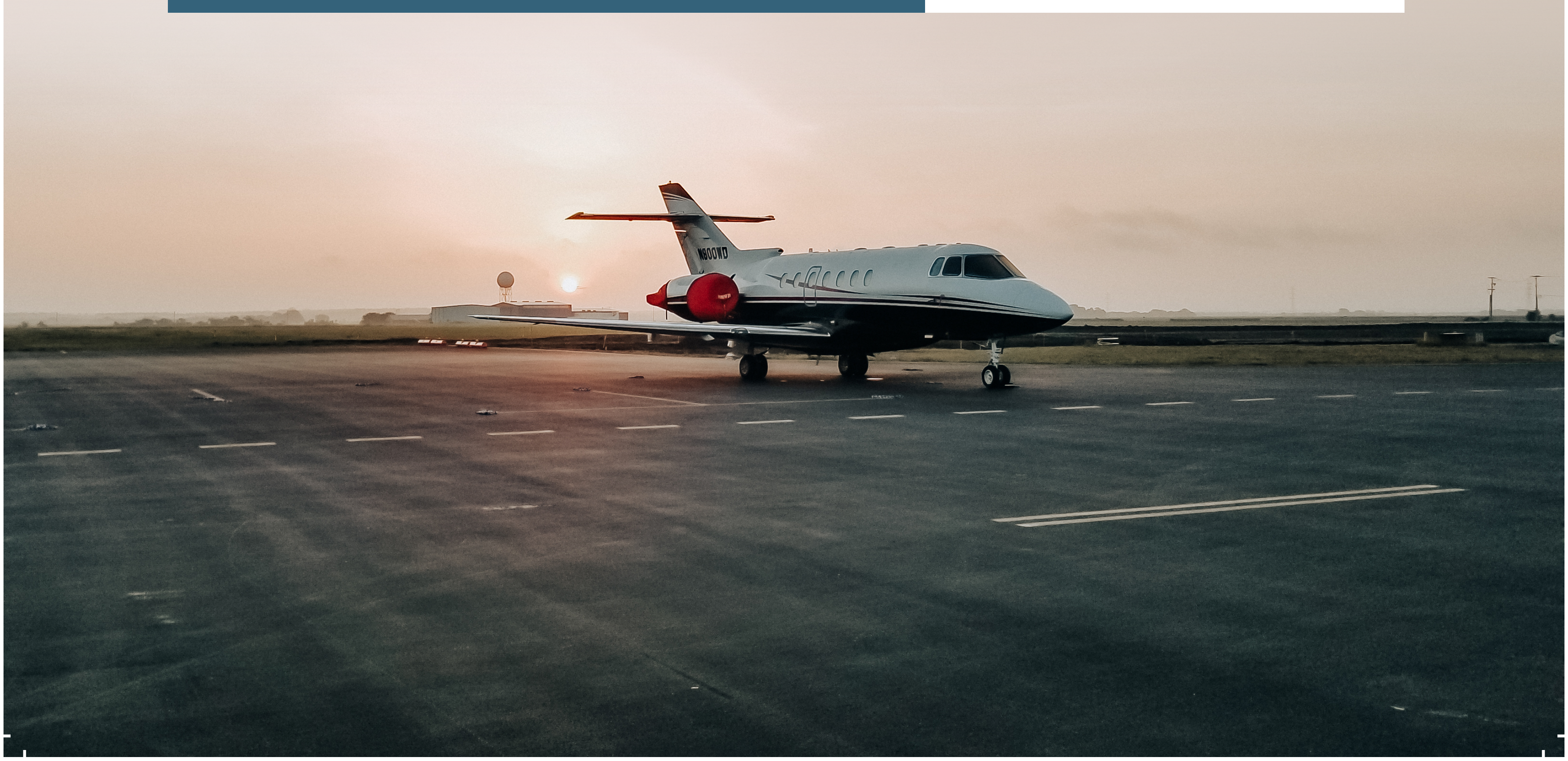
KSA

NEW BRAUNFELS REGIONAL AIRPORT

AIRPORT MASTER PLAN 2019

New Braunfels
REGIONAL AIRPORT



New Braunfels Regional Airport (BAZ)

Airport Master Plan

FINAL REPORT
Approved July 2019

Prepared for:
The City of New Braunfels and New Braunfels Regional Airport

New Braunfels
REGIONAL AIRPORT

2333 FM 758
New Braunfels, Texas 78130
&
Texas Department of Transportation (TxDOT)

Texas Department of Transportation

Aviation Division
Austin, TX

Prepared by:
KSA
A DYNAMIC PERSPECTIVE
McKinney, TX

This document was funded by the Texas Department of Transportation Aviation Division and City of New Braunfels. It was prepared in accordance with Federal Aviation Administration Advisory Circular AC 150/5070-6B Airport Master Plans. The contents do not necessarily reflect the official views or policies of the TXDOT or Federal Aviation Administration. Acceptance of this report by the TXDOT or FAA does not in any way constitute a commitment on the part of the State of Texas or United States to participate in any development depicted therein nor does it indicate that the proposed development is environmentally acceptable or would have justification in accordance with appropriate public laws.

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Chapter 1. Inventory

The following Airport Master Plan will define a concept for development at New Braunfels Regional Airport (BAZ or the Airport) with the goal of facilitating the growing aviation demands of the region. This plan will feature a 20-year planning period and has been prepared in collaboration with airport management, federal and state agencies, local officials, businesses and interested airport users/stakeholders. A key goal of this study is to identify needs and evaluate development alternatives to provide guidance for the future development of the Airport. The plan recommends improvements in accordance with Federal Aviation Administration (FAA) criteria, taking into consideration anticipated changes in aviation activity and development opportunities at the local, regional, and national levels.

The primary objective of this Airport Master Plan is to produce a comprehensive planning guide for continued development of a safe, efficient, and successful aviation facility that meets the goals of the City of New Braunfels, airport users and tenants, and the surrounding airport market area. The plan must also satisfy FAA and Texas Department of Transportation (TxDOT) guidelines for the development of airport master plans and facilities, while incorporating characteristics that are unique to the area. This study focuses on aeronautical forecasts, economic development opportunities, need and justification for improvements, and a staged plan for recommended development.

The staged plan typically looks at planning horizons of 0-5 years, 6-10 years, and 11-20 years. The first phase will address existing facility deficiencies or non-compliance to airport design standards as outlined in FAA Advisory Circular (AC) 150/5300-13A, *Airport Design*.

The first step in the airport master planning process includes the gathering of information about the airport and its environment. The information gathered during this phase will provide the foundation for subsequent phases. The inventory of existing conditions for the New Braunfels Regional Airport Master Plan will include the following:

- Information pertaining to airport ownership and management, transportation access, the relationship to the State and Federal Airport System, and history;
- An overview of the area's airspace, traffic control management, and meteorological conditions;
- Descriptions of facilities and services provided at the Airport, including a general description of airside, terminal, landside, and support facilities;
- Descriptions of users of property adjacent to the Airport, development plans and needs, and planning timeframe.

The data collected for this phase of the study was gathered from a variety of sources, including airport management, tenants and users, the City of New Braunfels, the Planning Advisory Committee for the project, and Airport service providers. The information gathered is current as of March 2018. Updated information gathered throughout the development of the master plan can be found in subsequent chapters.

During the onset of this master planning effort, interviews with Airport and TxDOT representatives revealed the following items that this master plan should consider.

- Justification of a potential runway extension and strengthen and rehabilitate pavement.
- Development of additional hangar storage areas to support existing and anticipated based aircraft as well as accommodate new or expanding business enterprises.
- Relocate fuel farm to a more centralized and usable location on the field.
- Potential relocation of terminal building to maximize development.
- Provide efficient overall auto access to the airport.
- Preserve the airport from encroachment of non-compatible land uses
- Preservation of aeronautical hangar development areas on the west side while considering expanded corporate hangars on the south.

This master plan will attempt to address these topics as well as include any additional topics that may arise during the course of the study.

1.1 Airport and Community Overview

This section provides an overview of New Braunfels Regional Airport with regard to its history, general location, management, and defined roles within various airport systems.

City of New Braunfels, TX

Nestled in the heart of Texas and situated at the confluence of the Guadalupe and Comal rivers, New Braunfels was founded by Prince Carl of Solms-Braunfels, German royalty, in March 1845. Shortly thereafter, settlers began to arrive and turned this bucolic countryside into a thriving industrial and textile community. The town was established to take advantage of the natural water resources in the region and sits 35-miles northeast of San Antonio and 45-miles southwest of Austin. As water and steam power became less relevant with the onset of electrical power, land within the city limits became available for public use.

New Braunfels is a major watersports destination in Texas. The City is home to the Schlitterbahn Resort and Water Park. Thus, tourism became a major industry and important economic tool to the city and is still evident today as witnessed by the numerous visitors to the Guadalupe River, Canyon Lake, and Natural Bridge Caverns.

Schlitterbahn Water Park, New Braunfels, TX

New Braunfels Regional Airport History

The New Braunfels Regional Airport was originally established by the U.S. Army Air Corps as a military training base in 1941. Over the years, the field has been transformed into the airfield that it is today. Key elements of the airport's evolution include:

- 1941 – U.S. Army Air Corp purchases the original property and additional land totaling 869 acres
- 1944 – Pavement is constructed to support B-25 training and operations conducted out of Randolph Air Force Base
- 1969 – Through the War Assets Administration (WAA), the U.S Government transfers the airfield deed to the City of New Braunfels and the airport is now under civilian control
- 1996 – First full-time airport manager is activated by the City

Today, New Braunfels Regional Airport is a fully operational general aviation airport that provides no scheduled commercial airline service. Its primary function is as an industrial, business and recreational flight service center that caters to all forms of general aviation.

Airport ownership and management

Following the transfer from the military, New Braunfels Regional Airport has been owned and operated by the City of New Braunfels, Texas. The Airport Director oversees the maintenance, development, and day to day operations of the airport. In addition, an Airport Advisory Board has been established to provide insights and recommendations related to policies carried out at the Airport.

New Braunfels
REGIONAL AIRPORT

Many of the day-to-day functions associated with operating the Airport rest with the City and are handled by City staff. The airport provides full-serve and self-serve fueling (both Jet A and 100LL) and uses a credit card system for payment. The Airport does have a General Aviation Terminal that includes public restrooms, flight planning room and lounge. Based on an understanding of the goals of the Airport, the mission for BAZ is:

The New Braunfels Regional Airport is dedicated to providing a safe and efficient transportation portal into the national airspace system, while enabling future growth and economic benefits for the community.

While this mission may be broad, it allows BAZ to utilize its resources, facilities, and assets to attract industry, develop businesses, and create jobs for the area. To do this, BAZ should continue undertaking community outreach to create awareness and interest, develop and maintain airside and landside facilities to accommodate and retain existing tenants, and attract new tenants and businesses.

The City, through its ownership and oversight of the Airport, has an obligation to achieve its mission. The master plan's goals are consistent with that of the Airport. The master plan is intended to support, determine and justify development needs to help the City achieve its mission for the Airport. Therefore, the master plan may be considered a guiding document for the City and its plan for the Airport's future.

Airport Location and Access

As shown in **Exhibit 1.1**, New Braunfels Regional Airport is located in South Central Texas, four miles east of the City of New Braunfels, in Guadalupe County. Primary access to the airport is provided by State Highways 758 and 46, via Interstate-35 with a secondary access point provided by Saur Lane via Interstate-35. The major transportation artery for the City is Interstate-35, running north to south, with the Guadalupe River sectioning the city between north and south. Other major metropolitan areas within close proximity of the airport include:

- San Antonio - BAZ is 35 miles northeast
- Austin - BAZ is 45 miles southeast
- San Marcos - BAZ is 19 miles south

Market Area / Travel Time

An important aspect of any airport is the ability to provide services for the community and the region it represents. Additionally, the ability to attract future business tenants, aircraft owners, and supporting services at the field is dependent upon proximity to amenities and the overall population base. Situated between two large metropolitan areas, New Braunfels Regional Airport is primed to capitalize on its convenient location. The following graphic, **Exhibit 1.1**, details the approximate drive time to / from the airport. As shown, a majority of New Braunfels proper falls within a 0-15 minute drive time of the airport; however, the areas beyond the city limits require a drive time of approximately 15-90 minutes depending on the destination and / or starting point. These drive times help provide a mechanism for the airport to focus marketing the airport and attracting additional business and clientele.

Exhibit 1.1
Travel Times

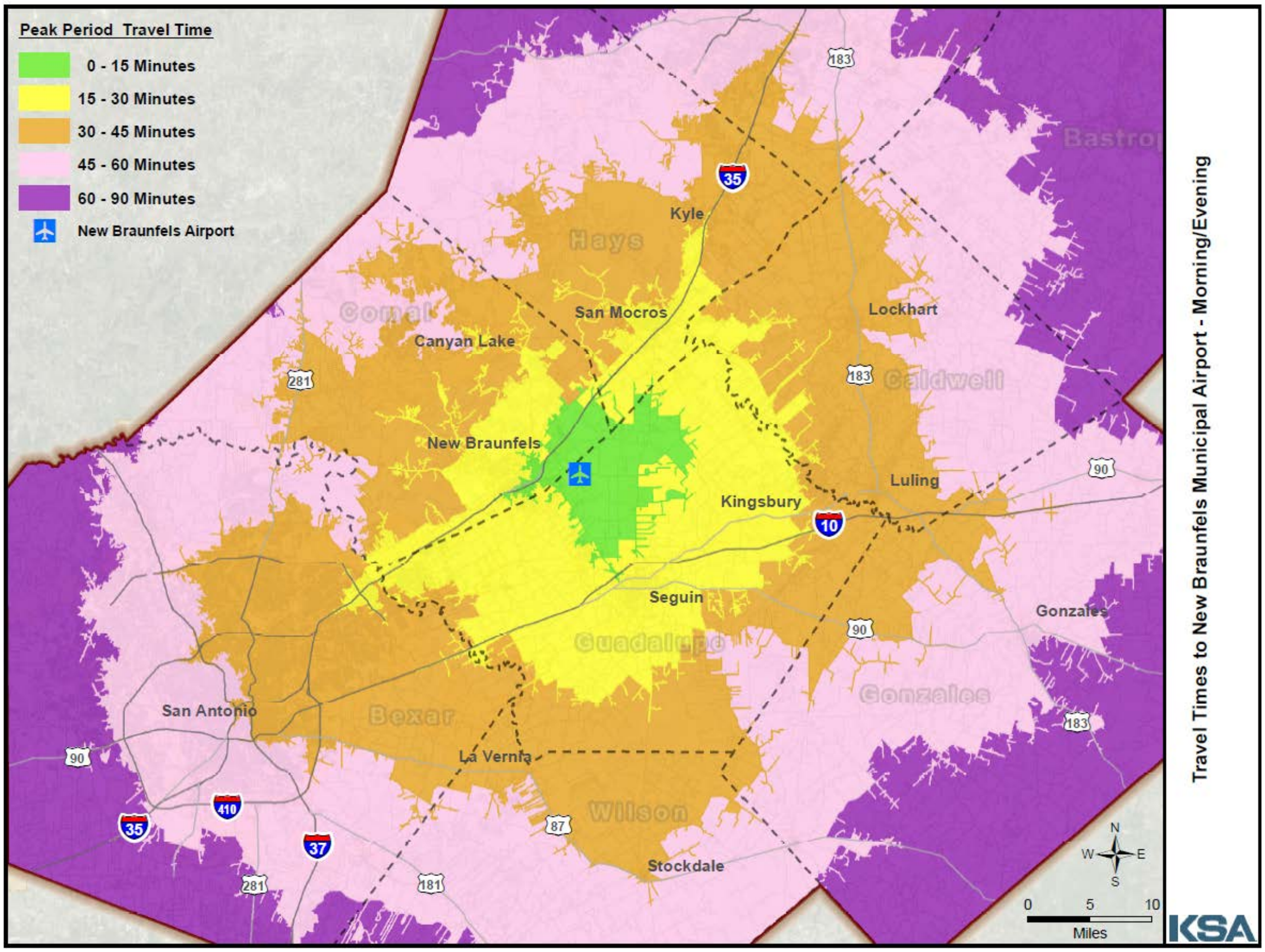

Table 1.1 on the following page provides a summary of important elements for New Braunfels Regional Airport. Note that the most recent Airport Layout Plan (ALP), FAA Airport Master Record (Form 5010), Texas Aviation System Plan (TASP), FAA National Plan of Integrated Airport Systems (NPIAS), and FAA General Aviation Asset Study were utilized as the source for a large portion of the data.

Table 1.1 Existing Conditions	
Airport Name	New Braunfels Regional Airport
FAA Designation	BAZ
Associated City	New Braunfels, TX
Airport Owner / Sponsor	City of New Braunfels, TX
Airport Management	Full-time city staff, on-site
Date Established	1941
Airport Roles	Texas Airport System Plan (TASP) – Business / Corporate FAA NPIAS – National Regional
Commercial Air Service	None
Airport Acreage	Approx. 1,500 acres
Airport Reference Point (ARP)	29°42’20.7000”N / 98°02’35.6000”W
Airport Elevation	658.4 ft.
Area Mean Max Temperature	96 Degrees

Source: FAA Form 5010-1. *Airport Master Record*

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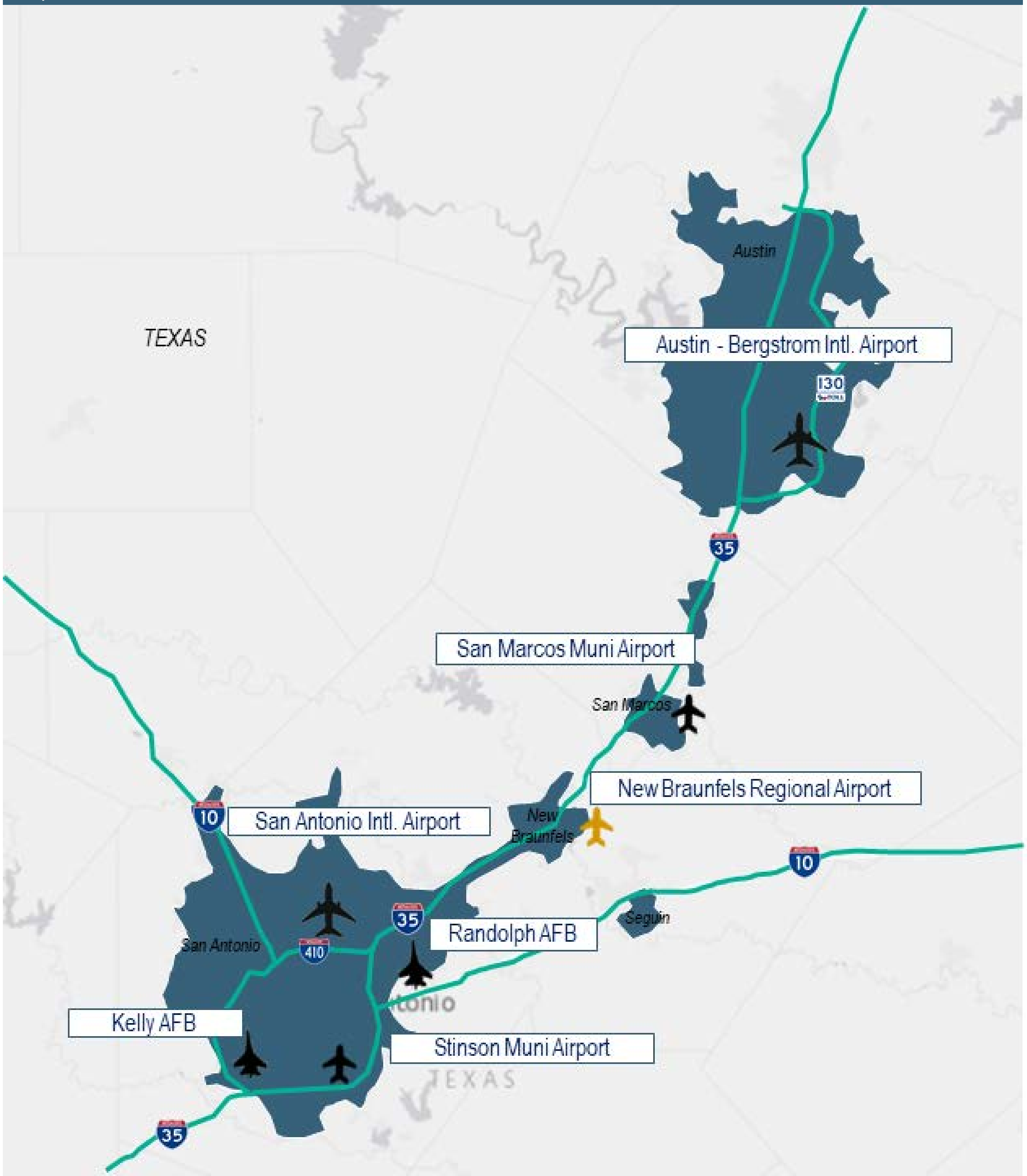
Exhibit 1.2
Airport Location



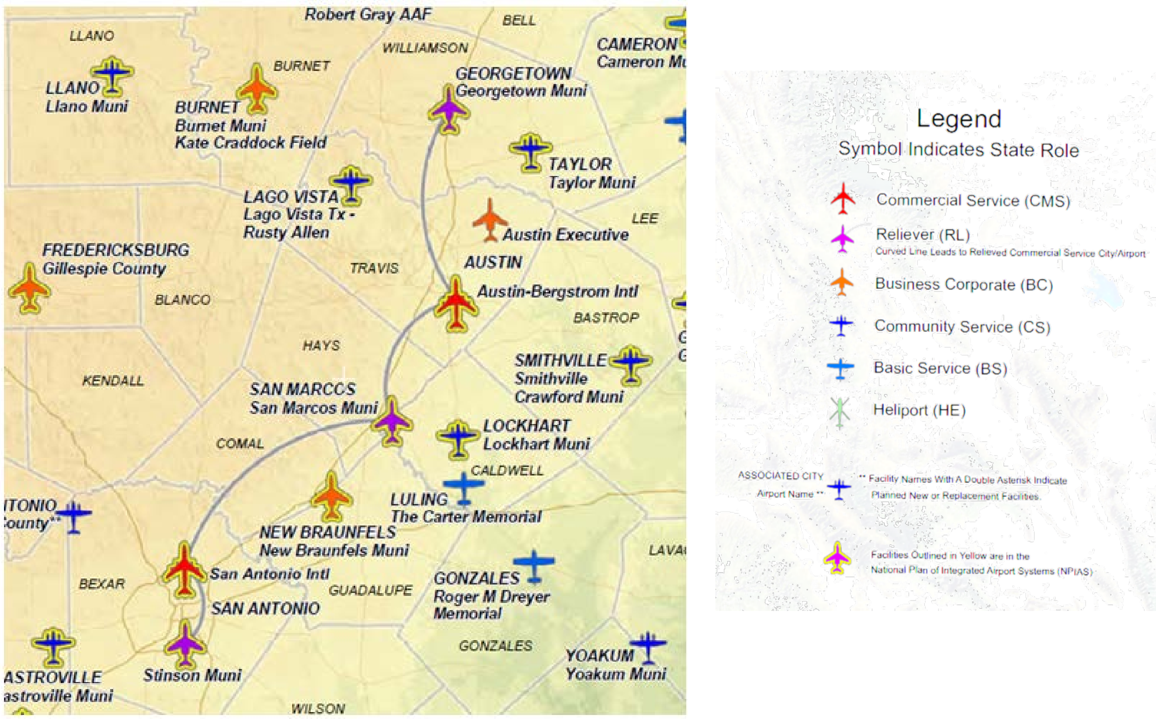
Source: KSA

Airport System Role

All airports play a variety of different functional roles and contribute at varying levels to meet the transportation and economic needs on a national, state, and local level. Identifying and understanding the various roles that an airport plays is essential for any airport in a system so it can continue to develop facilities and services that appropriately fulfill its respective role.

Emergency Preparedness and Response	Aeromedical Flights Law Enforcement/National Security/Border Security Emergency Response Aerial Fire Fighting Support	Emergency Diversionary Airport Disaster Relief and Search and Rescue Critical Federal Functions
Critical Community Access	Remote Population/Island Access Air Taxi/Charter Services	Essential Scheduled Air Services Cargo
Other Aviation Specific Functions	Self-Piloted Business Flights Corporate Flight Instructions Personal Flying Charter Passenger Services	Aircraft/Avionics Manufacturing/Maintenance Aircraft Storage Aerospace Engineering/Research
Commercial Industrial and Economic Activities	Agricultural Support Aerial Surveying and Observation Low-Orbit Space Launch and Landing Oil and Mineral Exploration/Survey Utility/Pipeline Control and Inspection Business Execution Flight Service	Manufacturing and Distribution Express Delivery Service Air Cargo
Destination and Special Events	Tourism and Success to Special Events Intermodal Connections (rail/ship)	Special Aeronautical (skydiving/airshows)

State Role: As defined in the *Texas Airport System Plan Update 2010*, New Braunfels Regional Airport is classified as "Business / Corporate" (BC). These types of airports provide access to turbo-prop and business jet aircraft and are located where sufficient population and economic activity can support a moderate to high levels of business jet activity. These airports typically serve communities located more than 30 minutes from the nearest Commercial Service or Reliever airport.



Source: Texas Airport System Plan

National Role – NPIAS: As defined in the FAA's *National Plan of Integrated Airport Systems (NPIAS) 2015-2019*, the Airport is classified as "National Regional." National Regional airports are located in metropolitan areas near major business centers and support regional economies with interstate and some long-distance flying and have high levels of activity, including jets and multi-engine turbo-prop aircraft. Inclusion in the NPIAS is a requirement for receiving federal funding through the Airport Improvement Program (AIP). When an airport accepts funds from the AIP, it must agree to certain obligations (or assurances). These obligations require the Airport to maintain and operate the facilities safely and efficiently in accordance with specified conditions.

Current Aviation Activity

According to the FAA Air Traffic Activity System (ATADS) database for 2017, the airport featured approximately 53,407 total operations, including takeoffs and landings, which is slightly more than that reflected on the 5010-1, *Airport Master Record*, which shows a tally of 52,541 operations for 2017. This discrepancy is not uncommon, particularly at those airports that provide air traffic control separation assistance. The broad categorization of aviation activity at BAZ is shown in **Table 1.2**, as provided by the

FAA Form 5010 Master Record (**Exhibit 1.3**). Additional detail, history and descriptions of activity are provided in Chapter 2 – Forecast of Aviation Demand.

Exhibit 1.3
FAA Form 5010-1, *Airport Master Record*

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL AVIATION ADMINISTRATION

AIRPORT MASTER RECORD

PRINT DATE: 4/20/2018
AFD EFF 03/29/2018
FORM APPROVED OMB 2120-0015

> 1 ASSOC CITY: NEW BRAUNFELS | 4 STATE: TX | LOC ID: BAZ | FAA SITE NR: 24407.*A
> 2 AIRPORT NAME: NEW BRAUNFELS RGNL | 5 COUNTY: GUADALUPE TX
3 CBD TO AIRPORT (NM): 04 E | 6 REGION/ADO: ASW/TEX | 7 SECT AERO CHT: SAN ANTONIO

GENERAL

10 OWNERSHIP: PUBLIC
> 11 OWNER: CITY OF NEW BRAUNFELS
> 12 ADDRESS: 550 LANDA ST.
NEW BRAUNFELS, TX 78130
> 13 PHONE NR: (830) 221-4000
> 14 MANAGER: ROBERT LEE
> 15 ADDRESS: 2333 FM 758
NEW BRAUNFELS, TX 78130
> 16 PHONE NR: 830-221-4290
> 17 ATTENDANCE SCHEDULE:
ALL ALL 0700-1900

18 AIRPORT USE: PUBLIC
19 ARPT LAT: 29-42-20.7000N ESTIMATED
20 ARPT LONG: 098-02-35.6000W
21 ARPT ELEV: 658.4 SURVEYED
22 ACREAGE: 1,200
> 23 RIGHT TRAFFIC: NO
> 24 NON-COMM LANDING: NO
25 NPIAS/FED AGREEMENTS: NGPY
> 26 FAR 139 INDEX:

SERVICES

> 70 FUEL: 100LL A
> 71 AIRFRAME RPRS: MAJOR
> 72 PWR PLANT RPRS: MAJOR
> 73 BOTTLE OXYGEN:
> 74 BULK OXYGEN: NONE
75 TSNT STORAGE: HGR, TIE
76 OTHER SERVICES:
CHTR, INSTR, RNTL

FACILITIES

> 80 ARPT BCN: CG
> 81 ARPT LGT SKED : SEE RMK
BCN LGT SKED: SS-SR
> 82 UNICOM: 122.700
> 83 WIND INDICATOR: YES
84 SEGMENTED CIRCLE: YES
85 CONTROL TWR: YES
86 FSS: SAN ANGELO
87 FSS ON ARPT: NO
88 FSS PHONE NR:
89 TOLL FREE NR: 1-800-WX-BRIEF

BASED AIRCRAFT

90 SINGLE ENG:	123
91 MULTI ENG:	11
92 JET:	9
TOTAL:	143
93 HELICOPTERS:	3
94 GLIDERS:	0
95 MILITARY:	0
96 ULTRA-LIGHT:	0

OPERATIONS

100 AIR CARRIER:	0
102 AIR TAXI:	838
103 G A LOCAL:	22,606
104 G A ITNRNT:	20,330
105 MILITARY:	8,767
TOTAL:	52,541
OPERATIONS FOR 12 MONTHS ENDING:	01/05/2017

RUNWAY DATA

	13/31	17/35		
> 30 RUNWAY INDENT:	13/31	17/35		
> 31 LENGTH:	6,503	5,364		
> 32 WIDTH:	100	100		
> 33 SURF TYPE-COND:	ASPH-G	ASPH-F		
> 34 SURF TREATMENT:				
35 GROSS WT: S	30.0	25.0		
36 (IN THSDS) D				
37 2D				
38 2D/2D2				
> 39 PCN:				
LIGHTING/APCH AIDS				
> 40 EDGE INTENSITY:	MED	MED		
> 42 RWY MARK TYPE-COND:	NPI - G / NPI - G	NPI - F / NPI - F	- / -	- / -
> 43 VGSI:	P4L / P4L	/	/	/
44 THR COSSING HGT.:	50 / 50	/	/	/
45 VISUAL GLIDE ANGLE:	3.00 / 3.00	/	/	/
> 46 CNTRLN-TDZ:	- / -	- / -	- / -	- / -
> 47 RVR-RVV:	- / -	- / -	- / -	- / -
> 48 REIL:	Y /	/	/	/
> 49 APCH LIGHTS:	MALS /	/	/	/
OBSTRUCTION DATA				
50 FAR 77 CATEGORY	D / D	C / C	/	/
> 51 DISPLACED THR:	/	522 /	/	/
> 52 CTLG OBSTN:	/ TREE	/	/	/
> 53 OBSTN MARKED/LGTD:	/	/	/	/
> 54 HGT ABOVE RWY END:	/ 22	/	/	/
> 55 DIST FROM RWY END:	/ 975	/	/	/
> 56 CNTRLN OFFSET:	/ 235L	/	/	/
57 OBSTN CLNC SLOPE:	50:1 / 35:1	50:1 / 50:1	/	/
58 CLOSE-IN OBSTN:	N / N	N / N	/	/
DECLARED DISTANCES				
> 60 TAKE OFF RUN AVBL (TORA):	/	/	/	/
> 61 TAKE OFF DIST AVBL (TODA):	/	/	/	/
> 62 ACLT STOP DIST AVBL (ASDA):	/	/	/	/
> 63 LNDG DIST AVBL (LDA):	/	/	/	/

(>) ARPT MGR PLEASE ADVISE FSS IN ITEM 86 WHEN CHANGES OCCUR TO ITEMS PRECEDED BY >

> 110 REMARKS

A 014	AIRPORT DIRECTOR.
A 057	RWY 17 APCH RATIO 50:1 TO DSPLCD THLD.
A 070	FOR FUEL CALL 830-221-4290; AFT HRS CALL 830-221-4100. 24 HR SELF SVC AVBL WITH MAJOR CREDIT CARD.
A 081	ACTVT MIRL RYS 13/31 & 17/35 - CTAF.
A 110-001	REMOTE RADIO FREQ 134.75 FROM RAMP TO SAN ANTONIO APCH CTL.
A 110-003	NUMEROUS BIRDS INVOF ARPT.
A 110-004	HIGH PERFORMANCE MILITARY ACFT OPERATING AT RANDOLPH AFB AUX (SEGUIN) AIRFIELD.
A 110-005	FOR CD WHEN ATCT IS CLSD CTC SAT APCH AT 210-805-5516.

111 INSPECTOR: (S) | 112 LAST INSP: 01/05/2017 | 113 LAST INFO REQ:

FAA FORM 5010-1 (3/96) SUPERSEDES PREVIOUS EDITION

Table 1.2 Airport Operational Statistics	
Based Aircraft	
Single-engine	123
Multi-engine	11
Jet	9
Total Fixed Wing	143
Helicopters	3
Gliders	0
Total Based Aircraft	146
Aircraft Operations	
Average Ops. per day	146
% Local Operations	53%
% Itinerant Operations	47%

Source: FAA Form 5010-1. *Airport Master Record*

Current Aviation Services

Airports can provide a wide range of services to meet the varied demands of its individual market area. Table 1.3 below provides a general listing of New Braunfels Regional Airport's current range of services.

Table 1.3 Existing Aviation Services
Aviation Fuel (100LL and Jet-A)
Aircraft Parking – Based (Hangar and Tie-down)
Aircraft Parking – Transient (Hangar and Tie-down)
Air Taxi / Charter Services
Airframe / Avionics Service
Power-plant Service
General Aviation Terminal
Aircraft Sales

Source: Airport Personnel

1.2 Airside Facilities

Presently, New Braunfels Regional Airport supports General Aviation activity with two paved runways. The primary runway (Runway 13-31) is oriented in a northwest / southeast direction and is supported by a system of parallel and connecting taxiways. The secondary runway (Runway 17-35), oriented in a north / south direction features three connector taxiways which provide access to each runway end and the mid-field point. Runways are given an identifier that is determined based on its magnetic compass orientation. Each runway end is named accordingly. For example, Runway 17 has a magnetic heading of 170 degrees, and Runway 35 has a magnetic heading of 350 degrees. Runway headings are important so pilots can identify which runway aligns with the prevailing winds.

The airfield is also supported by visual and electronic approach aids. **Exhibit 1.4** graphically illustrates the current existing airport facilities, airside and landside, and **Table 1.4** shows the associated characteristics of each runway and other airside equipment.

Table 1.4
Runway 13/31 and Runway 17/35 Summary Data

	Runway 13 / 31	Runway 17 / 35
Runway Dimensions	6,503' x 100'	5,364' x 100'
Displaced Threshold	None	522' (Runway 17)
Runway Surface (Condition)	Asphalt (Good)	Asphalt (Fair)
Pavement Strength	30,000 (SW)	25,000 (SW)
True Runway Bearing	135.731° / 315.739°	180.71° / 0.71°
Pavement Markings (Condition)	NPI (Good) / NPI (Good)	NPI (Fair) / NPI (Fair)
Part 77 Approach Slope Surfaces	34:1 / 34:1	34:1 / 34:1
Runway Lighting	Medium Intensity (MIRL)	Medium Intensity (MIRL)
Instrument Approach Lighting	MALS (R/W 13)	None
Visual Approach Aids	PAPI-4, REIL'S (R/W 13)	None
Standard Traffic Pattern	Left Hand	Left Hand
Other Airfield Items		
Weathering Reporting System	ASOS (On-Field)	
Beacon	Top of on-field ATCT (White / Green)	
Lighted Wind Cone	400' east and 890 ' north of Runway 31 end	
Segmented Circle	250' North of Taxiway F, 1,000' west of Runway 31 end	

Source: FAA 5010-1,

New Braunfels
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LABEL	DESCRIPTION	AREA (Sq. Ft.)
A1	HANGAR	3,600
A2	HANAGAR	10,700
A3	TEXAS AVIATION ACADEMY	15,750
A4	D-TECH AIRCRAFT	11,025
A5	SHADE HANGAR	24,000
A6	T-HANGAR	24,000
A7	HANGAR	6,375
A8	HANGAR	3,600
A9	CRYSTAL AVIONICS	10,500
A10	T-HANGAR	11,250
A11	HANGAR	
A12	HANGAR	3,225
A13	ELECTRICAL VAULT	
A14	HANGAR	2,926
A15	HANGAR	11,550
A16	T-HANGAR	17,080
A17	HANGAR	3,600
A18	HANGAR	3,600
A19	NATIONAL WEATHER SERVICES	6,160
A20	NATIONAL WEATHER SERVICES	
A21	NATIONAL FLIGHT SERVICES	39,600
A22	HANGAR	20,000
A23	HANGAR	
A24	GENERAL AVIATION/FBO TERMINAL	4,800
A25	AIR TRAFFIC CONTROL TOWER	
A26	ALFA AIRCRAFT SERVICES	30,000
A27	HANGAR	
A28	ALAMO COLLEGES	27,000
A29	ALAMO COLLEGES	27,000
A30	TODDCOE AVIATION	12,500
A31	FUEL STORAGE	
A32	HANGAR	
A33	HANGAR	
A34	HANGAR	

New Braunfels Regional Airport (KBAZ)
Existing Facilities

Taxiways and Apron

There are two full-length parallel taxiways serving the maneuvering needs of aircraft at the airport – Taxiway "A" and Taxiway "F". Taxiway "A" is situated 540 feet east of Runway 13-31, offers five connectors that are each 50 feet wide, and provides direct access between the runway and access between the parallel and the east side apron and hangar area. Taxiway "F" provides access to south portion of the airport that supports the general aviation terminal, aircraft parking apron, and ATCT. Also 50 feet in width, this taxiway provides access to the Runway 31 and Runway 35 ends. All taxiways are currently marked with centerline striping and exhibit standard blue Medium Intensity Taxiway Lights (MITL's). Directional signs and aircraft hold-line markings are prevalent at all locations enabling access to the runway.

