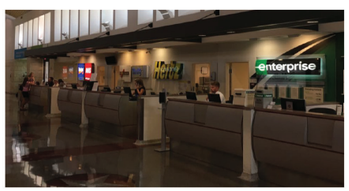
103
Wall mounted Flight Information Display System monitors and Restroom blade signage

104
Blade signage at vertical transportation node



105
Wall mounted Flight Information Display System monitors and ceiling mounted elevator signage at wall

106
Wall mounted restroom sign at wall



107
Wall-mounted signage for rental counters

108
Blade digital Airport signage and ceiling mounted baggage information display monitors

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EXHIBIT ix - WAYFINDING - LEVEL ONE - IMAGE LEGEND

1" = 40'-0"

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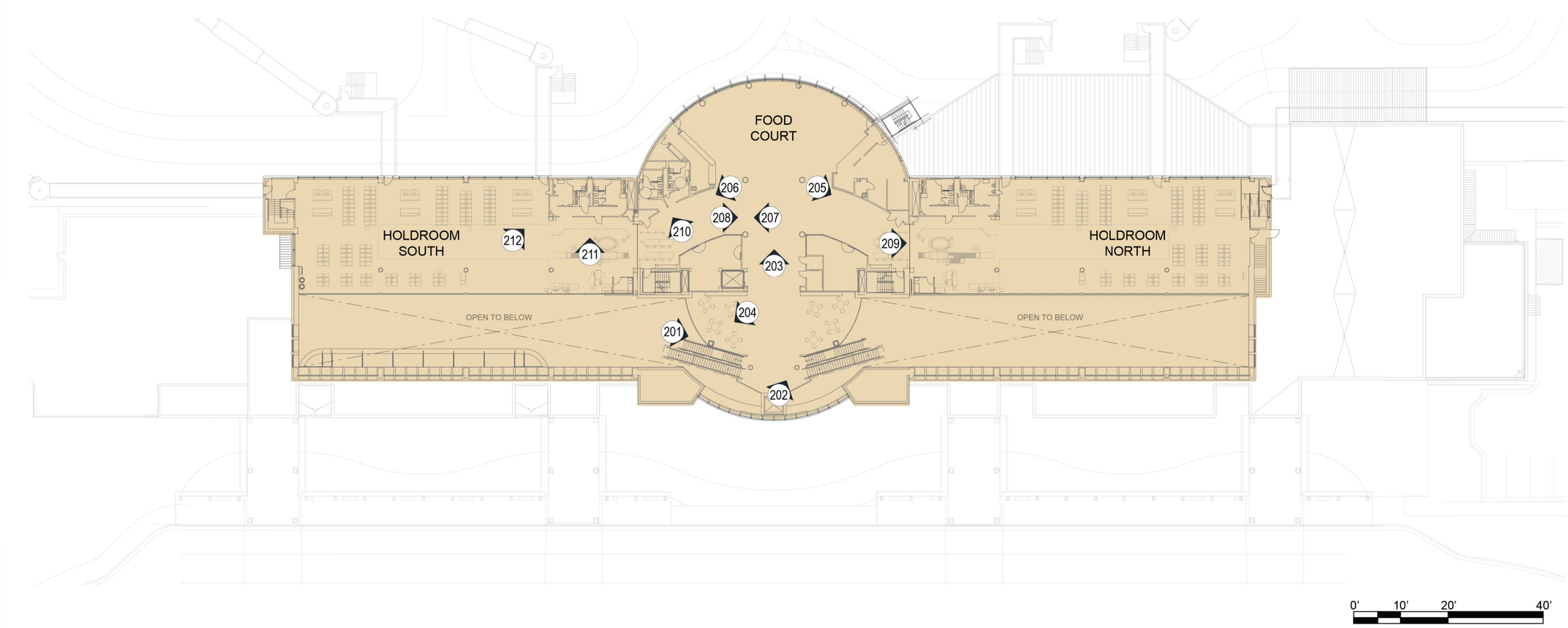

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EXHIBIT viii - WAYFINDING - LEVEL TWO

1" = 40'-0"

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PLAN N N

GARVER

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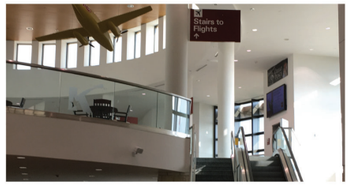
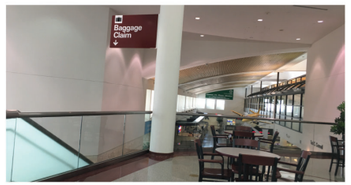


201
Blade signage for holdrooms

202
Blade signage for holdrooms and restaurant

203
Wall signage for gate locations



204
Blade signage for baggage claim location

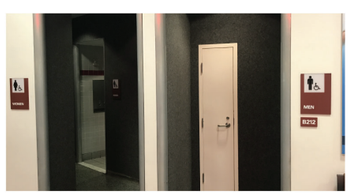
205
Wall signage for gate locations

206
Wall signage for gate locations

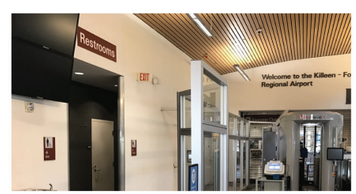
207
Blade signage for gate locations

208
Reverse 207 signage for baggage claim location

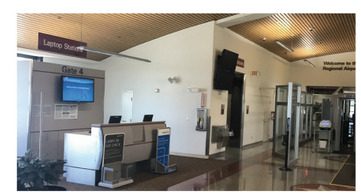
209
Ceiling-mounted signage at TSA screening



210
Wall mounted restroom sign at wall



211
Restroom signage at wall.



212
Ceiling-mounted laptop station signage

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EXHIBIT viii - WAYFINDING - IMAGE LEGEND

1" = 40'-0"

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Killeen-Fort Hood
REGIONAL AIRPORT

APPENDIX C

FINANCIAL ANALYSIS SCHEDULES

KILLEEN - FORT HOOD REGIONAL AIRPORT (GRK)
Killeen, Texas

GRK - MP - 2018 - 12

Schedule 6-1

Master Plan - Financial Implementation Analysis
Estimated Project Costs and Development Schedule

12-Oct-18

Capital Improvement Program	Funding Schedule								
	Short Term						Mid Term	Long Term	Total
	2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Funding
Funds Used for Capital Improvement Projects									
AIP Entitlement Grants:	$1,597,237	$1,617,090	$1,637,424	$1,658,253	$1,679,587	$8,189,591	$8,653,612	$18,562,813	$35,406,016
AIP Entitlements carryover from the prior years	5,264,080	1,914,031	1,632,120	1,314,924	2,436,450	5,264,080	(0)	0	5,264,080
AIP Entitlement unspent current year + carryover	(1,914,031)	(1,632,120)	(1,314,924)	(2,436,450)	0	0	0	0	0
AIP Discretionary Grants	0	0	0	0	3,429,916	3,429,916	2,050,000	0	5,479,916
AIP Military Airport Program (MAP) Grants	3,375,000	0	0	0	0	3,375,000	0	0	3,375,000
Passenger Facility Charges:	530,115	547,981	566,448	585,538	596,426	2,826,507	3,153,531	7,312,018	13,292,057
PFC beginning year unliquidated balance	364,391	344,807	686,788	753,236	1,284,138	364,391	1,047,124	(0)	364,391
PFC unspent current year + carryover	(344,807)	(686,788)	(753,236)	(1,284,138)	(1,047,124)	(1,047,124)	0	0	0
Debt Proceeds (City Enterprise Fund) (20 yrs, 5.0%) Thru 2040	375,000	0	0	0	0	375,000	0	0	375,000
Less Debt Service	0	0	0	(30,091)	(30,091)	(60,182)	(150,455)	(391,183)	(601,819)
RAC Customer Facility Charges	300,000	309,000	318,270	327,818	337,653	1,592,741	1,846,423	1,206,474	4,645,638
CFC beginning year unliquidated balance	1,925,000	1,475,000	(70,000)	248,270	576,088	1,925,000	913,741	(875,328)	1,925,000
CFC unspent current year + carryover	(1,475,000)	70,000	(248,270)	(576,088)	(913,741)	(913,741)	875,328	0	0
City Contribution	0	5,000	217,180	5,000	5,000	232,180	0	0	232,180
Department of Defense	0	0	0	1,966,909	0	1,966,909	10,906,477	480,095,979	492,969,364
Other Unidentified Funding	0	0	0	0	0	0	45,141,156	36,877,757	82,018,913
Net Operating Cash Flow	0	0	0	30,091	30,091	60,182	250,717	2,261,807	2,572,706
Funds Available Current Year	9,996,985	3,964,000	2,671,800	2,563,272	8,384,393	27,580,450	74,687,655	545,050,337	647,318,442
Beginning Cash Balance/Funds Carried Over from Prior Year	0	0	0	0	(0)	0	(0)	100,262	0
Funds Used Current Year	(9,996,985)	(3,964,000)	(2,671,800)	(2,563,272)	(8,384,393)	(27,580,450)	(74,587,393)	(543,179,713)	(645,347,556)
Funds Carried Over to Next Year	$0	$0	$0	($0)	($0)	($0)	$100,262	$1,970,886	$1,970,886