There are two aircraft parking aprons providing a total of 26 tie-down spaces. The east apron is located along Taxiway "A" providing approximately 664,000 square feet of maneuvering space and the south apron is situated along Taxiway F, providing approximately 141,100 square feet of space.

Visual Aids and Lighting

Both runways are equipped with Medium Intensity Runway Lights (MRIL) which can either be pilot- or ATCT activated and operate from sunset to sunrise. Runway 13 is equipped with a 1,400' long Medium Intensity Approach Light System (MALS) and Runway End Identifier Lights (REIL). As previously mentioned, the existing taxiway system and its connectors accommodate MITL.

Visual approach aids assist aircraft on final approach by providing vertical situational awareness in relation to the runway threshold. Runway 13-31 is equipped with a four-light Precision Approach Path Indicator (PAPI-4L) situated on the left side of each runway end. Runway 17-35 is not currently served by visual approach aids.

An additional aid to navigation is the airport beacon. The beacon is a visual navigation aid displaying white and green flashes to indicate a lighted airport or white flashes only for an unlighted airport. The airport's beacon is located atop the ATCT. Additionally, the airport has a lighted wind cone and segmented circle. The lighted wind cone is located approximately 400' and 890' north of the Runway 31 end and the segmented circle is located approximately 250' north of Taxiway "F" and 1,000' west of the Runway 31 end. While the wind cone is a free rotating truncated cone to indicate wind direction and wind force, the segmented circle aids pilots in locating an airport and provides traffic pattern information for individual or all runways.

Weather Reporting System

BAZ is served by an Automated Surface Observation System (ASOS) on frequency 119.325. An ASOS unit is a suite of automated sensors which measure, collect and disseminate minute-by-minute weather data to help aircrews and flight dispatchers monitor weather conditions and plan flight routes for navigation to or from the airport. The ASOS facility is located approximately 650 feet west of Runway 13-31 and 700 feet north of the Runway 17 end.

1.3 Landside Facilities

A reflected in **Exhibit 1.4**, the existing landside development areas at the airport consist of a general linear layout. The east development area runs parallel and east of Taxiway “A” while the south development area runs parallel and south of Taxiway “F”. These various facilities include a city owned Fixed Base Operator (FBO) facilities, maintenance hangar facilities, and aircraft parking aprons with tie-downs, general aviation aircraft storage hangars, Air Traffic Control Tower, and an airport terminal building

Terminal Building / FBO and Auto Parking

The terminal building complex, which also doubles as the city owned FBO (City Terminal Flight Services) facility, is located within the southern quadrant, south of Taxiway “F”. This single-story structure is approximately 4,800 square feet and consists of space and amenities for local and itinerant users including a pilot’s lounge, waiting area, flight planning facilities, public restrooms, and kitchen / concession area. City staff including the Airport Director and other ancillary services are located within this facility.

The terminal auto parking area includes parking for 36 automobiles and is approximately 20,000 square feet in size.

New Braunfels Airport Terminal Building

Air Traffic Control Tower (ATCT)

The New Braunfels ATCT is located west of the general aviation terminal and south of Taxiway “F”. This facility operates under the Federal Contract Tower Program and is operational between the hours of 7:00 a.m. and 7:00 p.m. The control area for the ATCT includes a 5-mile radius around the airport (not including the extensions for the approach procedures) that extends to an altitude of 3,350’ (i.e., 2,700’ above airport elevation). Actual approach and departure control for the airport is provided by the Houston Air Route Traffic Control Center (ARTCC) and the San Antonio Terminal Radar Approach Control (TRACON). Pilots may also utilize the local remote radio frequency of 134.75 to communicate directly with SAT approach control while on the ramp.

Hangar Facilities

The majority of the Airport's hangar facilities are currently concentrated along Taxiway "A" and consist of a variety of T-hangars, open shade hangars, executive hangars, apron tie-down positions. The remainder of hangar staging is located along Taxiway "F" and consist of the general aviation terminal, ATCT, and larger corporate / executive hangars. **Table 1.5** provides detail of the current landside inventory. According to airport management, the airport has 14 conventional hangars, four T-hangar structures providing 63 individual storage units, and one shade hangar structure providing 33 individual storage spaces. As of date, there are approximately 23 aircraft owners on the active hangar wait list.

Table 1.5
Existing Airport Hangar and Building Facilities

Building Number	Building Type	Approximate Size (sq. ft.)	Condition
A1	Trailer	3,600	Very Poor
A2	Rush Hangar	10,700	Poor
A3	Texas Aviation Academy	15,000	Good
A4	Airlife	11,025	Excellent
A5	Shade Hangar	24,000	Poor
A6	T-Hangar	24,000	Poor
A7	Paint Booth	6,375	Fair / Poor
A8	Blue Skies Manufacturing	3,600	Fair
A9	Crystal Avionics	10,500	Good
A10	T-Hangar	11,250	Poor
A11	Vault	--	--
A12	Quonset Hut	3,225	Abandoned
A13	Electrical Vault	--	--
A14	Café / Restaurant	2,900	Very Poor
A15	Triple-A Hangar	11,000	Excellent
A16	T-hangar (B)	17,000	Good
A17	Hangar	3,600	Excellent
A18	Hangar	3,600	Good / Fair
A19	National Weather Service	6,000	Good
A20	National Weather Service	--	--
A21	T-Hangar (A)	39,600	Poor
A22	National Fight Services	20,000	Good
A23	Hangar	7,500	Excellent
A24	General Aviation Terminal	4,800	Poor
A25	Air Traffic Control Tower	--	Poor
A26	ALFA Aircraft Services	30,000	Fair / Good
A27	Canyon Hangar	12,500	Excellent

Table 1.5 (Continued) Existing Airport Hangar and Building Facilities			
Building Number	Building Type	Approximate Size (sq. ft.)	Condition
A28	Alamo College	27,000	Good
A29	Alamo College	27,000	Good
A30	Toddcoe Aviation	12,500	Good
A31	Fuel Storage	--	--
A32	Hangar	12,500	Good
A33	Hangar	12,500	Good

Source: Google Earth; Airport Personnel; 2011 BAZ Airport Layout Drawing

Aircraft Rescue and Fire Fighting (ARFF)

The airport does not presently have an Airport Rescue and Fire Fighting (ARFF) facility on the field. However, fire protection services for the airport are provided by the City of New Braunfels Fire Department, Station 6, located 3.5 miles from the Airport. The NBFD has discussed plans to construct a new fire station on airport property. The proposed site would be near the approach end of Runway 13 and outside the proposed RPZ. It will serve a dual purpose role for community and airport fire response. The location, size, and other siting requirements for this proposed land use will be considered in the alternatives section for this plan.

Were the airport to house an ARFF on site, mandated FAA and FAR Part 139 requirements would need to be followed to achieve proper levels of minimal equipment. Typically, on airfield ARFF's are associated with air carrier or large aircraft activity; however, any airport can be outfitted with fire protection services, as long as the airport meets the minimal equipment threshold, or Index rating. **Table 1.6** below reflects these Index levels and the components for each and is based upon a certain level of daily operations with the minimal requirement being Index A. 14 CFR 139.315 and 139.317 discuss such requirements in greater detail.

A subsequent section of this master plan will evaluate the full implications of achieving FAR Part 139 certification.

Table 1.6
ARFF Index Ratings

Index	Aircraft length	Vehicles	Extinguishing Agents
A	<90'	1	Either 500 pounds of sodium-based dry chemical, halon 1211, or clean agent; or 450 pounds of potassium-based dry chemical and water with a commensurate quantity of AFFF to total 100 gallons for simultaneous dry chemical and AFFF application.
B	90' to <126'	1	500 pounds of sodium-based dry chemical, halon 1211, or clean agent and 1,500 gallons of water and the commensurate quantity of AFFF for foam production
		2	One vehicle carrying the extinguishing agents as specified for Index A; and one vehicle carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 1,500 gallons.
C	126' to <159'	2	One vehicle carrying the extinguishing agents as specified for Index B; and one vehicle carrying water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by both vehicles is at least 3,000 gallons
		3	One vehicle carrying the extinguishing agents as specified for Index A; and two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by all three vehicles is at least 3,000 gallons
D	159' to <200'	3	One vehicle carrying the extinguishing agents as specified for Index A; and two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by all three vehicles is at least 4,000 gallons
E	200' and longer	3	One vehicle carrying the extinguishing agents as specified for Index A; and two vehicles carrying an amount of water and the commensurate quantity of AFFF so the total quantity of water for foam production carried by all three vehicles is at least 6,000 gallons

Source: 14 CFR 139.315 and 139.317. The longest aircraft with an average of five (5) or more daily departures determines the Index required for the airport.

Fuel Storage Facilities

Currently, the airport's fuel storage area is located on the north end of the east side apron area. The fuel is owned by the Airport and consists of two above ground storage tanks with 24-hour self-serve fueling capabilities. Tanks consist of one 12,000-gallon AVGAS/100LL and one 12,000-gallon Jet-A, and comply with Environmental Protection Agency (EPA) guidelines, including associated spill containment requirements. In addition, mobile fuel dispensing is provided by one 5,000-gallon Jet-A truck and one 1,000-gallon AVGAS/100LL truck. Total fuel sales for the last three years equaled 264,000 gallons for AVGAS/100LL and 1,115,000 for Jet-A, equating to an average annual gallon flow of 88,000 for AVGAS/100LL and 371,666 for Jet-A. **Table 1.7** provides the fuel sales for the past three years.

Table 1.7 Airport Fuel Sales, 2015-2017			
Year	AVGAS (gallons)	Jet-A (gallons)	Total (gallons)
2015	89,000	364,000	453,000
2016	80,000	342,000	422,000
2017	95,000	409,000	504,000
Annual Average	88,000	371,666	459,666

Source: Airport Personnel

1.4 Airspace System / Navigation and Communication Aids

New Braunfels Regional Airport operates within the larger National Airspace System (NAS), which comprises a wide array of services, systems and requirements for airports as well as for the pilots that function within it. The following sections provide an overview of some of the Airport's key considerations with respect to navigating and operating within the NAS.

- Air Traffic Service Areas and Aviation Communications
- National Airspace System
- Navigational Aids
- Part 77 Airspace Surfaces

Air Traffic Service Area and Aviation Communications

FAA Order 7110.65M, Air Traffic Control (ATC), established that the mission of ATC is safety by stating that the "primary purpose of the ATC system is to prevent a collision between aircraft operating in the system and to organize and expedite the flow of traffic." ATC is the means by which aircraft are directed and separated within controlled airspace.

Within the continental United States, there are some 22 geographic areas that are under ATC jurisdiction. Air traffic services within each area are provided by air traffic controllers in Air Route Traffic Control Centers (ARTCCs). The ARTCCs provide air traffic service to aircraft operating on Instrument Flight Rules (IFR) flight plans within controlled airspace, and primarily during the en-route phase of flight. Those aircraft operating under Visual Flight Rules (VFR) that depend primarily on the "see and avoid" principle for separation, may also contact the ARTCC or other ATC services to request traffic advisory services. Traffic advisory service is used to alert pilots of other known aircraft in the vicinity of, or within the flight path of the aircraft. The airspace overlying BAZ is contained within the Houston ARTCC jurisdiction, which has a coverage area of airspace in portions of Alabama, Louisiana, Mississippi, Texas, and the Gulf of Mexico.

Aircraft on instrument flight plans that are approaching or departing an airport are also subject to airspace and ATC. At BAZ, clearance delivery, approach and departure services are provided by the San Antonio Approach and Departure Control. The primary means of controlling aircraft employed by air traffic controllers is computerized radar systems that are supplemented with two-way radio communications. Altitude assignments, speed adjustments, and radar vectors are examples of techniques used by controllers to ensure that aircraft maintain proper separation. The specified lateral and vertical separation criterion for aircraft used by controllers is as follows:

- Lateral Aircraft Separation: three (3) miles (radar environment)
- Lateral Aircraft Separation: five (5) miles (non-radar environment)
- Vertical Aircraft Separation: 1,000 feet below (below 29,000 feet) and 2,000 feet (29,000 feet and above)

National Airspace System (NAS)

To ensure a safe and efficient airspace environment for all aspects of aviation, the FAA has established an airspace structure through the Federal Aviation Regulations (FAR) that regulates and establishes procedures for aircraft that use the NAS. This airspace structure essentially provides two basic categories of airspace: controlled (classified as A, B, C, D and E) and uncontrolled (classified as G).

Further, FAR Part 71 and FAR Part 73 establish these classifications of airspace with the following characteristics.

- Class A airspace is generally the airspace from 18,000 feet mean sea level (MSL) up to Flight Level 600 (or 60,000 feet MSL). Unless otherwise authorized, all operation in Class A airspace is conducted under instrument flight rules (IFR).

- Class B airspace is generally airspace from the surface to 10,000 feet MSL surrounding the nation's busiest airports in terms of airport operations or passenger enplanements. An ATC clearance is required for all aircraft to operate within Class B airspace, and all aircraft that are so cleared receive separation services within the airspace. Clearance into Class B airspace can only be received when the controller specifically call the tail number of the aircraft and grants explicit clearance to enter the airspace. (e.g. "N1234, you are cleared to enter the Class B airspace").
- Class C airspace is generally airspace from the surface up to 4,000 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower, are serviced by radar approach control and have a certain number of IFR operations or passenger enplanements. Each aircraft must establish two-way radio communications with the ATC facility providing air traffic services prior to entering the airspace and, thereafter, maintain those communications while in the airspace.
- Class D airspace is generally airspace from the surface up to 2,500 feet above the airport elevation (charted in MSL) surrounding those airports that have an operational control tower. Unless otherwise authorized, each aircraft must establish two-way radio communications with the ATC facility

providing air traffic services prior to entering the airspace and thereafter maintain those communications while in the airspace.

- If the airspace is not classified as A, B, C, or D, and is controlled airspace, then it is Class E airspace. Class E airspace extends upward from either the surface of designated altitude to the overlying or adjacent controlled airspace. Only aircraft operating under IFR are required to be in contact with ATC when operating within Class E airspace
- Glass G or uncontrolled airspace is the portion of airspace that has not been designated with any of the above classifications. It extends from the surface to the base of the overlying Class E airspace. Although ATC has no authority or responsibility to control air traffic, pilots must still abide by visual flight rules (VFR) minimums in Class G airspace.

New Braunfels Regional Airport lies within Class D airspace which is tailored to individual airports. Generally, Class D airspace consists of the immediate airspace within a horizontal radius of five statute miles from the geographic center of airports with operating control towers. The Class D airspace at New Braunfels Regional Airport ranges from the surface to 2,700 feet above the airport elevation. Class D airspace is in effect whenever the ATCT is operational, which is between 7:00 a.m. to 7:00 p.m. local time at the Airport. In order to operate on the Airport or within Class D airspace, pilots must establish two-way radio communications with air traffic control personnel. **Exhibit 1.5** and **Exhibit 1.6** show airspace classifications and the portion of the sectional chart published by the FAA's National Aeronautical Charting Office for the immediate regional airspace around BAZ.

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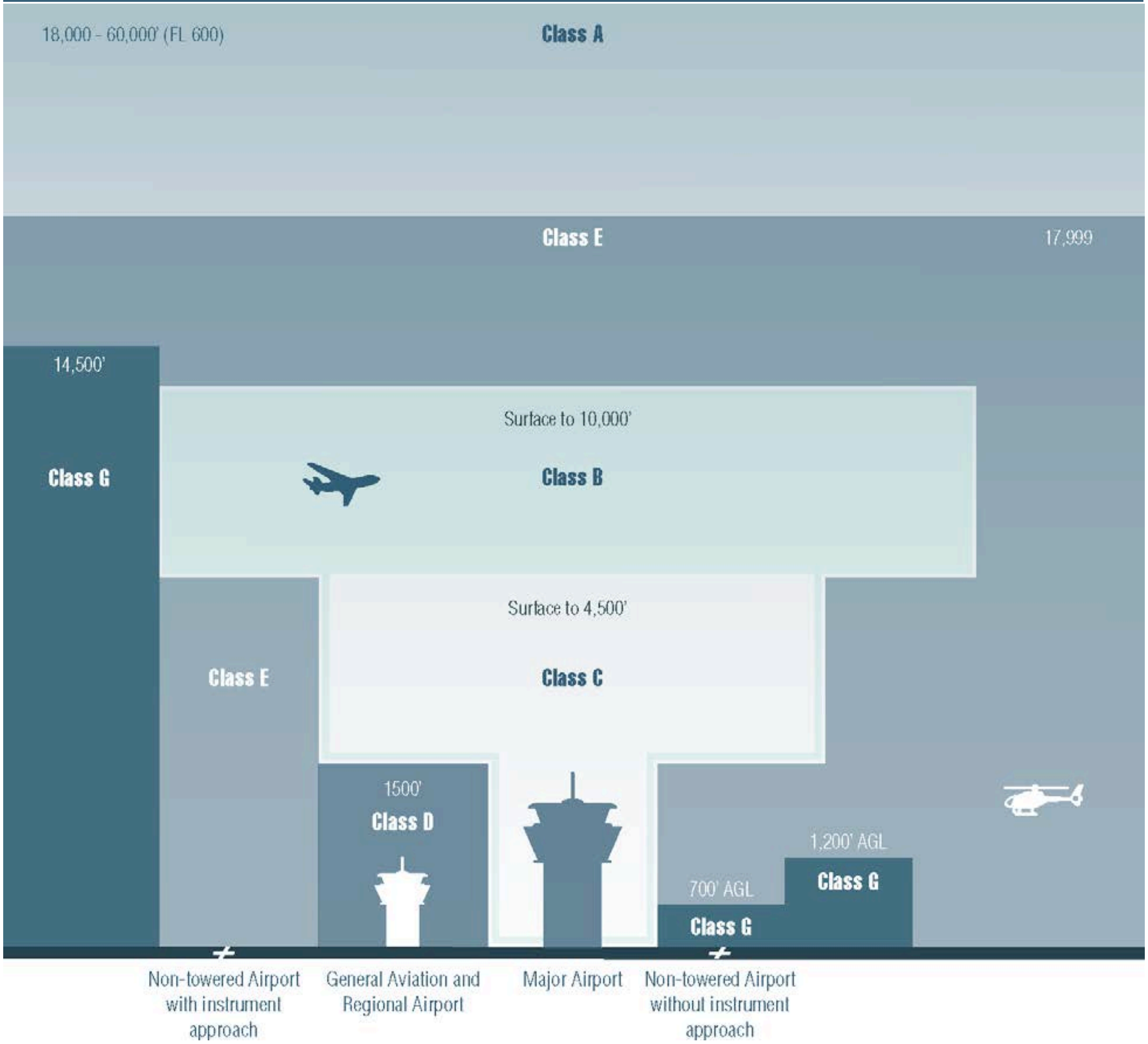
Exhibit 1.5
FAA Airspace Classifications



Source: FAA/KSA

NAVAIDS / Communications

In 2003, the FAA implemented Wide Area Augmentation Systems (WAAS) availability to public airports. Pilots are now benefiting from the large number of Area Navigation (RNAV) Global Positioning System (GPS) approaches and lower minimums provided by WAAS-enabled systems. These systems area greatly more abundant than instrument landing systems (ILS) and other ground based systems from the 20th century. As of June 2015, there are 3,554 Wide Area Augmentation System (WAAS) Localizer Performance with Vertical Guidance (LPV) approach procedures serving 1,732 airports, 989 of these airports are Non-ILS airports. Currently, there are also 594 Localizer Performance (LP) approach procedures in the U.S. serving 429 airports.

A variety of navigational facilities are currently available to pilots around New Braunfels Regional Airport, whether based at the field or at other locations in the region. Many of these navigational aids (NAVAIDs) are available to en-route air traffic as well. The NAVAIDs available for use by pilots in the vicinity of BAZ are VORTAC and VOR facilities.

A VORTAC (VHF Omnidirectional Range/Tactical Air Navigation) is a ground-based electronic navigation aid, transmitting very high frequency signals, 360 degrees in azimuth oriented from magnetic north, with equipment used to measure, in miles, the slant range distance of an aircraft from that navigational aid. A VORTAC provides VOR azimuth, TACAN azimuth, and TACAN distance measuring equipment (DME) at one site. The two VORTAC's associated with New Braunfels Regional Airport are RANDOLPH (RND, 112.30) located 17 miles southwest and SAN ANTONIO (SAT, 116.80) located 22 miles southwest of the field.

A VOR is a Very High Frequency Omnidirectional Range Station transmitting very high frequency signals, 360 degrees in azimuth oriented from magnetic north. The nearest VOR associated with the airport is STINSON (SSN, 108.40) located 34 miles southwest of the field.

There are five published instrument approach procedures that serve New Braunfels Regional Airport: RNAV (GPS) Runway 13, RNAV (GPS) Runway 31, RNAV (GPS) Runway 17, RNAV (GPS) Runway 35, and VOR/DME-A. **Table 1.8** summarizes the approach and visibility minimums of these published instrument approaches.

Table 1.8
Instrument Approach Procedures

	Lowest Straight-In Minimums		Lowest Circling Minimums	
Instrument Approach	Ceiling	Visibility	Ceiling	Visibility
RNAV (GPS) Runway 13	250'	¾-Mile	500'	1-Mile
RNAV (GPS) Runway 31	250'	¾-Mile	400'	1-Mile
RNAV (GPS) Runway 17	570'	1-Mile	570'	1-Mile
RNAV (GPS) Runway 35	279'	1-Mile	490'	1-Mile
VOR/DME	--	--	491'	1-Mile

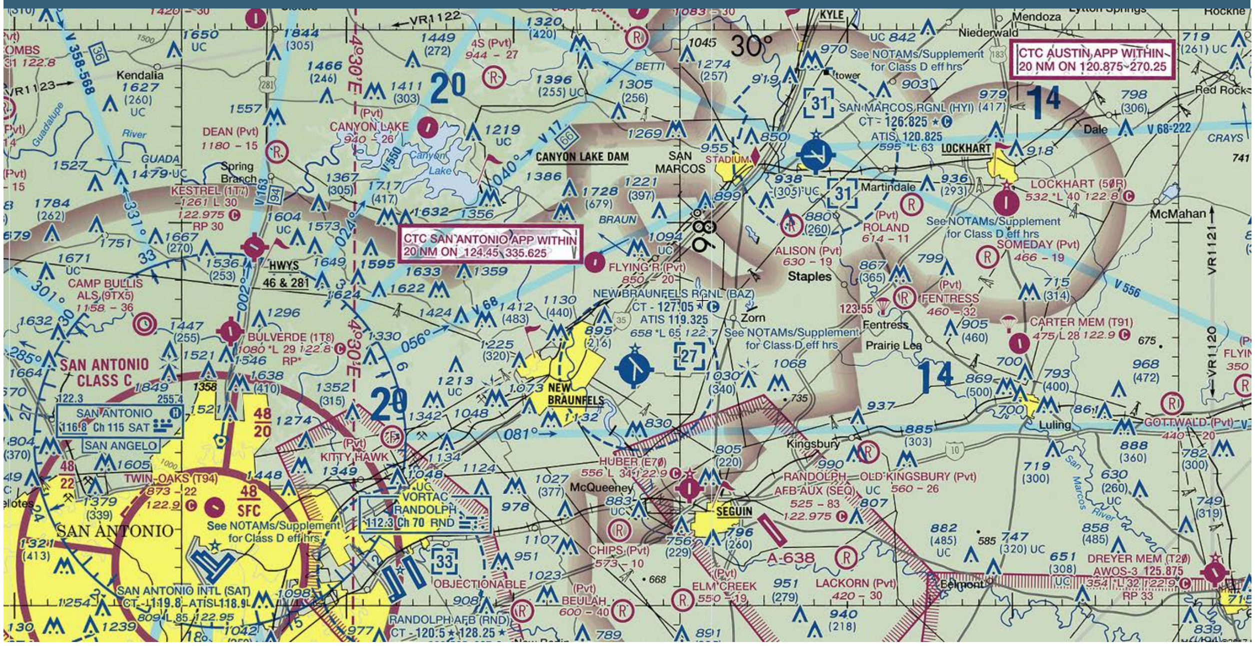
Source: FAA Terminal Procedures, 29 March 2018 – 25 April 2018

Special Use Airspace

ATC designates certain areas of airspace as special-use airspace, which is designed to segregate flight activity related to military and national security needs from other airspace users. There are currently six classifications of special-use airspace – prohibited areas, restricted areas, military operations areas (MOA), alert areas, warning areas, and controlled firing areas. Currently, there are two Alert and two Military Operations Areas (MOA) within range of the airfield. Alert areas are defined as those areas wherein a high volume of pilot training or unusual type of aeronautical activity is conducted while Military Operations Areas are those areas established to separate military traffic for IFR traffic. These areas are utilized for acrobatic type maneuvering which could be hazardous to those aircraft traversing this airspace.

Similar to the various airspace classes, these special use areas have limiting altitudes. Alert area A-635 has a use between 1,500' MSL to 4,000' MSL, Monday – Friday, sunrise to sunset; whereas Alert area A-638 has a use from the surface up to 3,000', Monday – Friday, sunrise to 3 hours after sunset. Neither of these areas has ground to air communications or controlling agency.

Exhibit 1.6
FAA Sectional Chart



Source: FAA, Skyvector.com

The MOA's include Randolph 1A and Randolph 1B. Randolph 1A is operational between the surface and 8'000' MSL, Monday – Friday, sunrise to sunset, while Randolph 1B is operational between the surface and 7,000', Monday – Friday, sunrise to sunset. The controlling communication authority is Houston Center for Randolph 1A and San Antonio TRACON for Randolph 1B.

Part 77 / Imaginary Surfaces

Federal Aviation Administrations (FAR) Part 77, Objects Affecting Navigable Airspace, is a tool used to protect the airspace over and around a given airport and each of its runway approaches from potential obstructions to air navigation. It is important to note that as a federal regulation, all airports included in the NAS are subject to the requirements of Part 77. To determine whether an object is an obstruction to air navigation, Part 77 established several imaginary airspace surfaces in relation to an airport and each runway end. The dimensions and slopes of these surfaces depend on the configuration and approach categories or each airport's runway system. The size of the imaginary surfaces depends largely upon the type of approach to the runway in questions. The principal imaginary surfaces are described in **Exhibit 1.7**.

- **Primary Surface**: Longitudinally centered on the runway at the same elevation as the nearest point on the runway centerline.

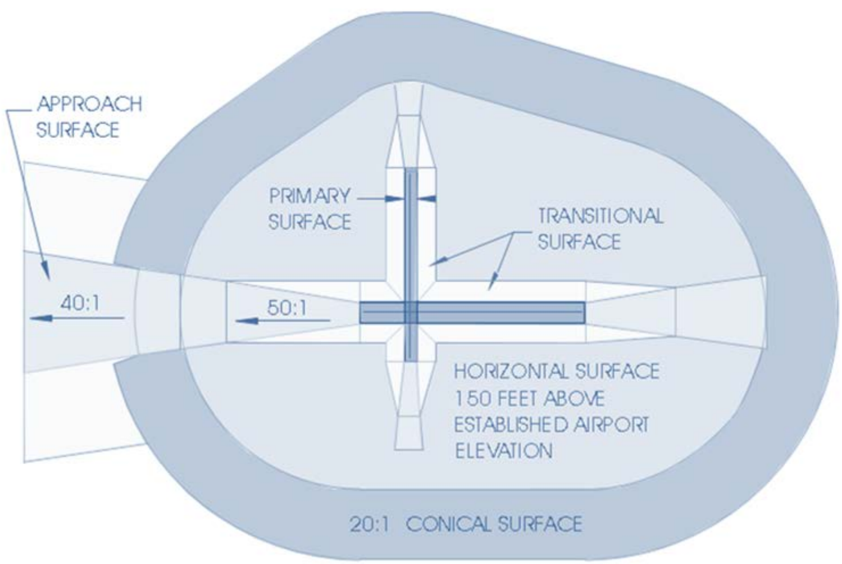
- **Horizontal Surface:** Located 150 feet above the established airport elevation, the perimeter of which is established by swinging arcs of specified radii from the center of each primary surface end and connected via tangent lines.

- **Conical Surface:** Extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet.

- **Approach Surface**: Longitudinally centered on the extended centerline, and extending outward and upward from each runway end at a designated slope (e.g. 20:1, 34:1, 40:1, and 50:1) based on the runway approach.

- **Transitional Surface:** Extends outward and upward at a right angle to the runway centerline at a slope of 7:1 up to the horizontal surface.

Exhibit 1.7
Part 77 / Imaginary Surfaces



Known obstructions to the Part 77 surfaces described above will be illustrated on the ALP set being prepared with this master plan. It is important to note, however, that updated obstruction information for the Airport and its surroundings should be collected through an aerial photogrammetry/survey effort prior to any physical changes to the runway or modifications to approaches serving either runway end.

Local Airports

Table 1.9 lists local airports including information regarding each facility's physical characteristics and facilities, airport role, as well as distance and direction from BAZ. Currently, there are four airports within BAZ's 25 NM service area.

Table 1.9
Local Airports

Airport Name	Airport ID	Runway(s)	Based Aircraft / Total Ops.	NPIAS Role	TASP Role
San Marcos Regional	HTI	8/26 – 6,330' x 100' 13/31 – 5,601' x 100'	130 / 45,000	National / Regional	Reliever
Lockhart Municipal	50R	18/36 – 4,001' x 75'	36 / 16,000	Local / Basic	Community Service
San Antonio International	SAT	4/22 – 8,505' x 150' 13R/31L – 8,501' x 150' 13L/31R – 5,519' x 100'	218 / 164,000	Large / Medium Hub	Commercial Service
Stinson Municipal	SSF	9/27 – 5,000' x 100' 14/32 – 4,128' x 100	81 / 93,000	National / Regional	Reliever

Source: Airnav.com; FAA Sectional Charts

1.5 Airport Environs

This section addresses and examines the regional setting of the airport and land uses which surround it. This task is critical to the future development of the airport given that planning decisions will most likely extend beyond the Airport's physical property boundary, while local land use patterns will ultimately affect the potential for expansion and capital improvements.

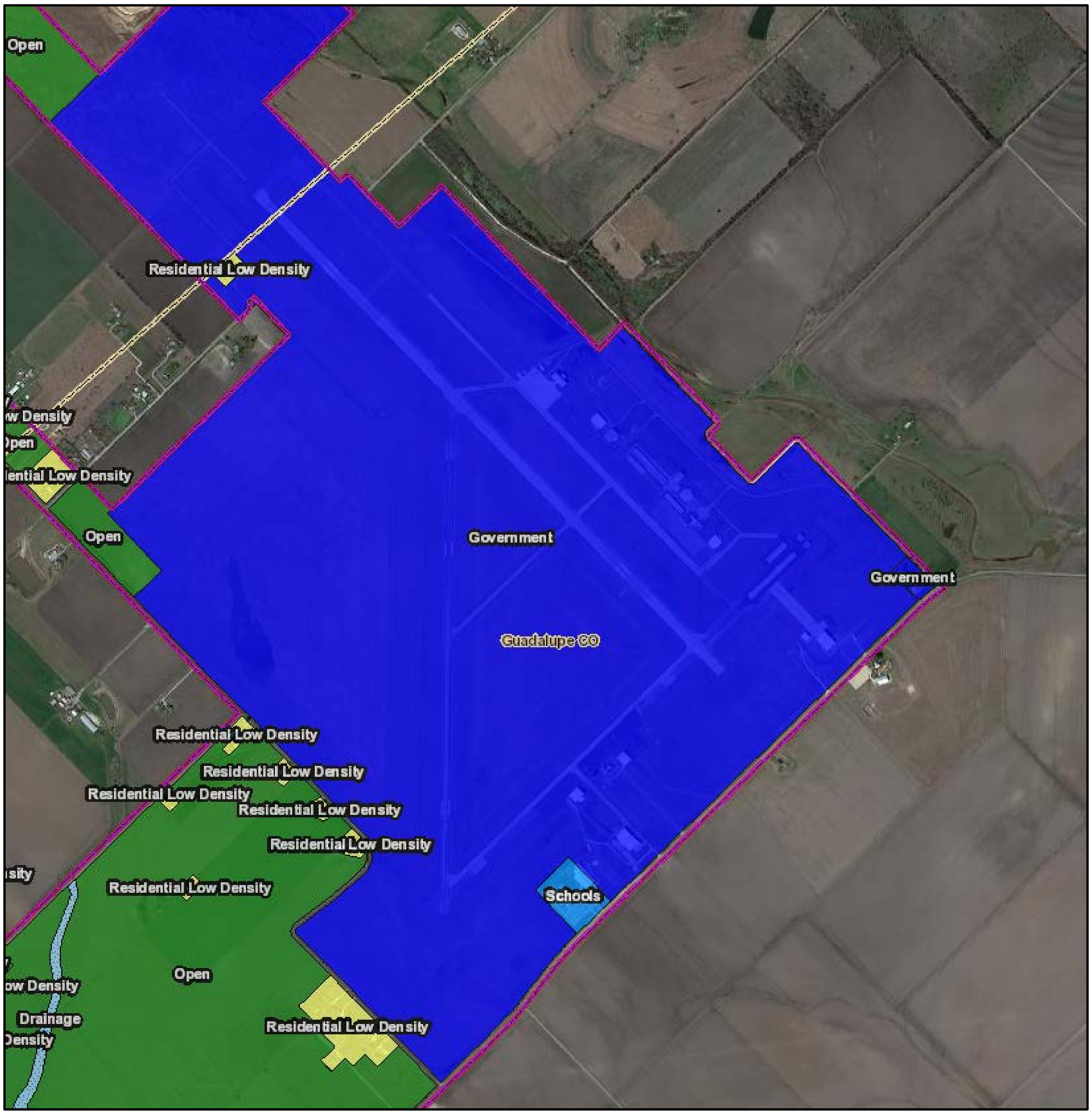
Existing Land Use

While the City of New Braunfels does have police powers and local land use controls in the form of zoning and comprehensive planning, Comal and Guadalupe Counties have a limited role in providing these limitations which is not uncommon for a majority of counties nationwide. It is more difficult to implement restrictions within a county than that of a city due to lack of population density, as well as the overall general use of land, which typically lies within the agricultural category.

City of New Braunfels GIS

The City of New Braunfels maintains a Geographic Information Database (GIS) that provides high-quality data of land use and zoning for information purposes. This general reference database offers access to base maps, aerial imagery, and other pertinent information about the community, including the airport. Currently, the airport is labeled as Government on the New Braunfels Existing Land Use Map with adjacent properties shown as Open and Residential Low Density. **Exhibit 1.8** reflects the existing land use for the airport.

Exhibit 1.8
Existing Land Use

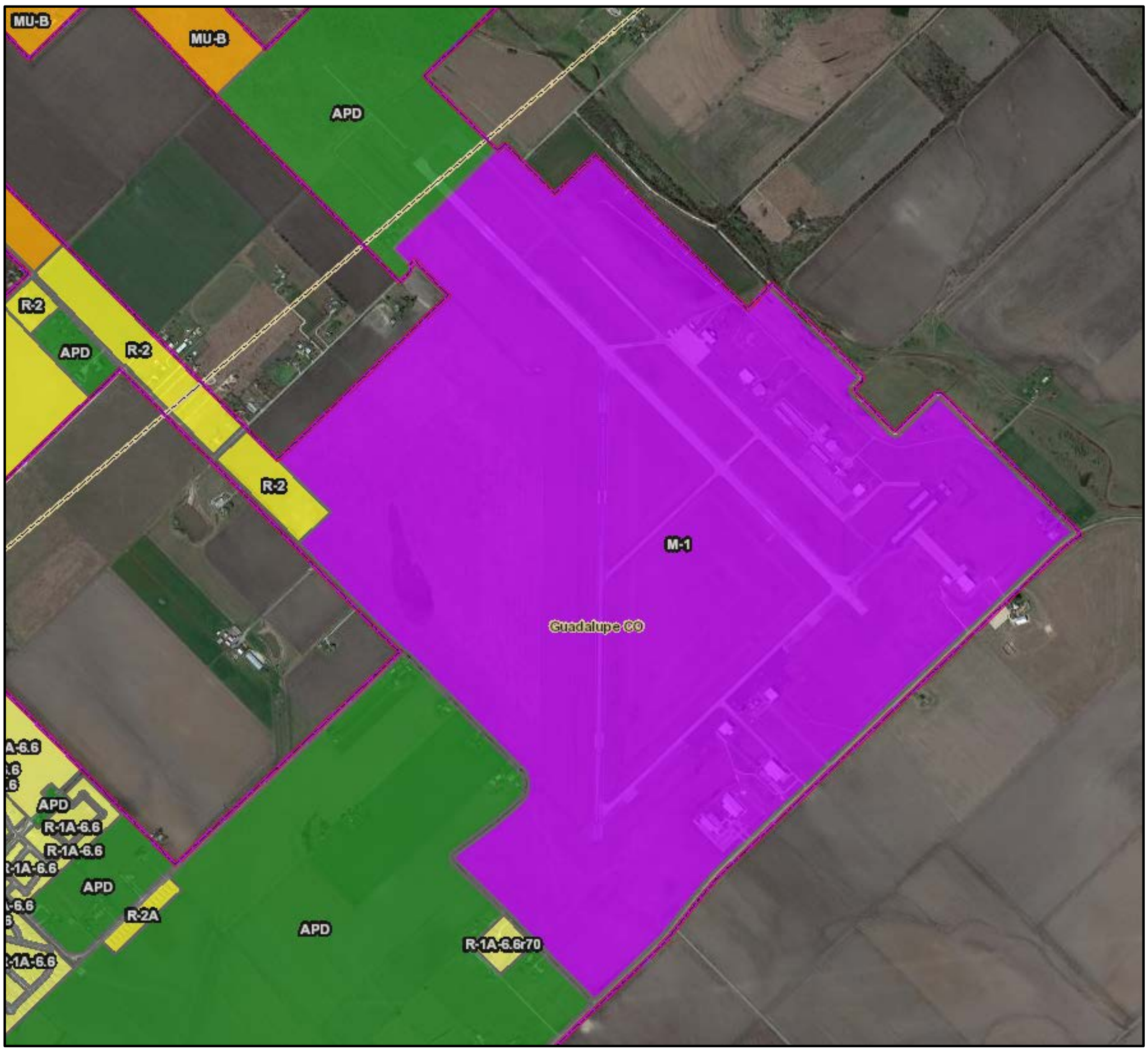


Source: City of New Braunfels GIS Web Application website, Planning Map Viewer.

Existing Zoning

Exhibit 1.9 specifies the existing zoning for the airport, which is classified as Light Industrial. Most of the adjacent property is undeveloped or vacant, other zoning classifications to the north, west, and south sides of the airport include Agricultural / Pre-Development District and Single-Family residential. Further north beyond the Agricultural area, areas of Heavy Mixed-Use Development are prevalent. It is important for the City and Airport to work congruently to ensure the airport is protected from incompatible land uses and encroachment from areas that directly conflict with activities at an airport, such as schools, churches, hospitals, places of public gathering.

Exhibit 1.9
Existing Zoning Map



Source: City of New Braunfels GIS Web Application website, Planning Map Viewer.

Height Hazard Zoning

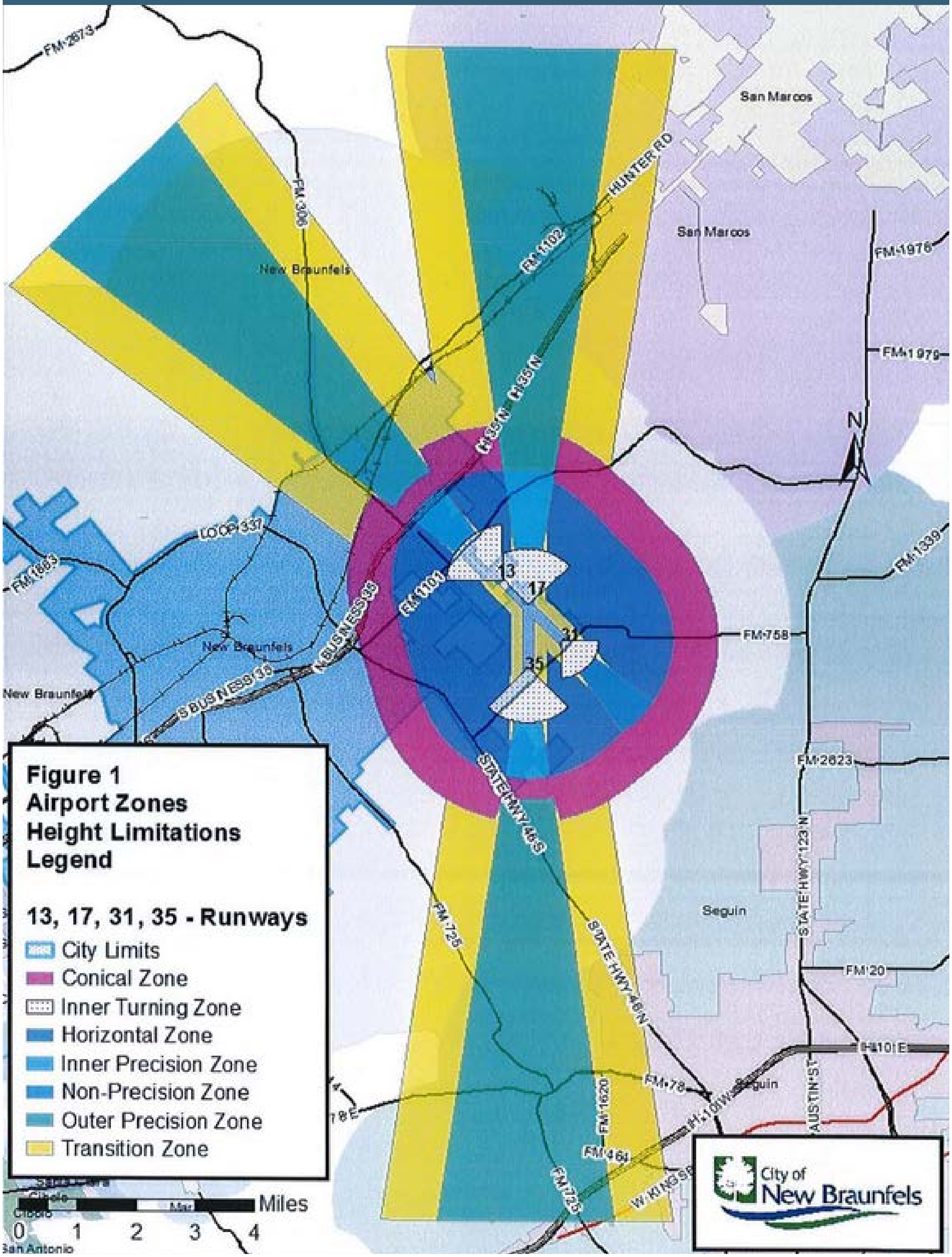
Although the Federal Aviation Administration (FAA) has authority to regulate the flight of aircraft, it has only limited authority to ensure that areas surrounding airports are free of hazards. Without regulatory authority at the Federal level of government, the responsibility for insuring that areas surrounding an airport are free from hazards is left to the local government. In order to assist local municipalities in regulating the height of structures and use of land in the vicinity of an airport, the Texas Legislature created the *Texas Airport Zoning Act* (AZA) which is codified in Chapter 241 of the Texas Local Government Code. The AZA permits political subdivisions, municipalities or countries to adopt, administer, and enforce airport zoning regulations in order to protect the safety of the airport users as well as the public investment in the airport. While the AZA does not identify specific standards that must be used in determining what constitutes incompatible land uses or airport hazards, it is generally accepted that contours based on varying levels of noise generated by an airport and the various imaginary surfaces established in the Federal Aviation Regulations (FAR) Part 77 are the preferred standards to be used in airport zoning.

The need to regulate the construction of tall structures in carious critical areas surrounding the airport seems evident, to protect the safety of the users of the airport as well as persons and property on the ground. The requirement to do so is contained in the Texas Administrative Code (TAC), Title 43, Chapter 30, Subchapter C, *Aviation Facilities Development and Financial Assistance Rules*. These are the rules under which the Aviation Division's airport grant program is operated. Zoning is addressed in several sections including Section 30.120(d) (13) and 30.215. These sections allow the Aviation Division to review and approve airport zoning prior to considering additional projects for grants or loans under the program. The airport sponsor must certify through their attorney that the airport zoning has been accomplished in accordance with applicable laws, ordinances, rules, and/or regulations and the adopted zoning ordinance is binding, enforceable, and, if associated with the requirements of an airport improvement grant from TxDOT, fulfills the requirements of Texas Administrative Code. No sponsor shall be eligible for a subsequent grant or loan under the program uncles the sponsor has adopted and, as called upon to do so, enforced the airport zoning ordinance/order approved by the division.

Additionally, the implementation of Avigation Easements may give the airport further control over future land uses that might be hazardous to flight operations. An aviation easement protects the surrounding airspace, above a specific height, from future obstructions by retaining the rights to a property from a landowner in order to limit the use of the land subject to the easement.

Currently, the City of New Braunfels has an Adopted Hazard Zoning District that helps to protect the airport and its airspace from incompatible land uses and the construction of obstructions such as water or cell phone towers. Section 144.5.20 of the Municipal Code of Ordinances provides the details and language associated with this protection mechanism. **Exhibit 1.10** graphically illustrates the adopted surfaces as they pertain to the Airport. The surfaces typically follow the patterns of Part 77, discussed in an earlier section of this chapter.

Exhibit 1.10
Airport Height Hazard Zoning



City Comprehensive Plan

In 2017, the city undertook a new city-wide planning study called Envision New Braunfels. This comprehensive plan is designed to develop a vision and ‘roadmap’ for New Braunfels’ future through 2030 and will align well with the goals of the airport master plan. Although the airport is only one small piece of the entire city plan, careful consideration must be given to incorporating findings from both planning documents to best complement the goals of the city with the airport. Timing of this plan will align well with the completion of the master plan and recommendations must be communicated throughout the planning process.

As of April 2018, the draft goals for the plan and relevant issues include:

- Position the Airport so that it will be a preferred regional airport
- Reserve land and acquire avigation easements for future airport runway expansion to accommodate larger aircraft/passenger traffic.
- Protect the airport from incompatible land use encroachment.

1.6 Summary

This inventory chapter represents a consolidated resource containing the Airport’s data that will be referenced during the completion of the New Braunfels Airport Master Plan. When necessary, data presented in this chapter will be expanded on for the completion of specific master planning tasks. In addition, as the master plan progresses, new and/or updated data related to facilities and infrastructure examined in this chapter may become available. When appropriate, new data will be incorporated into this chapter and the entire BAZ Master Plan Report.

The inventory data presented in this chapter provides a framework from which analysis in the New Braunfels Master Plan will proceed. Some inventory data, such as the Airport’s history, provides general background knowledge. Other types of inventory data, such as airport role and existing airport facilities are used to help determine future facility requirements. Subsequent chapters, especially the Forecast of Aviation Demand, will also be key components to the development of facility requirements.

Much of the data presented in this chapter is used to conduct numerous analyses as the master planning process works toward identifying a recommended development plan for BAZ. The next step in the planning process is to formulate forecasts for the quality and type of future aviation activity expected to occur at the Airport during the 20-year planning period.

FORECAST OF AVIATION DEMAND

Chapter 2. Forecasts

Forecasts of aviation demand are a key element in all airport planning. Demand forecasts, based upon the desires and needs of the service area, provide a basis for determining the future type, size, and timing of aviation facility development at New Braunfels Regional Airport (BAZ). Consequently, these forecasts influence virtually all phases of the planning process. Major topics addressed in this chapter include:

- Purpose
- Aviation Demand Elements
- Forecast Framework
- General Aviation Demand Forecasts
- Military Operational Activity Forecasts
- Summary of Aviation Demand Forecasts

2.1 Purpose

The aviation demand forecasts will serve four purposes in the development of this Airport Master Plan. Specifically, they provide the basis for:

- Determining the necessary capacity of the airfield, passenger terminal area, general aviation area, and ground access system serving the Airport.
- Determining the Airport's future facility size and type of expansion needed.
- Evaluating potential environmental effects of alternative Airport development layouts.
- Evaluating the financial feasibility of alternative Airport development scenarios.

2.2 Aviation Demand Elements

Forecasts of aviation demand can be developed for a variety of activity indicators. In the case of BAZ, demand elements revolve primarily around existing and future general aviation activity. Military operations forecasts are also presented. Basic activity indicators include the type and number of aircraft operations, along with the number of aircraft based at the Airport. Other important elements are derived from these basic indicators. The Airport does not have scheduled air carrier service. Therefore, 20-year aviation activity forecasts were prepared for the following aviation elements:

- Based Aircraft: Defined as a general aviation aircraft which is stationed at an airport on a permanent basis.
    - Based Aircraft Fleet Mix
- General Aviation Aircraft Operations: This type of operation is either a takeoff or a landing of a general aviation aircraft.
    - Total Annual
    - Local Versus Itinerant
    - Fleet Mix
    - Peak Period (Monthly, Daily, Hourly)
- Annual Instrument Approaches: Defined as an Instrument Flight Rules (IFR) approach to an airport, conducted during instrument meteorological weather conditions.
- Critical Aircraft Determination: Largest aircraft to regularly use the Airport
- General Aviation Enplaned Passengers: Defined as air travelers who have boarded departing general aviation aircraft.
- Military Aircraft Operations: This type of operation is either a takeoff or a landing of a military aircraft.

Table 2.1 presents the historical aircraft operational activity at BAZ. There are currently 146 aircraft based at the airport.

Table 2.1
BAZ Historical Aviation Activity, 2007-2017

	Itinerant Operations					Local Operations			
Year[1]	AC	AT	GA	Mil	Total	Civil	Mil	Total	Total Ops
2007	0	1,000	15,000	0	16,000	10,000	0	10,000	26,000
2008	0	1,000	15,000	0	16,000	10,000	0	10,000	26,000
2009	0	1,000	15,000	0	16,000	10,000	0	10,000	26,000
2010	0	1,000	15,000	0	16,000	10,000	260	10,260	26,260
2011	2	473	16,176	302	16,953	15,460	1,165	16,625	33,578
2012	3	1,017	13,730	228	14,978	13,232	112	13,344	28,322
2013	10	1,114	16,280	329	17,733	20,691	368	21,059	38,792
2014	0	1,019	16,278	1,165	18,462	19,407	1,310	20,717	39,179
2015	9	796	16,743	1,416	18,964	21,655	1,362	23,017	41,981
2016	0	820	16,198	2,759	19,777	19,464	2,677	22,141	41,918
2017	0	993	19,984	3,481	24,458	24,989	2,472	27,461	51,919
CAGR[2]	N/A	13.2%	3.6%	50.3%	6.3%	8.3%	13.4%	8.7%	7.5%

Source: 2017 FAA Terminal Area Forecast

Legend: AC = Air Carrier; AT = Air Taxi; GA = General Aviation

[1]Fiscal Year: October-September

[2]CAGR: Compound Annual Growth Rate (2011-2017)

2.3 Forecast framework

The framework for this forecast was based upon the development of a consensus or likely set of forecasts of demand, accompanied by potential adjustments (up or down) resulting from changes to basic assumptions of the likely forecast. By way of explanation, a twenty-year forecast of aviation demand carries inherent uncertainties. These uncertainties about the future grow as the timeframe extends. For this reason, a number of projections were developed that used different methods of prediction. Some methods were based upon local socioeconomic factors, others were based on national forecasts, while others used historical trends. The benefit of using a variety of projection methods occurs when the results show a forecast consensus. That is, if a number of projections all point in the same direction, even though they were generated using different data and methods, greater confidence is gained in the resulting forecast.

To achieve a forecasting consensus, all projection methods employed traditional means of extrapolating historical aviation trends at the airport or in the Airport service area into future time frames. In this regard, the airport service area for general aviation demand are the eight counties located in the San Antonio-New Braunfels Metropolitan Statistical Area (Atascosa, Bandera, Bexar, Comal, Guadalupe, Kendall, Medina, and Wilson Counties). This does not imply that aircraft from all of those counties will locate at BAZ. Rather, the economic base of the region will be used in generating growth rates for aviation activity at BAZ.

Market Share Projection

Market share projections are developed by calculating historical shares of BAZ activity and projecting these respective shares into future time frames. This method of projection reflects demand based upon trends occurring in the service area and the entire U.S. Market share projections reflect historical trends and may include static (constant) or dynamic (increasing or decreasing) future market shares. It is essentially a "top-down" method of forecasting where other forecasts of activity for larger areas are used as drivers of the local share of that demand.

Socioeconomic Regression Analysis

The socioeconomic regression projection is based upon an assumed causal relationship between population, income, or employment and the aviation activity in a particular area. This projection of demand is obtained by relating socioeconomic data via regression analysis to aviation activity. The resulting set of regression equations produces a projection of aviation activity when they are coupled with independent projections of future socioeconomic data. **Table 2.2** presents a summary of the historical and forecast socioeconomic variables used in developing the general aviation forecasts for BAZ.

Table 2.2 Service Area Socio-economic Growth Projections			
Year[1]	Population	PCPI	Employment
2007	2,011,543	$34,544	1,155,413
2008	2,061,275	$36,472	1,181,460
2009	2,105,672	$34,588	1,174,641
2010	2,153,229	$35,661	1,180,288
2011	2,194,063	$38,215	1,207,284
2012	2,237,381	$39,166	1,236,761
2013	2,281,831	$39,944	1,270,672
2014	2,331,197	$42,196	1,313,225
2015	2,381,703	$44,127	1,355,489
2016	2,429,609	$44,285	1,394,012
2017	2,470,828	$46,358	1,424,540
Forecasts			
2022	2,699,950	$53,675	1,577,039
2027	2,947,192	$60,992	1,736,093
2037	3,477,529	$75,625	2,063,466
CAGR 2017-2037:	1.7%	2.5%	1.9%

[1] Years 2007-2016 Source: Bureau of Economic Analysis, "Table CA1-1 Population" (accessed March 2017). Growth rates from Woods & Poole Economics Inc. population projections were used in the 2022-2037 projections

[2] Years 2007-2016 Source: Bureau of Economic Analysis, "Table CA1-3 Per Capita Personal Income" (accessed March 2017). Consultant projections for years 2017-2037

[3] Years 2007-2016 Source: Bureau of Economic Analysis, "Table CA25N Total Full-Time and Part-Time Employment by NAICS Industry" (accessed March 2017). The growth rates from Woods & Poole Economics Inc. employment projections were used in the 2017-2037 projections.

[4] Consultant Estimate

This Forecast utilized population, income (in the form of Per Capita Personal Income - PCPI), and employment statistics as the independent socioeconomic variables. Historical data was obtained from the U.S. Department of Commerce, Bureau of Economic Analysis. Projections of population and employment were calculated using growth rates from Woods & Poole Complete Economic and Demographic Data Source (CEEDS) 2017. Forecasts of PCPI were created using regression analysis.

The Socioeconomic Regression Analysis was used in forecasting based aircraft at BAZ. The R^2 statistics (coefficient of determination) are used to gauge the significance of the regression. An R^2 of 0 means there is no statistical correlation between the independent and dependent variables. R^2 values near 1 indicate a significant relationship or trend.

Trend Analysis

Trend projections use historical data to formulate predictions of future activity. For this study, two trend analysis methods were used to project baseline aviation activity: double exponential smoothing and least squares linear trending.

The double exponential smoothing process produces projections by combining the forecast for the previous period with an adjustment for past errors. It is desirable to correct for past errors when the error has resulted from changes in the trend. In this case, correcting for past errors will put the forecast back on track. Double exponential smoothing is appropriate when the time series contains a linear trend. It acts by calculating two smoothed series - a single and a double smoothed value. Both will lag behind any trend. However, the difference between them indicates the size of the trend. This difference is used to adjust the forecast for the trend.

The second trend method used was least squares linear trend. This method uses aviation activity regressed against time to produce a projection. No assumptions about the causes of trends are included in the trend analysis projections.

2.4 General Aviation Forecast

General aviation is defined as all civil aviation not classified as commercial or military. Forecasts of aviation demand can be developed for a variety of activity indicators. BAZ's primary demand elements revolve around existing and future general aviation activity. Activity indicators include the type and number of aircraft operations, along with the number of aircraft based at the Airport. Other important elements are derived from these basic indicators. These different elements include:

- Based Aircraft Forecast
    - Based Aircraft Fleet Mix
- Annual Aircraft Operations
    - Total Annual
    - Local Versus Itinerant
    - Fleet Mix
    - Peak Period (Monthly, Daily, Hourly)
- Annual Instrument Approaches
- Critical Aircraft (Largest to use the Airport regularly)
- General Aviation Enplaned Passengers

At New Braunfels Regional Airport, general aviation accounted for 88.5 percent of all aircraft operations while the military conducted 11.5 percent of operations in 2017. Forecasts of general aviation activity are presented in the following sections.

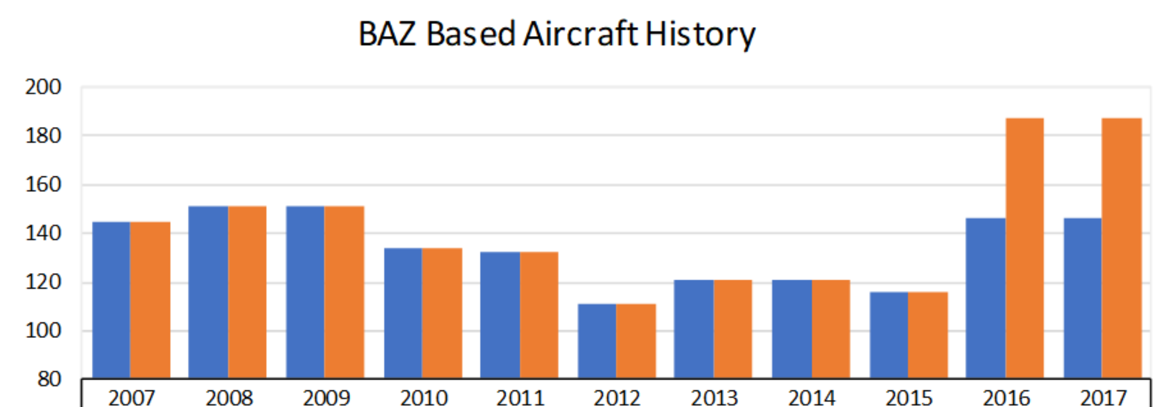
Based Aircraft Forecast

A based aircraft is an aircraft that is operational and air worthy and based at the facility for a majority of the year. To generate the historical data for based aircraft, data from the Terminal Area Forecast (TAF) and discussions with Airport Management concerning a census of existing based aircraft were used.

Exhibit 2.1 presents a graphic illustration of the based aircraft growth trends since 2007. Historical based aircraft data obtained from Airport management has fluctuated in the past decade with negligible overall growth. The TAF, which is not confirmed by Airport Management, shows historical based aircraft growing at 2.6 percent annually.

Exhibit 2.2 shows the trends in based aircraft alongside state and national based aircraft. The number of aircraft based at New Braunfels Regional Airport is dependent, in part, upon the economic health of the region. Because of BAZ's proximity to San Antonio, the service area for general aviation users is the San Antonio-New Braunfels Metropolitan Statistical Area.

Exhibit 2.1
Based Aircraft History



	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Airport	145	151	151	134	132	111	121	121	116	146	146
TAF	145	151	151	134	132	111	121	121	116	187	187

Exhibit 2.2
Historical Based Aircraft Growth Comparisons

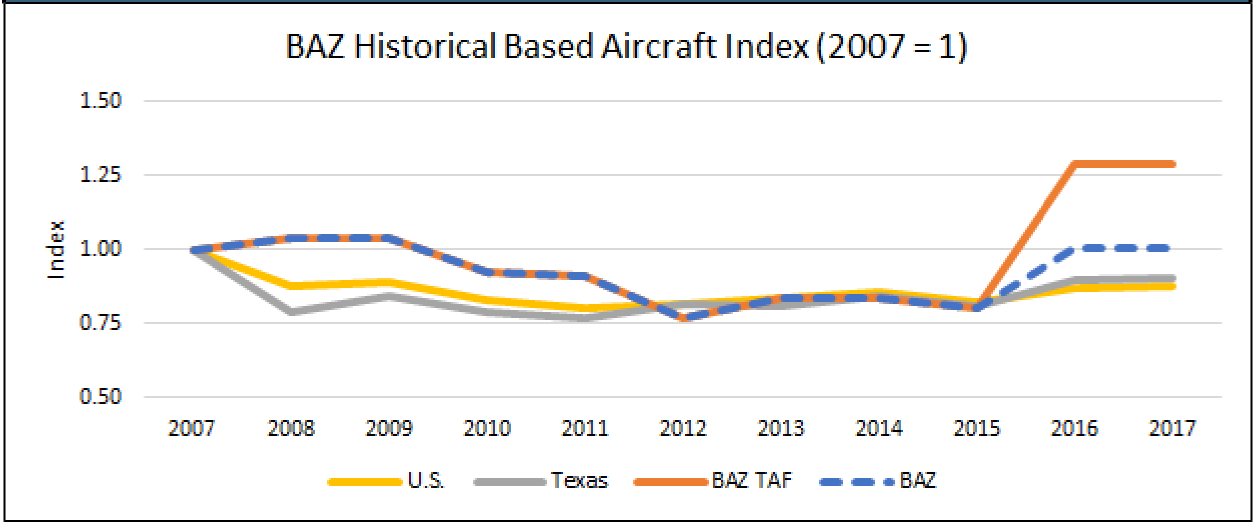
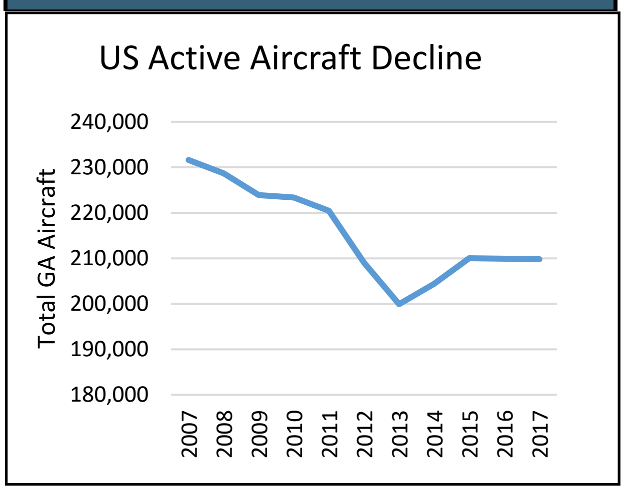


Table 2.3 presents a summary of the eight projections of based aircraft demand for BAZ. Also presented are the regression R^2 values for each projection. The Constant Market Share Projection of demand predicts the number of based aircraft if the service area keeps pace with national growth trends.

With declines in the US Active Fleet (21,806 from 2007-2017), shown in Exhibit 2.3, and growth projections of 0.086 percent per year, the constant market share projection yields the lowest number of based aircraft of all the projections with a total of 149 based aircraft by the year 2037. The Dynamic Market Share Projection used the current Airport market share percentage of based aircraft to registered aircraft in the Service Area. This generated a projection of 164 Based Aircraft by the year 2037.

The Socioeconomic Regression Projections in Table 2-5 included population, employment, and income statistics from the counties in the service area. These projections resulted from the regression analyses between each indicator and based aircraft from 2011 through 2017. All three projections showed positive growth throughout the period.

Exhibit 2.3
Active General Aviation Aircraft



The Trend Analysis Projection, similar to the Socioeconomic Regression Projections, examined the historical trend of based aircraft. The Trend Analysis methodology projected growth using Linear Trend Analysis (least squares) and Double Exponential Smoothing Analysis (Table 2.3).

The various projections of based aircraft at BAZ in **Table 2.3** show there is a wide range between high and low projections. To select a preferred forecast, a systematic process that incorporated statistical methods with intuitive judgment was used. The analytical method first examined the equational statistics for each projection. In this regard, the R^2 statistic was used to judge the strength of the correlation for the socioeconomic regressions and linear trend equation. Regression projections ranged from a low of 206 (Employment) to 222 (Population) in year 2037.

Table 2.3
Forecast of Based Aircraft

Projection/Forecast	2017	2022	2027	2037	R2	CAGR
Market Share						
Constant	146	146	146	149	--	0.1%
Dynamic	146	150	153	164	--	0.6%
Socioeconomic						
Population	146	158	178	222	35%	2.1%
Employment	146	155	172	206	36%	1.7%
Income	146	157	176	213	30%	1.9%
Trend Analysis						
Linear Trend	146	158	177	215	34%	2.0%
Exp Smoothing	146	162	181	219	--	2.0%
Derived Projections						
High/Low Average	146	153	163	185	--	1.2%
Multi-Average	146	155	169	198	--	1.5%
Selected Forecast	146	155	169	198	--	1.5%

Source: Consultant Forecast Estimates

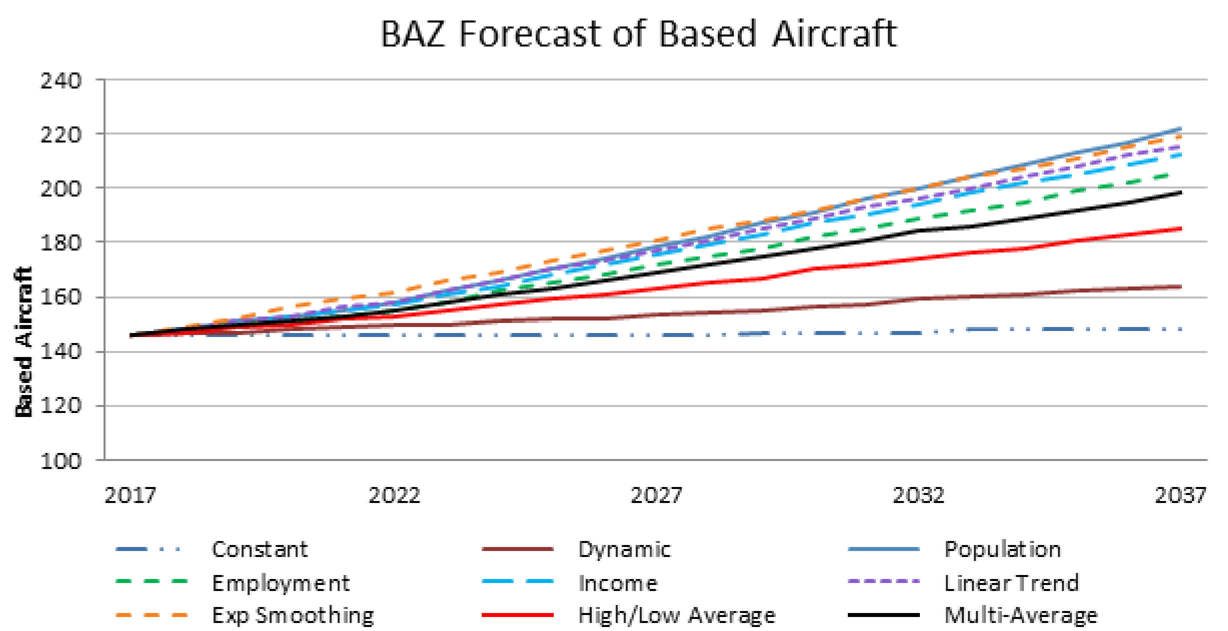
The Exponential Smoothing projection fell between the upper and lower ranges of the Socioeconomic and Linear projections. Even though the R^2 values of the projections using regressions had relatively low correlation statistics, five projections were within 16 aircraft of each other.

The Constant Market Share projection has 15 less based aircraft than the next closest projection and 73 aircraft less than the highest projection. The Constant Market Share could not be discounted because it represents the most current thinking about the growth of entire US fleet. The Dynamic Market Share projection was above the Constant Market Share and below the Socioeconomic and Linear projections.

The Derived Projections are simply derivatives of the other existing projections. For example, the High/Low Average is the average of the highest and lowest projections. The Multiple Average is the average of all projections. As shown, these Derived Projections produce low to mid-range estimates of demand. Both of the derived projections were above the Constant Market Share projection, (meaning that the based aircraft totals at BAZ are anticipated to grow faster than the U.S. trend).

The Selected Forecast considered each of the projections as a possible forecast for based aircraft at the airport. Because of the possibility of BAZ picking up market share from nearby San Antonio, the Multi-Average projection was selected as the preferred based aircraft forecast. As shown, based aircraft are anticipated to grow from 146 in 2017 to 198 by the year 2037- a 35.6 percent overall growth (1.5 percent annually) **Exhibit 2.4** shows the based aircraft projections in graphic form.

Exhibit 2.4
Based Aircraft Projections



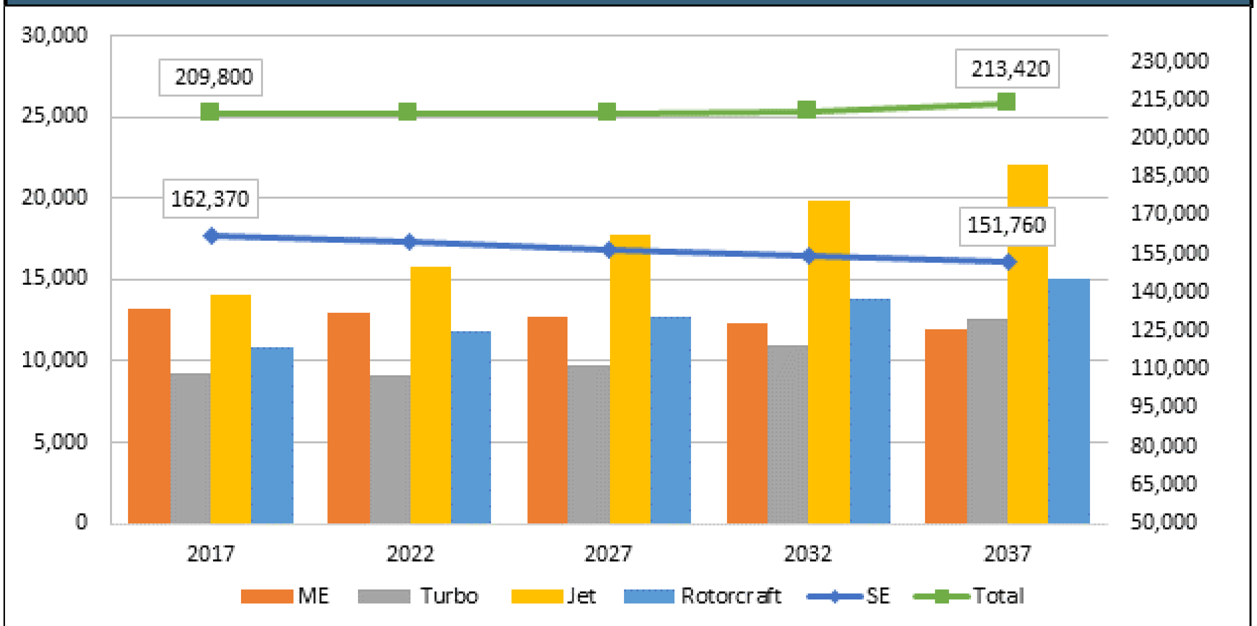
Based Aircraft Fleet Mix

An aircraft fleet mix refers to the characteristics of a population of aircraft. General aviation aircraft are classified with regard to specific physical traits such as aircraft type (whether fixed wing or rotorcraft), their weight, and number and type of engines. Aircraft having dissimilar physical and operating traits require varying types and amounts of airport facilities. For this reason, it is important to estimate the type of aircraft that will be operating and based at BAZ.

In the forecasting process, the based aircraft fleet mix is used as one component to help determine operational fleet mix forecasts. It is also used to help determine the future runway design category. Fleet mix categories included: single engine, multi-engine, turbojet, rotorcraft, and "other." The current fleet mix was taken from the most recent FAA Form 5010 Master Record.

Projection of the fleet mix involved the consideration of the effects of the national trends in aircraft manufacturing, and the service area registered aircraft fleet mix. **Exhibit 2.5** shows the projected national fleet mix for general aviation aircraft. **Table 2.4** shows the forecast in tabular form for the 20-year period.

Exhibit 2.5
U.S. Fleet Mix Active GA and Air Taxi Aircraft Forecast



Source: FAA Aerospace Forecast 2017-2037; Table 28 Active General Aviation

Table 2.4 Forecast of Based Aircraft						
Year	SE	ME	Jet	Rotorcraft	Other	Total
2015	163,034	18,110	13,440	10,506	4,941	210,031
2016	162,555	17,930	13,770	10,700	4,950	209,905
2017	162,058	17,798	14,100	10,890	4,955	209,800
Forecast						
2022	157,254	19,801	15,845	11,800	4,955	209,655
2027	154,314	20,021	17,745	12,760	4,965	209,805
2037	149,891	21,409	22,040	15,065	5,015	213,420
CAGR[1]	-0.39%	0.93%	2.26%	1.64%	0.06%	0.086%

Source: FAA Aerospace Forecast 2017-37

Legend: SE = Single Engine; ME = Multi-Engine

[1] CAGR: Compound Annual Growth Rate (2017-2037)

The decline in single engine aircraft nationally will be reflected in BAZ as a much slower growth than the other categories of aircraft. Although the total number of aircraft will be significant, the based fleet will be moving toward a more sophisticated, larger, business-type aircraft mix. **Table 2.5** presents the forecast of based aircraft fleet mix anticipated for BAZ. As shown, the single engine aircraft projection will grow from the existing 123 to 144 by 2037. The most significant growth is anticipated to occur in the jet aircraft category, with an additional 19 jets in 20 years – growing from 9 to 28 over the period.