Capital Project Description	2018 Base Year Costs	Estimated Project Costs and Development Schedule								
		Short Term						Mid Term	Long Term	Total Escalated
		2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Costs
Short Term Projects (2018-2022)										
Capital Projects 2018										
S1-D Corporate Hangar/Terminal Development on the southern edge of the airline ramp. Includes vehicle parking lot and access. (Design)	$400,000	$400,000					$400,000			$400,000
S1-C Corporate Hangar/Terminal Development on the southern edge of the airline ramp. Includes vehicle parking lot and access. (Construction)	3,350,000	3,350,000					3,350,000			3,350,000
S9 Terminal Building Boarding Bridges, Phase 3	5,496,985	5,496,985					5,496,985			5,496,985
S11 Car Wash Facility Improvements	750,000	750,000					750,000			750,000
Total Capital Projects 2018	$9,996,985	$9,996,985	$0	$0	$0	$0	$9,996,985	$0	$0	$9,996,985
Capital Projects 2019										
S12 Rental Car Covered Parking Project	$1,800,000		$1,854,000				$1,854,000			$1,854,000
S13 Rehabilitate Runway (Maintenance)	50,000		50,000				50,000			50,000
S3 BMU1 Baggage System Replacement	2,000,000		2,060,000				2,060,000			2,060,000
Total Capital Projects 2019	$3,850,000	$0	$3,964,000	$0	$0	$0	$3,964,000	$0	$0	$3,964,000
Capital Projects 2020										
S14 Rehabilitate Taxiway (Maintenance)	$50,000			$50,000			$50,000			$50,000
S15 Terminal PA System Upgrade	500,000			500,000			500,000			500,000
S4 Property Acquisition	2,000,000			2,121,800			2,121,800			2,121,800
Total Capital Projects 2020	$2,550,000	$0	$0	$2,671,800	$0	$0	$2,671,800	$0	$0	$2,671,800

Appendix C - 1

KILLEEN - FORT HOOD REGIONAL AIRPORT (GRK)
Killeen, Texas

GRK - MP - 2018 - 12

Schedule 6-1

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Estimated Project Costs and Development Schedule

12-Oct-18

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AIP Entitlements carryover from the prior years	5,264,080	1,914,031	1,632,120	1,314,924	2,436,450	5,264,080	(0)	0	5,264,080
AIP Entitlement unspent current year + carryover	(1,914,031)	(1,632,120)	(1,314,924)	(2,436,450)	0	0	0	0	0
AIP Discretionary Grants	0	0	0	0	3,429,916	3,429,916	2,050,000	0	5,479,916
AIP Military Airport Program (MAP) Grants	3,375,000	0	0	0	0	3,375,000	0	0	3,375,000
Passenger Facility Charges:	530,115	547,981	566,448	585,538	596,426	2,826,507	3,153,531	7,312,018	13,292,057
PFC beginning year unliquidated balance	364,391	344,807	686,788	753,236	1,284,138	364,391	1,047,124	(0)	364,391
PFC unspent current year + carryover	(344,807)	(686,788)	(753,236)	(1,284,138)	(1,047,124)	(1,047,124)	0	0	0
Debt Proceeds (City Enterprise Fund) (20 yrs, 5.0%) Thru 2040	375,000	0	0	0	0	375,000	0	0	375,000
Less Debt Service	0	0	0	(30,091)	(30,091)	(60,182)	(150,455)	(391,183)	(601,819)
RAC Customer Facility Charges	300,000	309,000	318,270	327,818	337,653	1,592,741	1,846,423	1,206,474	4,645,638
CFC beginning year unliquidated balance	1,925,000	1,475,000	(70,000)	248,270	576,088	1,925,000	913,741	(875,328)	1,925,000
CFC unspent current year + carryover	(1,475,000)	70,000	(248,270)	(576,088)	(913,741)	(913,741)	875,328	0	0
City Contribution	0	5,000	217,180	5,000	5,000	232,180	0	0	232,180
Department of Defense	0	0	0	1,966,909	0	1,966,909	10,906,477	480,095,979	492,969,364
Other Unidentified Funding	0	0	0	0	0	0	45,141,156	36,877,757	82,018,913
Net Operating Cash Flow	0	0	0	30,091	30,091	60,182	250,717	2,261,807	2,572,706
Funds Available Current Year	9,996,985	3,964,000	2,671,800	2,563,272	8,384,393	27,580,450	74,687,655	545,050,337	647,318,442
Beginning Cash Balance/Funds Carried Over from Prior Year	0	0	0	0	(0)	0	(0)	100,262	0
Funds Used Current Year	(9,996,985)	(3,964,000)	(2,671,800)	(2,563,272)	(8,384,393)	(27,580,450)	(74,587,393)	(543,179,713)	(645,347,556)
Funds Carried Over to Next Year	$0	$0	$0	($0)	($0)	($0)	$100,262	$1,970,886	$1,970,886

Capital Project Description		2018 Base Year Costs	Estimated Project Costs and Development Schedule								
			Short Term						Mid Term	Long Term	Total Escalated
			2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Costs
Capital Projects 2021											
S2	Apron Rehabilitation	$500,000				$546,364		$546,364			$546,364
S16	Rehabilitate Runway (Maintenance)	50,000				50,000		50,000			50,000
M13	Runway Lighting and Airport Signage Upgrade	1,800,000				1,966,909		1,966,909			1,966,909
	Total Capital Projects 2021	$2,350,000	$0	$0	$0	$2,563,272	$0	$2,563,272	$0	$0	$2,563,272
Capital Projects 2022											
S5-D	Taxiway B and Associated Taxiways Rehabilitation, Addition of Paved Shoulders, Electrical Vault Improvements (Design)	$865,000					$973,565	$973,565			$973,565
S5-C	Taxiway B and Associated Taxiways Rehabilitation, Addition of Paved Shoulders, Electrical Vault Improvements (Construction)	6,540,000					7,360,828	7,360,828			7,360,828
S17	Rehabilitate Taxiway (Maintenance)	50,000					50,000	50,000			50,000
	Total Capital Projects 2022	$7,455,000	$0	$0	$0	$0	$8,384,393	$8,384,393	$0	$0	$8,384,393
	Total Short Term Project Costs	$26,201,985	$9,996,985	$3,964,000	$2,671,800	$2,563,272	$8,384,393	$27,580,450	$0	$0	$27,580,450

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KILLEEN - FORT HOOD REGIONAL AIRPORT (GRK)
Killeen, Texas

Schedule 6-1

Master Plan - Financial Implementation Analysis
Estimated Project Costs and Development Schedule