Table 2.5 BAZ GA Based Aircraft Fleet Mix						
Year	Single	Multi	Jet	Helicopter	Other	Total
2017	123	11	9	3	0	146
Forecast						
2022	125	14	12	4	0	155
2027	131	16	17	5	0	169
2037	144	20	28	6	0	198
CAGR	0.79%	3.03%	5.84%	3.53%	NA	1.53%

Source: Historical Data from FAA 5010 Airport Master Record, Forecast from Consultant estimates

Annual General Aviation Operations Forecast

An aircraft operation is defined as either a takeoff or a landing. A takeoff and landing are considered two operations. The annual general aviation operations forecast was derived for both local and itinerant operations through the use of an operations-per-based-aircraft (OPBA) ratio. By definition, local operations are performed by aircraft that operate within the local traffic pattern or within sight of an airport. They can also be assigned to aircraft arriving or departing from local practice areas within 20 miles of an airport. In essence, local operations are associated with pilot training. Itinerant operations, on the other hand, are all other aircraft operations other than local operations.

For this study, historical Air Traffic Control Tower (ATCT) operations counts were used to develop OPBA ratios that could then be forecast throughout the planning period. **Table 2.6** presents the historical OPBA ratios for local and itinerant operations at BAZ.

Growth in the overall level of general aviation operations is expected to occur as a natural outgrowth in the number of based aircraft and business and corporate use of the Airport. The results of the general aviation operations forecast show a growth from 45,966 operations in 2017 to 69,300 operations in 2037.

Table 2.6
Forecast of Local and Itinerant General Aviation Operations

Year	Based Aircraft	Local Ops	OPBA	Itinerant Ops	OPBA	Total Ops
2012	111	13,232	119	14,747	133	27,979
2013	121	20,691	171	17,394	144	38,085
2014	121	19,407	160	17,297	143	36,704
2015	116	21,655	187	17,539	151	39,194
2016	146	19,464	133	17,018	117	36,482
2017	146	24,989	171	20,977	144	45,966
Forecast						
2022	155	27,900	180	23,250	150	51,150
2027	169	27,885	165	29,575	175	57,460
2037	198	29,700	150	39,600	200	69,300
CAGR	1.53%	0.87%	-0.66%	3.23%	1.67%	2.07%

Source: Historical Data from Air Traffic Control Tower data. Forecast from Consultant estimates.

General Aviation Operational Fleet Mix

The operational fleet mix forecast presents a breakdown of aircraft operations by aircraft type. **Table 2.7** presents the forecast of operational fleet mix for general aviation aircraft using the BAZ. The operational fleet mix forecast was derived from the based aircraft fleet mix. The process involved multiplying the operations per based aircraft (OPBA) utilization rate times the number of aircraft in each category.

Table 2.7
Forecast of General Aviation Operational Fleet Mix

Year	Single-Engine	Multi-Engine	Jet	Helicopter	Other	Total
2017	38,725	3,463	2,834	945	0	45,966
Forecast						
2022	41,250	4,620	3,960	1,320	0	51,150
2027	44,540	5,440	5,780	1,700	0	57,460
2037	50,400	7,000	9,800	2,100	0	69,300
CAGR	1.3%	3.6%	6.4%	4.1%	NA	2.1%

Source: Based Aircraft Fleet Mix times OBPA

General Aviation Operational Peaking Characteristics

Since a number of the airport's facility needs are related to the levels of activity during peak periods, forecasts were developed for general aviation peak month, peak day, and peak hour operations. For this study, Air Traffic Control Tower operations data was used to find the peaking characteristics of BAZ. This estimate was then extrapolated into future years to provide a comprehensive forecast of general aviation operational peaking characteristics. **Table 2.8** presents the forecast of peak hour and peak month operations at BAZ.

Table 2.8
Forecast of General Aviation Peak Period Operations

Year	Annual GA Operations	GA Peak Month Operations	GA Peak Day Operations	GA Peak Hour Operations
2017	45,966	4,894	370	34
Forecast				
2022	51,150	5,446	415	39
2027	57,460	6,118	466	43
2037	69,300	7,378	562	52
CAGR	2.07%	2.07%	2.11%	2.15%

Source: ATCT data for 2017 Forecast – Consultant estimates

Historically, general aviation peak months have typically been in the spring. In 2017 the peak month was 10.6 percent of annual operations and peak day was 7.6 percent of peak month operations. These peak percentages were held constant throughout the planning period. Estimates of peak hour operations were forecast to be 10 percent higher than average peak hour (of the peak day) operations.

Annual Instrument Approach Forecast

The ATCT keeps detailed records of instrument flight rules (IFR) operations conducted at BAZ. **Table 2.9** presents a summary of IFR operations by year and user type. In 2017, roughly 60 percent of all IFR operations were conducted by corporate aviation.

Table 2.9
BAZ IFR Operations History (2011-2017)

Year	Air Taxi	Corporate/GA	Military	Total IFR Operations
2011	110	2,262	105	2,477
2012	129	2,426	147	2,702
2013	141	2,460	175	2,776
2014	262	3,636	909	4,807
2015	227	3,678	1,147	5,052
2016	157	3,653	2,439	6,249
2017	260	5,068	3,133	8,461

Source: ATCT Data

Table 2.10 summarizes the forecast of annual civilian instrument approaches at BAZ throughout the planning period. The forecast of annual instrument approaches (AIAs) provides further guidance in determining requirements for the type, extent, and timing of future navigational aid (NAVAID) equipment. These Exhibits are strictly for instrument flight rules (IFR) operations conducted during instrument meteorological conditions (IMC), which exist whenever the cloud ceiling is at or below 1,000 feet and/or visibility is lower than 3 miles.

The forecast was developed by using the relationship between total operations, instrument operations, instrument approaches, and IMC percentage of time (assumed at 10.0%). In 2017, total instrument operations were 16.3 percent of total operations. IFR approaches during all weather conditions are one half of total operations (departures make up the other 50 percent). IMC conditions at BAZ exist approximately 10.0 percent of the time. This factor was used to reduce IFR approaches to those actual instrument approaches conducted at the BAZ.

Table 2.10 Forecast of Annual Instrument Approaches				
Year	Total Operations	Instrument Operations	Instrument Approaches	Instrument Approaches in IMC Conditions
2017	51,919	8,461	4,231	423
Forecast				
2022	57,100	9,305	4,653	465
2027	63,410	10,334	5,167	517
2037	75,250	12,263	6,132	613

Source: Consultant Estimates

Critical Aircraft Determination

The existing design standards for the Airport are listed on the Airport's current Airport Layout Plan (ALP) as Airport Reference Code (ARC) C-II. The Airport's Design Aircraft is a medium jet aircraft (C-II). Historical operations by design code are shown in **Table 2.11**.

Table 2.11 Historical Operations by Design Code								
Design Code	2010	2011	2012	2013	2014	2015	2016	2017
A-I	2,324	1,235	1,155	1,549	2,192	2,301	1,662	2,013
A-II	39	82	53	92	130	193	79	128
A-III	--	--	2	1	--	--	--	--
B-I	594	617	639	933	1,017	939	848	931
B-II	745	615	576	590	948	1,213	1,025	1,076
B-III	8	4	--	2	6	1	--	2
C-I	159	231	137	187	139	180	174	105
C-II	168	227	178	171	298	283	313	304
C-III	1	--	--	--	--	--	2	--
D-I	19	30	4	9	--	2	5	16
D-II	6	3	2	--	4	8	3	54
D-III	--	2	2	--	--	2	1	3
Totals								
II	958	927	809	853	1,380	1,697	1,420	1,562
III	9	4	2	3	6	1	2	2
B	1,347	1,236	1,215	1,525	1,971	2,153	1,873	2,009
C & D	353	493	323	367	441	475	498	482

Source: Traffic Flow Management System Counts (TFMSC)

The "Critical Aircraft" at an airport is the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is defined as 500 annual operations, excluding touch-and-go operations. The Critical Aircraft at BAZ is a composite aircraft, made up of various business jets in the C-II category. These include aircraft such as the Cessna Citation X, the Embraer ERJ 135, and the Challenger 600 series of business jets. Because the Challenger 600 performs a majority of the C-II category operations, this aircraft has been reflected as the existing critical aircraft for the airport. Ultimately, it is not anticipated the airport will accommodate significant operational changes, thus, this same aircraft will also be reflected as the ultimate critical aircraft.

Table 2.11a
Historical Operations by Design Aircraft

Design Code	Aircraft	2014	2015	2016	2017
B-II	C550 - Cessna Citation II/Bravo	129	224	281	304
B-II	BE20 - Beech 200 Super King	215	374	129	192
B-II	C560 - Cessna Citation V/Ultra/Encore	120	136	221	183
B-II	C56X - Cessna Excel/XLS	25	48	44	64
B-II	B350 - Beech Super King Air 350	34	37	51	48
B-II	BE9T - Beech F90 King Air	128	136	70	32
C-II	CL60 - Bombardier Challenger 600/601/604	186	161	174	153
C-II	ASTR - IAI Astra 1125	100	107	101	87
C-II	E135 - Embraer ERJ 135/140/Legacy	2	2	--	22
C-II	LJ75 - Learjet 75	--	--	--	12
D-I	LJ35 - Bombardier Learjet 35/36		2	4	16
D-II	GLF4 - Gulfstream IV/G400	4	8	3	54

Source: Traffic Flow Management System Counts (TFMSC)

Bombardier Challenger 604

General Aviation Enplanements

Forecasts of annual general aviation enplaned passengers can be used by Airport Management and FBOs to determine the need for such landside facilities as the general aviation terminal building sizes and the amount of automobile parking areas and access roads. This activity indicator is often ignored due to the lack of historical data.

For this projection, Air Taxi operational data (which is recorded by FAA) was separated from the other itinerant general aviation operations. The standard estimate of aircraft occupancy (2.5 per itinerant departure) was doubled for these large aircraft to 5.0. For the smaller general aviation aircraft operations, the 2.5 number was used, however, it was assumed that only half (50 percent) of small general aviation itinerant departures were true transients, needing terminal services. **Table 2.12** shows the projected number of general aviation enplanements, which include the corporate/air taxi plus smaller general aviation aircraft population.

Table 2.12
Forecast of General Aviation Enplanements

Year	Air Taxi Departures	Enplanements Per Departure	Enplanements	Itinerant GA Departures	Enplanements Per Departure	Enplanements	Total*
2015	398	5	1,990	8,372	1.25	10,464	12,500
2016	410	5	2,050	8,099	1.25	10,124	12,200
2017	497	5	2,483	9,992	1.25	12,490	15,000
Forecast							
2022	550	5	2,750	11,075	1.25	13,844	16,600
2027	700	5	3,500	14,088	1.25	17,609	21,100
2037	937	5	4,685	18,863	1.25	23,579	28,300

Source: FAA historical operational data. Consultant estimates based upon average occupancy times aircraft departures. * Rounded to nearest 100.

2.5 Military Aviation Operations

Military activity shows little or no correlation to community socioeconomic data or other recognized air traffic indicators. The level of military operations is a function of Department of Defense Policy and Congressional funding. Therefore, it is difficult to accurately predict the level of activity for BAZ. Over the past 5 years, military operations at BAZ have fluctuated between a low of 697 in 2013 and a high of 5,953 in 2017. **Table 2.13** presents the existing and forecast military activity at BAZ. To develop a forecast, the most recent historical level of activity was held constant throughout the planning period.

Table 2.13 BAZ Forecast of Military Operations			
Year	Itinerant Military Operations	Local Military Operations	Total Military Operations
2013	329	368	697
2014	1,165	1,310	2,475
2015	1,416	1,362	2,778
2016	2,759	2,677	5,436
2017	3,481	2,472	5,953
Forecast			
2022	3,480	2,470	5,950
2027	3,480	2,470	5,950
2037	3,480	2,470	5,950

Source: Tower historical operational data.

Military Operational Peaking Characteristics

Air Traffic Control Tower operations data was used to find the peaking characteristics of military operations at BAZ. Table 2.14 presents the forecast of peak hour and peak month military operations at BAZ. The five-year historical average of peak month and peak hour operations were held constant throughout the forecast.

Table 2.14 BAZ Forecast of Military Peak Period Operations				
Year	Annual Military Operations	Military Peak Month Operations	Military Peak Day Operations	Military Peak Hour Operations
2013	697	109	38	4
2014	2,475	367	70	7
2015	2,778	347	100	10
2016	5,436	970	200	19
2017	5,953	651	106	10
Forecast				
2022	5,950	489	103	10
2027	5,950	489	103	10
2037	5,950	489	103	10

Source: Tower historical operational data.

2.6 Summary of Forecast Demand

Table 2.15 presents a summary of the aviation demand forecasts for New Braunfels Regional Airport. These forecasts are considered reasonable and achievable and will be used throughout the master plan to help in the development of facility requirements and the identification of alternatives.

Table 2.15
BAZ Aviation Demand Forecast Summary

ITEM	2017	2022	2027	2037	2017-2022	2017-2027	2017-2037
	Base Year	Base Yr. + 5yrs.	Base Yr. + 10yrs.	Base Yr. + 20yrs.	Base yr. to +5	Base yr. to +10	Base yr. to +20
General Aviation Enplaned Passengers							
Air Taxi	2,483	2,750	3,500	4,685	2.1%	3.5%	3.2%
General Aviation	12,490	13,844	17,609	23,579	2.1%	3.5%	3.2%
Total GA Enplanements	15,000	16,600	21,100	28,300	2.1%	3.5%	3.2%
General Aviation – Itinerant Operations							
Air Taxi	993	1,100	1,400	1,874	2.1%	3.5%	3.2%
General Aviation	19,984	22,150	28,175	37,726	2.1%	3.5%	3.2%
Military	3,481	3,480	3,480	3,480	0.0%	0.0%	0.0%
General Aviation – Local Operations							
General Aviation	24,989	27,900	27,885	29,700	2.2%	1.1%	0.9%
Military	2,472	2,470	2,470	2,470	0.0%	0.0%	0.0%
Total Operations	51,919	57,100	63,410	75,250	1.9%	2.0%	1.9%
OPBA	356	368	375	380	0.7%	0.5%	0.3%
Instrument Operations	423	465	517	613	1.9%	2.0%	1.9%
Based Aircraft							
Single-Engine	123	125	131	144	0.3%	0.6%	0.8%
Multi-Engine	11	14	16	20	4.9%	3.8%	3.0%
Jet	9	12	17	28	5.9%	6.6%	5.8%
Rotorcraft	3	4	5	6	5.9%	5.2%	3.5%
Other	0	0	0	0			
Total Based Aircraft	146	155	169	198	1.2%	1.5%	1.5%
General Aviation Peaking Characteristics							
Peak Month Operations	4,894	5,446	6,118	7,378	2.2%	2.3%	2.1%
Peak Day Operations	370	415	466	562	2.3%	2.3%	2.1%
Peak Hour Operations	34	39	43	52	2.8%	2.4%	2.1%

Military Demand							
Military Operations	5,953	5,950	5,950	5,950	0.0%	0.0%	0.0%
Military Peak Hour Operations	10	10	10	10	0.0%	0.0%	0.0%

2.7 Comparison with FAA Terminal Area Forecasts

Comparison of this Airport Master Plan forecast to the FAA's 2017 Terminal Area Forecast (TAF) is presented in **Table 2.16 and Table 2.17**. The graphs of these comparisons are shown below each table. As shown, the FAA's 2017 Terminal Area Forecast has zero growth for based aircraft and an operations growth rate of 0.91 percent annually. In contrast, the master plan forecasts a 1.53 percent yearly increase in based aircraft and 1.87 percent increase in operations over the period. While the based aircraft forecast is only 11 more (5.9%) than the TAF in 2037, the methods used to arrive at those forecasts were vastly different. Similarly, the Master Plan forecast of operations shows a difference of 21 percent greater than the TAF. These differences are considered reasonable, and since the totals are far less than 100,000 operations, no adjustments are required.

Table 2.16
Comparing Airport Planning and TAF Forecast of Based Aircraft

Based Aircraft	Year	Airport Forecast	TAF	(% Difference)	Adjusted TAF	(% Difference)
Base yr.	2017	146	187	-22%	146	0%
Base yr. + 5yrs.	2022	155	187	-17%	146	6%
Base yr. + 10yrs.	2027	169	187	-10%	146	16%
Base yr. + 15yrs.	2032	184	187	-2%	146	26%
Base yr. + 20yrs.	2037	198	187	6%	146	36%
CAGR		1.53%	0.00%		0.00%	

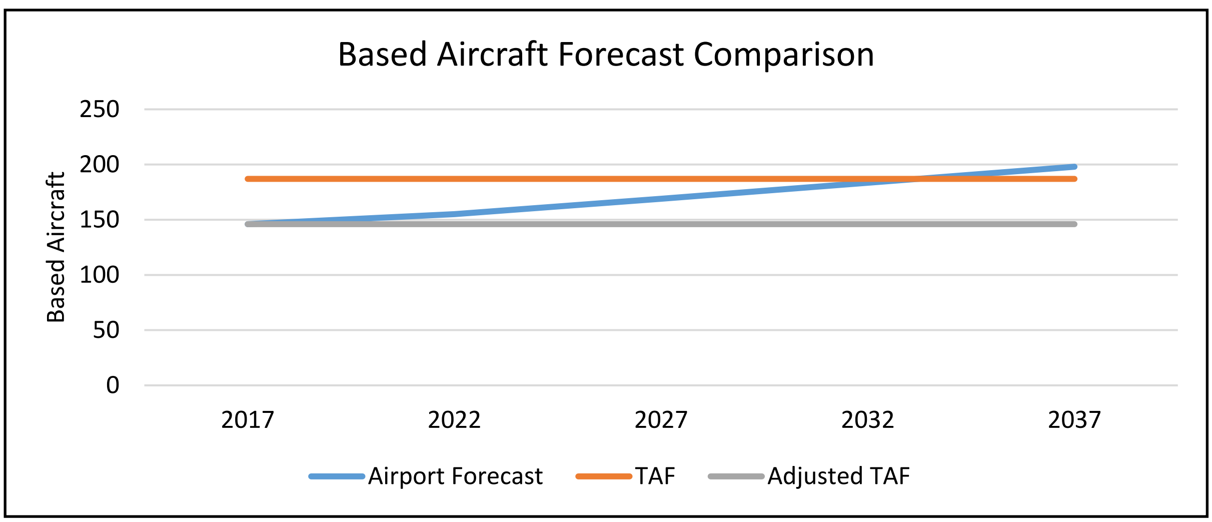
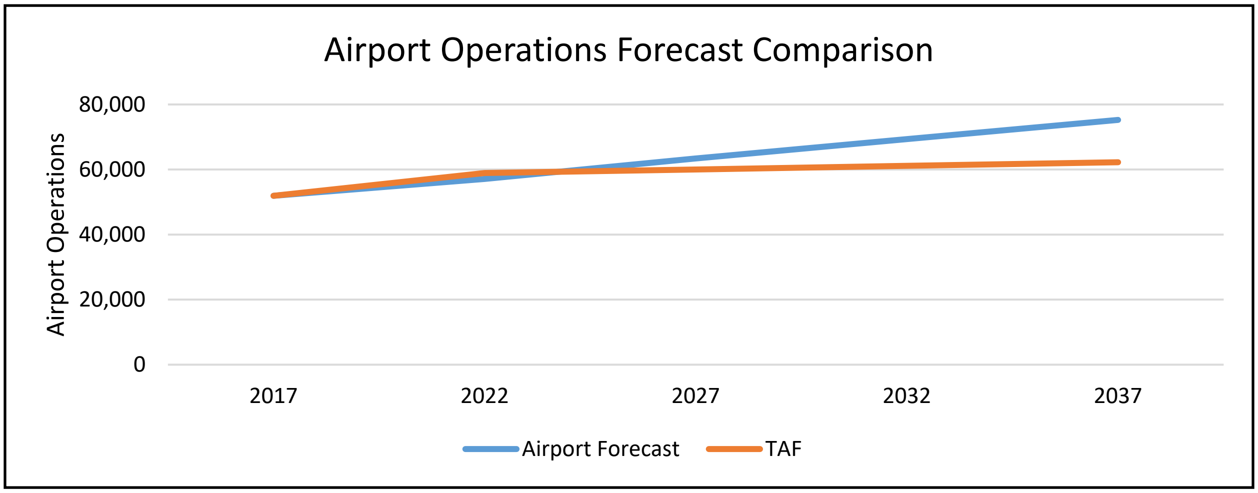


Table 2.17 Comparing Airport Planning and TAF Forecast of Operations				
Operations	Year	Airport Forecast	TAF	(% Difference)
Base yr.	2017	51,919	51,919	0%
Base yr. + 5yrs.	2022	57,100	58,937	-3%
Base yr. + 10yrs.	2027	63,410	60,015	6%
Base yr. + 15yrs.	2032	69,330	61,126	13%
Base yr. + 20yrs.	2037	75,250	62,236	21%
CAGR		1.87%	0.91%	



FACILITY REQUIREMENTS

Chapter 3. Facilities Requirements

A key step in the master planning process is developing requirements of airport facilities, which will allow for airside and landside evolution over the term of the planning period. By comparing the existing conditions of the airport to forecast aviation activity based upon both existing and future aircraft usage, the requirements for runways, taxiways, aprons, terminal, and other related facilities to accommodate growth over the short, intermediate, and long-term planning periods can be determined. Demand-capacity analyses aid in the identification of airport deficiencies, surpluses, and opportunities for future development.

This chapter of the master plan will analyze the ability of the current facilities at New Braunfels Regional Airport (BAZ) to meet the forecast planning activity shown in Chapter 2, Forecast of Aviation Demand. Using Federal Aviation Administration (FAA) methodologies and typical sizing factors, the aviation projections are converted into facility requirements over the 20 year planning period.

An essential step in the process of estimating airport needs is the determination of an airport's current capacity to accommodate anticipated demand. Demand-capacity analyses yield information that is ultimately used to design the airport layout plan and stage facility development. This chapter will examine the ability of BAZ to accommodate anticipated aviation demand and outline specific facility requirements necessary to address any deficiencies in the existing airport system. Specifically, this analysis will extend into the following areas.

- Airfield Capacity, Runway Orientation, Design Standards including Runway and Taxiway System
- Approach and Navigational Aids
- Airfield Lighting, Signage and Pavement Markings
- Aircraft Parking Aprons
- Aircraft Storage Hangars
- Aircraft Fuel Storage
- Airport Terminal Building
- Public Automobile Parking
- Ground Access
- Airport Security and Fencing

3.1 Airfield Demand and Capacity

The major components of the airfield system to be considered when determining capacity include runway orientation and configuration, runway length, and runway exit locations. Additionally, the capacity of a given system is affected by operational characteristics such as fleet mix, climatology, and air traffic control (ATC) procedures. Each of these components has been examined as part of the airside capacity analysis. Runway orientation and the degree to which it meets wind coverage requirements influence how the runway system is utilized. Design standards established by the FAA set geometric clearance guidelines for airfield components. Upon completion of analysis of these elements, a review of existing facilities is performed and any additional requirements necessary to meet the forecasted demand are identified in this chapter.

FAA guidance for airfield capacity is contained in AC 150/5060-5, *Airport Capacity and Delay*. According to the FAA, airfield capacity is generally defined as the number of aircraft operations that can be safely accommodated on both the runway and taxiway system at a given point in time before an unacceptable level of delay is experienced. The method of analysis for determining airside capacity is Annual Service Level (ASV). The ASV identifies the maximum number of annual operations that can be accommodated at the airport without excessive delay. In order to determine ASV, the following determinates specific to BAZ need to be identified.

- Predominant Meteorological Conditions
- Runway Use Configuration
- Aircraft Mix (based on existing aircraft group demand)
- Percentage of Arrival Operations
- Touch and Go Operations

Annual Service Volume

Using the guidance from the FAA AC 150/5060-5, the ASV for the existing runway layout at BAZ is calculated to be approximately 270,000 operations, with a VFR capacity of 150 operations per hour and in IFR capacity of 59 operations per hour. For the base year 2017, the recorded operations at BAZ were calculated at 51,919 with a forecast of 75,250 by 2037. This number accounts for approximately 27 percent of the current ASV. Based on the current level and forecast level of demand at BAZ, no capacity enhancement projects will be needed during the planning period of this Airport Master Plan.

By using this measure, it is easy to compare current and projected annual operations numbers and analyze capacity. Although not always viable for hourly capacity or delay peak periods, this guideline is helpful for long range 20 year planning horizons. Planning guidelines typically assume that when an airport meets 60 percent capacity, planning for capacity enhancements should begin. At 80 percent capacity, construction for those projects should begin. If 100 percent capacity is reached, serious impacts to airport operations may occur resulting in increased delay.

3.2 Airfield Requirements

The design, or critical, aircraft is defined as the largest aircraft family or single aircraft anticipated to utilize an airport on a regular basis. A "regular basis" is defined by the FAA as conducting at least 500 annual itinerant operations, with an operation classified as either a take-off or landing. The selection of the design aircraft allows for the identification of the Airport Reference Code (ARC).

Runway Design Code (RDC)

The RDC is a coding system developed by the FAA to relate airport design criteria to the operational and physical characteristics of the airplane types that will operate at a particular airport. The RDC has three components relating to the airport design aircraft. The first component, depicted by a letter, is the aircraft approach category and relates to aircraft approach speed. The second component, depicted by a Roman numeral, is the airplane design group and relates to airplane wingspan. The third component relates to the designated, or planned, visibility minimums expressed by runway visual range (RVR) values in feet.

Generally, aircraft approach speed applies to runways and runway length related features. Airplane wingspan primarily relates to separation criteria and width-related features. Airports expected to accommodate single-engine airplanes normally fall into Airport Reference Code A-I or B-I. Airports serving larger general aviation and commuter-type planes are usually Airport Reference Code B-II or B-III. Small to medium-sized airports serving air carriers are usually Airport Reference Code C-III, while larger air carrier airports are usually Airport Reference Code D-VI or D-V. As established in the forecast chapter of this study, the RDC at New Braunfels Regional Airport is C-II-4000. Table 3.1 details the FAA Runway Design Code guidelines. Based on existing and ultimate operations at the airport and the existing and ultimate critical aircraft, the current C-II ARC is deemed appropriate for the 20-year planning period.

Table 3.1 Runway Design Code (RDC) Criteria		
Aircraft Approach Category (AAC)		
Approach Category	Approach Speed	
A	< 91 Knots	
B	91 - < 121 Knots	
C	121 - < 141 Knots	
D	141 - < 166 Knots	
E	> 166 Knots	
Airplane Design Group (ADG)		
Design Group	Tail Height (ft)	Wingspan (ft)
I	< 20 feet	< 49 feet
II	20 - < 30 feet	49 < 79 feet
III	30 - < 45 feet	79 - < 118 feet
IV	45 - < 60 feet	118 - < 171 feet
V	60 - < 66 feet	171 - < 214 feet
VI	66 - < 80 feet	214 - < 262 feet
Visibility Minimums		
RVR	Instrument Flight Visibility Category (statute mile)	
Visual	Visual Only	
5000	> 1-mile	
4000	< 1-mile but > ¾-mile	
2400	< ¾-mile but > ½-mile	
1600	< ½-mile but > ¼-mile	
1200	< ¼-mile	

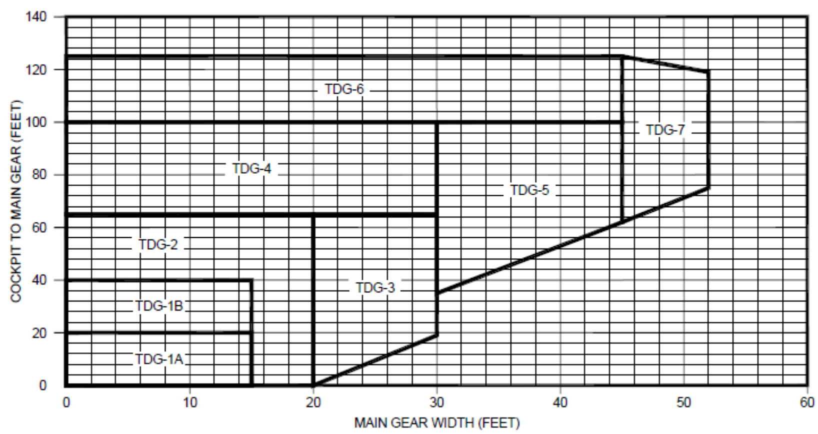
Source: FAA Advisory Circular 150/5300-13A

Taxiway Design Group (TDG)

Similar to runways, taxiways are also required to be designed to certain limitations and offer a set of criteria referred to as Taxiway Design Group (TDG). TDG is based on guidance that establishes requirements based on overall Main Gear Width (MGW) and the Cockpit to Main Gear Distance (CMG) for all aircraft operating at the airport. This criteria helps to establish design guidance for fillets and edge safety margins to help limit pilot error and use a consistent taxi method throughout the airport. FAA Advisory Circular 150/5300-13A, *Airport Design*, Table 3.2, provides the essential requirements for taxiway design and the associated design groups.

Table 3.2 Taxiway Design Group (TDG) Criteria								
Item	Taxiway Design Group							
	1A	1B	2	3	4	5	6	7
Taxiway Width	25’	25’	35’	50’	50’	75’	75’	82’
Taxiway Edge Safety Margin	5’	5’	7.5’	10’	10’	15’	15’	15’
Taxiway Shoulder Width	10’	10’	15’	20’	20’	30’	30’	40’

Source: FAA Advisory Circular 150/5300-13A



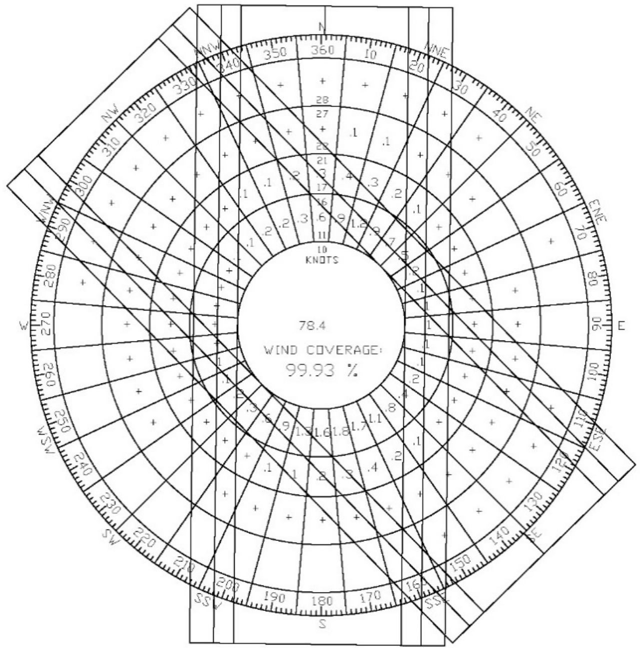
Runway Orientation / Wind Analysis

Surface wind conditions have a direct effect and impact on airport functionality. Runways that are not oriented to take the fullest advantage of prevailing winds will restrict the capacity of the airport to varying degrees. When landing and taking off, aircraft are able to operate on a runway properly and safely as long as the wind velocity perpendicular to the direction of flight (i.e., crosswind) is not excessive. The wind coverage analysis translates the crosswind velocity and direction into a “crosswind component”. Smaller aircraft are more easily affected by crosswinds that larger aircraft, thus, they have a smaller crosswind component.

The determination of the appropriate crosswind component is dependent upon the RDC, as described above, is C-II for both runways. According to AC 150/5300-13A, *Airport Design*, Change 1, the maximum crosswind component used for RDC’s A-I and B-I is 10.5-knots, a 13-knot crosswind component is used for RDC A-II and B-II, and for RDC’s C-I and C-II, a 16-knot maximum crosswind component is used.

Accurate and timely wind velocity and directional data during all weather conditions were obtained from the National Climatic Data Center (NCDC), which compiles the data provided by the on-field Automated Surface Observation System (ASOS). Using this data, an all-weather wind rose was constructed and is presented in the following **Exhibit 3.1**.

Exhibit 3.1
All-Weather Wind Rose



Source: National Climatic Data Center, Station 722416, 136,843 Observations; New Braunfels Regional Airport, Period of Record 2008-2017.

The desirable wind coverage for an airport is 95%, meaning the runway system should be oriented so that the maximum crosswind component is not exceeded more than 5% of the time annually. Based on the all-weather wind analysis for New Braunfels Regional Airport, the existing runway system provides 99.93% wind coverage for the 16-knot crosswind component, 99.90% for the 13-knot crosswind component, and 99.87% for the 10-5 knot crosswind component. The following table, **Table 3.3**, quantifies the wind coverage provided by the individual runways and the combined runway ends during all weather conditions at the Airport.

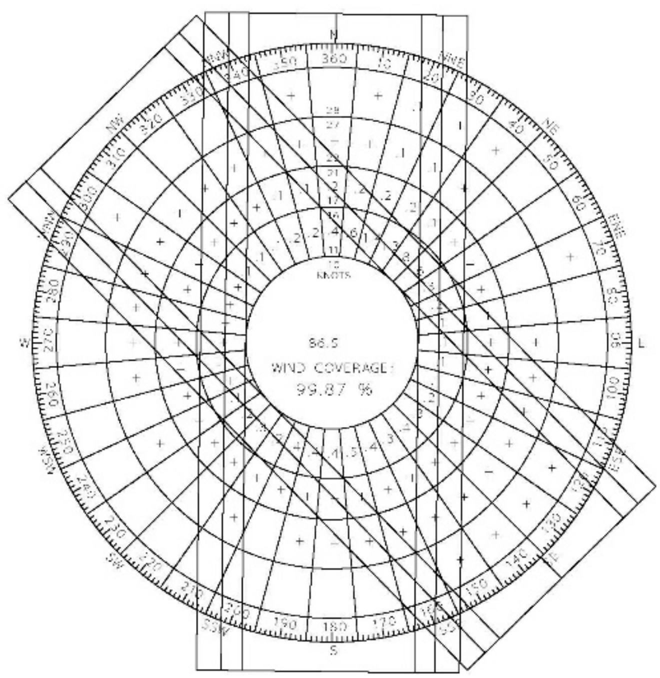
Table 3.3
All-Weather Wind Coverage Summary

Runway	10-5 Knot	13-Knot	16-Knot
Runway 13-31	89.99%	94.74%	98.56%
Runway 13	84.49%	87.87%	90.51%
Runway 31	69.93%	71.85%	74.82%
Runway 17-35	97.32%	98.98%	99.75%
Runway 17	82.93%	83.88%	84.38%
Runway 35	69.29%	70.21%	70.73%
Combined	99.87%	99.90%	99.93%

Source: National Climatic Data Center, Station 722416, 136,843 Observations; New Braunfels Regional Airport, Period of Record 2008-2017.

In an effort to analyze the effectiveness of the existing instrument procedures and the need for placement of improved or additional procedures, an Instrument Flight Rules (IFR) wind rose has been constructed and is presented in the following **Exhibit 3.2**.

Exhibit 3.2
IFR Wind Rose



Source: National Climatic Data Center, Station 722416, 25,744 Observations; New Braunfels Regional Airport, Period of Record 2008-2017.

The following table, **Table 3.4**, presents wind coverage analysis provided during IFR meteorological conditions (i.e., weather conditions having a ceiling less than 1,000 feet, but equal to or greater than 200 feet and / or visibility less than 3-miles, but equal to or greater than ½-mile). The table quantifies the wind coverage provided by the individual runway ends and the combined runway system. From this analysis, it can be concluded that Runway 13 provides the best wind coverage for all crosswind components, which coincides with the location of the existing approach lighting system.

Table 3-4
IFR Wind Coverage Summary

Runway	10-5 Knot	13-Knot	16-Knot
Runway 13-31	91.65%	95.09%	98.52%
Runway 13	87.62%	89.94%	92.28%
Runway 31	78.43%	81.20%	84.22%
Runway 17-35	97.07%	98.70%	99.57%
Runway 17	81.15%	81.95%	82.46%
Runway 35	79.32%	80.41%	81.05%
Combined	99.77%	99.81%	99.87%

Source: National Climatic Data Center, Station 722416, 25,744 Observations; New Braunfels Regional Airport, Period of Record 2008-2017.

Runway Length

As outlined in FAA AC 150/5325-4B, *Runway Length Requirement for Airport Design*, the runway length necessary for an airport is dependent on several factors including; airport elevation, temperature, wind velocity, aircraft operating weight and configurations, runway surface condition (wet or dry), obstructions present in the vicinity of the airport, and departure/arrival procedures.

New Braunfels Regional Airport's primary runway, Runway 13-31, is 6,503 feet in length and the secondary runway, Runway 17-35, is 5,364 feet in length. These runway lengths allow the Airport to serve a wide variety of aircraft in the general aviation fleet, including most corporate jet aircraft. However, larger corporate aircraft such as the Global Express and Gulfstream 450 (currently based at the airport) are restricted or limited in their ability to operate effectively during high temperatures or when longer stage lengths are necessary. Based on the amount of operations conducted by the based G-450 and the potential to attract the Global Express, it is important to determine if the existing runway length is adequate to support these operations without placing significantly burdensome weight restrictions on aircraft operators.

The method for determining the recommended runway length is based on examining the Airport's critical aircraft (ARC C-II) and the characteristics of aircraft included in that design category. In order to determine the ultimate required length of a runway, several issues must be considered, including the characteristics of the critical aircraft type that will use the runway, the typical stage length being flown by the critical aircraft, as well as common atmospheric conditions at the Airport. In general, longer stage lengths require aircraft to carry more fuel thereby increasing the aircraft's weight at takeoff and increasing the runway length required for takeoff. Similarly, warmer air temperatures (and its corresponding impacts on air density) result in increased runway takeoff length requirements for most aircraft.

The following table, **Table 3.5**, presents the recommended FAA design standard lengths for runways using various categories of aircraft at standard useful loads.

Table 3.5 Runway Length Analysis Summary	
Airport and Runway Data	
Airport Elevation (MSL)	658'
Mean daily maximum temperature of hottest month	97°
Maximum difference in runway centerline elevation	14'
Existing Runway Condition Runway 13-31 Runway 17-35	 6,503' 5,364'
Small aircraft ≤ 12,500 pounds with less than 10 seats	
95% of the fleet	3,320'
100% of the fleet	4,000'
Small aircraft with more than 10 seats	4,500'
Aircraft between 12,500 pounds and 60,000 pounds	
75% of Fleet – 60% useful load	5,200'
75% of Fleet – 90% useful load	7,400'
100% of Fleet – 60% useful load	6,350'
100% of Fleet – 90% useful load	9,700'
Large Aircraft > 60,000 pounds	Refer to individual aircraft manufacturer's planning manual

Source: FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design.* Lengths based on 658' MSL, 97 degrees F Mean Max Temperature, 500 NM stage length, and maximum difference in runway centerline elevation of 14'.

FAA Airport Design runway length requirements are based on small airplanes with weights of 12,500 pounds or less, large airplanes between 12,500 and 60,000 pounds, and large airplanes greater than 60,000 pounds. Global Express and Gulfstream 450 aircraft each have maximum weights of greater than 90,000 pounds, with maximum takeoff weights of 96,000 lbs. and 72,000 lbs., respectively.

The results of the runway length analysis conducted for New Braunfels Regional Airport indicate that the current runway length is more than sufficient to accommodate operations by all small airplanes. Runway length requirements for large airplanes between 12,500 and 60,000 pounds are calculated based on the percentage of aircraft in that category that can be accommodate as well as the useful load of those aircraft. As shown in **Table 3.5**, the runway length analysis indicates that a runway length of 5,200 feet is sufficient to accommodate approximately 75% of large airplanes (less than 60,000 pounds) when operating at 60% of their average useful load and 7,400' would be required for 75% of large airplanes at 90% useful load. The Airport's current runway length is adequate to accommodate 100 percent of these large aircraft at 60 percent of their average useful load; however, a runway length of approximately 9,700 feet would be required to accommodate 100 percent of these aircraft at 90 percent of their average useful loads. Unless a specific aircraft is identified that requires a runway approaching this length, 75% of the fleet at 90 percent load should be planned for.

It is important to note that aircraft greater than 60,000 pounds can safely operate at the Airport with the current runway length; however, some aircraft may have to fly at less than 100 percent of their useful load and may not be able to fly the maximum range of their aircraft when temperatures are high. Again, aircraft performance characteristics determine the required runway length necessary.

As the runway length analysis indicates, the existing runway length at New Braunfels Regional Airport is sufficient to accommodate a significant proportion of the active general aviation aircraft fleet. Even the largest general aviation jets can safely operate on the existing runway system. Again, in certain conditions these large aircraft may have to take weight and range penalties. As the number of corporate general aviation jets in national fleet increases, and as the number of operations conducted by these aircraft at the Airport increases, a runway extension resulting in an ultimate runway length of 7,400 feet may be warranted at the Airport.

Balanced Field Length

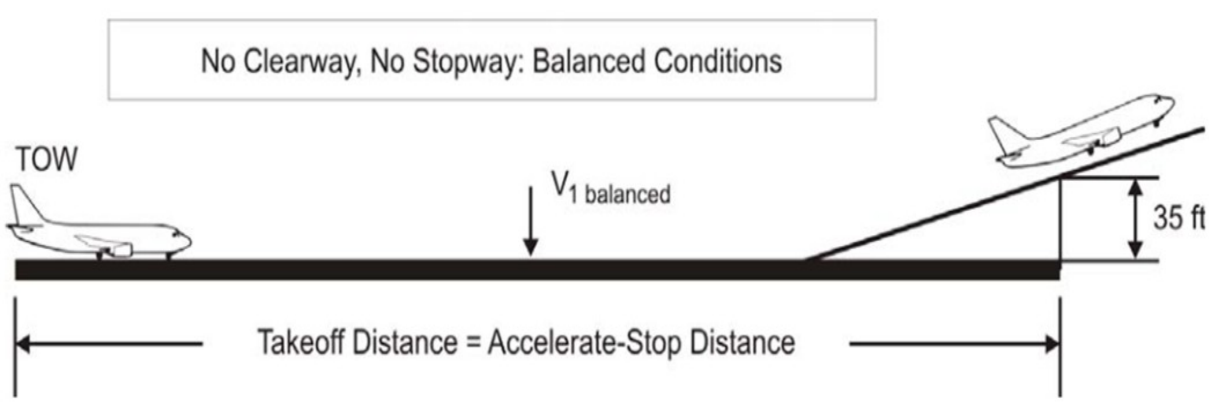
While the FAA runway analysis provides an overview for categories of aircraft, balanced field length is a more precise calculation to determine the runway length needs for a certain aircraft. Specific to each aircraft and determined by the aircraft manufacturer, balanced field length is defined as "*distance required to stop an accelerating aircraft in exactly the same distance as that required to reach take-off speed*". As with those distances presented in **Table 3.5**, balanced field length requirements are based on airport elevation, temperature, MTOW, and stage length. **Table 3.6** details a cross-section of the largest corporate aircraft that currently operate at the field or within the national fleet.

Table 3.6
Balanced Field Length Analysis Summary

Aircraft	MTOW	Approximate Length	
		Standard Day (59°)	Mean Max Temp (97°)
Bombardier Challenger 604	47,600	6,130'	7,260'
Bombardier Global Express	96,000	6,750'	8,020'
Cessna Citation 550	14,800	4,000'	4,700'
Cessna Citation X	36,100	5,550'	6,500'
Dassault Falcon 900	45,500	5,000'	5,980'
Gulfstream 450	71,780	5,900'	7,000'
Gulfstream 550	89,000	6,400'	7,600'
Learjet 60	23,500	5,700'	6,800'

Source: Flight Planning Guides, Airport Planning Manuals, Manufacturer websites

These lengths provide a general overview of the approximate requirements for larger corporate aircraft to operate at the field. Discussions with airport personnel indicate the based Gulfstream 450 is weight restricted for international operations and utilizes SAT during those times maximum fuel needs are necessary (currently every other month). Additionally, several operators have indicated a desire to operate from the field if the Airport offered a longer runway. In an effort to understand the exact needs of these operators, the airport should request information letters from the chief pilots or flight departments that specify their runway length requirements, stage length or destinations, and number of times per year these restricted operations would likely occur. If it is determined local demand justifies its implementation, a runway extension project could be completed in conjunction with other runway or taxiway improvements that may be planned at the Airport over the study period. Justification for a runway extension would be required to be eligible for FAA funding. Such justification could include letters from actual operators requesting an extension for a specific aircraft or type of aircraft.



Source: FAA

Runway Width

The required width of a runway is determined by the critical aircraft and the instrumentation available for the airport. Based on FAA design criteria and existing instrument procedures, the existing width of 100' for both runways is adequate for meeting the existing and proposed operational levels during the 20-year planning period.

Pavement Strength

Runway pavement strength is typically expressed by common landing gear configurations. Example aircraft for each type of gear configuration are as follows.

- Single-wheel: each landing gear unit has a single tire; example aircraft include light aircraft and some business jet aircraft.
- Dual-wheel: each landing gear unit has two tires; example aircraft are the Gulfstream 450, Bombardier Global Express, and Boeing 737.
- Dual-tandem: main landing gear unit has four tires arranged in the shape of a square; example aircraft is the Boeing 757.

The aircraft gear type and configuration dictates how aircraft weight is distributed to the pavement and determines pavement response to loading.

The current pavement strength published on the FAA Form 5010 for BAZ allows for single wheel up to 30,000 pounds for Runway 13-31 and 25,000 pounds for Runway 17-35. Based on this published weight bearing capacity of the runways, along with the existing and anticipated aircraft fleet mix, the current pavement strength is not adequate to serve consistent operations by those aircraft weighing in excess of 30,000 pounds. While such aircraft are not precluded from operating on runways with lower rated pavement strengths, consistent operations by heavier aircraft increases the potential to deteriorate pavement more quickly and before the end of its calculated useful life. It is recommended, when funding allows, the Airport increase the pavement strength of the primary runway – Runway 13-31 – when funds allow or when major maintenance is required. The newly designed pavement strength would depend on the critical aircraft demanding the increased strength and the total annual operations performed by this aircraft.

The Airport does not currently have a formal Pavement Classification Number (PCN) or Aircraft Classification Number (ACN) published.

Taxiways

As previously mentioned, the FAA updated taxiway design requirements to aid in the appropriate design for spacing and size of taxiways. It is important to note that the FAA lists seven conditions which should be addressed to reduce the potential for runway incursions:

- **Increase Pilot Situational Awareness.** Keep taxiways simple – "three-node" concept.

- **Avoid wide expanses of pavement.** Requires signage placed away from pilot's line of sight.
- **Limit runway crossings.** Reduces the number of occurrences and ATC workload.
- **Avoid "high energy" intersections.** Intersections in the middle third of the runways create the potential for a high speed/energy collision.
- **Increase visibility.** Using right angle intersections, both between taxiways and between taxiways and runways, provides the best visibility for pilots.
- **Avoid "dual purpose" pavements.** Dual purpose runways/taxiways can lead to confusion.
- **Indirect Access.** Taxiways leading directly from an apron to a runway without requiring a turn increase the possibility for incursions.

Per AC 150-5300-13A, FAA requires that a full length parallel for runways configured with instrument approach procedures with visibility minimums below one mile and recommended for all other conditions. Both runways are provided excellent taxiway access. No additional taxiways are recommended for construction.

3.3 Navigational Aids

Navigational aids (NAVAIDs) are any visual or electronic devices, airborne or on the ground, that provide point-to-point guidance information or position data to aircraft in flight. Airport NAVAIDs provide guidance to a specific runway end or to an airport. An airport is equipped with precision, non-precision, or visual capabilities in accordance with design standards that are based on safety considerations and airport operational needs. The type, mission, and volume of activity used in association with meteorological, airspace, and capacity considerations determine an airports eligibility and need for various NAVAIDs.

Instrument NAVAIDs

This category of NAVAID provides assistance to aircraft performing instrument approach procedures to an airport. An instrument approach procedure is defined as a series of predetermined maneuvers for guiding an aircraft under instrument flight conditions from the beginning of the initial approach to a landing, or to a point from which a landing be made visually.

The current instrument approaches outlined in Chapter 1, Inventory, are sufficiently meeting the current demands at BAZ. However, given the forecast increase in based aircraft, potential extension of Runway 13-31 to 7,400 feet, and the increased operations by large business jets, it is recommended the airport retain the existing ¾-mile visibility minimums and strive to achieve revised visibility minimums of ½-mile should justification occur. Land use regarding Runway Protection Zones will be outlined in the Alternatives portion of the master plan.

Automated Weather

New Braunfels Regional Airport is served by an on-site Automated Surface Observation System (ASOS) which can be tuned on frequency 118.05 or by phone at (903) 583-2082. An AWOS provides pilots with a computer-generated voice message which is broadcast via radio frequency in the vicinity of an airport. The message contains pertinent weather information including wind speed and direction, visibility, temperature, dew point, and cloud ceiling heights.

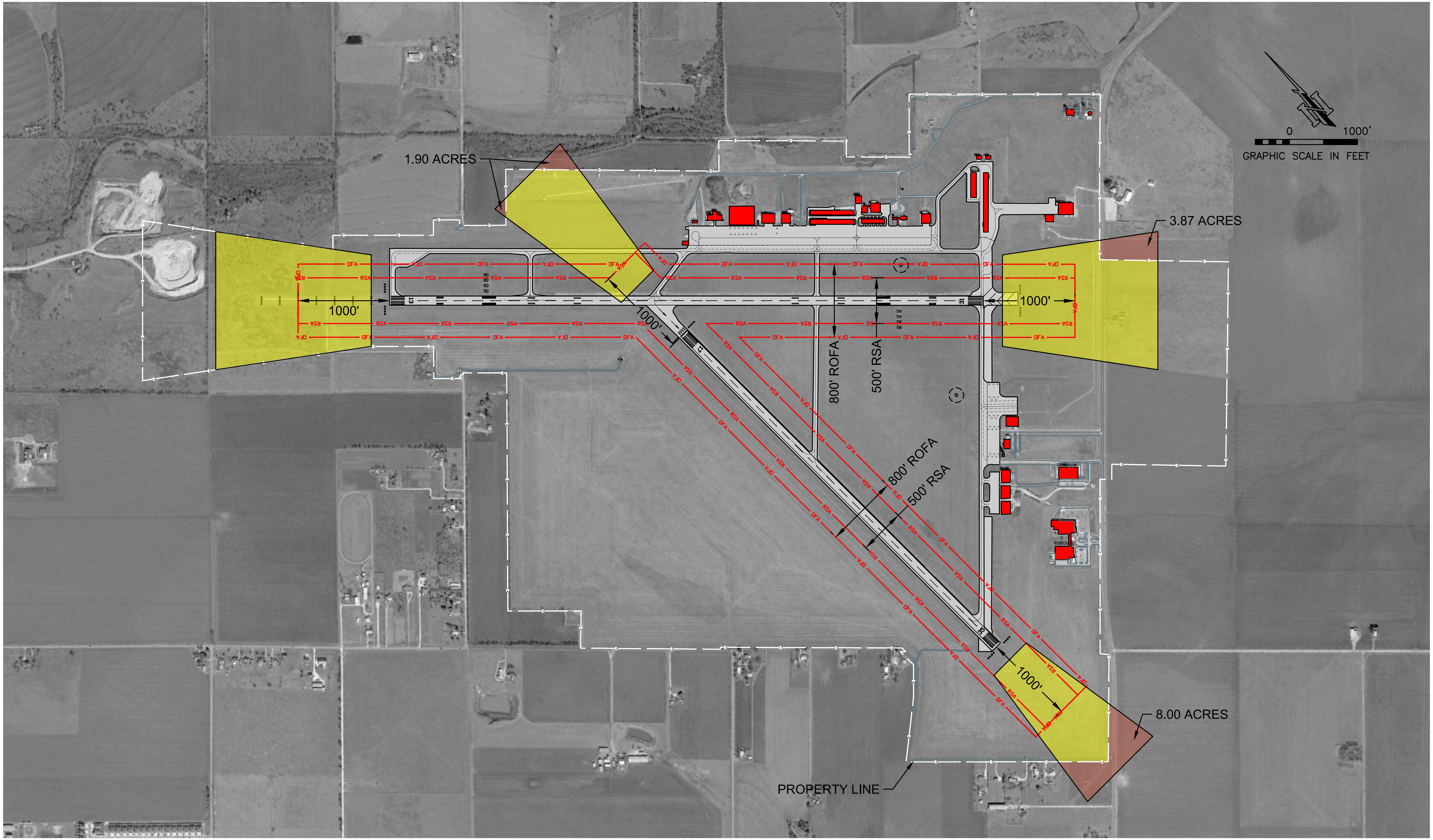
3.4 Dimensional Standards

Dimensional standards include measurements that account for physical runway and taxiway characteristics as well as safety related areas. These standards, contained in FAA AC 150/5300-13A, are shown in **Table 3-7** and graphically illustrated in **Exhibit 3.3** as they pertain to BAZ. As established in previous sections, the design aircraft is considered to be within the ARC C-II group category for each runway.

The following dimensional standards are important to the design of the runway and taxiway system at BAZ as well as the safety of the aircraft operating within the airport environment.

Table 3.7 FAA Design Criteria Summary		
Design Item	Runway 13-31 (C-II)	Runway 17-35 (C-II)
Runway		
Width	100’	100’
Safety Areas (SA)		
Width	500’	500’
Length beyond Runway end	1,000’ / 1,000’	1,000’ / 1,000’
Length beyond Runway end	1,000’ / 1,000’	1.000’ / 1,000’
Object Free Areas (OFA)		
Width	800’	800’
Length beyond Runway end	1,000’ / 1,000’	1,000’ / 1,000’
Length beyond Runway end	1,000’ / 1,000’	1.000’ / 1,000’
Obstacle Free Zone (OFZ)		
Width	400’	400’
Length beyond Runway end	200’ / 200’	200’ / 200’
Length beyond Runway end	200’ / 200’	200’ / 200’
Taxiway		
Width	50’	35’
Safety Area	79’	79’
Object Free Area	131’	131’
Centerline to Fixed or Movable Object	57.5’	57.5’
Runway Centerline to:		
Holdline	250’	250’
Taxiway Centerline	300’	300’
A/C Parking Area	400’	400’

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



New Braunfels Regional Airport

Existing Design Dimensions

Runway Safety Area

The **Runway Safety Area** (RSA) is a defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway. According the FAA's definition and dimensional standards illustrated in **Table 3.7**, the RSA should be cleared, graded, and have no potentially hazardous ruts or surface variations.

For both Runway 13-31 and Runway 17/35, C-II runway standards dictate that the RSA is required to be 500 feet wide and extend 1,000 feet beyond the departure end of the runway. The Airport meets required RSA criteria for both runways.

Runway Object Free Area

The **Runway Object Free Area (OFA)** is a two-dimensional ground area centered on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by remaining clear of objects except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes. The OFA prohibits parked aircraft and other` objects, except NAVAIDs and objects with locations fixed by function. According to FAA guidelines, OFA for ARC C-II runways should extend 1,000 feet beyond each runway end and have a width of 800 feet. Both runways meet the necessary dimensional criteria.

Obstacle Free Zones

The **Obstacle Free Zone (OFZ)** is a three-dimensional volume of airspace that surrounds the transition of ground-to-airborne operations (or vice versa). The OFZ clearing standards prohibit taxiing, parked aircraft, and other objects with the exception of frangible NAVAIDs or fixed-function objects, from penetrating this zone. The OFZ consists of a volume of airspace below 150 feet above the established airport elevation and is centered on the extended runway centerline. The OFZ extends 200 feet beyond each end of the runway and has a width that varies with approach visibility minimums and the size of aircraft using the runway, in the case of BAZ, 400'.

Runway Protection Zones

A **Runway Protection Zone** (RPZ) is an area off the runway end intended to enhance the protection of people and property on the ground. This is achieved through airport control of the RPZ areas. The RPZ is trapezoidal in shape, centered on the extended runway centerline, and begins 200 feet beyond the end of the area usable for take-off or landing. RPZ dimensions are a function of the RDC, aircraft size, and the lowest visibility minimums associated with a runway end.

As noted in the *Inventory* chapter, Runway 13 -31 has visibility minimums as low as ¾-mile and Runway 17-35 offers visibility minimums not lower than 1-mile. **Table 3.8** presents the RPZ dimensions as illustrated on the existing Airport Layout Plan (ALP) and if the Airport owns and controls the entire area contained within the RPZ.

The **Controlled Activity Area** is the portion of the RPZ beyond and to the sides of the runway OFA. It is recommended that an airport control, in fee, this activity area. The controlled activity area should be free of land uses that create glare and smoke. Also, the construction of residences, fuel-handling facilities, churches, schools, and offices is not recommended in the RPZ's controlled activity area. Roads are typically not recommended in the RPZ. Table 3-4 shows the existing RPZ dimensions and Part 77 approach slopes for each runway end at BAZ. Recommended RPZs to coincide with improved approach capabilities will be illustrated on the airport layout drawing as part of this master plan.

Table 3.8
RPZ Dimensions

Item	Width at Inner Edge	Length	Width at Outer Edge	Airport Control
Existing RPZ Dimension				
Runway 13	1,000'	1,700'	1,510'	Yes
Runway 31	1,000'	1,700'	1,510'	No
Runway 17	500'	1,700'	1,010'	No
Runway 35	500'	1,700'	1,010'	No
Required RPZ Dimension				
Visual and not lower than 1-mile, small aircraft only	250'	1,000'	450'	
Visual and not lower than 1-mile, approach categories A & B	500'	1,000'	700'	
Visual and not lower than 1-mile, approach categories C & D	500'	1,700'	1,010'	
Not lower than ¾-mile, all aircraft	1,000'	1,700'	1,510'	
Lower than ¾-mile, all aircraft	1,000'	2,500'	1,750'	

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

Based on the existing property line, the Airport is deficient in meeting the requirements to own, in fee simple, the entire RPZ for Runways 31, 17, and 35. Approximately 13.77 combined acres of land is necessary for recommended purchase to control and own all aspects of the Airport's RPZ's. **Exhibit 3.3** graphically illustrates the deficiencies associated with the current RPZ's.

3.5 Landside Requirements

This section described the landside requirements needed to accommodate BAZ's general aviation activity throughout the planning period. Areas of particular focus include the hangars, aprons and tie-down areas, automobile parking, as well as the various associated support facilities.

Hangars

Hangars are the preferred method for based aircraft storage at BAZ to protect aircraft from high temperatures, sun exposure and severe weather. The airport currently has a waiting list for hangar rentals. Currently, there are four (4) T-Hangar structures providing 63 storage units, one (1) shade hangar providing thirty-six (36) storage units, and several box / conventional hangars providing the remainder of the aircraft storage needs.

All based aircraft are stored in hangars. The aforementioned rate is assumed for the future based aircraft at BAZ and used in determining the demand for additional hangars. The aircraft type influences the type of storage required for based aircraft. Taking this into consideration, the projected based aircraft fleet mix was used to identify the number of additional hangars by type projected over each phase of the planning period.

Of the 146 aircraft based at BAZ, 123 are single-engine, and three (3) are helicopters. As previously identified in Chapter Two: Forecast of Aviation Demand, and based on the Airport's existing fleet mix, single-engine aircraft are expected to remain as the largest portion of the fleet at BAZ. Given the forecast, twenty (20) multi-engine and twenty-eight (28) jets are anticipated to be based on the field by 2037. With the current number of 146 aircraft expected to increase to 198 by the end of the planning period, additional facilities will be necessary to accommodate the storage demands.

Based Aircraft Apron Storage

Based aircraft tie-downs are usually provided for those aircraft owners and operators that do not require or desire to pay the cost for long-term hangar storage, accommodate lower activity, and have lower turnover with size and type or aircraft. Space calculations for these areas are typically based on 360 square yards of apron for each aircraft tie-down. This space allotment provides for aircraft parking and circulation between the rows of tie-downs. Trends indicate that as more aircraft are based at an airport, hangar storage capacity is surpassed before additional hangar space is supplied.

Itinerant Aircraft Apron Storage

Itinerant apron storage is provided for transient aircraft owners and operators requiring short-term or temporary storage, to provide higher levels of activity, and to have higher turnover with various aircraft. Calculation of this storage requirement option allots 500 per square yard for small single- and multi-engine aircraft and 1,600 square yards for turbo-prop and business jet aircraft. This additional space allotment over that of based aircraft is due to the typical itinerant pilot not being conditioned or familiar with the airport and its maneuvering or circulation patterns and the overall increase in overall aircraft size.

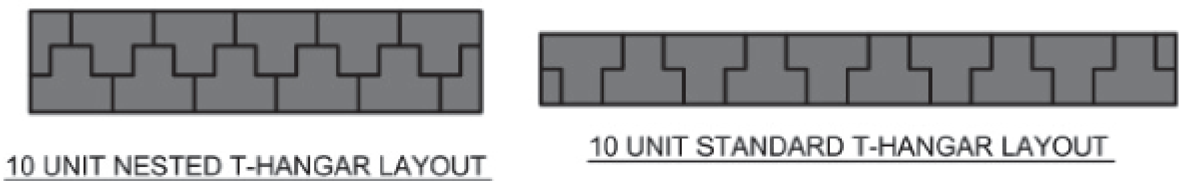
Hangar Storage

A storage hangar typically consists of three walls, a roof, and a large door and serves to keep parked aircraft out of the elements. Storage hangars can be built to any size and dimension to meet the needs of the airport, tenant, and aircraft type.

T-Hangars

T-hangars come in two types: standard and nested. Standard T-hangar configurations produce a longer and narrower building and work well where existing infrastructure or available property is not wide enough for nested T-hangars while nested T-hangar configurations produce a shorter and wider building than the standard T-hangar. Nested T-hangars optimize the developable space and reduce the required taxilane pavements and allows for the construction of a larger rectangular unit or "pod" on the ends of the building for larger aircraft. Nested T-hangars are the most common hangar types. T-hangars are typically constructed for single-engine and smaller twin-engine aircraft or those aircraft with a wingspan up to 79 feet. Single- and twin-piston engine aircraft generally require approximately 1,250 square feet of storage space.

Exhibit 3.4
Typical T-Hangar Layouts



Source: ACRP Report 118 *Guidebook on General Aviation Facility Planning*

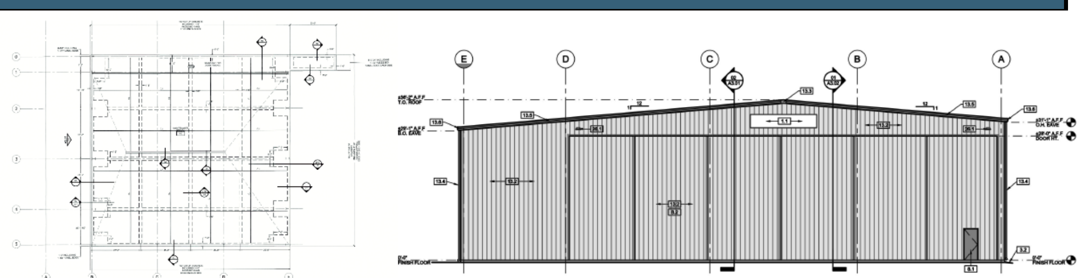
Clear Span/Box Hangars

These type of hangars typically accommodate a single aircraft as stand-alone structures and are typically occupied by larger complex and more costly aircraft. Sizes can range from 60' x 60' up to 120' x 120' and at times, could double as a community type storage unit.

Corporate and Executive Hangars

A corporate hangar is usually a clear span/box hangar with the addition of dedicated space such as an office, restroom, conference room, break room, and lobby area. These type of hangars work well when there is a local FBO present or aircraft manager that oversees the hangar. Executive hangars are hangars constructed when a conventional hangar is too big and T-hangar is too small and are typically a single structure divided into as little as two and up to six storage units. These hangars most often accommodate large multi-engine piston and small twin-engine turbo-prop aircraft. Executive hangars provide flexibility for an airport that does not need hangar space to accommodate large aircraft but needs to house aircraft too large for a standard T-hangar. These hangars are usually custom sized and offer expansion capabilities.

Exhibit 3.5
Corporate and Executive Hangar Sample Layout



Source: KSA

Table 3.9 presents the type of facilities and the number of units or area needed in order to meet the forecast demand for each development phase. It is expected that most of the owners and operators of newly-based aircraft at the airport will desire hangar storage facilities. It should be noted that the actual number, size, type, and location of future hangars will depend on user needs, market conditions, and financial feasibility at the time demand occurs.

Table 3.9
Summary of Hangar Requirements

	Existing	Short (0-5 Years)	Mid (6-10 Years)	Long (11-20 Years)
Total Forecast Based Aircraft	146	155	169	198
Additional Aircraft Hangar Need	--	9	14	29
Single-Engine	123	2	6	13
Multi-Engine	11	3	2	4
Business Jet	9	3	5	11
Helicopter	3	1	1	1
Hangar Area Requirements				
T- and Shade Hangars (sq. ft.)	76,250	2,500	7,500	16,250
Executive Hangars (sq. ft.)	26,900	7,500	5,000	10,000
Corporate / Conventional Hangar Area (sq. ft.)	165,725	30,000	50,000	110,000
Additional Total Hangar Space (sq. ft.)	268,875	40,000	62,500	136,250

Source: KSA

While the airport currently provides approximately 268,875 square feet of aircraft storage space, based on the predicted incremental increase in based aircraft, the airport will need to enhance storage capacity by approximately 136,250 square feet in the long-term to accommodate the needs of the airport's future tenants.

Apron and Tie-down Areas

There are two aircraft parking aprons providing a total of 26 tie-down spaces. The east apron is located along Taxiway "A" providing approximately 664,000 square feet of maneuvering space and the south apron is situated along Taxiway F, providing approximately 141,100 square feet of space. Since nearly all based aircraft at the Airport are stored in hangars, these tie-downs are currently only used for transient aircraft. **Table 3.10** summarizes the apron needs for the 20-year planning period.

Table 3.10 Summary of Apron Requirements				
	Existing	Short (0-5 Years)	Mid (6-10 Years)	Long (11-20 Years)
Based Aircraft Apron				
Tie-Down Need	26	2	2	2
Apron Area (sq. yds.)	--	600	600	700
Itinerant Aircraft Area				
Single- and Multi-Engine (sq. yds.)	--	16,000	20,400	26,500
Turbo-prop and Business Jet (sq. yds.)	--	5,800	7,200	9,500
Total Apron (sq. yds.)	664,000	22,400	28,200	36,700

Source: KSA; FAA AC 150/5300-13A, *Airport Design*, Change 1
Note: Existing apron does not differentiate between based and itinerant.

As can be seen, from an overall size standpoint, both aprons combined provide ample space for aircraft that desire apron area parking. However, the terminal area apron, as a standalone, is inadequate in its current size for accommodating the needs of medium to large aircraft. In its current layout, the terminal apron can park no more than one jet at a time side by side, creating an inconvenience for accommodating more than one jet simultaneously. Thus, the alternatives chapter will review expansion opportunities for terminal apron parking needs.

General aviation terminal building

The primary objective of the terminal building is to achieve an acceptable balance between passenger convenience, facility operational efficiency, capital investment, and aesthetics. A well-conceived terminal building should allow passengers and visitors to transition from the surface transportation mode to the air transportation mode with a minimum of inconvenience. Potential expansion of the terminal building should be planned, designed, and developed by taking into consideration allowable funding levels that consider construction costs, as well as operational and maintenance costs.

The recommended terminal functional areas including square footage and parking facilities were determined by referring to FAA AC 150/5360-13. *Planning and Design for Airport Terminal Facilities*, as well as FAA AC 150/5390-9, *Planning and Design of Terminal Facilities at Non-Hub Locations*. Calculations for the terminal building sizing account for the forecasted passenger enplanements and itinerant operations as provided in the *Forecast* chapter. **Table 3.11** summarizes the terminal building spatial needs throughout the 20-year master plan period.

Table 3.11 Summary of Terminal Building Spatial Requirements				
Operational Activity	Existing	Short (0-5 Years)	Mid (6-10 Years)	Long (11-20 Years)
Annual Itinerant Operations	24,921	26,837	32,973	42,893
General Aviation Enplanements	15,000	16,600	21,100	28,300
Total Annual Activity	39,921	43,437	54,073	71,193
Peak Hour Passengers	30	33	41	53
Terminal Building Requirements (sq. ft.)	4,500	4,800	6,000	8,000
Existing Terminal Space Available	4,800	4,800	4,800	4,800
Spatial Needs Surplus (Deficit), (sq. ft.)	300	0	(1,200)	(3,200)

Source: KSA

The existing passenger terminal building at the airport provides approximately 4,800 square feet of space and is deficient by the termination of the 20-year plan according to standard methodology criteria. The methodology contained in AC 150/5360-13 is based on passenger activity during the peak hour and the demand that is placed on the facility. A rule-of-thumb guideline from this Advisory Circular indicates that for long-term passenger terminal planning purposes, the building area should provide approximately 150 square feet per peak hour passenger. Utilizing this rule-of-thumb guideline, a terminal building of approximately 4,800 square feet would be required in the short-term increasing to 8,000 square feet by the end of the planning period. Based on the current size, the existing terminal will require additional space during the mid- and long-terms. Options for terminal expansion at the current location or elsewhere will be reviewed in the *Alternatives* section of this report.

Automobile Parking

Currently, the parking available at BAZ is east and adjacent to the General Aviation Terminal Building. The existing facility provides approximately 36 parking spaces. Planning guidelines contained in AC 150/5360-9 indicate vehicle parking requirements are closely related to annual enplanements. Additionally, FAA AC 150/5360-13 indicates that an increase of 15 percent in the number of parking spaces should be provided to minimize the amount of time necessary to find a parking space. In determining the future public auto parking needs, 1.5 spaces are allotted per peak hour passenger. **Table 3.12** summarizes the ultimate auto parking needs during normal airport operating conditions.

Table 3.12 Summary of Auto Parking Requirements				
Operational Activity	Existing	Short (0-5 Years)	Mid (6-10 Years)	Long (11-20 Years)
Peak Hour Passengers	30	33	41	53
Parking Spaces / Peak Hour Passengers	45	49	61	80
Existing Auto Parking Facilities	36	36	36	36
Parking Space Surplus (Deficit)	(9)	(13)	(25)	(44)

Source: KSA

Currently, calculations show the General Aviation Terminal Building's auto parking facilities deficient through all phases based on technical assumptions provided in FAA airport planning manuals. Similar to the terminal facility, the *Alternatives* chapter will provide concepts pertaining to auto parking needs of the airport over the 20-year planning period.

Fuel Storage Facilities

Fuel storage at New Braunfels Regional Airport includes one (1) 12,000 gallon 100LL tank and one (1) 12,000 gallon Jet-A tank that provides fuel for the airport. The Airport's fuel storage is located on the north end of the aircraft apron situated east of Runway 13-31 and offers self-fueling capabilities. Typically, aircraft fueling equipment is located near the terminal building to accommodate visiting aircraft. Because of this, it is recommended existing fuel farm facilities be relocated to the terminal area, along with self-serve dispensing capabilities, when funding allows.

According to fuel sales estimates provided by the airport, there has been an average of 88,000 gallons of AVGAS and 371,000 gallons of Jet-A fuel sold annually at the airport over the last three (3) years. Based on 2017 total operation counts, this equates to approximately four (4) gallons per operation for both piston-aircraft and seventeen (17) gallons for turbine-engine aircraft. Typically, as operations increase, fuel storage requirements can be expected to increase proportionately. By increasing the ration of gallons sold per operation, an estimate of future fuel storage needs can be calculated as a two-week supply during the peak month of operations. As can be seen in **Table 3.13**, the airport's 12,000 gallon Jet-A tank is undersized for the planning period and the forecasted operations for turbine aircraft support the need to add a Jet-A fuel tank in the capacity of 12,000 gallons.

Table 3.13 Summary of Aircraft Fuel Storage Requirements				
Operational Activity	Existing	Short (0-5 Years)	Mid (6-10 Years)	Long (11-20 Years)
100LL				
Average Day of Peak Month Ops	83	93	93	99
Two Weeks of Operations	1166	1302	1301	1386
Gallons Per Operation	4	4.4	4.8	5.3
Fuel Storage (gallons)	4,665	5,700	6,300	7,400
Jet-A				
Average Day of Peak Month Ops	70	77	100	130
Two Weeks of Operations	979	1080	1400	1820
Gallons Per Operation	17	18.7	20.6	22.6
Fuel Storage (gallons)	16,647	20,200	28,800	41,200

Source: KSA

Security (fencing)

Airport security and fencing is an important part of airfield infrastructure. Tenants, users and businesses count on airport management to provide secure and safe facilities to help protect their investments. As a general aviation airport, security at BAZ is not held to the same standard as commercial service airports, but should provide facilities to restrict access from trespassers and wildlife. The Transportation Security Administration (TSA) has provided guidance to general aviation airports to assist with evaluating appropriate security measures specific to the type of operations at these airports.

Security fencing is the most common way of securing an airport perimeter. Various types of fencing are used for wildlife and security and vary in height, and type depending on local security needs. These fences are low-maintenance and provide clear visibility for security sweeps and may include barbed wire, razor wire, and other available features to increase intrusion difficulty. The airport currently provides sufficient fencing and controlled access to the apron and taxiway via key pad control gates at various locations around the field. The Terminal building is secured and monitored by personnel during the day and locked during the evening hours.

3.6 Facility Requirements Summary

This chapter describes the facility developments needed in order to meet those standards as well as accommodate forecasted operations and based aircraft in the next 20 years. Tables 3.14 and 3.15 summarize these requirements.