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Capital Improvement Program	Funding Schedule								
	Short Term						Mid Term	Long Term	Total
	2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Funding
Funds Used for Capital Improvement Projects									
AIP Entitlement Grants:	$1,597,237	$1,617,090	$1,637,424	$1,658,253	$1,679,587	$8,189,591	$8,653,612	$18,562,813	$35,406,016
AIP Entitlements carryover from the prior years	5,264,080	1,914,031	1,632,120	1,314,924	2,436,450	5,264,080	(0)	0	5,264,080
AIP Entitlement unspent current year + carryover	(1,914,031)	(1,632,120)	(1,314,924)	(2,436,450)	0	0	0	0	0
AIP Discretionary Grants	0	0	0	0	3,429,916	3,429,916	2,050,000	0	5,479,916
AIP Military Airport Program (MAP) Grants	3,375,000	0	0	0	0	3,375,000	0	0	3,375,000
Passenger Facility Charges:	530,115	547,981	566,448	585,538	596,426	2,826,507	3,153,531	7,312,018	13,292,057
PFC beginning year unliquidated balance	364,391	344,807	686,788	753,236	1,284,138	364,391	1,047,124	(0)	364,391
PFC unspent current year + carryover	(344,807)	(686,788)	(753,236)	(1,284,138)	(1,047,124)	(1,047,124)	0	0	0
Debt Proceeds (City Enterprise Fund) (20 yrs, 5.0%) Thru 2040	375,000	0	0	0	0	375,000	0	0	375,000
Less Debt Service	0	0	0	(30,091)	(30,091)	(60,182)	(150,455)	(391,183)	(601,819)
RAC Customer Facility Charges	300,000	309,000	318,270	327,818	337,653	1,592,741	1,846,423	1,206,474	4,645,638
CFC beginning year unliquidated balance	1,925,000	1,475,000	(70,000)	248,270	576,088	1,925,000	913,741	(875,328)	1,925,000
CFC unspent current year + carryover	(1,475,000)	70,000	(248,270)	(576,088)	(913,741)	(913,741)	875,328	0	0
City Contribution	0	5,000	217,180	5,000	5,000	232,180	0	0	232,180
Department of Defense	0	0	0	1,966,909	0	1,966,909	10,906,477	480,095,979	492,969,364
Other Unidentified Funding	0	0	0	0	0	0	45,141,156	36,877,757	82,018,913
Net Operating Cash Flow	0	0	0	30,091	30,091	60,182	250,717	2,261,807	2,572,706
Funds Available Current Year	9,996,985	3,964,000	2,671,800	2,563,272	8,384,393	27,580,450	74,687,655	545,050,337	647,318,442
Beginning Cash Balance/Funds Carried Over from Prior Year	0	0	0	0	(0)	0	(0)	100,262	0
Funds Used Current Year	(9,996,985)	(3,964,000)	(2,671,800)	(2,563,272)	(8,384,393)	(27,580,450)	(74,587,393)	(543,179,713)	(645,347,556)
Funds Carried Over to Next Year	$0	$0	$0	($0)	($0)	($0)	$100,262	$1,970,886	$1,970,886

Capital Project Description	2018 Base Year Costs	Estimated Project Costs and Development Schedule								
		Short Term						Mid Term	Long Term	Total Escalated
		2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Costs
Mid Term Projects (2023-2027)										
S6-D Airline Ramp Expansion and Relocation of Taxiway E East of Taxiway Bravo to prevent direct ramp to runway access. (Design)	$450,000						$0	$545,324		$545,324
S6-C Airline Ramp Expansion (Construction)	3,000,000						0	3,635,492		3,635,492
S7 Relocation of Taxiway E East of Taxiway Bravo to prevent direct ramp to runway access.	2,000,000						0	2,423,661		2,423,661
M1 Rental Car Parking Area Expansion and Fuel Relocation	3,000,000						0	3,635,492		3,635,492
M2-D South Ramp Development (Design)	400,000						0	484,732		484,732
M2-C South Ramp Development (Construction)	4,000,000						0	4,847,323		4,847,323
M3 Corporate Aviation Hangar/Terminal	3,000,000						0	3,635,492		3,635,492
M5-D Airline Ramp Expansion - Phase 2 (Design)	250,000						0	302,958		302,958
M5-C Airline Ramp Expansion - Phase 2 (Construction)	2,500,000						0	3,029,577		3,029,577
M6-D Taxiway G Extension East (Design)	500,000						0	605,915		605,915
M6-C Taxiway G Extension East (Construction)	5,000,000						0	6,059,154		6,059,154
M14 Runway 15-33 Rehabilitation	9,000,000						0	10,906,477		10,906,477
M7-D MRO/FBO/SASO/GA Hangar apron - Phase 1 (Design)	800,000						0	969,465		969,465
M7-C MRO/FBO/SASO/GA Hangar apron - Phase 1 (Construction)	8,000,000						0	9,694,646		9,694,646

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KILLEEN - FORT HOOD REGIONAL AIRPORT (GRK)
Killeen, Texas

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Master Plan - Financial Implementation Analysis
Estimated Project Costs and Development Schedule

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Capital Improvement Program	Funding Schedule								
	Short Term						Mid Term	Long Term	Total
	2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Funding
Funds Used for Capital Improvement Projects									
AIP Entitlement Grants:	$1,597,237	$1,617,090	$1,637,424	$1,658,253	$1,679,587	$8,189,591	$8,653,612	$18,562,813	$35,406,016
AIP Entitlements carryover from the prior years	5,264,080	1,914,031	1,632,120	1,314,924	2,436,450	5,264,080	(0)	0	5,264,080
AIP Entitlement unspent current year + carryover	(1,914,031)	(1,632,120)	(1,314,924)	(2,436,450)	0	0	0	0	0
AIP Discretionary Grants	0	0	0	0	3,429,916	3,429,916	2,050,000	0	5,479,916
AIP Military Airport Program (MAP) Grants	3,375,000	0	0	0	0	3,375,000	0	0	3,375,000
Passenger Facility Charges:	530,115	547,981	566,448	585,538	596,426	2,826,507	3,153,531	7,312,018	13,292,057
PFC beginning year unliquidated balance	364,391	344,807	686,788	753,236	1,284,138	364,391	1,047,124	(0)	364,391
PFC unspent current year + carryover	(344,807)	(686,788)	(753,236)	(1,284,138)	(1,047,124)	(1,047,124)	0	0	0
Debt Proceeds (City Enterprise Fund) (20 yrs, 5.0%) Thru 2040	375,000	0	0	0	0	375,000	0	0	375,000
Less Debt Service	0	0	0	(30,091)	(30,091)	(60,182)	(150,455)	(391,183)	(601,819)
RAC Customer Facility Charges	300,000	309,000	318,270	327,818	337,653	1,592,741	1,846,423	1,206,474	4,645,638
CFC beginning year unliquidated balance	1,925,000	1,475,000	(70,000)	248,270	576,088	1,925,000	913,741	(875,328)	1,925,000
CFC unspent current year + carryover	(1,475,000)	70,000	(248,270)	(576,088)	(913,741)	(913,741)	875,328	0	0
City Contribution	0	5,000	217,180	5,000	5,000	232,180	0	0	232,180
Department of Defense	0	0	0	1,966,909	0	1,966,909	10,906,477	480,095,979	492,969,364
Other Unidentified Funding	0	0	0	0	0	0	45,141,156	36,877,757	82,018,913
Net Operating Cash Flow	0	0	0	30,091	30,091	60,182	250,717	2,261,807	2,572,706
Funds Available Current Year	9,996,985	3,964,000	2,671,800	2,563,272	8,384,393	27,580,450	74,687,655	545,050,337	647,318,442
Beginning Cash Balance/Funds Carried Over from Prior Year	0	0	0	0	(0)	0	(0)	100,262	0
Funds Used Current Year	(9,996,985)	(3,964,000)	(2,671,800)	(2,563,272)	(8,384,393)	(27,580,450)	(74,587,393)	(543,179,713)	(645,347,556)
Funds Carried Over to Next Year	$0	$0	$0	($0)	($0)	($0)	$100,262	$1,970,886	$1,970,886

Capital Project Description		2018 Base Year Costs	Estimated Project Costs and Development Schedule								
			Short Term						Mid Term	Long Term	Total Escalated
			2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Costs
M8-D	MRO/FBO/SASO/GA Phase 2 - Parking and Access (Design)	300,000						0	363,549		363,549
M8-C	MRO/FBO/SASO/GA Phase 2 - Parking and Access (Construction)	3,000,000						0	3,635,492		3,635,492
M9-D	Level 02 - Modify the south SSCP lane to a High-Efficiency lane (Design)	130,256						0	157,848		157,848
M9-C	Level 02 - Modify the south SSCP lane to a High-Efficiency lane (Construction)	1,302,560						0	1,578,482		1,578,482
M10-D	Level 01 - Bag Claim Area Expansion/Inbound Baggage/General Circulation/ new Loading Dock, Staging Room/Non-secure Public Area Restrooms/Building Systems Expansion (Design)	605,255						0	733,467		733,467
M10-C	Level 01 - Bag Claim Area Expansion/Inbound Baggage/General Circulation/ new Loading Dock, Staging Room/Non-secure Public Area Restrooms/Building Systems Expansion (Construction)	6,052,550						0	7,334,666		7,334,666
S8-D	Level 01 - BSO Office (Design)	0						0	0		0
S8-C	Level 01 - BSO Office (Construction)	0						0	0		0
M11-D	Level 02 - South Holdroom Expansion, Storage, Maintenance, Secure Concessions, Mech/Elec on the second level (Design)	732,039						0	887,107		887,107

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Capital Improvement Program	Funding Schedule								
	Short Term						Mid Term	Long Term	Total
	2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Funding
Funds Used for Capital Improvement Projects									
AIP Entitlement Grants:	$1,597,237	$1,617,090	$1,637,424	$1,658,253	$1,679,587	$8,189,591	$8,653,612	$18,562,813	$35,406,016
AIP Entitlements carryover from the prior years	5,264,080	1,914,031	1,632,120	1,314,924	2,436,450	5,264,080	(0)	0	5,264,080
AIP Entitlement unspent current year + carryover	(1,914,031)	(1,632,120)	(1,314,924)	(2,436,450)	0	0	0	0	0
AIP Discretionary Grants	0	0	0	0	3,429,916	3,429,916	2,050,000	0	5,479,916
AIP Military Airport Program (MAP) Grants	3,375,000	0	0	0	0	3,375,000	0	0	3,375,000
Passenger Facility Charges:	530,115	547,981	566,448	585,538	596,426	2,826,507	3,153,531	7,312,018	13,292,057
PFC beginning year unliquidated balance	364,391	344,807	686,788	753,236	1,284,138	364,391	1,047,124	(0)	364,391
PFC unspent current year + carryover	(344,807)	(686,788)	(753,236)	(1,284,138)	(1,047,124)	(1,047,124)	0	0	0
Debt Proceeds (City Enterprise Fund) (20 yrs, 5.0%) Thru 2040	375,000	0	0	0	0	375,000	0	0	375,000
Less Debt Service	0	0	0	(30,091)	(30,091)	(60,182)	(150,455)	(391,183)	(601,819)
RAC Customer Facility Charges	300,000	309,000	318,270	327,818	337,653	1,592,741	1,846,423	1,206,474	4,645,638
CFC beginning year unliquidated balance	1,925,000	1,475,000	(70,000)	248,270	576,088	1,925,000	913,741	(875,328)	1,925,000
CFC unspent current year + carryover	(1,475,000)	70,000	(248,270)	(576,088)	(913,741)	(913,741)	875,328	0	0
City Contribution	0	5,000	217,180	5,000	5,000	232,180	0	0	232,180
Department of Defense	0	0	0	1,966,909	0	1,966,909	10,906,477	480,095,979	492,969,364
Other Unidentified Funding	0	0	0	0	0	0	45,141,156	36,877,757	82,018,913
Net Operating Cash Flow	0	0	0	30,091	30,091	60,182	250,717	2,261,807	2,572,706
Funds Available Current Year	9,996,985	3,964,000	2,671,800	2,563,272	8,384,393	27,580,450	74,687,655	545,050,337	647,318,442
Beginning Cash Balance/Funds Carried Over from Prior Year	0	0	0	0	(0)	0	(0)	100,262	0
Funds Used Current Year	(9,996,985)	(3,964,000)	(2,671,800)	(2,563,272)	(8,384,393)	(27,580,450)	(74,587,393)	(543,179,713)	(645,347,556)
Funds Carried Over to Next Year	$0	$0	$0	($0)	($0)	($0)	$100,262	$1,970,886	$1,970,886

Capital Project Description	2018 Base Year Costs	Estimated Project Costs and Development Schedule								
		Short Term						Mid Term	Long Term	Total Escalated
		2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Costs
M11-C Level 02 - South Holdroom Expansion, Storage, Maintenance, Secure Concessions, Mech/Elec on the second level (Construction)	7,320,390						0	8,871,074		8,871,074
M12 Rehabilitate Runway/Taxiway (Maintenance)	250,000						0	250,000		250,000
Total Mid Term Project Costs	$61,593,050	$0	$0	$0	$0	$0	$0	$74,587,393	$0	$74,587,393

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Capital Improvement Program	Funding Schedule								
	Short Term						Mid Term	Long Term	Total
	2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Funding
Funds Used for Capital Improvement Projects									
AIP Entitlement Grants:	$1,597,237	$1,617,090	$1,637,424	$1,658,253	$1,679,587	$8,189,591	$8,653,612	$18,562,813	$35,406,016
AIP Entitlements carryover from the prior years	5,264,080	1,914,031	1,632,120	1,314,924	2,436,450	5,264,080	(0)	0	5,264,080
AIP Entitlement unspent current year + carryover	(1,914,031)	(1,632,120)	(1,314,924)	(2,436,450)	0	0	0	0	0
AIP Discretionary Grants	0	0	0	0	3,429,916	3,429,916	2,050,000	0	5,479,916
AIP Military Airport Program (MAP) Grants	3,375,000	0	0	0	0	3,375,000	0	0	3,375,000
Passenger Facility Charges:	530,115	547,981	566,448	585,538	596,426	2,826,507	3,153,531	7,312,018	13,292,057
PFC beginning year unliquidated balance	364,391	344,807	686,788	753,236	1,284,138	364,391	1,047,124	(0)	364,391
PFC unspent current year + carryover	(344,807)	(686,788)	(753,236)	(1,284,138)	(1,047,124)	(1,047,124)	0	0	0
Debt Proceeds (City Enterprise Fund) (20 yrs, 5.0%) Thru 2040	375,000	0	0	0	0	375,000	0	0	375,000
Less Debt Service	0	0	0	(30,091)	(30,091)	(60,182)	(150,455)	(391,183)	(601,819)
RAC Customer Facility Charges	300,000	309,000	318,270	327,818	337,653	1,592,741	1,846,423	1,206,474	4,645,638
CFC beginning year unliquidated balance	1,925,000	1,475,000	(70,000)	248,270	576,088	1,925,000	913,741	(875,328)	1,925,000
CFC unspent current year + carryover	(1,475,000)	70,000	(248,270)	(576,088)	(913,741)	(913,741)	875,328	0	0
City Contribution	0	5,000	217,180	5,000	5,000	232,180	0	0	232,180
Department of Defense	0	0	0	1,966,909	0	1,966,909	10,906,477	480,095,979	492,969,364
Other Unidentified Funding	0	0	0	0	0	0	45,141,156	36,877,757	82,018,913
Net Operating Cash Flow	0	0	0	30,091	30,091	60,182	250,717	2,261,807	2,572,706
Funds Available Current Year	9,996,985	3,964,000	2,671,800	2,563,272	8,384,393	27,580,450	74,687,655	545,050,337	647,318,442
Beginning Cash Balance/Funds Carried Over from Prior Year	0	0	0	0	(0)	0	(0)	100,262	0
Funds Used Current Year	(9,996,985)	(3,964,000)	(2,671,800)	(2,563,272)	(8,384,393)	(27,580,450)	(74,587,393)	(543,179,713)	(645,347,556)
Funds Carried Over to Next Year	$0	$0	$0	($0)	($0)	($0)	$100,262	$1,970,886	$1,970,886

Capital Project Description	2018 Base Year Costs	Estimated Project Costs and Development Schedule								
		Short Term						Mid Term	Long Term	Total Escalated
		2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Costs
Long Term Projects (2028-2037)										
L1-D Level 01 - Rental Car Counters/BSO Office, Rental Car Counter, Concession, Non-Public Restroom, Curbside Check- in, Armed Forces Lounge, Statue Relocation, Airline Operations, TSA Break Renovation (Design)	$199,024						$0		$301,042	$301,042
L1-C Level 01 - Rental Car Counters/BSO Office, Rental Car Counter, Concession, Non-Public Restroom, Curbside Check- in, Armed Forces Lounge, Statue Relocation, Airline Operations, TSA Break Renovation (Construction)	1,990,240						0		3,010,417	3,010,417
L2-D Level 01 - Addition of Maintenance, Bag Screen Room/Egress Stair (Design)	115,192						0		174,238	174,238
L2-C Level 01 - Addition of Maintenance, Bag Screen Room/Egress Stair (Construction)	1,151,920						0		1,742,382	1,742,382
L3-D Level 02 - Consolidate security checkpoint to accommodate two high-efficiency lanes, relocate and expand secure restrooms, holdroom expansion to the west and north, new secure concessions with open seating. (Design)	1,231,764						0		1,863,154	1,863,154
L3-C Level 02 - Consolidate security checkpoint to accommodate two high-efficiency lanes, relocate and expand secure restrooms, holdroom expansion to the west and north, new secure concessions with open seating. (Construction)	12,317,640						0		18,631,536	18,631,536