Table 3.14 Summary of Terminal Area Facility Requirements				
Operational Activity	Existing	Short (0-5 Years)	Mid (6-10 Years)	Long (11-20 Years)
Total Forecast Based Aircraft	146	155	169	198
Additional Aircraft Hangar Need	--	9	14	29
Single-Engine	123	2	6	13
Multi-Engine	11	3	2	4
Business Jet	9	3	5	11
Helicopter	3	1	1	1
Hangar Area Requirements				
T-Hangars (sq. ft.)	76,250	2,500	7,500	16,250
Executive Hangars (sq. ft.)	26,900	7,500	5,000	10,000
Corporate / Conventional Hangar Area (sq. ft.)	165,725	30,000	50,000	110,000
Additional Total Hangar Space (sq. ft.)	268,875	40,000	62,500	136,250
Based Aircraft Apron				
Tie-Down Need	26	2	2	2
Apron Area (sq. yds.)	--	600	600	700
Itinerant Aircraft Area				
Single- and Multi-Engine (sq. yds.)	--	16,000	20,400	26,500
Turbo-prop and Business Jet (sq. yds.)	--	5,800	7,200	9,500
Total Apron (sq. yds.)	664,000	22,400	28,200	36,700
Terminal Requirements				
Annual Itinerant Operations	24,921	26,837	32,973	42,893
General Aviation Enplanements	15,000	16,600	21,100	28,300
Total Annual Activity	39,921	43,437	54,073	71,193
Peak Hour Passengers	30	33	41	53
Terminal Building Requirements (sq. ft.)	4,500	4,800	6,000	8,000
Existing Terminal Space Available	4,800	4,800	4,800	4,800
Spatial Needs Surplus (Deficit), (sq. ft.)	300	0	(1,200)	(3,200)
Auto Parking Requirements				
Peak Hour Passengers	30	33	41	53
Parking Spaces / Peak Hour Passengers	45	49	61	80
Existing Auto Parking Facilities	36	36	36	36
Parking Space Surplus (Deficit)	(9)	(13)	(25)	(44)

Fuel Storage Requirements				
100LL				
Average Day of Peak Month Ops	83	93	93	99
Two Weeks of Operations	1166	1302	1301	1386
Gallons Per Operation	4	4.4	4.8	5.3
Fuel Storage (gallons)	4,665	5,700	6,300	7,400
Jet-A				
Average Day of Peak Month Ops	70	77	100	130
Two Weeks of Operations	979	1080	1400	1820
Gallons Per Operation	17	18.7	20.6	22.6
Fuel Storage (gallons)	16,647	20,200	28,800	41,200

Table 3.15
Summary of Facility Requirements

Facility	Planning Period Requirements	Justification
Runway 13-31	It is recommended this runway be extended to 7,400'.	Capacity. Accommodation of medium to large business jets and associated balanced field length requirements.
Runway 17-35	It is recommended this runway retains its current runway length of 5,364' and remove the displaced threshold with a new taxiway alignment to Runway 17 end. Additionally, this runway should be rehabilitated due to its deteriorating state.	Safety and Capacity. Maintain a safe operating pavement and accommodate medium sized business jets and associated balanced field length requirements.
Runway Lighting	The existing approach lighting system (MALS) should be shifted to coincide with the proposed Runway 13-31 extension.	Safety and Capacity. Maintain a safe operating environment for operating during times of IMC conditions.
Taxiway and Taxiway Connectors	It is recommended the parallel taxiway and all connectors retain current placement.	Safety and Capacity. This will retain the safe maneuvering areas for aircraft utilizing the airport.
Total Apron Requirement	Additional expansion of the total apron area is not required.	Capacity. This will retain the safe and efficient use of the east side apron.
Terminal Parking Apron	Terminal aircraft parking apron is inadequate to accommodate the needs of aircraft visiting and operating at the airport.	Capacity. Construction of additional terminal apron area will enhance the capability of the airport to attract and retain business aircraft.
Single and Multi-Engine Aircraft Storage	A variety of hangars will be necessary during the planning period and will vary depending on size and market needs.	Terminal / Revenue enhancement. This will accommodate the forecasted based aircraft number. If demands exceed the forecasted numbers, additional hangars should be built as needed for future tenants.
Corporate Hangar	With the forecasted increase in jet traffic, large corporate hangars will be required. Size and quantity will vary depending on market needs.	Terminal / Revenue enhancement. Forecast period will need to accommodate the addition of one based jet.
Parking	Auto parking affiliated with the General Aviation Terminal will need to be expanded.	Access. As new hangars are constructed, parking should be added to accommodate new tenants.
NAVAIDs	The current approaches are sufficient.	Capacity. As larger jet aircraft continue to utilize the airport, lower approach minimums will increase the ability of the airport to serve these customers.
Fuel	Short-term, it is recommended that additional jet fuel (Jet-A) fuel storage be installed at the airport. Long-term, it is recommended fuel storage be relocated	Terminal / Revenue enhancement. Jet fuel is necessary for retaining and attracting additional turbine and jet aircraft.

	to terminal area and include self-serve dispensing capabilities.	
Security Fencing	The current fencing around the perimeter of the airport is sufficient to adequately protect against wildlife and intrusions to the airfield.	Security. As the airport grows and gains additional based aircraft, a reasonable level of security should be provided to aeronautical users of the airport.
RPZ – Land Acquisition	The existing RPZ's for Runways 31, 17, and 35 extend beyond airport property. The airport should strive to purchase, in fee simple, the additional acreage for ownership purposes.	Safety and Capacity. This will allow the airport to control the additional safety enhancement the RPZ provides.

AIRPORT DEVELOPMENT ALTERNATIVES

Chapter 4. Development Concepts and Alternatives Analysis

4.1 Introduction

The previous chapter identified the airside and landside facility requirements needed to satisfy the forecast demand throughout the entirety of the planning period. Using the identified requirements, the following recommendations have been made to address how those requirements will be met using various development alternatives. This chapter will analyze the benefits and weaknesses associated with each alternative and provide a strategy for selecting a preferred airport development plan. Once selected, the preferred alternative will be implemented into the Airport Layout Plan (ALP) drawings.

The objective of this effort is to develop a balanced airside infrastructure and appropriate landside aircraft storage infrastructure to best serve the forecast aviation demands. Assessment of each alternative is grounded primarily in local, state, and federal planning standards, however, technical judgment must also be applied in order to determine the appropriate course of action, factors surrounding development and evaluation of design options should be assessed. These factors include:

- Develop a safety oriented and efficient aviation facility through compliance with Federal Aviation Administration (FAA) airport design standards and airspace criteria as defined in FAA Advisory Circular (AC) 150/5300-13A.
- The short and long-term development cost of the defined alternatives.
- Compatibility with existing and proposed land uses, with respect given to zoning ordinances and neighboring off-airport uses.
- Compatibility with the short and long-range goals of the City of New Braunfels and the Texas Department of Transportation.
- Minimization of environmental impacts on and off-airport.

Alternatives to be considered will include options for both airside and landside development.

4.2 Evaluation Criteria

When reviewing alternatives, a set of criteria was established for which each one would be evaluated. Then an assignment of the relative importance to each criterion should be decided and will assist in making recommendations on the final recommended alternative. Criterion may include but not be limited to:

Criterion	Weighted Factor
• Safety and efficiency of aviation operations	x2
• Ability to accommodate expected general aviation demand	x1
• Acceptability to users, the TxDOT, FAA, and the community at large	x2
• Land availability and ownership	x1
• Environmental factors	x1
• Airspace/obstruction requirements	x1
• Consistency with area wide plans	x1
• Political, jurisdictional, and implementation factors	x1
• Economic feasibility	x2
• Accessibility	x1

Some of this criterion is inherently of higher importance. For instance, safety should always be evaluated at the highest importance, while convenience or efficiency would be a lower priority. Financial feasibility is also a major factor when determining the likelihood that the plans presented in the alternative will actually be built over the master plan period. However, due to the uncertainty of long term cost estimates, a higher priority should be placed on the possible of funding eligibility by funding agencies such as the FAA and TxDOT. Although total cost is important, the applicability to grant shared expense will highly impact the ability of a project to gain support.

To quantify this criterion, a scoring matrix will be provided for each of the airside alternatives. A scaling system of 1-3 has been developed with the following scoring in mind:

1 = Negative Impact

2 = No Impact

3 = Positive Impact

In order to weight the scoring criteria, each individual criterion will be multiplied by a factor of one or two based on its relative importance. This will help ensure the most important factors are relative to one another and an accurate scoring method can be presented. Keeping in mind these scores are subjective in nature, they are only intended to help planners evaluate the best option from a long range planning perspective and may not necessarily impact the ability of the airport to use other alternatives or projects.

The design concepts represent the range of possibilities to reasonably improve certain design and operational characteristics at the airport. Following a review of these alternatives based on performance standards of future airport operational activity (individual or combination of strategies), a preferred alternative design will be selected and will be carried throughout the remainder of the study and ultimately used to update the New Braunfels Regional Airport layout plan.

4.3 Facility Requirements Summary

Facility requirements are intended to compare existing facilities with current safety standards as well as the demand for new or expanded facilities. The facilities previously outlined in Chapter 3 have provided the baseline to determine the feasibility to accommodate various alternatives. In addition, airfield demand / capacity, airside facility requirements, and landside capacity have all been evaluated during the selection of alternatives. Furthermore, two main standards are taken into account when evaluating facility requirements. First, alternatives must meet the design requirements established by the current and future Airport Reference Code (ARC) and second, standards identified in FAA Advisory Circular 150/5300-13A, *Airport Design* must be met.

To meet future facility requirements, New Braunfels Regional Airport must make provisions to accommodate future operations. The demand for additional facilities was calculated in the previous chapter and can be summarized by examining forecast based aircraft and operations.

1. Based Aircraft – BAZ currently accommodates 146 based aircraft; this number is expected to increase to as much as 198 by 2037. (Table 4.1)
2. Operations – In 2017, BAZ had 46,000 aircraft operations; this is expected to rise to as much as 69,300 by 2037. (Table 4.1)

Table 4.1 Projection of Activity Summary				
	Existing	2022	2027	2037
Based Aircraft				
Single-Engine	123	125	131	144
Multi-Engine	11	14	16	20
Jets	9	12	17	28
Rotorcraft	3	4	5	6
Other	0	0	0	0
Total	146	155	169	198
Operations				
Single-Engine	38,725	41,250	44,540	50,400
Multi-Engine	3,463	4,620	5,440	7,000
Jet	2,834	3,960	5,780	9,800
Rotorcraft	945	1,320	1,700	2,100
Other	0	0	0	0
Total	45,966	51,150	57,460	69,300

Source: KSA

Airside Requirements

Airfield facilities include infrastructure that interacts with the arrival and departure of aircraft as well as their subsequent movement around the airfield to parking and storage areas. Areas of focus include runway / taxiway dimensions, aprons, navigational aids (NAVAIDS), landing aids, and dimensional standards. These criteria are taken into account during the development of the airside alternatives.

The following airside improvements outlined in **Table 4.2** were recommended in the previous chapter and are intended to meet future design requirements as well as enhance the efficiency of the airfield. Each of the proposed alternatives will incorporate these improvements while ensuring compliance with FAA Airport Design standards.

Table 4.2
Summary of Facility Requirements

Facility	Planning Period Requirements	Justification
Runway 13-31	It is recommended this runway be extended to 7,400'.	Capacity. Accommodation of medium to large business jets and associated balanced field length requirements.
Runway 17-35	It is recommended this runway remove the displaced threshold and implement a new taxiway alignment to the Runway 17 end. Additionally, this runway should be rehabilitated due to its deteriorating state.	Safety and Capacity. Maintain a safe operating pavement and accommodate medium sized business jets and associated balanced field length requirements.
Runway Lighting	The exiting approach lighting system (MALS) should be shifted to coincide with the proposed Runway 13-31 extension.	Safety and Capacity. Maintain a safe operating environment for operating during times of IMC conditions.
Taxiway and Taxiway Connectors	It is recommended the parallel taxiway and all connectors retain current placement.	Safety and Capacity. This will retain the safe maneuvering areas for aircraft utilizing the airport.
Total Apron Requirement	Additional expansion of the total apron area is not required.	Capacity. This will retain the safe and efficient use of the east side apron.
Terminal Parking Apron	Terminal aircraft parking apron is inadequate to accommodate the needs of aircraft visiting and operating at the airport.	Capacity. Construction of additional terminal apron area will enhance the capability of the airport to attract and retain business aircraft.
Single and Multi-Engine Aircraft Storage	A variety of hangars will be necessary during the planning period and will vary depending on size and market needs.	Terminal / Revenue enhancement. This will accommodate the forecasted based aircraft number. If demands exceed the forecasted numbers, additional hangars should be built as needed for future tenants.
Corporate Hangar	With the forecasted increase in jet traffic, large corporate hangars will be required. Size and quantity will vary depending on market needs.	Terminal / Revenue enhancement. Forecast period will need to accommodate the addition of one based jet.
Parking	Auto parking affiliated with the General Aviation Terminal will need to be expanded.	Access. As new hangars are constructed, parking should be added to accommodate new tenants.
NAVAIDs	The current approaches are sufficient.	Capacity. As larger jet aircraft continue to utilize the airport, lower approach minimums will increase the ability of the airport to serve these customers.
Fuel	Short-term, it is recommended that additional jet fuel (Jet-A) fuel storage be installed at the airport. Long-term, it is recommended fuel storage be relocated	Terminal / Revenue enhancement. Jet fuel is necessary for retaining and attracting additional turbine and jet aircraft.

	to terminal area and include self-serve dispensing capabilities.	
Security Fencing	The current fencing around the perimeter of the airport is sufficient to adequately protect against wildlife and intrusions to the airfield.	Security. As the airport grows and gains additional based aircraft, a reasonable level of security should be provided to aeronautical users of the airport.
RPZ – Land Acquisition	The existing RPZ's for Runways 31, 17, and 35 extend beyond airport property. The airport should strive to purchase, in fee simple, the additional acreage for ownership purposes.	Safety and Capacity. This will allow the airport to control the additional safety enhancement the RPZ provides.

Landside Requirements

Various landside improvements are recommended to accommodate current and forecast aviation activity throughout the planning period at BAZ. As stated in Chapter 3, areas of particular focus include the addition of T-Hangars and conventional hangars; however, other areas including auto parking, aircraft fueling, and new ATCT siting will also be reviewed. These facility requirements are developed from the analysis of the demand and capacity requirements, and based on standards established by the FAA Advisory Circular 150/5300-13A, *Airport Design*.

The following landside improvements were recommended in the previous chapter and are intended to meet future demands for aircraft storage, safety/security, and functionality. Each of these proposed alternatives will incorporate these improvements while following compliance with FAA Airport Design Standards with regards to the following landside development.

a) Provide additional T-Hangars

b) Provide additional conventional hangars

c) Provide alternate aircraft fuel farm / dispensing locations

d) Provide additional auto parking

e) Provide potential new ATCT siting locations

4.4 Development Alternatives Evaluation

Airside Alternatives

As outlined in the Inventory Chapter, New Braunfels Regional Airport is based on a dual runway and parallel taxiway system. The primary parallel taxiway is located on the east side of the field and connects the east side apron / aircraft parking area to each end of Runway 13-31. Additionally, the parallel taxiway system for Runway 17-35 doubles as the main access and maneuvering points to and from the terminal parking apron, as well as entry and points for the Runway 35 and 31 ends.

Advisory Circular 150/5300-13A, *Airport Design*, outlines the correct method for the layout of runways, taxiways, and taxiway connectors leading to another taxiway or runway entrance. This new guidance stipulates the disallowance of "lead-in" taxiways. Taxiways should be designed to mitigate incursions by limiting direct access from the apron to a runway by implementing a turn prior to entrance. Based on this design criteria, the airside alternatives include proposed revisions to the existing taxiway layout.

In an effort to maintain continued safety at the airport and minimize confusion associated with the "V" threshold configuration of Runway 17 and Runway 13-31, it is recommended the existing displaced threshold be removed and Taxiway "D" be realigned to eliminate direct "lead-in" access to the Runway 17 end. This new access point would still require the necessary air traffic clearance to cross Runway 13-31; however, the holding point for access to Runway 17 will now require aircraft to implement a turn before entering the runway. Taxiway "E" is recommended to be extended to enable its use for connection to the terminal area, as well as providing a mid-field entry / exit point to / from Runway 17-35. Additionally, the south end of Taxiway "F" has been re-evaluated to include a connecting point that requires aircraft to turn before entering the runway. Consideration for a west side parallel taxiway will be also be evaluated.

Because Runway 13-31 accommodates the existing instrument approach light system, captures the bulk of business jet activity, and is considered the primary runway by TxDOT Aviation, enhancements will focus solely on this runway.

The following alternatives have been assembled to provide a full range of design options. These alternatives are based on the forecasts of aviation activity, facility requirements needs, and potential future expansions at the airport.

Alternative One

Alternative One postulates extending Runway 13-31 and associated parallel taxiway (Taxiway "A"), 800' to the north, providing an overall usable runway length of 7,303', capable of accommodating business aircraft needs at the airport. With this option, the Medium Intensity Approach Light System (MALS) would be relocated to coincide with the proposed extension. This shift maximizes runway length based on the retaining the existing RPZ within airport property. It is estimated the cost to shift and relocate the MALS would be approximately $250,000. Additionally, the weight bearing capacity of the new pavement should be reflective of the existing condition of 30,000 pounds for single-wheel aircraft.

Exhibit 4.1 graphically illustrates Alternative One and its proposals.

Design Considerations Summary:

- Extend Runway 13-31 and associated parallel Taxiway "A", 800' to the north.
- Relocate existing approach lighting system 800' to coincide with runway extension (proposed cost $250,000).

- Eliminate the 522' displaced threshold associated with Runway 17 and shift associated RPZ within airport property.
- Relocate south end of Taxiway "F" to account for FAA design standards.
- Construct and extend Taxiway "E" to become an east side partial parallel taxiway for Runway 17-35.
- Construct Taxiway "D" in new location and eliminate the Runway 17 displaced threshold.
- Construct new perimeter road for fuel trucks and other designated airport vehicles

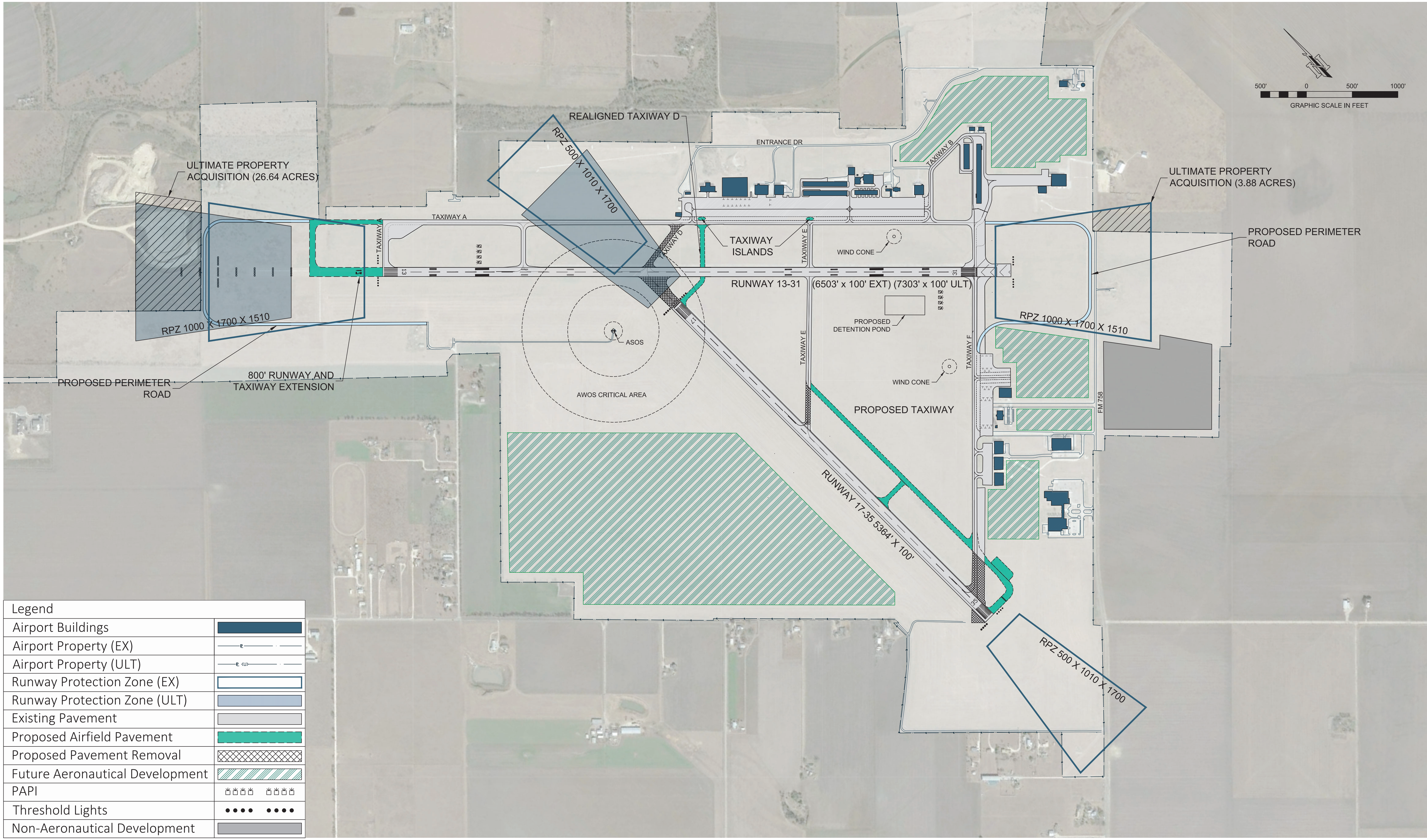
Pros:

- Taxiway system provides better and safer access to runways and throughout the airport.
- Provides additional length to Runway 13-31.
- Utilizes pavement more efficiently by keeping aircraft from traversing active runways.
- Ability to accommodate larger business jets and their operating needs

Cons:

- Potential cost for improvements
- Airport would need to acquire additional property for control of RPZ's

Table 4.3 Airside Alternative One Criteria Summary	
Criteria	Score (Multiplier)
Safety and efficiency of aviation operations	3 (x2)
Ability to accommodate expected general aviation demand	3
Acceptability to users, FAA, and the community	3 (x2)
Land availability and ownership	1
Environmental Factors	2
Airspace / Obstruction requirements	1
Political, jurisdiction, and implementation factors	2
Economic feasibility	2 (x2)
Phasing and constructability considerations	2
Accessibility	2
TOTAL	29 / 39



New Braunfels Regional Airport
Airside Alternative One

Alternative Two

Alternative Two extends Runway 13-31 and associated parallel taxiway (Taxiway "A"), 1,000' to the north, providing an overall usable runway length of 7,503'. This length is capable of accommodating 75% of the national fleet at 90% useful load and all business jet activity that require additional length to operate effectively at the airport. The Medium Intensity Approach Light System (MALS) would be relocated to coincide with the proposed extension; however, the relocation would situate the lights adjacent to the open pit further north. Because of this, there is the possibility to either enhance the equipment footings and length of the lighting poles or fill in the pit to ensure the light system is maintained at a proper height and on stable ground.

Additionally, with this proposed extension, the associated RPZ now extends beyond airport owned property by approximately 35.14 acres and would need to be acquired for RPZ and approach lighting capabilities. Similar to the previous alternative, the weight bearing capacity of the new pavement should be reflective of the existing condition of 30,000 pounds for single-wheel aircraft.

Exhibit 4.2 graphically illustrates Alternative Two and its proposals.

Design Considerations Summary:

- Extend Runway 13-31 and associated parallel Taxiway "A", 1,000' to the north.
- Relocate existing approach lighting system 1,000' to coincide with runway extension (approximately $250,000).
- Relocate south end of Taxiway "F" to account for FAA design standards.
- Construct and extend Taxiway "E" to become mid-field connector for Runway 17-35 and access point to the terminal apron area.
- Construct Taxiway "D" in new location and eliminate the Runway 17 displaced threshold and shift coinciding RPZ to be within airport property.
- Construct new perimeter road for fuel trucks and other designated airport vehicles

Pros:

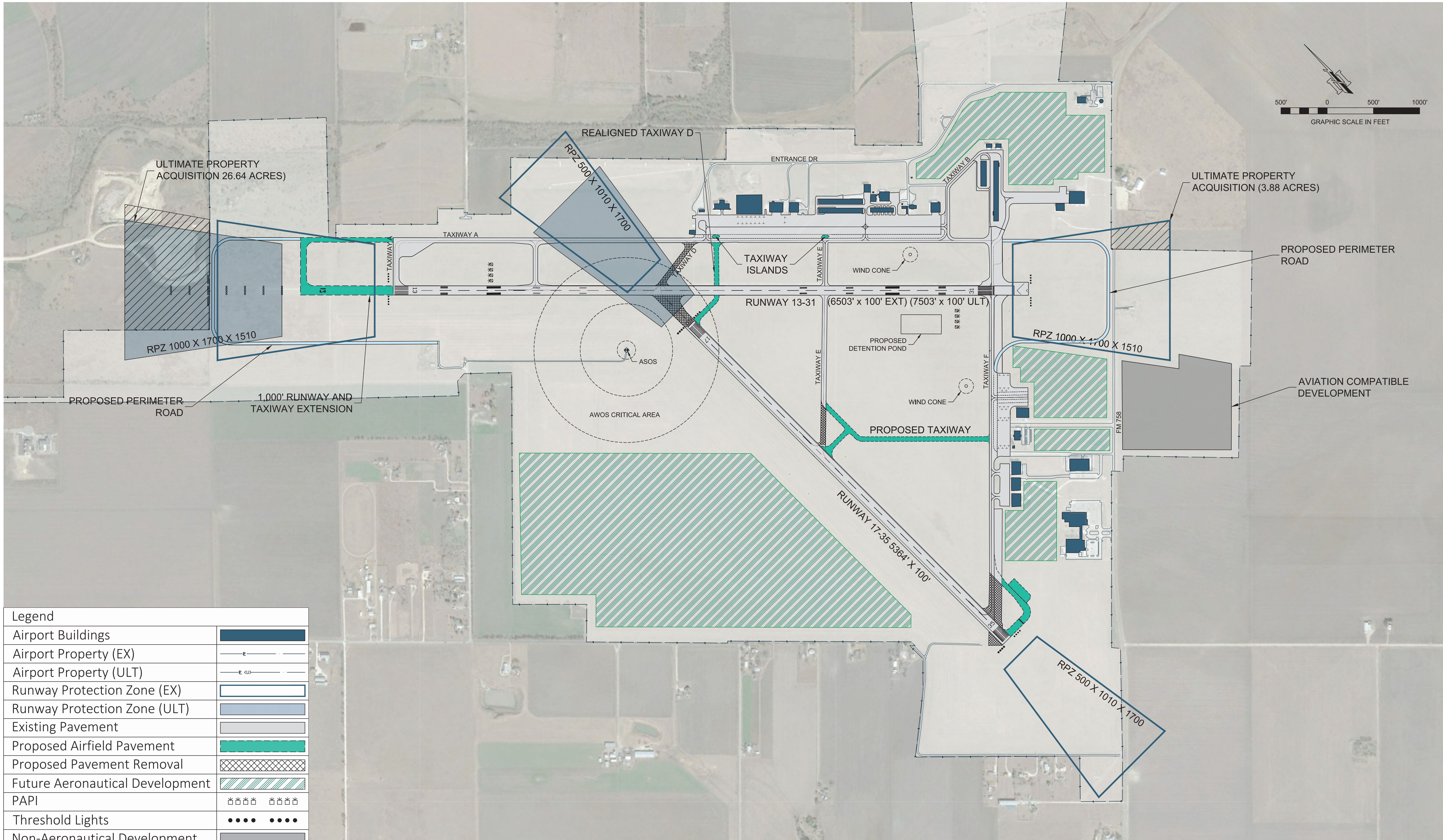
- Taxiway system provides better and safer access to runways and throughout the airport.
- Provides additional length to Runway 13-31.
- Utilizes pavement more efficiently by keeping aircraft from traversing active runways.
- Ability to accommodate larger business jets and their operating needs

Cons:

- Potential cost for improvements
- Potential cost for fill of pit or ancillary enhancements for the lighting system.
- Airport would need to acquire additional property for control of RPZ's

Table 4.4
Airside Alternative Two Criteria Summary

Criteria	Score (Multiplier)
Safety and efficiency of aviation operations	3 (x2)
Ability to accommodate expected general aviation demand	3
Acceptability to users, FAA, and the community	2 (x2)
Land availability and ownership	1
Environmental Factors	2
Airspace / Obstruction requirements	1
Political, jurisdiction, and implementation factors	2
Economic feasibility	2 (x2)
Phasing and constructability considerations	2
Accessibility	2
TOTAL	27 / 39



New Braunfels Regional Airport

Airside Alternative Two

Alternative Three

Alternative Three proposes to extend Runway 13-31 1,000' south, providing an overall runway length of 7,503'. To provide access to the new runway end, Taxiway "A" will be extended 1,000' south and Taxiway "F" will be constructed with a new connector. While this option provides additional length of 1,000', the actual construction need is approximately 600', due to the exiting pavement not currently being utilized for operational needs. This length is capable of accommodating 75% of the national fleet at 90% useful load and all business jet activity that require additional length to operate effectively at the airport.

As mentioned in the *Facility Requirements* chapter, FAA design criteria states this runway should maintain a RSA and ROFA of 1,000' beyond the runway end. Because of the proposed extension, these safety surfaces would now extend beyond FM 758, showcasing the need to relocate the roadway around those areas that should be free and clear of obstructions. Additionally, the associated RPZ for this runway end shifts further south, necessitating the need to acquire approximately 23.57 acres for control within this surface. This alternative also proposes installation of a Medium Intensity Approach Light System (MALS) to Runway 31, providing an additional safety measure for aircraft operating during times of IMC.

Exhibit 4.3 graphically illustrates Alternative Three and its proposals.

Design Considerations Summary:

- Extend Runway 13-31 1,000' to the south.
- Extend Taxiway "A" 1,000' to the south.
- Construct Taxiway "F" connector to Runway 31 end.
- Install new Medium Intensity Approach Lighting System (MALS) on south end
- Relocate and re-route FM 758
- Eliminate the 522' displaced threshold associated with Runway 17.
- Relocate south end of Taxiway "F" to account for FAA design standards.
- Construct and extend Taxiway "E" to become east side partial parallel taxiway for Runway 17-35.
- Construct Taxiway "D" in new location and eliminate the Runway 17 displaced threshold and retain associated RPZ within airport property due to shift.
- Proposed construction of a west side parallel taxiway system to accommodate west side growth and development
- Requirement for airport to own, in fee simple, 23.57 acres for shift of Runway 31 RPZ further south.

- Construct new perimeter road for fuel trucks and other designated airport vehicles

Pros:

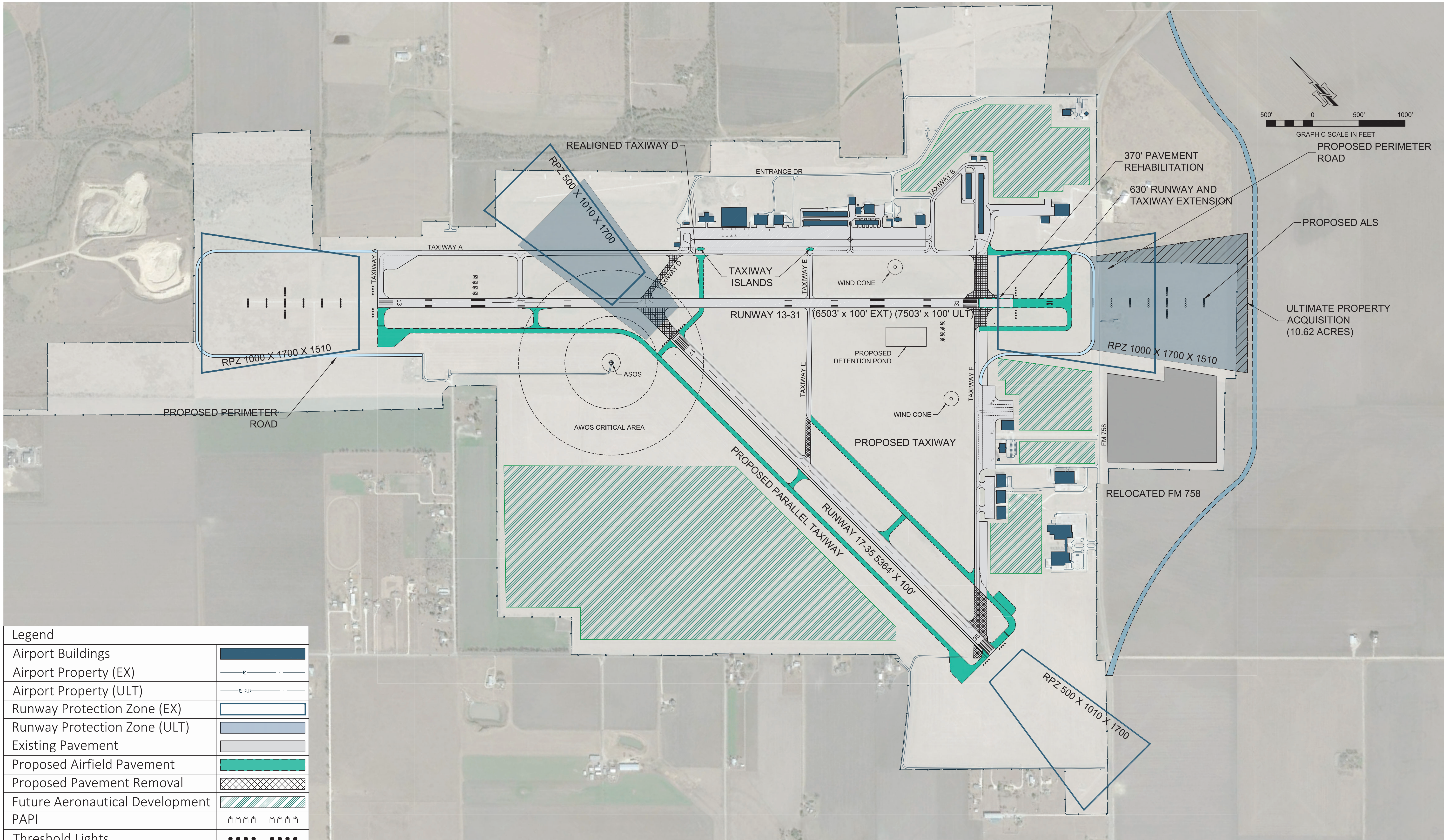
- Taxiway system provides better and safer access to runways and throughout the airport.
- Provides additional length to Runway 13-31, accommodating the needs of larger business jet activity.
- Utilizes pavement more efficiently by keeping aircraft from traversing active runways.
- Cost effective approach to help meet runway length needs.

Cons:

- Overall cost for improvements
- Require significant coordination with local political bodies to justify and accept a plan to relocate the FM 758.
- Airport would need to acquire additional property for control of RPZ's

Table 4.5
Airside Alternative Three Criteria Summary

Criteria	Score (Multiplier)
Safety and efficiency of aviation operations	3 (x2)
Ability to accommodate expected general aviation demand	3
Acceptability to users, FAA, and the community	1 (x2)
Land availability and ownership	1
Environmental Factors	1
Airspace / Obstruction requirements	2
Political, jurisdiction, and implementation factors	1
Economic feasibility	1 (x2)
Phasing and constructability considerations	1
Accessibility	2
TOTAL	21 / 39



New Braunfels Regional Airport

Airside Alternative Three

Alternative Four

Alternative Four duplicates Alternative Two with exception of adopting lower visibility minimums to ½-mile for Runway 13. Based on FAA design criteria, this new proposed approach will require an increase in the size of the associated RPZ (1,000' x 1,700' x 1,510' to 1,000' x 2,500' x 1,750') and include a more complex approach lighting system. The additional land requirement for the RPZ is approximately 36.81 acres and the existing MALS equipment will need to be upgraded to a MALSR (Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights).

Exhibit 4.4 graphically illustrates Alternative Four and its proposals.