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Capital Improvement Program	Funding Schedule								
	Short Term						Mid Term	Long Term	Total
	2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Funding
Funds Used for Capital Improvement Projects									
AIP Entitlement Grants:	$1,597,237	$1,617,090	$1,637,424	$1,658,253	$1,679,587	$8,189,591	$8,653,612	$18,562,813	$35,406,016
AIP Entitlements carryover from the prior years	5,264,080	1,914,031	1,632,120	1,314,924	2,436,450	5,264,080	(0)	0	5,264,080
AIP Entitlement unspent current year + carryover	(1,914,031)	(1,632,120)	(1,314,924)	(2,436,450)	0	0	0	0	0
AIP Discretionary Grants	0	0	0	0	3,429,916	3,429,916	2,050,000	0	5,479,916
AIP Military Airport Program (MAP) Grants	3,375,000	0	0	0	0	3,375,000	0	0	3,375,000
Passenger Facility Charges:	530,115	547,981	566,448	585,538	596,426	2,826,507	3,153,531	7,312,018	13,292,057
PFC beginning year unliquidated balance	364,391	344,807	686,788	753,236	1,284,138	364,391	1,047,124	(0)	364,391
PFC unspent current year + carryover	(344,807)	(686,788)	(753,236)	(1,284,138)	(1,047,124)	(1,047,124)	0	0	0
Debt Proceeds (City Enterprise Fund) (20 yrs, 5.0%) Thru 2040	375,000	0	0	0	0	375,000	0	0	375,000
Less Debt Service	0	0	0	(30,091)	(30,091)	(60,182)	(150,455)	(391,183)	(601,819)
RAC Customer Facility Charges	300,000	309,000	318,270	327,818	337,653	1,592,741	1,846,423	1,206,474	4,645,638
CFC beginning year unliquidated balance	1,925,000	1,475,000	(70,000)	248,270	576,088	1,925,000	913,741	(875,328)	1,925,000
CFC unspent current year + carryover	(1,475,000)	70,000	(248,270)	(576,088)	(913,741)	(913,741)	875,328	0	0
City Contribution	0	5,000	217,180	5,000	5,000	232,180	0	0	232,180
Department of Defense	0	0	0	1,966,909	0	1,966,909	10,906,477	480,095,979	492,969,364
Other Unidentified Funding	0	0	0	0	0	0	45,141,156	36,877,757	82,018,913
Net Operating Cash Flow	0	0	0	30,091	30,091	60,182	250,717	2,261,807	2,572,706
Funds Available Current Year	9,996,985	3,964,000	2,671,800	2,563,272	8,384,393	27,580,450	74,687,655	545,050,337	647,318,442
Beginning Cash Balance/Funds Carried Over from Prior Year	0	0	0	0	(0)	0	(0)	100,262	0
Funds Used Current Year	(9,996,985)	(3,964,000)	(2,671,800)	(2,563,272)	(8,384,393)	(27,580,450)	(74,587,393)	(543,179,713)	(645,347,556)
Funds Carried Over to Next Year	$0	$0	$0	($0)	($0)	($0)	$100,262	$1,970,886	$1,970,886

Capital Project Description		2018 Base Year Costs	Estimated Project Costs and Development Schedule								
			Short Term						Mid Term	Long Term	Total Escalated
			2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Costs
L4-D	GA Hangar Spur Taxiway/Apron (Design)	300,000						0		453,777	453,777
L4-C	GA Hangar Spur Taxiway/Apron (Construction)	3,000,000						0		4,537,769	4,537,769
L5-D	GA Hangar Road and Parking (Design)	300,000						0		453,777	453,777
L5-C	GA Hangar Road and Parking (Construction)	3,000,000						0		4,537,769	4,537,769
L6-D	GA Hangar Apron (Design)	600,000						0		907,554	907,554
L6-C	GA Hangar Apron (Construction)	6,000,000						0		9,075,538	9,075,538
L7-D	2,000 ft. Extension of Runway 15/33 to the South. Includes parallel taxiways on each side of the runway (75 ft. wide with paved shoulders). Relocation of MALSR system. Reroute of Ivy Mountain Road. (Design)	3,900,000						0		5,899,100	5,899,100
L7-C	2,000 ft. Extension of Runway 15/33 to the South. Includes parallel taxiways on each side of the runway (75 ft. wide with paved shoulders). Relocation of MALSR system. Reroute of Ivy Mountain Road. (Construction)	26,000,000						0		39,327,333	39,327,333
L8-D	Taxiway B Widening (Design)	1,500,000						0		2,268,885	2,268,885
L8-C	Taxiway B Widening (Construction)	10,000,000						0		15,125,897	15,125,897
L9-D	New offset parallel runway (10,000 ft. x 200 ft.) to the west and south of the existing runway. Includes dual parallel taxiways extending between the runways and a single parallel taxiway for the new runway. (Design)	37,500,000						0		56,722,115	56,722,115

KILLEEN - FORT HOOD REGIONAL AIRPORT (GRK)
Killeen, Texas

Schedule 6-1

Master Plan - Financial Implementation Analysis
Estimated Project Costs and Development Schedule

12-Oct-18

Capital Improvement Program	Funding Schedule								
	Short Term						Mid Term	Long Term	Total
	2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Funding
Funds Used for Capital Improvement Projects									
AIP Entitlement Grants:	$1,597,237	$1,617,090	$1,637,424	$1,658,253	$1,679,587	$8,189,591	$8,653,612	$18,562,813	$35,406,016
AIP Entitlements carryover from the prior years	5,264,080	1,914,031	1,632,120	1,314,924	2,436,450	5,264,080	(0)	0	5,264,080
AIP Entitlement unspent current year + carryover	(1,914,031)	(1,632,120)	(1,314,924)	(2,436,450)	0	0	0	0	0
AIP Discretionary Grants	0	0	0	0	3,429,916	3,429,916	2,050,000	0	5,479,916
AIP Military Airport Program (MAP) Grants	3,375,000	0	0	0	0	3,375,000	0	0	3,375,000
Passenger Facility Charges:	530,115	547,981	566,448	585,538	596,426	2,826,507	3,153,531	7,312,018	13,292,057
PFC beginning year unliquidated balance	364,391	344,807	686,788	753,236	1,284,138	364,391	1,047,124	(0)	364,391
PFC unspent current year + carryover	(344,807)	(686,788)	(753,236)	(1,284,138)	(1,047,124)	(1,047,124)	0	0	0
Debt Proceeds (City Enterprise Fund) (20 yrs, 5.0%) Thru 2040	375,000	0	0	0	0	375,000	0	0	375,000
Less Debt Service	0	0	0	(30,091)	(30,091)	(60,182)	(150,455)	(391,183)	(601,819)
RAC Customer Facility Charges	300,000	309,000	318,270	327,818	337,653	1,592,741	1,846,423	1,206,474	4,645,638
CFC beginning year unliquidated balance	1,925,000	1,475,000	(70,000)	248,270	576,088	1,925,000	913,741	(875,328)	1,925,000
CFC unspent current year + carryover	(1,475,000)	70,000	(248,270)	(576,088)	(913,741)	(913,741)	875,328	0	0
City Contribution	0	5,000	217,180	5,000	5,000	232,180	0	0	232,180
Department of Defense	0	0	0	1,966,909	0	1,966,909	10,906,477	480,095,979	492,969,364
Other Unidentified Funding	0	0	0	0	0	0	45,141,156	36,877,757	82,018,913
Net Operating Cash Flow	0	0	0	30,091	30,091	60,182	250,717	2,261,807	2,572,706
Funds Available Current Year	9,996,985	3,964,000	2,671,800	2,563,272	8,384,393	27,580,450	74,687,655	545,050,337	647,318,442
Beginning Cash Balance/Funds Carried Over from Prior Year	0	0	0	0	(0)	0	(0)	100,262	0
Funds Used Current Year	(9,996,985)	(3,964,000)	(2,671,800)	(2,563,272)	(8,384,393)	(27,580,450)	(74,587,393)	(543,179,713)	(645,347,556)
Funds Carried Over to Next Year	$0	$0	$0	($0)	($0)	($0)	$100,262	$1,970,886	$1,970,886

Capital Project Description	2018 Base Year Costs	Estimated Project Costs and Development Schedule								
		Short Term						Mid Term	Long Term	Total Escalated
		2018	2019	2020	2021	2022	Total	2023-2027	2028-2037	Costs
L9-C New offset parallel runway (10,000 ft. x 200 ft.) to the west and south of the existing runway. Includes dual parallel taxiways extending between the runways and a single parallel taxiway for the new runway. (Construction)	250,000,000						0		378,147,431	378,147,431
Total Long Term Project Costs	$359,105,780	$0	$0	$0	$0	$0	$0	$0	$543,179,713	$543,179,713
Total Project Costs	$446,900,815	$9,996,985	$3,964,000	$2,671,800	$2,563,272	$8,384,393	$27,580,450	$74,587,393	$543,179,713	$645,347,556

KILLEEN - FORT HOOD REGIONAL AIRPORT (GRK)
Killeen, Texas

Schedule 6-2

Master Plan - Financial Implementation Analysis
Projected Capital Funding Sources

12-Oct-18

	Capital Improvement Projects	Total Escalated Costs	AIP Entitlement Funding	AIP Discretionary Funding	AIP Military Airport Program Grants	Total AIP Funding	Passenger Facility Charges (PAYG)	Rental Car Customer Facility Charge	City Contribution	Department of Defense	Other Unidentified Funding	Cash Reserves/ Net Revs	Total Funding
Short Term Projects (2018-2022)													
Capital Projects 2018													
S1-D	Corporate Hangar/Terminal Development on the southern edge of the airline ramp. Includes vehicle parking lot and access. (Design)	$400,000			$360,000	$360,000						$40,000	$400,000
S1-C	Corporate Hangar/Terminal Development on the southern edge of the airline ramp. Includes vehicle parking lot and access. (Construction)	3,350,000			3,015,000	3,015,000						335,000	3,350,000
S9	Terminal Building Boarding Bridges, Phase 3	5,496,985	4,947,287			4,947,287	549,699					0	5,496,985
S11	Car Wash Facility Improvements	750,000				0		750,000				0	750,000
	Totals for 2018	$9,996,985	$4,947,287	$0	$3,375,000	$8,322,287	$549,699	$750,000	$0	$0	$0	$375,000	$9,996,985
Capital Projects 2019													
S12	Rental Car Covered Parking Project	$1,854,000				$0		$1,854,000				$0	$1,854,000
S13	Rehabilitate Runway (Maintenance)	50,000	45,000			45,000			$5,000			0	50,000
S3	BMU1 Baggage System Replacement	2,060,000	1,854,000			1,854,000	206,000					0	2,060,000
	Totals for 2019	$3,964,000	$1,899,000	$0	$0	$1,899,000	$206,000	$1,854,000	$5,000	$0	$0	$0	$3,964,000
Capital Projects 2020													
S14	Rehabilitate Taxiway (Maintenance)	$50,000	$45,000			$45,000			$5,000			$0	$50,000
S15	Terminal PA System Upgrade	500,000				0	500,000					0	500,000
S4	Property Acquisition	2,121,800	1,909,620			1,909,620			212,180			0	2,121,800
	Totals for 2020	$2,671,800	$1,954,620	$0	$0	$1,954,620	$500,000	$0	$217,180	$0	$0	$0	$2,671,800
Capital Projects 2021													
S2	Apron Rehabilitation	$546,364	$491,727			$491,727	$54,636					$0	$546,364
S16	Rehabilitate Runway (Maintenance)	50,000	45,000			45,000			5,000			0	50,000
M13	Runway Lighting and Airport Signage Upgrade	1,966,909				0				1,966,909		0	1,966,909
	Totals for 2021	$2,563,272	$536,727	$0	$0	$536,727	$54,636	$0	$5,000	$1,966,909	$0	$0	$2,563,272
Capital Projects 2022													
S5-D	Taxiway B and Associated Taxiways Rehabilitation, Addition of Paved Shoulders, Electrical Vault Improvements (Design)	$973,565	$876,209			$876,209	$97,357					$0	$973,565
S5-C	Taxiway B and Associated Taxiways Rehabilitation, Addition of Paved Shoulders, Electrical Vault Improvements (Construction)	7,360,828	3,194,829	3,429,916		6,624,745	736,083					0	7,360,828
S17	Rehabilitate Taxiway (Maintenance)	50,000	45,000			45,000			5,000			0	50,000
	Totals for 2022	$8,384,393	$4,116,037	$3,429,916	$0	$7,545,953	$833,439	$0	$5,000	$0	$0	$0	$8,384,393
	Total Short Term Project Funding	$27,580,450	$13,453,671	$3,429,916	$3,375,000	$20,258,587	$2,143,774	$2,604,000	$232,180	$1,966,909	$0	$375,000	$27,580,450

KILLEEN - FORT HOOD REGIONAL AIRPORT (GRK)
Killeen, Texas

Schedule 6-2

Master Plan - Financial Implementation Analysis
Projected Capital Funding Sources

12-Oct-18

	Capital Improvement Projects	Total Escalated Costs	AIP Entitlement Funding	AIP Discretionary Funding	AIP Military Airport Program Grants	Total AIP Funding	Passenger Facility Charges (PAYG)	Rental Car Customer Facility Charge	City Contribution	Department of Defense	Other Unidentified Funding	Cash Reserves/ Net Revs	Total Funding
Mid Term Projects (2023-2027)													
S6-D	Airline Ramp Expansion and Relocation of Taxiway E East of Taxiway Bravo to prevent direct ramp to runway access. (Design)	$545,324	$490,791			$490,791	$54,532					$0	$545,324
S6-C	Airline Ramp Expansion (Construction)	3,635,492	1,221,943	2,050,000		3,271,943	363,549					0	3,635,492
S7	Relocation of Taxiway E East of Taxiway Bravo to prevent direct ramp to runway access.	2,423,661	1,715,000			1,715,000	708,661					0	2,423,661
M1	Rental Car Parking Area Expansion and Fuel Relocation	3,635,492				0		3,635,492				0	3,635,492
M2-D	South Ramp Development (Design)	484,732				0					484,732	0	484,732
M2-C	South Ramp Development (Construction)	4,847,323				0					4,847,323	0	4,847,323
M3	Corporate Aviation Hangar/Terminal	3,635,492				0					3,635,492	0	3,635,492
M5-D	Airline Ramp Expansion - Phase 2 (Design)	302,958	272,662			272,662	30,296					0	302,958
M5-C	Airline Ramp Expansion - Phase 2 (Construction)	3,029,577	1,481,288			1,481,288	1,548,289					0	3,029,577
M6-D	Taxiway G Extension East (Design)	605,915				0					605,915	0	605,915
M6-C	Taxiway G Extension East (Construction)	6,059,154				0					6,059,154	0	6,059,154
M14	Runway 15-33 Rehabilitation	10,906,477				0				10,906,477		0	10,906,477
M7-D	MRO/FBO/SASO/GA Hangar apron - Phase 1 (Design)	969,465				0					969,465	0	969,465
M7-C	MRO/FBO/SASO/GA Hangar apron - Phase 1	9,694,646				0					9,694,646	0	9,694,646
M8-D	MRO/FBO/SASO/GA Phase 2 - Parking and Access (Design)	363,549				0					363,549	0	363,549
M8-C	MRO/FBO/SASO/GA Phase 2 - Parking and Access (Construction)	3,635,492				0					3,635,492	0	3,635,492
M9-D	Level 02 - Modify the south SSCP lane to a High-Efficiency lane (Design)	157,848	142,063			142,063	15,785					0	157,848
M9-C	Level 02 - Modify the south SSCP lane to a High-Efficiency lane (Construction)	1,578,482	1,420,634			1,420,634	157,848					0	1,578,482
M10-D	Level 01 - Bag Claim Area Expansion/Inbound Baggage/General Circulation/ new Loading Dock, Staging Room/Non-secure Public Area Restrooms/Building Systems Expansion (Design)	733,467	484,230			484,230	234,867				14,370	0	733,467
M10-C	Level 01 - Bag Claim Area Expansion/Inbound Baggage/General Circulation/ new Loading Dock, Staging Room/Non-secure Public Area Restrooms/Building Systems Expansion (Construction)	7,334,666	1,200,000			1,200,000	460,250				5,674,416	0	7,334,666
S8-D	Level 01 - BSO Office (Design)	0				0						0	0
S8-C	Level 01 - BSO Office (Construction)	0				0						0	0
M11-D	Level 02 - South Holdroom Expansion, Storage, Maintenance, Secure Concessions, Mech/Elec on the second level (Design)	887,107	0			0	56,962				830,146	0	887,107
M11-C	Level 02 - South Holdroom Expansion, Storage, Maintenance, Secure Concessions, Mech/Elec on the second level (Construction)	8,871,074	0			0	569,617				8,301,457	0	8,871,074
M12	Rehabilitate Runway/Taxiway (Maintenance)	250,000	225,000			225,000					25,000	0	250,000
	Total Mid Term Project Funding	$74,587,393	$8,653,612	$2,050,000	$0	$10,703,612	$4,200,656	$3,635,492	$0	$10,906,477	$45,141,156	$0	$74,587,393

KILLEEN - FORT HOOD REGIONAL AIRPORT (GRK)
Killeen, Texas

Schedule 6-2

Master Plan - Financial Implementation Analysis
Projected Capital Funding Sources