Design Considerations Summary:

- Extend Runway 13-31 and associated parallel Taxiway "A", 1,000' to the north.
- Relocate existing approach lighting system 1,000' to coincide with runway extension and upgrade the MALS equipment to a MALSR.
- Relocate south end of Taxiway "F" to account for FAA design standards.
- Construct and extend Taxiway "E" to become mid-field connector for Runway 17-35 and access point to the terminal apron area.
- Construct Taxiway "D" in new location and eliminate the Runway 17 displaced threshold and shift associated RPZ to be within airport property.
- Construct new perimeter road for fuel trucks and other designated airport vehicles
-

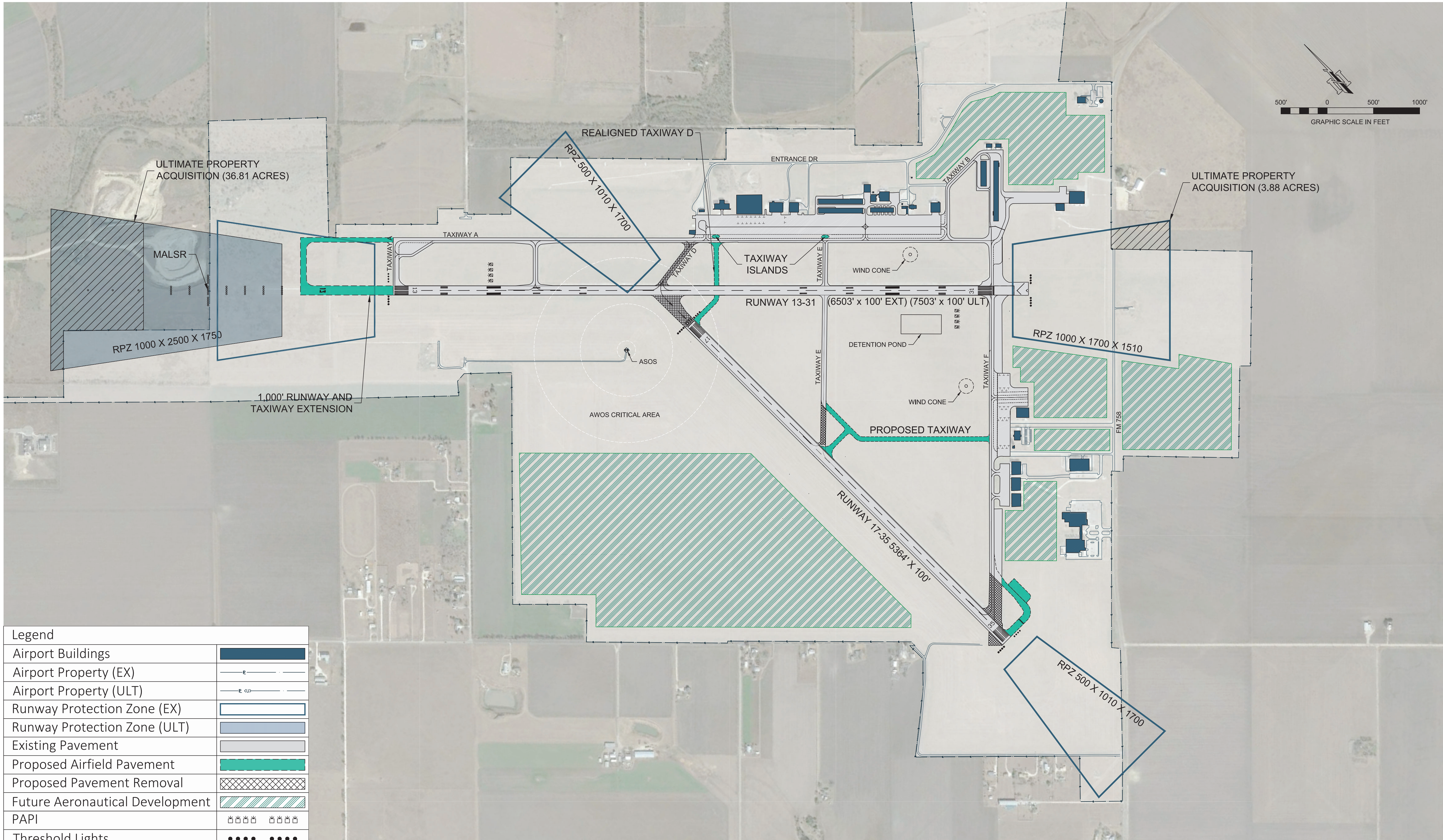
Pros:

- Taxiway system provides better and safer access to runways and throughout the airport.
- Provides additional length to Runway 13-31.
- Utilizes pavement more efficiently by keeping aircraft from traversing active runways.
- Ability to accommodate larger business jets and their operating needs

Cons:

- Potential cost for improvements
- Potential cost for fill of the pit or ancillary enhancements for the new approach lighting system.
- Airport would need to acquire additional property for control of RPZ's

Table 4.6 Airside Alternative Four Criteria Summary	
Criteria	Score (Multiplier)
Safety and efficiency of aviation operations	3 (x2)
Ability to accommodate expected general aviation demand	3
Acceptability to users, FAA, and the community	2 (x2)
Land availability and ownership	1
Environmental Factors	1
Airspace / Obstruction requirements	1
Political, jurisdiction, and implementation factors	2
Economic feasibility	1 (x2)
Phasing and constructability considerations	2
Accessibility	2
TOTAL	24 / 39



New Braunfels Regional Airport

Airside Alternative Four

Landside Alternatives

With the completion of the Airside Facilities Requirements, alternatives will be presented for landside development evaluation.

To help determine terminal and support area facilities for the future planning periods, landside capacity and future demand were evaluated for itinerant and based aircraft parking aprons, aircraft storage facilities, automobile parking, fuel storage, and support area requirements. Both conventional and T-hangars are needed during all time frames of the planning period. Additionally, the New Braunfels Utility (NBU) company has compiled preliminary information regarding potential water well sites within airport property. These have been reflected on the alternative layouts to help provide optimal development locations and not to interfere with proposed well sites.

Development strategies were explored for New Braunfels Regional Airport based on the following criteria:

- Market position
- Regional economic development opportunities
- SWOT analysis results from stakeholders
- Property attributes

By analyzing the landside facility needs as well as the development strategies presented through the Master Plan process, alternatives were evaluated for development. The alternatives for this analysis were prepared in accordance with FAA Advisory Circular 150/5300-13A, *Airport Design* and based on a "neighborhood" type concept where smaller aircraft and larger aircraft facilities are placed in strategic locations across the airport to minimize any potential conflict with each other. The following alternatives consider the "neighborhood" concept and have been assembled to provide a full range of design options.

New Braunfels Utilities (NBU)

In keeping pace with growth in the region, New Braunfels Utilities (NBU) will be providing significant investment on airport property with the development of several Aquifer Storage and Recovery Wells (ASR), which directly inject surface water supplies such as potable water, reclaimed water, or river water into an aquifer for later recovery and use. This investment will include the installation of electric and water lines, allowing the airport an opportunity to expand and develop the west side of the airport. While the exact ASR well quantities and locations have not been determined, a preliminary concept was previously developed for the airport and has been included on the landside alternatives to ensure development does not conflict the proposed well construction sites.

Air Traffic Control Tower Siting

As part of the landside alternatives, an evaluation for preliminary siting of a new location for the existing Air Traffic Control Tower will be evaluated. Based on conversations with airport and ATCT personnel, the existing tower is limited in providing complete unobstructed views of all runway ends – particularly Runway 13. In addition, the tower lacks sufficient RADAR equipment to facilitate additional operations per hour and allow enhanced communications between San Antonio Approach/Departure and the tower itself. FAA Order 6480.4A outlines the methods and criteria used to complete the Air Traffic Control Tower siting process which determines the optimum height and location of the new, or replacement ATCT. Each of the following siting criterion should be analyzed during the siting process:

1. Visibility Performance Requirements.
    - Visibility from the ATCT cab should provide an unobstructed view of all controlled movement areas and of air traffic in the vicinity of the airport.
    - A Line of Sign (LOS) Angle of Incidence Analysis should be performed to access the angle at which the observers' view of a distant object intersects with the airport surface.
    - Consideration should also be given to the two-point lateral discrimination to ensure that ACTC location and height enhance visibility performance as much as possible.
2. Federal Laws, Regulations and Standards
    - Terminal Instrument Procedures (TERPS) for the airport should be evaluated to ensure a new ATCT would not degrade any current or planned terminal instrument procedures.
    - 14 CFR Part 77 shall be reviewed and complied with during the siting process to ensure conformance to all applicable airport surfaces.
    - The ATCT should be sited where it does not degrade of affect the performance of existing or planned communications, navigation and surveillance equipment and facilities.
    - The recommended ATCT location will be subject to an Environmental Due Diligence Audit (EDDA) review and to the National Environmental Protection Act (NEPA) process outlined in FAA Order 1050.1, *Environmental Impacts: Policies and Procedures*, to determine impacts.
3. Operational Requirements
    - The ATCT shall be oriented where the primary operational view faces north, or alternately east, or west, or finally south in that order of preference to provide consideration to; direct sun glare, indirect sun glare off natural and manmade surfaces, night-time lighting glare, external light sources, and thermal distortion.
    - A 10-year weather history should be analyzed to determine local weather phenomena that may impair visibility including the predominant flow of traffic, ceiling and visibility in determining ATCT height.
    - Consideration shall be given to impacts or a look down angle to ensure an unobstructed view of controlled movement areas around the base of the ATCT.

- Consideration should be given to LOS from the existing ATCT during construction of the new ATCT and impacts from the old ATCT when operating from the new ATCT.
- Access to the ATCT shall avoid crossing areas of aircraft operations.
- Visibility of all airport surface areas for ground operations or aircraft and of airport ground vehicles on ramps, aprons, and tie-down areas, and test areas shall be considered.

4. Economic Considerations
    - Detailed cost estimates, to include at a minimum the following items, shall be documented for the preferred sites in the siting report.
        - Height. Consideration shall be given to the height of a proposed ATCT as it is typically the largest contributing factor to the project cost.
        - Land Use Planning. The ATCT plot shall have sufficient area to accommodate the initial building, parking, and future expansion. Environmental concerns shall be documented as part of the construction cost estimate.
        - Utilities and Cabling: Consideration shall be given to the connectivity of existing FAA cabling and utilities to the preferred ATCT sites.
        - Site Access. Consideration shall be given to any necessary new or redesigned site access roadways.
        - Security. Consideration shall be given to the impacts of security compliance at the preferred ATCT sites.

Terminal Building Siting

Most airports have at least one on-site building that designates as the focal point for general aviation. All terminal buildings should provide at least the most basic meeting / greeting and pilot services. The specific layout is often driven by whether or not it is an airport-owned and operated facility or a private FBO building while the size is dictated by the peak hour passengers – previously discussed in the *Forecast* chapter. Considerations for locating a terminal building include:

- Providing maximum visibility from the runway and / or parallel taxiway for arriving aircraft.
- Providing good visibility of the airfield from the terminal.
- Providing safe and efficient access from primary roadways.
- Being close to an adequate apron for based and transient aircraft.
- Having room for adequate automobile parking.

- Not interfering with the possible expansion or construction of other airfield facilities.
- Having room for future expansion of the building and associated parking.
- Allowing easy access to utilities or areas for well water and / or septic system.

Because the terminal building is a focal point of the airport, this structure should be easy to locate and navigate to / from the airside and landside. The view of the terminal should not be blocked by other buildings and other buildings should not block the view of the airfield from the terminal. The terminal should be aligned with a parallel taxiway or the runway as much as possible. These variables will be evaluated as part of this alternatives evaluation.

Fuel Farm Facility Siting

Other than determining the type and quantity of fuel needed at an airport, the primary component and concern is location and placement a fuel farm facility. Factors to consider for fuel farm location include:

- Ability to provide safe and easy ingress / egress for the fuel delivery truck. Trucks should avoid having to cross active airfield pavements.
- Provide safe and easy ingress and egress for fuel tenders and aircraft to /from a self-service area.
- Situated outside taxiway and taxi-lane object free areas.
- Does not interfere with other aircraft or airfield operations.

When considering the location and access to the site for the delivery truck, the unfamiliarity of the driver with the airport and maneuverability are critical. The delivery truck should not have to cross any aprons, taxiways, T-hangars, taxi-lanes, or runways to reach the facility. Ideally, the fuel farm location would be such that the delivery vehicle does not have to enter the secure fenced portion of the airport.

The size of an aviation fuel farm will depend on the amount and types of fuel needed which are determined by the projected fuel usage based on historical records or determined from the master plan. The greatest impact in siting a fuel farm is maintaining accordance with NFPA 407, *Standard for Aircraft Fuel Servicing*, which states, no fuel system should located within 50 feet of any building.

These attributes will be evaluated during the conceptualization of siting the fuel farm.

General Aviation Development

According to the forecast based aircraft counts, expected increases in both training and itinerant operations and the facility requirement projections that were presented in the previous chapter, alternative development options have been evaluated that will accommodate the projected demand for the 20-year planning period and beyond. It should be noted that the future development of aircraft storage facilities would be demand dictated. Therefore, the number, size, and location of these facilities will vary depending on the demand for the specific type, and the development plans must be flexible to accommodate a variety of users. Additionally, there are important development guidelines that the airport sponsor should consider when making hangar placement determinations at the airport, which include:

- Each executive hangar should be supplied with taxiway access that is separated from automobile access and adjacent automobile parking. This is most efficiently accomplished when a row of hangars is developed and provided with taxiway access on one side and automobile access and parking on the other side.
- Each T-hangar should be nested and developed with taxiway access to both sides of the hangar. Controlled automobile access should be provided to the taxiway / apron area near the T-hangars, and a public access parking area should be provided near the T-hangar facilities to accommodate both users and visitors.

Based upon input received from airport personnel, coupled with the projected aircraft storage improvements that will be needed to serve the aviation users, the following hangar, apron, and access taxiway development improvement options have been identified, and are presented in the **Exhibits** 4.5, 4.6, 4.7, and 4.8. Included in the landside alternatives are concepts that consider the need or potential for Alamo Community College to provide flight training and / or aviation related education opportunities should the need arise in the future. It is important to recognize the ultimate build-out of the various aviation development areas presented far exceeds that which is projected for the 20-year planning period of this study.

Alternative One – Option 1

In Alternative One – Option 1, consideration is given to providing a multi-use development area on the west side of the field to account for a new terminal, replete with auto parking, new and improved access off Saur Road, a new proposed ATCT location to allow for unobstructed views of all runway ends, and considers the preliminary locations of the proposed NBU water well sites. Additionally, the 'neighborhood" concept can be witnessed with segregation of various type hangars and aircraft needs. Access to the runway system is provided by a new west side parallel taxiway system.

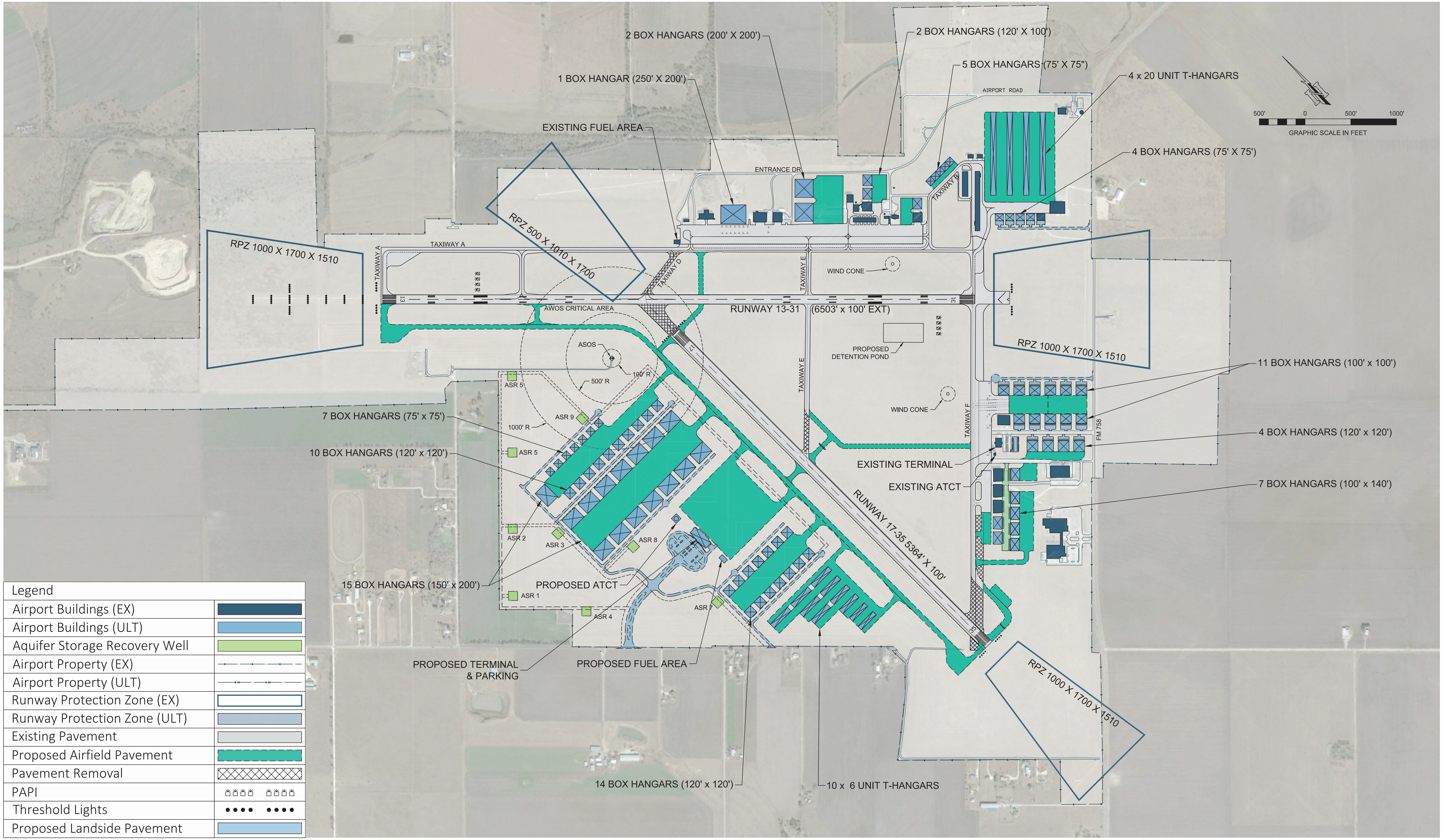
The East Development Area, bounded by Taxiway "A" on the west, Airport Road on the east, and FM 758 on the south is proposed to provide infill with the removal of the existing shade T-hangars and expansion of similar type box / executive type hangars. The area between Taxiway "B" and the National Weather Service accommodates new T-hangars and smaller, individual box hangars.

The existing terminal area is provided an expansion of the auto parking area and addition large corporate type hangars. The proposed hangar area and associated taxiway west of the terminal is currently being designed for construction.

Summary of Improvements include:

- T-hangars: 4 Units (20 bays each); 10 units (6 bays each);
- Conventional Box / Executive Hangars:
  - 16 units – 75' x75'
  - 11 units – 100' x 100'
  - 7 units – 100' x 140'
  - 28 units – 120' x 120'
  - 17 units – 150' x 200'
- Apron: 87,000 square yards

KSA



New Braunfels Regional Airport

New Braunfels Regional Airport
Landside Alternative One - Option 1

Alternative One – Option 2

Alternative One – Option 2, retains the same layout of Option 1 with exception of a more elongated terminal apron for aircraft parking. Due to the larger apron, the space requirements precludes the ability to provide as many storage units within this west side area. With exception of a decrease in hangar options, this alternative remains committed to providing the same multi-use development area to account for a new terminal, auto parking, new and improved access off Saur Road, and a new proposed ATCT location. Additionally, the 'neighborhood" concept is retained by segregating the various hangar types and aircraft needs. Access to the runway system is provided by a new west side parallel taxiway system.

The east side and existing terminal development areas are unchanged from Option 1.

Summary of improvements include:

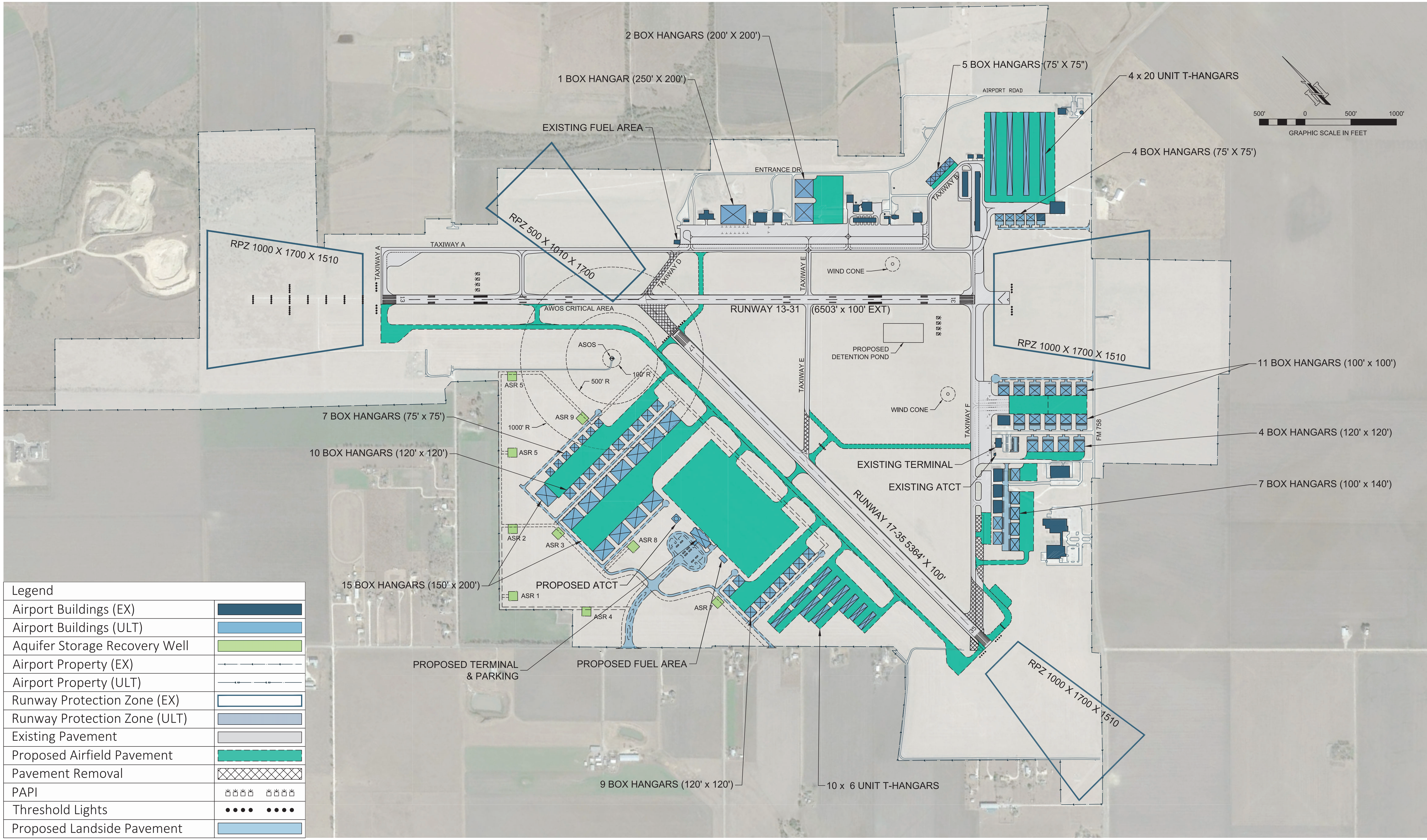
- T-hangars: 4 Units (20 bays each); 10 units (6 bays each);
- Conventional Box / Executive Hangars:
    - 16 units – 75' x75'
    - 11 units – 100' x 100'
    - 7 units – 100' x 140'
    - 23 units – 120' x 120'
    - 12 units – 150' x 200'
- Apron: 135,000 square yards

Alternative Two

Alternative Two proposes construction of a new terminal building on the east side of the airport in the location currently occupied by the shade T-hangars. The new terminal location provides ample auto parking and is situated to take advantage of the large east side apron. This new location situates the terminal closer to the existing fuel farm and takes advantage of access to Taxiway "A" and would provide a more seamless route to / from Runway 13-31 for business jet operators. Additionally, a new location for the ATCT is proposed for the north end of this apron, adjacent to the fuel farm. The aircraft stored within the existing shade T-hangars will be relocated to a new set of T-hangars proposed for construction on the south end of the field, situated off Taxiway "F".

The west side development area offers a complete build-out of various sizes and types of hangars. The hangar placements have accounted for the proposed well sites based on New Braunfels Utility data. Access to this area will be provided off Saur Road.

Similar to the previous alternatives, the existing terminal area is provided an expansion of the auto parking area and addition large corporate type hangars. The proposed hangar area and associated taxiway west of the terminal is currently being designed for construction.



New Braunfels Regional Airport

Landside Alternative One - Option 2

Summary of improvements include:

- T-hangars: 4 Units (20 bays each)
- Conventional Box / Executive Hangars:
  - 16 units – 75' x75'
  - 14 units – 100' x 100'
  - 7 units – 100' x 140'
  - 42 units – 120' x 120'
  - 20 units – 150' x 200'
  - 2 Units – 200' x 250'

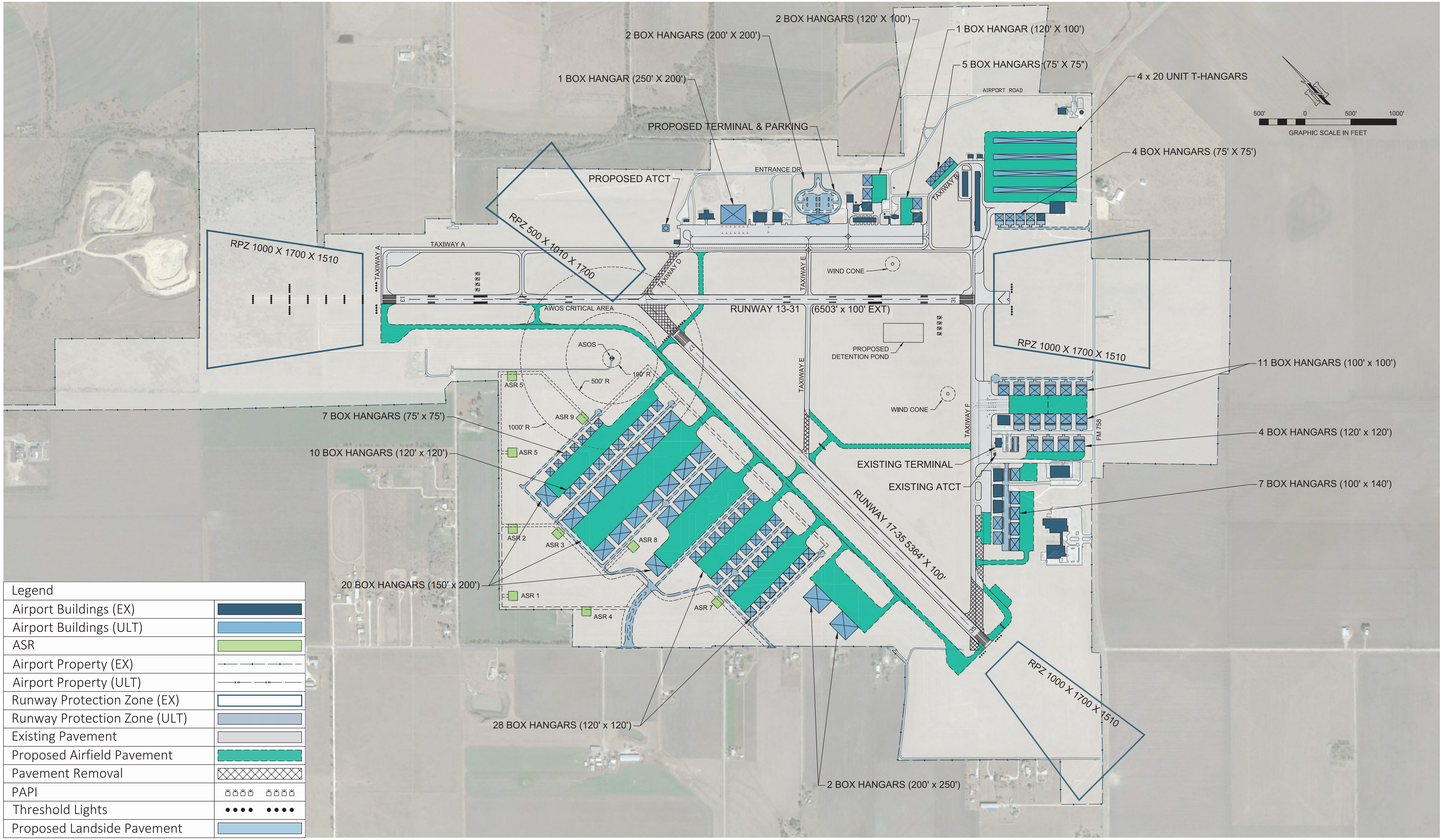
Alternative Three

Alternative Three retains the existing terminal area in its current location with the opportunity for expansion. The proposed hangars follow the pattern in previous alternatives; however, a new fuel farm area is proposed to be located on the east of the apron, adjacent to the hangars currently in the design stage. This new fuel location relocates the equipment to an area that is more strategic and convenient for visiting and larger aircraft utilizing the airport. The existing ATCT would remain in its current location as part of this alternative.

The east side development area would take advantage of infill opportunities and construction for T-hangar aircraft storage, while the west side would preserve the opportunity to attract commercial / industrial development off Saur Road and preserve the opportunity to development hangars along the proposed west side parallel taxiway.

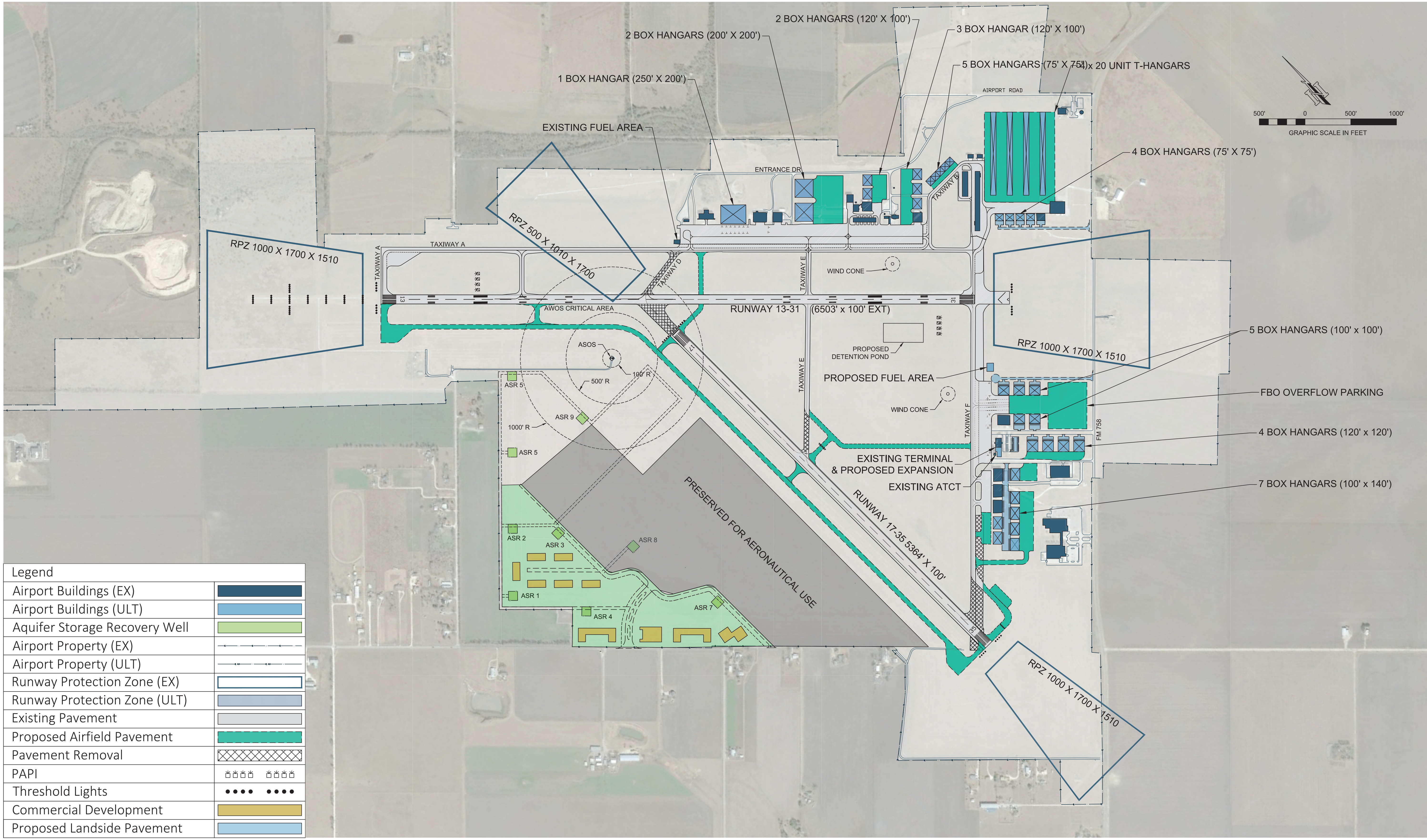
Summary of improvements include:

- T-hangars: 4 Units (20 bays each)
- Conventional Box / Executive Hangars:
  - 9 units – 75' x75'
  - 10 units – 100' x 100'
  - 7 units – 100' x 140'
  - 4 units – 120' x 120'
  - 2 units – 150' x 200'
  - 2 units – 200' x 200'



New Braunfels Regional Airport

Landside Alternative Two



New Braunfels Regional Airport

Landside Alternative Three

4.5 Development Alternatives Evaluation

The overall Recommended Development Plan combines aspects of each airside and landside alternative. In this comprehensive plan, the most feasible and relevant portions of each alternative are included to give one consolidated overview of what development should occur at the airport. This recommended plan will be included in the Airport Layout Plan for approval and will be the basis of the Implementation and Capital Improvement Program moving forward.

Airside

The airside portion considers those improvements related to the runway and taxiway system as they relate to safety, planning and design criteria, and capability to accommodate existing and future operational needs of the airport and its users. Operational activity at New Braunfels Regional Airport is forecast to increase through the 20-year planning time frame of this Master Plan, serving a full-range of general and business aviation users. Major airside issues addressed in the recommended plan include:

- Adhere to Runway Design Code (RDC) C/D-II standards on the airfield
- Extend Runway 13-31 and associated parallel Taxiway “A”, 1,000’ to the north to optimize and facilitate larger aircraft operations.
- Relocate existing approach lighting system 1,000’ to coincide with runway extension.
- Remove displaced threshold to Runway 17 and shift associated RPZ to remain within airport property.
- Enhance airfield geometry and adhere to FAA design standards by:
    - Relocating south end of Taxiway “F”
    - Constructing and extending Taxiway “E” to become mid-field connector for Runway 17-35 and access point to the terminal apron area.
    - Constructing Taxiway “D” in new location and eliminate the Runway 17 displaced threshold and shift coinciding RPZ to be within airport property.
    - Constructing new full-length west parallel taxiway
- Constructing a new perimeter road for fuel trucks and other designated airport vehicles.
- Land acquisition to accommodate Runway 13-31 extension and approach lighting system.
- Upgrade MITL to light emitting diode (LED) technology and install Precision Approach Path Indicator Lights (PAPI-4) to Runway 17-35.

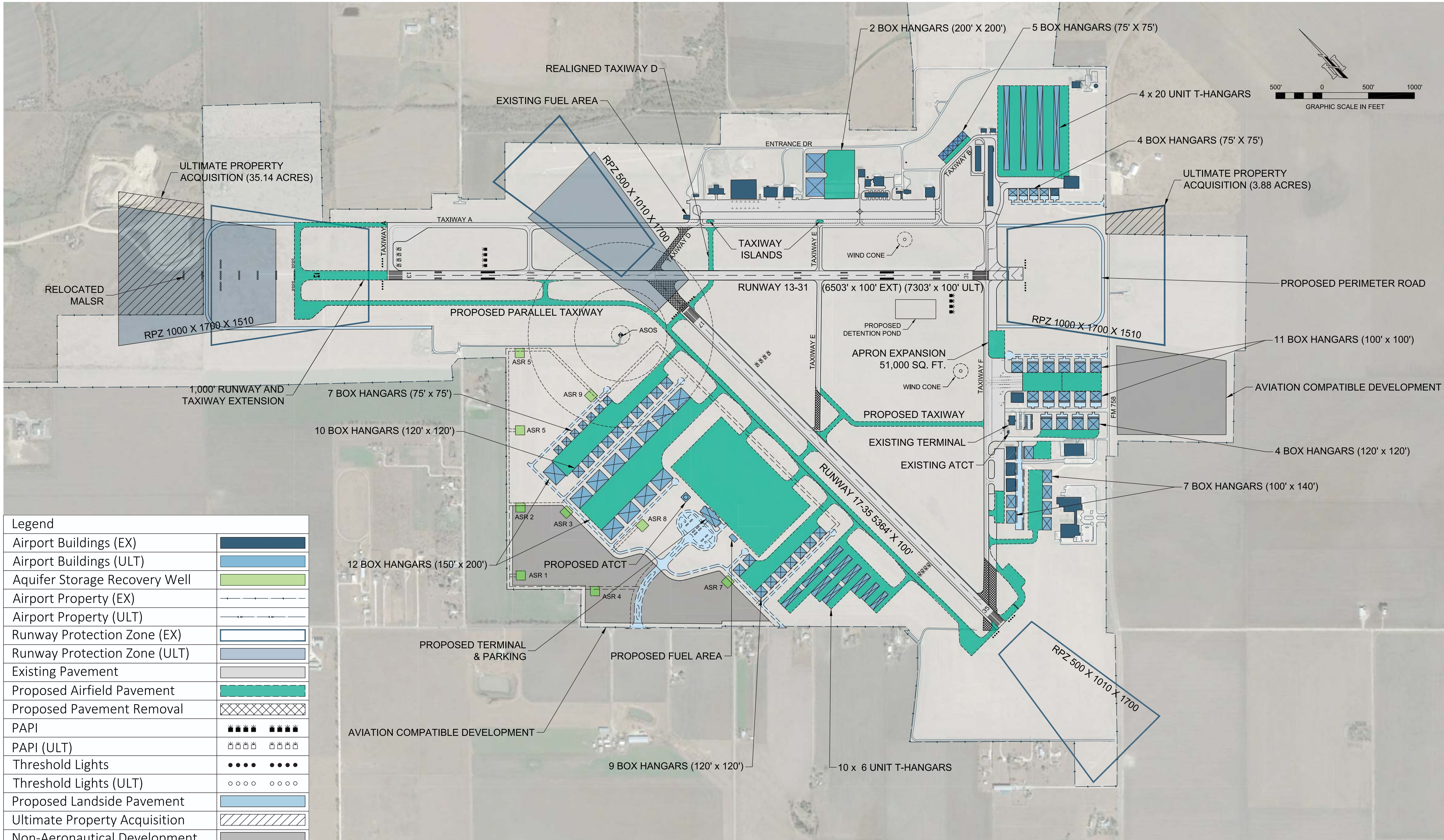
Landside

The primary goal of landside facilities is to provide adequate terminal facilities and aircraft storage space to meet forecast demand, while also maximizing operational efficiencies. Landside components include terminal buildings, hangars (storage / FBO / MRO), aircraft parking aprons, and aviation support services.