12-Oct-18

	Capital Improvement Projects	Total Escalated Costs	AIP Entitlement Funding	AIP Discretionary Funding	AIP Military Airport Program Grants	Total AIP Funding	Passenger Facility Charges (PAYG)	Rental Car Customer Facility Charge	City Contribution	Department of Defense	Other Unidentified Funding	Cash Reserves/ Net Revs	Total Funding
Long Term Projects (2028-2037)													
L1-D	Level 01 - Rental Car Counters/BSO Office, Rental Car Counter, Concession, Non-Public Restroom, Curbside Check- in, Armed Forces Lounge, Statue Relocation, Airline Operations, TSA Break Renovation (Design)	$301,042				$0		$30,104			270,937	$0	$301,042
L1-C	Level 01 - Rental Car Counters/BSO Office, Rental Car Counter, Concession, Non-Public Restroom, Curbside Check- in, Armed Forces Lounge, Statue Relocation, Airline Operations, TSA Break Renovation (Construction)	3,010,417				0		301,042			2,709,375	0	3,010,417
L2-D	Level 01 - Addition of Maintenance, Bag Screen Room/Egress Stair (Design)	174,238				0	93,758				80,480	0	174,238
L2-C	Level 01 - Addition of Maintenance, Bag Screen Room/Egress Stair (Construction)	1,742,382				0	937,579				804,804	0	1,742,382
L3-D	Level 02 - Consolidate security checkpoint to accommodate two high-efficiency lanes, relocate and expand secure restrooms, holdroom expansion to the west and north, new secure concessions with open seating.	1,863,154	1,580,542			1,580,542	175,616				106,996	0	1,863,154
L3-C	Level 02 - Consolidate security checkpoint to accommodate two high-efficiency lanes, relocate and expand secure restrooms, holdroom expansion to the west and north, new secure concessions with open seating.	18,631,536	7,650,000			7,650,000	5,068,147				5,913,389	0	18,631,536
L4-D	GA Hangar Spur Taxiway/Apron (Design)	453,777				0					453,777	0	453,777
L4-C	GA Hangar Spur Taxiway/Apron (Construction)	4,537,769				0					4,537,769	0	4,537,769
L5-D	GA Hangar Road and Parking (Design)	453,777				0					453,777	0	453,777
L5-C	GA Hangar Road and Parking (Construction)	4,537,769				0					4,537,769	0	4,537,769
L6-D	GA Hangar Apron (Design)	907,554				0					907,554	0	907,554
L6-C	GA Hangar Apron (Construction)	9,075,538				0					9,075,538	0	9,075,538
L7-D	2,000 ft. Extension of Runway 15/33 to the South. Includes parallel taxiways on each side of the runway (75 ft. wide with paved shoulders). Relocation of MALSR system. Reroute of Ivy Mountain Road. (Design)	5,899,100				0				5,899,100		0	5,899,100
L7-C	2,000 ft. Extension of Runway 15/33 to the South. Includes parallel taxiways on each side of the runway (75 ft. wide with paved shoulders). Relocation of MALSR system. Reroute of Ivy Mountain Road. (Construction)	39,327,333				0				39,327,333		0	39,327,333
L8-D	Taxiway B Widening (Design)	2,268,885	2,041,996			2,041,996	226,888					0	2,268,885
L8-C	Taxiway B Widening (Construction)	15,125,897	7,290,275			7,290,275	810,031				7,025,592	0	15,125,897
L9-D	New offset parallel runway (10,000 ft. x 200 ft.) to the west and south of the existing runway. Includes dual parallel taxiways extending between the runways and a single parallel taxiway for the new runway. (Design)	56,722,115				0				56,722,115		0	56,722,115
L9-C	New offset parallel runway (10,000 ft. x 200 ft.) to the west and south of the existing runway. Includes dual parallel taxiways extending between the runways and a single parallel taxiway for the new runway. (Construction)	378,147,431				0				378,147,431		0	378,147,431
	Total Long Term Project Funding	$543,179,713	$18,562,813	$0	$0	$18,562,813	$7,312,018	$331,146	$0	$480,095,979	$36,877,757	$0	$543,179,713
Total Project Funding		$645,347,556	$40,670,096	$5,479,916	$3,375,000	$49,525,012	$13,656,449	$6,570,638	$232,180	$492,969,364	$82,018,913	$375,000	$645,347,556

KILLEEN - FORT HOOD REGIONAL AIRPORT (GRK)
Killeen, Texas

GRK - MP - 2018 - 12

Schedule 6-3

Master Plan - Financial Implementation Analysis
Actual, Budgeted and Projected Operations & Maintenance Expenses

12-Oct-18

				Short Term							
	Actual	Actual	Actual	Budget	Projected					Mid Term	Long Term
Operations & Maintenance Expenses	2015	2016	2017	2018	2019	2020	2021	2022	Total	2023-2027	2028-2037
Salaries	$1,368,960	$1,385,014	$1,340,009	$1,410,114	$1,452,417	$1,495,990	$1,540,870	$1,587,096	$7,486,487	$8,678,890	$21,724,915
Supplies	71,481	60,096	71,841	65,660	67,630	69,659	71,748	73,901	348,598	404,120	1,011,590
Maintenance	145,743	74,681	74,329	69,714	71,805	73,960	76,178	78,464	370,121	429,072	1,074,048
Repairs	99,824	72,584	116,026	80,130	82,534	85,010	87,560	90,187	425,421	493,180	1,234,522
Support Services	457,851	437,838	378,165	322,808	371,929	383,087	394,579	406,417	1,878,820	2,222,453	5,563,224
Benefits	366,007	333,288	338,168	371,447	382,590	394,068	405,890	418,067	1,972,063	2,286,161	5,722,696
Minor Capital Outlay	3,316	1,235	6,613	0	0	0	0	0	0	0	0
Professional Services	0	1,605	18,237	12,260	12,628	13,007	13,397	13,799	65,090	75,457	188,884
Information Technology	167,079	122,800	135,249	114,150	117,575	121,102	124,735	128,477	606,038	702,564	1,758,651
Human Resources	375	718	404	0	0	0	0	0	0	0	0
Insurance	49,426	51,234	59,765	78,785	81,149	83,583	86,090	88,673	418,280	484,901	1,213,801
Support Services - General Fund	0	0	0	23,079	23,771	24,485	25,219	25,976	122,530	142,045	355,567
Total Operations & Maintenance Expenses	$2,730,062	$2,541,093	$2,538,806	$2,548,147	$2,664,028	$2,743,949	$2,826,267	$2,911,055	$13,693,447	$15,918,844	$39,847,898
Annual Growth Rate	-	-6.9%	-0.1%	0.4%	4.5%	3.0%	3.0%	3.0%	2.8%	3.0%	3.0%
Operating Expenses Per Enplaned Passenger:											
Killeen - Fort Hood Regional Airport	$18.83	$18.94	$19.56	$18.99	$19.21	$19.14	$19.07	$19.28	$19.14	$19.94	$21.53
Non-Hub Industry Average	$43.78	$46.73	$47.48	$48.25	$49.03	$49.82	$50.62	$51.44	$49.83	$54.42	$61.39

KILLEEN - FORT HOOD REGIONAL AIRPORT (GRK)
Killeen, Texas

GRK - MP - 2018 - 12

Schedule 6-4

Master Plan - Financial Implementation Analysis
Actual, Budgeted and Projected Operating Revenues

12-Oct-18

Revenues	Actual 2015	Actual 2016	Actual 2017	Budget 2018	Short Term Projected 2019	2020	2021	2022	Total	Mid Term 2023-2027	Long Term 2028-2037
					LDW - Landed Weight Growth + Inflation						
					ENP - Enplanement Growth + Inflation						
					ENP - Enplanement Growth Only						
AIRLINE REVENUES											
Landing Fees	$178,782	$167,463	$170,177	$158,922	$142,656	$149,411	$156,487	$162,680	$770,155	$915,355	$2,471,818
Air Carrier Operations/Rent	301,161	277,655	316,733	311,648	258,078	265,821	273,795	282,009	1,391,352	1,542,142	3,860,276
Total Airline Revenues	$479,943	$445,118	$486,910	$470,570	$400,734	$415,232	$430,282	$444,689	$2,161,507	$2,457,497	$6,332,094
Annual Growth Rate	-	-7.3%	9.4%	-3.4%	-14.8%	3.6%	3.6%	3.3%	-1.8%	3.4%	3.4%
Airline Cost Per Enplaned Passenger:											
Killeen - Fort Hood Regional Airport	$3.31	$3.32	$3.75	$3.51	$2.89	$2.90	$2.90	$2.95	$3.02	$3.08	$3.42
Non-Hub Industry Average	$8.08	$9.14	$9.29	$9.44	$9.59	$9.74	$9.90	$10.06	$9.75	$10.64	$12.01
NON-AIRLINE REVENUES											
Fuel Sales - Auto Fuel	$137,214	$81,194	$122,507	$84,176	$86,701	$89,302	$91,981	$94,741	$446,902	$518,082	$1,296,857
Fuel Sales - Jet A	12,205	8,637	9,948	6,553	6,750	6,952	7,161	7,375	34,791	40,332	100,959
Cost of Fuel Sales	(119,009)	(70,067)	(90,559)	(75,700)	(77,971)	(80,310)	(82,719)	(85,201)	(401,902)	(465,914)	(1,166,272)
Operating Supplies Sales	0	3,962	590	5,202	5,358	5,519	5,684	5,855	27,618	32,017	80,145
Hangar Rent (DBO 2021)	0	0	0	0	0	0	93,300	93,300	186,600	466,500	933,000
Into Plane Fees	334,116	304,011	256,694	309,051	318,323	327,872	337,708	347,840	1,640,794	1,902,130	4,761,393
TxDOT RAMP Grant	50,000	50,000	49,948	37,500	50,000	50,000	50,000	50,000	237,500	250,000	500,000
Airport Parking Lot Fees	648,058	586,477	568,590	592,342	612,305	632,940	654,271	666,436	3,158,294	3,523,706	8,170,332
Airport Rent and Concession - Rental Car/FB/Retail	806,667	771,136	882,234	820,740	873,852	930,401	990,609	1,039,299	4,654,902	6,016,616	17,525,150
Airport Rent and Concession - Other Terminal Services	201,051	235,351	227,859	230,774	237,697	244,828	252,173	259,738	1,225,211	1,420,355	3,555,419
Micellaneous Receipts	37,445	5,334	5,643	1,339	1,379	1,421	1,463	1,507	7,109	8,241	20,629
Total Non-Airline Revenues	$2,107,747	$1,976,035	$2,033,454	$2,011,977	$2,114,394	$2,208,925	$2,401,632	$2,480,891	$11,217,818	$13,712,064	$35,777,611
Annual Growth Rate	-	-6.2%	2.9%	-1.1%	5.1%	4.5%	8.7%	3.3%	4.1%	3.4%	3.6%
NON-OPERATING REVENUES											
Investment Income	$32	$23	$0	$0	$0	$0	$0	$0	$0	$0	$0
Total Non-Operating Revenues	$32	$23	$0	$0	$0	$0	$0	$0	$0	$0	$0
Annual Growth Rate	-	-28.1%	-100.0%	-	-	-	-	-	-	-	-
Total Revenues	$2,587,722	$2,421,176	$2,520,364	$2,482,547	$2,515,128	$2,624,157	$2,831,914	$2,925,580	$13,379,325	$16,169,561	$42,109,705
Annual Growth Rate	-	-6.4%	4.1%	-1.5%	1.3%	4.3%	7.9%	3.3%	3.0%	3.4%	3.6%
Operating Revenues Per Enplaned Passenger:											
Killeen - Fort Hood Regional Airport	$17.85	$18.05	$19.42	$18.50	$18.13	$18.30	$19.11	$19.38	$18.70	$20.26	$22.75
Non-Hub Industry Average	$41.71	$47.11	$47.87	$48.64	$49.43	$50.23	$51.04	$51.86	$50.24	$54.87	$61.90

KILLEEN - FORT HOOD REGIONAL AIRPORT (GRK)
Killeen, Texas

GRK - MP - 2018 - 12

Schedule 6-5

Master Plan - Financial Implementation Analysis
Financial Plan Summary
Budgeted and Projected Net Revenues, Capital Funding and Capital Expenditures

12-Oct-18

Operating/Capital Cash Flow	Short Term						Mid Term	Long Term
	Budget	Projected						
	2018	2019	2020	2021	2022	Total	2023-2027	2028-2037
Passenger Enplanements								
Commercial Service Passenger Enplanements	134,172	138,694	143,368	148,200	150,956	715,390	798,160	1,850,675
Annual Growth Rate	-	3.37%	3.37%	3.37%	1.86%	2.99%	1.86%	2.00%
Military Charter Enplanements	30,717	30,201	29,629	29,000	29,016	148,563	145,108	290,705
Annual Growth Rate	-	-1.68%	-1.89%	-2.12%	0.06%	-1.41%	0.00%	0.00%
Total Passenger Enplanements	164,889	168,895	172,998	177,200	179,972	863,953	943,269	2,141,381
Annual Growth Rate	-	2.43%	2.43%	2.43%	1.56%	2.21%	1.56%	1.72%
Operating Cash Flow								
Revenues:								
Airline Revenues	$470,570	$400,734	$415,232	$430,282	$444,689	$2,161,507	$2,457,497	$6,332,094
Non-Airline Revenues	2,011,977	2,114,394	2,208,925	2,401,632	2,480,891	11,217,818	13,712,064	35,777,611
Non-Operating Revenues	0	0	0	0	0	0	0	0
Contributions from Aviation Fund Balance	65,600	148,901	119,792	24,444	15,566	374,303	0	0
City Subsidy Required to Fund Operating Deficit	0	0	0	0	0	0	0	0
Total Revenues	$2,548,147	$2,664,028	$2,743,949	$2,856,358	$2,941,146	$13,753,629	$16,169,561	$42,109,705
Operations & Maintenance Expenses	(2,548,147)	(2,664,028)	(2,743,949)	(2,826,267)	(2,911,055)	(13,693,447)	(15,918,844)	(39,847,898)
Total Net Operating Cash Flow Available For Capital Expenditures	$0	$0	$0	$30,091	$30,091	$60,182	$250,717	$2,261,807
Capital Cash Flow								
Beginning Cash Balance	$0	$0	$0	$0	($0)	$0	($0)	$100,262
Other Capital Funding Sources:								
AIP Entitlement Grants:	$1,597,237	$1,617,090	$1,637,424	$1,658,253	$1,679,587	$8,189,591	$8,653,612	$18,562,813
AIP Entitlement unspent current year + carryover	(1,914,031)	(1,632,120)	(1,314,924)	(2,436,450)	0	0	0	0
AIP Entitlements carryover from the prior years	5,264,080	1,914,031	1,632,120	1,314,924	2,436,450	5,264,080	0	0
AIP Discretionary Grants	0	0	0	0	3,429,916	3,429,916	2,050,000	0
AIP Military Airport Program (MAP) Grants	3,375,000	0	0	0	0	3,375,000	0	0
Passenger Facility Charges:	530,115	547,981	566,448	585,538	596,426	2,826,507	3,153,531	7,312,018
PFC beginning year unliquidated balance	364,391	344,807	686,788	753,236	1,284,138	364,391	1,047,124	(0)
PFC unspent current year + carryover	(344,807)	(686,788)	(753,236)	(1,284,138)	(1,047,124)	(1,047,124)	0	-
Debt Proceeds (City Enterprise Fund) (20 yrs, 5.0%) Thru 2040	375,000	0	0	0	0	375,000	0	0
Less Debt Service	0	0	0	(30,091)	(30,091)	(60,182)	(150,455)	(391,183)
RAC Customer Facility Charges	300,000	309,000	318,270	327,818	337,653	1,592,741	1,846,423	1,206,474
CFC beginning year unliquidated balance	1,925,000	1,475,000	(70,000)	248,270	576,088	1,925,000	913,741	(875,328)
CFC unspent current year + carryover	(1,475,000)	70,000	(248,270)	(576,088)	(913,741)	(913,741)	875,328	0
City Contribution	0	5,000	217,180	5,000	5,000	232,180	0	0
Department of Defense	0	0	0	1,966,909	0	1,966,909	10,906,477	480,095,979
Total Other Capital Funding Sources	$9,996,985	$3,964,000	$2,671,800	$2,533,181	$8,354,302	$27,520,268	$74,436,938	$542,788,530
Total Funds Available for Capital Expenditures	$9,996,985	$3,964,000	$2,671,800	$2,563,272	$8,384,393	$27,580,450	$74,687,655	$545,150,599
Capital Improvement Program Expenditures	9,996,985	3,964,000	2,671,800	2,563,272	8,384,393	27,580,450	74,587,393	543,179,713
Ending Cash Balance	$0	$0	$0	($0)	($0)	($0)	$100,262	$1,970,886

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Carl Walker