Additionally, those areas capable of supporting revenue generating opportunities should be allocated and seen as providing economic benefits to both the airport and the region. The ability of the airport to identify adjacent land uses in an effort to preserve the facility well into future is also an important aspect of landside development. Major landside issues addressed in the recommended plan include:

- Construct new west side general aviation terminal building and associated aircraft parking apron.
- Construct new airport entrance road.
- Designate areas able to accommodate aviation development.
- Create new fuel farm and self-serve dispensing location adjacent to new west side parking apron.
- As demand dictates, construct various sized aircraft storage hangars.
- Invest in new RADAR equipment for ATCT.
- Other airport support facilities as necessary

The ultimate build-out or initial construction of the development areas will not only be flexible, but will be demand driven and not constructed until the market dictates the need for additional aircraft facilities. The following chapter, *Capital Improvement Program*, will evaluate the individual projects at the airport over the 20-year time frame and associate a proposed cost and funding source



New Braunfels Regional Airport

Recommended Development

AIRPORT LAYOUT PLAN

Chapter 5. Airport Plans

As required by the FAA and TxDOT, an Airport Layout Plan set was prepared to graphically depict the airport environs and the subsequent recommendations for development described in this Airport Master Plan. Recommendations for airfield geometry, airspace and obstructions, and landside development are described in the following

- Cover Sheet
- Airport Layout Plan Drawing
- Inner Portion of the Approach Surface Drawing (Runways 13, 31, 17, and 35)
- Runway Departure Surface Drawing
- Terminal Area Drawing
- Land Use Plan
- Exhibit "A" Property Map

5.1 Airport Layout Plan Drawing

The Airport Layout Plan (ALP), which illustrates both airside and landside facilities, is a graphic depiction of the existing and ultimate airport facilities that will be required for the airport to properly accommodate the forecast future demand. Additionally, the ALP provides detailed information on both airport and runway design criteria, which is necessary to define relationships with applicable standards.

5.2 Inner Portion of the Approach Surface Drawing

Inner portion drawings provide a more detailed view of the inner portion of the FAR Part 77 imaginary approach surfaces. This drawing provides large scale plan and profile delineations of the approach surfaces out to a distance where the surface is 100 feet above the runway end elevation. They are intended to facilitate identification of roads, utility lines, railroads, structures, trees and vegetation, and other possible obstructions that may lie within the confines of, or near, the approach surfaces close to the runway ends. Inner portion drawings are based upon the ultimate planned runway lengths, the ultimate planned approaches to each runway end, and the ultimate runway end elevations.

5.3 Runway Departure Surface Drawing

This drawing is a large scale plan and profile illustration depicting the dimension and slope of the departure end of runway (DER) surfaces. No object should penetrate a surface beginning at the elevation of the DER or end of the clearway, whichever is greater, that slopes to a 40 to 1 gradient. This drawing is based upon the ultimate planned runway length, along with the ultimate planned departure surface extending from the runway end.

5.4 Terminal Area Plan

The terminal area plan illustrates the projected facilities layout of the airport based on the recommended development plan. This plan specifies location and size of hangars, aprons, taxi-lanes, fuel farm, ATCT, and other improvements based on the 20-year footprint.

5.5 Land Use Drawing

The purpose of the land use drawing is to provide the airport a plan for leasing revenue producing areas on the airport. All existing and future development with the airport boundary will be compatible with the primary function of the airport and will generate lease revenue to the operation of the airport.

This drawing also provides guidance to local authorities for establishing appropriate land use zoning near the airport. As specified by FAA Grant Assurance 21, *Compatible Land Use*, the airport sponsor, "will take appropriate action, to the extent reasonable, include the adoption of zoning laws, to restrict the use of land adjacent to, or in the immediate vicinity of, the airport to activities and purposes compatible with normal airport operations, including landing and take-off of aircraft."

5.6 Exhibit "A" Airport Property Map

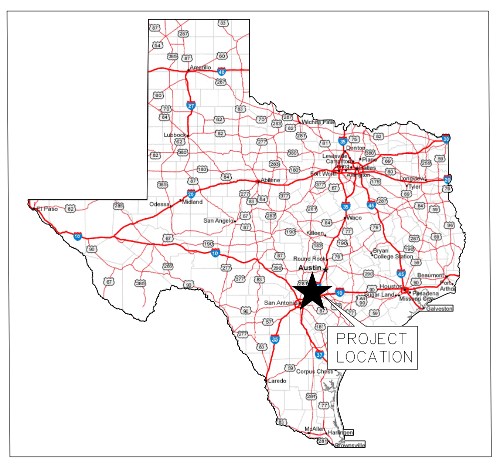
This map indicates how various tracts of airport property and / or easements were acquired and the dates of such acquisition. Its purpose is to provide documentation of the current and future aeronautical use of land acquired with federal funds or through an FAA administered land transfer program.

AIRPORT LAYOUT PLAN

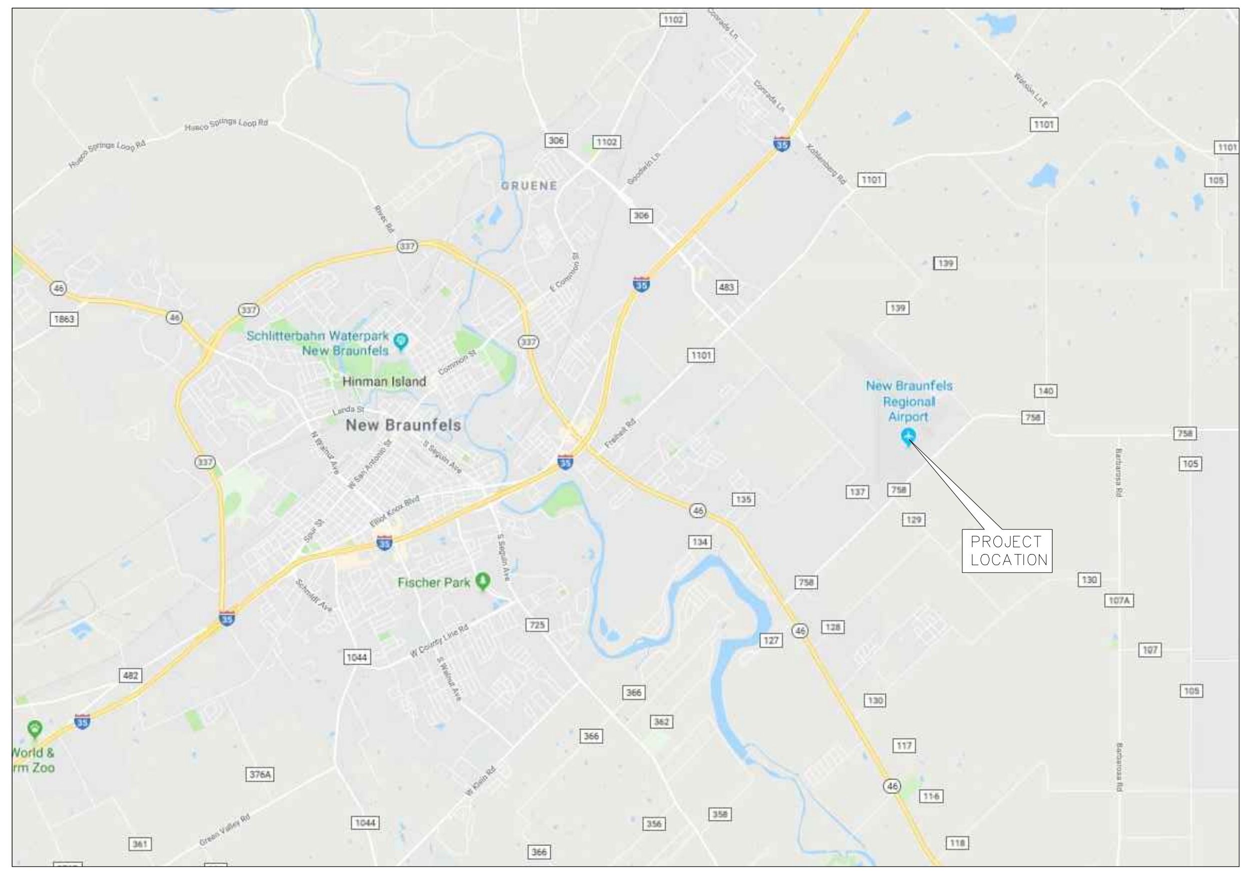
FOR

NEW BRAUNFELS REGIONAL AIRPORT

NEW BRAUNFELS, TEXAS



LOCATION MAP



VICINITY MAP

SHEET INDEX	
NO.	TITLE
1	TITLE SHEET
2	AIRPORT LAYOUT DRAWING
3	INNER PORTION OF THE APPROACH SURFACE DRAWING – RUNWAY 13
4	INNER PORTION OF THE APPROACH SURFACE DRAWING – RUNWAY 31
5	INNER PORTION OF THE APPROACH SURFACE DRAWING – RUNWAY 17
6	INNER PORTION OF THE APPROACH SURFACE DRAWING – RUNWAY 35
7	INNER PORTION OF THE APPROACH SURFACE DRAWING – RUNWAY 17
8	INNER PORTION OF THE APPROACH SURFACE DRAWING – RUNWAY 35
9	DEPARTURE SURFACE DRAWING – RUNWAY 13–31
10	DEPARTURE SURFACE DRAWING – RUNWAY 17–35
11	TERMINAL AREA DRAWING
12	TERMINAL AREA DRAWING
13	TERMINAL AREA DRAWING
14	LAND USE DRAWING
15	EXHIBIT A PROPERTY MAP

MAYOR
BARRON CASTELL

CITY COUNCIL
SHANE HINES
JUSTIN MEADOWS
HARRY BOWERS
METTHEW E. HOYT
WAYNE PETERS
LEAH A. GARCIA

CITY MANAGER
ROBERT CAMARENO

AIRPORT MANAGER
ROBERT LEE

REV	DESCRIPTION	DATE	APPROVED

TEXAS DEPARTMENT OF TRANSPORTATION
AVIATION DIVISION

ALP APPROVED ACCORDING TO FAA AC 150/5300–13 CHANGE 16 PLUS THE REQUIREMENTS OF A FAVORABLE ENVIRONMENTAL FINDING AND FAA NRA STUDY PRIOR TO THE START OF ANY LAND ACQUISITION OR CONSTRUCTION ON AIRPORT PROPERTY.

DAVID FULTON, DIRECTOR, AVIATION DIVISION — DATE

AIRPORT SPONSOR

CURRENT AND FUTURE DEVELOPMENT DEPICTED ON THIS ALP IS APPROVED AND SUPPORTED BY AIRPORT SPONSOR

SPONSOR ACKNOWLEDGES APPROVAL OF ALP BY TXDOT DOES NOT CONSTITUTE A COMMITMENT TO FUNDING.

SIGNATURE — DATE

TITLE, AIRPORT SPONSOR'S REPRESENTATIVE

PREPARED BY:

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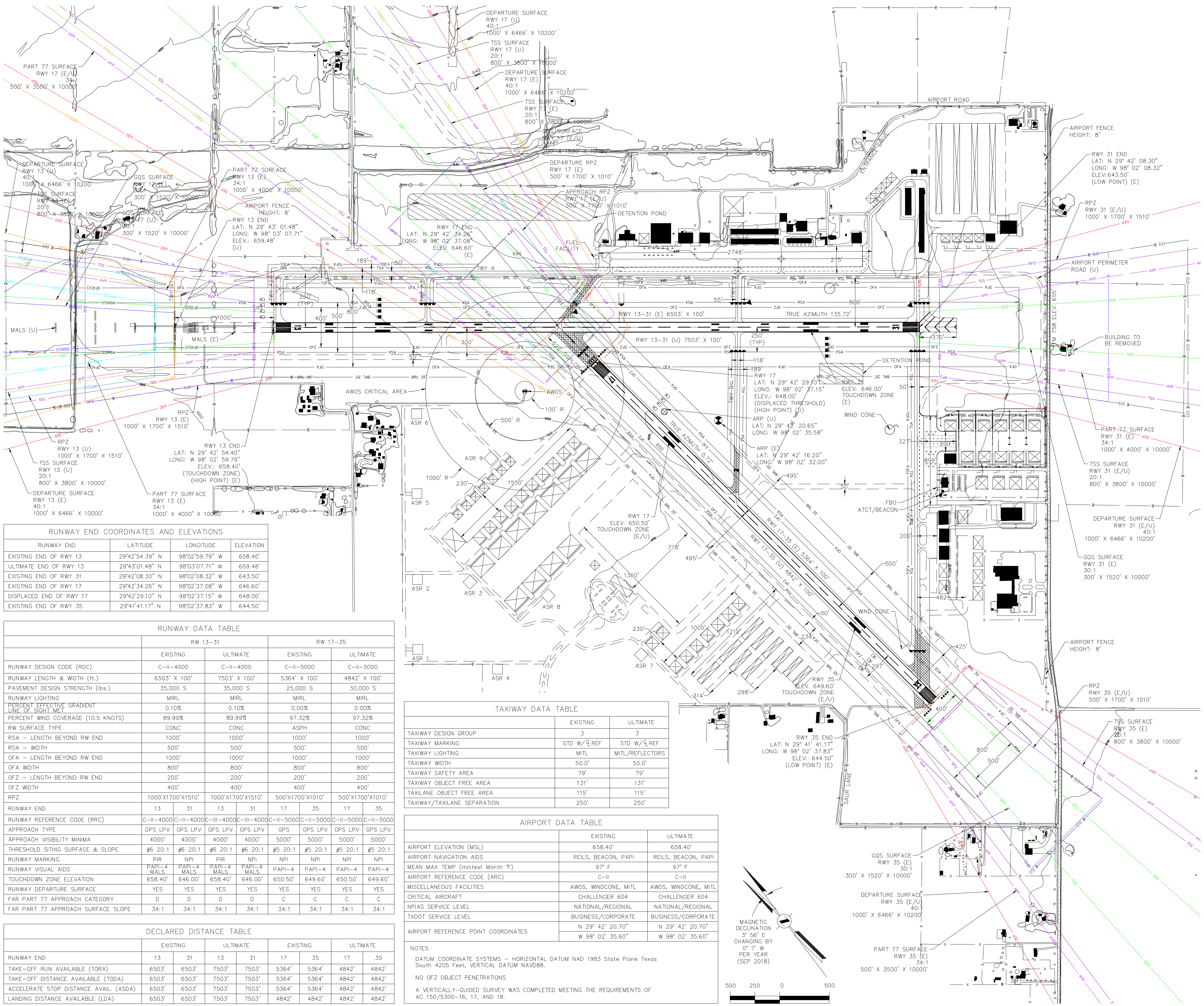
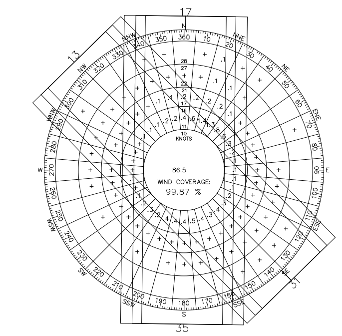
M MALLONEE — SEPTEMBER 2018
DESIGNED BY — DATE

C MOERI — SEPTEMBER 2018
DRAWN BY — DATE

TITLE SHEET
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

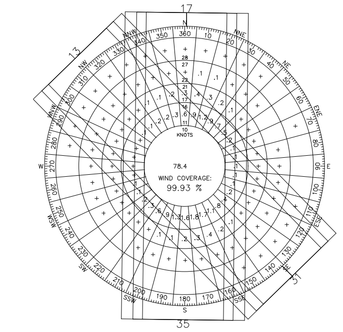
Texas Department of Transportation
Aviation Division





IFR WIND COVERAGE			
RUNWAY	10.5 KNOTS	13 KNOTS	16 KNOTS
RUNWAY 13-31	91.65%	95.09%	98.52%
RUNWAY 17-35	97.07%	98.70%	99.57%
COMBINED COVERAGE	99.77%	99.81%	99.87%

STATION 722550, NEW BRAUNFELS REGIONAL AIRPORT 24,635 OBSERVATIONS
JAN. 2008 – DEC 2017
WWW.NCDC.NOAA.GOV



AWWR WIND COVERAGE			
RUNWAY	10.5 KNOTS	13 KNOTS	16 KNOTS
RUNWAY 13-31	89.99%	94.74%	98.56%
RUNWAY 17-35	97.32%	98.98%	99.75%
COMBINED COVERAGE	99.87%	99.90%	99.93%

STATION 722550, NEW BRAUNFELS REGIONAL AIRPORT 137,874 OBSERVATIONS
JAN. 2008 – DEC 2017
WWW.NCDC.NOAA.GOV

RUNWAY END COORDINATES AND ELEVATIONS

RUNWAY END	LATITUDE	LONGITUDE	ELEVATION
EXISTING END OF RWY 13	29°42'54.39" N	98°02'59.79" W	658.40'
ULTIMATE END OF RWY 13	29°43'01.48" N	98°03'07.71" W	659.48'
EXISTING END OF RWY 31	29°42'08.30" N	98°02'08.32" W	643.50'
EXISTING END OF RWY 17	29°42'34.26" N	98°02'37.08" W	646.60'
DISPLACED END OF RWY 17	29°42'29.10" N	98°02'37.15" W	648.00'
EXISTING END OF RWY 35	29°41'41.17" N	98°02'37.83" W	644.50'

RUNWAY DATA TABLE

	RW 13-31				RW 17-35			
	EXISTING		ULTIMATE		EXISTING		ULTIMATE	
RUNWAY DESIGN CODE (RDC)	C-II-4000		C-II-4000		C-II-5000		C-II-5000	
RUNWAY LENGTH & WIDTH (ft.)	6503' X 100'		7503' X 100'		5364' X 100'		4842' X 100'	
PAVEMENT DESIGN STRENGTH (lbs.)	35,000 S		35,000 S		25,000 S		30,000 S	
RUNWAY LIGHTING	MIRL		MIRL		MIRL		MIRL	
PERCENT EFFECTIVE GRADIENT LINE OF SIGHT MET	0.10%		0.10%		0.00%		0.00%	
PERCENT WIND COVERAGE (10.5 KNOTS)	89.99%		89.99%		97.32%		97.32%	
RW SURFACE TYPE	CONC		CONC		ASPH		CONC	
RSA – LENGTH BEYOND RW END	1000'		1000'		1000'		1000'	
RSA – WIDTH	500'		500'		500'		500'	
OFA – LENGTH BEYOND RW END	1000'		1000'		1000'		1000'	
OFA WIDTH	800'		800'		800'		800'	
OFZ – LENGTH BEYOND RW END	200'		200'		200'		200'	
OFZ WIDTH	400'		400'		400'		400'	
RPZ	1000'X1700'X1510'		1000'X1700'X1510'		500'X1700'X1010'		500'X1700'X1010'	
RUNWAY END	13	31	13	31	17	35	17	35
RUNWAY REFERENCE CODE (RRC)	C-II-4000	C-II-4000	C-III-4000	C-III-4000	C-II-5000	C-II-5000	C-II-5000	C-II-5000
APPROACH TYPE	GPS LPV	GPS LPV	GPS LPV	GPS LPV	GPS	GPS LPV	GPS LPV	GPS LPV
APPROACH VISIBILITY MINIMA	4000'	4000'	4000'	4000'	5000'	5000'	5000'	5000'
THRESHOLD SITING SURFACE & SLOPE	#6 20:1	#6 20:1	#6 20:1	#6 20:1	#5 20:1	#5 20:1	#5 20:1	#5 20:1
RUNWAY MARKING	PIR	NPI	PIR	NPI	NPI	NPI	NPI	NPI
RUNWAY VISUAL AIDS	PAPI-4 MALS	PAPI-4 MALS	PAPI-4 MALS	PAPI-4 MALS	PAPI-4	PAPI-4	PAPI-4	PAPI-4
TOUCHDOWN ZONE ELEVATION	658.40'	646.00'	658.40'	646.00'	650.50'	649.60'	650.50'	649.60'
RUNWAY DEPARTURE SURFACE	YES	YES	YES	YES	YES	YES	YES	YES
FAR PART 77 APPROACH CATEGORY	D	D	D	D	C	C	C	C
FAR PART 77 APPROACH SURFACE SLOPE	34:1	34:1	34:1	34:1	34:1	34:1	34:1	34:1

DECLARED DISTANCE TABLE

	EXISTING		ULTIMATE		EXISTING		ULTIMATE	
RUNWAY END	13	31	13	31	17	35	17	35
TAKE-OFF RUN AVAILABLE (TORA)	6503'	6503'	7503'	7503'	5364'	5364'	4842'	4842'
TAKE-OFF DISTANCE AVAILABLE (TODA)	6503'	6503'	7503'	7503'	5364'	5364'	4842'	4842'
ACCELERATE STOP DISTANCE AVAIL. (ASDA)	6503'	6503'	7503'	7503'	5364'	5364'	4842'	4842'
LANDING DISTANCE AVAILABLE (LDA)	6503'	6503'	7503'	7503'	4842'	4842'	4842'	4842'

TAXIWAY DATA TABLE

	EXISTING	ULTIMATE
TAXIWAY DESIGN GROUP	3	3
TAXIWAY MARKING	STD W/ ℄ REF	STD W/ ℄ REF
TAXIWAY LIGHTING	MITL	MITL/REFLECTORS
TAXIWAY WIDTH	50.0'	50.0'
TAXIWAY SAFETY AREA	79'	79'
TAXIWAY OBJECT FREE AREA	131'	131'
TAXILANE OBJECT FREE AREA	115'	115'
TAXIWAY/TAXILANE SEPARATION	250'	250'

AIRPORT DATA TABLE

	EXISTING	ULTIMATE
AIRPORT ELEVATION (MSL)	658.40'	658.40'
AIRPORT NAVIGATION AIDS	REILS, BEACON, PAPI	REILS, BEACON, PAPI
MEAN MAX TEMP (Hottest Month °F)	97° F	97° F
AIRPORT REFERENCE CODE (ARC)	C-II	C-II
MISCELLANEOUS FACILITIES	AWOS, WINDCONE, MITL	AWOS, WINDCONE, MITL
CRITICAL AIRCRAFT	CHALLENGER 604	CHALLENGER 604
NPIAS SERVICE LEVEL	NATIONAL/REGIONAL	NATIONAL/REGIONAL
TXDOT SERVICE LEVEL	BUSINESS/CORPORATE	BUSINESS/CORPORATE
AIRPORT REFERENCE POINT COORDINATES	N 29° 42' 20.70"	N 29° 42' 20.70"
	W 98° 02' 35.60"	W 98° 02' 35.60"

NOTES

DATUM COORDINATE SYSTEMS – HORIZONTAL DATUM NAD 1983 State Plane Texas South 4205 Feet, VERTICAL DATUM NAVD88.

NO OFZ OBJECT PENETRATIONS

A VERTICALLY-GUIDED SURVEY WAS COMPLETED MEETING THE REQUIREMENTS OF AC 150/5300-16, 17, AND 18.

ALD LEGEND

FEATURE	EXISTING	ULTIMATE
RUNWAY/TAXIWAY OUTLINE		
RUNWAY/TAXIWAY TO BE REMOVED		
BUILDINGS/FACILITIES		
AIRPORT PROPERTY LINE		(U)
AIRPORT PROPERTY LINE w/FENCE		(U)
FENCE LINE		xu xu xu
BUILDING RESTRICTION LINE (BRL)		BRL 0'
AIRPORT REFERENCE POINT		
WIND CONE & SEGMENTED CIRCLE		
THRESHOLD LIGHTS		
RW END IDENTIFIER LIGHTS (REILS)		
C&G BEACON		
VGSI		
HOLD POSITION AND SIGN		
ASOS/AWOS		
PACS AND SACS MARKERS		
GROUND CONTOURS	1620	
SIGNIFICANT OBJECT LOCATION		
TREES/BRUSH		
NONDIRECTIONAL BEACON (NDB)		
PAPI		

EXEEDS STANDARDS
NONE

MODIFICATION TO STANDARDS
NONE

REV	DESCRIPTION	DATE	APPROVED

TEXAS DEPARTMENT OF TRANSPORTATION AVIATION DIVISION

ALP APPROVED ACCORDING TO FAA AC 150/5300-13 CHANGE 16 PLUS THE REQUIREMENTS OF A FAVORABLE ENVIRONMENTAL FINDING AND FAA NRA STUDY PRIOR TO THE START OF ANY LAND ACQUISITION OR CONSTRUCTION ON AIRPORT PROPERTY.

DAVID FULTON, DIRECTOR, AVIATION DIVISION — DATE

AIRPORT SPONSOR

CURRENT AND FUTURE DEVELOPMENT DEPICTED ON THIS ALP IS APPROVED AND SUPPORTED BY AIRPORT SPONSOR

SPONSOR ACKNOWLEDGES APPROVAL OF ALP BY TXDOT DOES NOT CONSTITUTE A COMMITMENT TO FUNDING.

SIGNATURE — DATE

TITLE, AIRPORT SPONSOR'S REPRESENTATIVE

PREPARED BY:

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F.972-542-6750
www.ksaeng.com

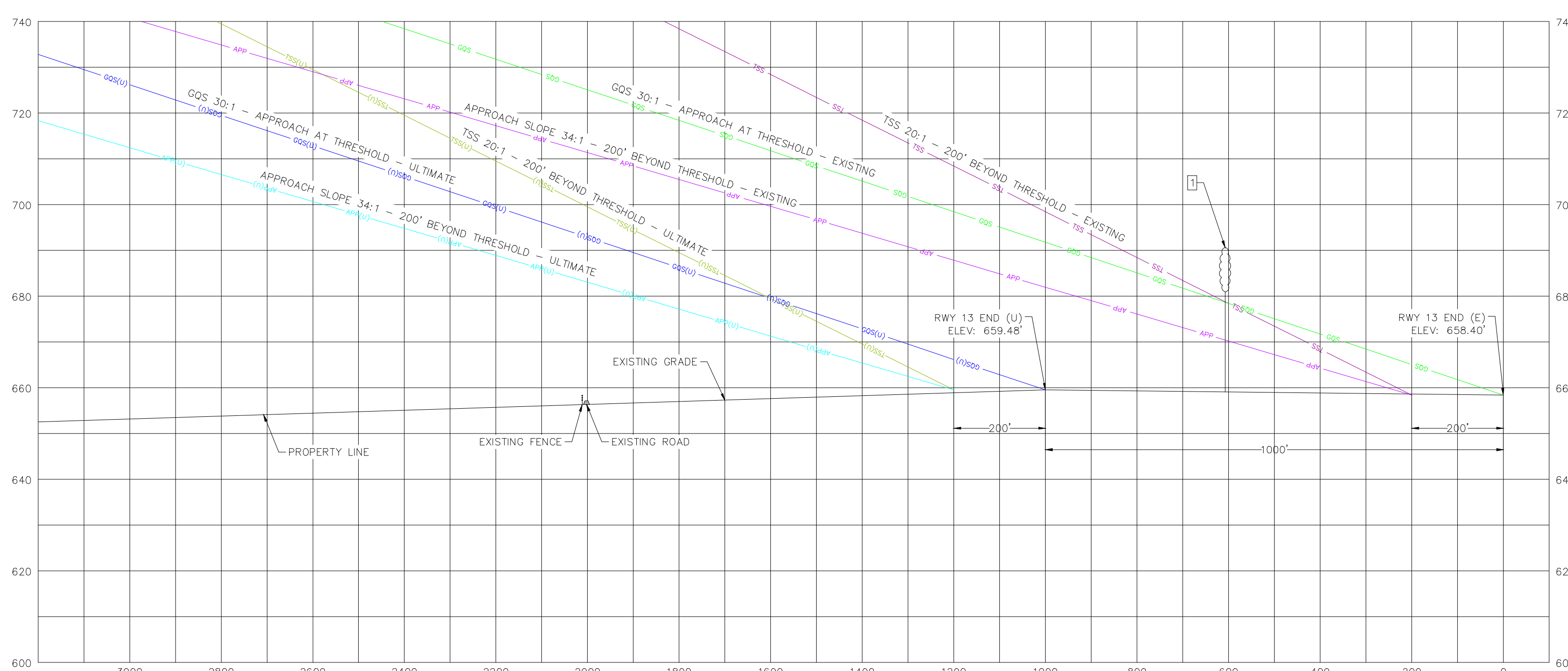
M MALLONEE — SEPTEMBER 2018
DESIGNED BY — DATE

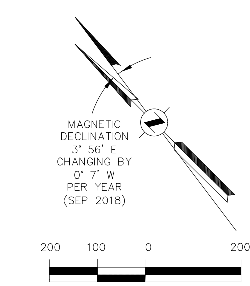
C MOERI — SEPTEMBER 2018
DRAWN BY — DATE

AIRPORT LAYOUT DRAWING
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division

RWY 13 OBSTRUCTION TABLE													
No.	Object Description	Latitude (N)	Longitude (W)	Distance fm RW end (E)	Offset fm RW C/L*	Top Elevation**	Amt of Penetration (TSS)(E)	Amt of Penetration (TSS)(U)	Amt of Penetration (GQS)(E)	Amt of Penetration (GQS)(U)	Amt of Penetration (APP)(E)	Amt of Penetration (APP)(U)	REMEDIATION
1	TREE	29° 42' 59.30"	98° 03' 03.90"	607.59'	86.99'	690.60'	11.82'	0'	11.95'	0'	20.21'	0'	TO BE REMOVED





REV	DESCRIPTION	DATE	APPROVED

TEXAS DEPARTMENT OF TRANSPORTATION AVIATION DIVISION

ALP APPROVED ACCORDING TO FAA AC 150/5300-13 CHANGE 16 PLUS THE REQUIREMENTS OF A FAVORABLE ENVIRONMENTAL FINDING AND FAA NRA STUDY PRIOR TO THE START OF ANY LAND ACQUISITION OR CONSTRUCTION ON AIRPORT PROPERTY.

DAVID FULTON, DIRECTOR, AVIATION DIVISION — DATE

AIRPORT SPONSOR

CURRENT AND FUTURE DEVELOPMENT DEPICTED ON THIS ALP IS APPROVED AND SUPPORTED BY AIRPORT SPONSOR

SPONSOR ACKNOWLEDGES APPROVAL OF ALP BY TXDOT DOES NOT CONSTITUTE A COMMITMENT TO FUNDING.

SIGNATURE — DATE

TITLE, AIRPORT SPONSOR'S REPRESENTATIVE

PREPARED BY:

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8875 Synergy Drive
McKinney, Texas 75070
T.972-542-2995
F.972-542-6750
www.ksaeng.com

M. MALLONEE — DESIGNED BY — SEPTEMBER 2018 — DATE

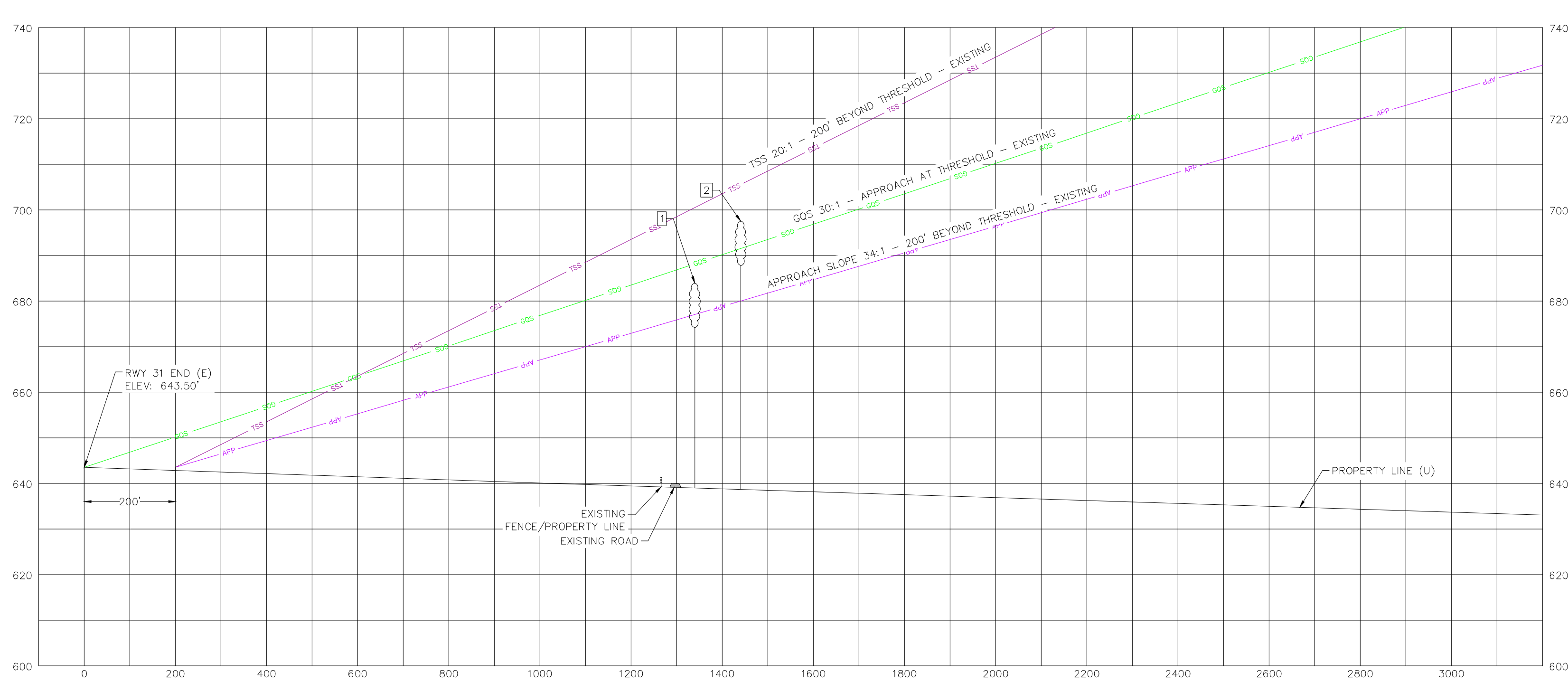
C. MOERI — DRAWN BY — SEPTEMBER 2018 — DATE

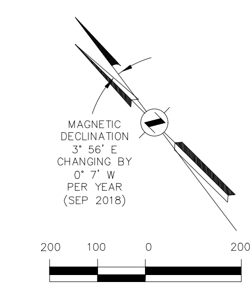
IPASD RWY 13
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division

RWY 31 OBSTRUCTION TABLE

No.	Object Description	Latitude (N)	Longitude (W)	Distance fm RW end (E)	Offset fm RW C/L*	Top Elevation**	Amt of Penetration (TSS)(E)	Amt of Penetration (TSS)(U)	Amt of Penetration (GQS)(E)	Amt of Penetration (GQS)(U)	Amt of Penetration (APP)(E)	Amt of Penetration (APP)(U)	REMEDIATION
1	TREE	29° 41' 56.98"	98° 01' 59.84"	1340.94'	263.72'	683.90'	0'	0'	0'	0'	6.88'	0'	TO BE REMOVED
2	TREE	29° 41' 56.31"	98° 01' 58.99"	1441.85'	256.84'	697.50'	0'	0'	5.98'	0'	17.51'	0'	TO BE REMOVED





REV	DESCRIPTION	DATE	APPROVED

TEXAS DEPARTMENT OF TRANSPORTATION
AVIATION DIVISION

ALP APPROVED ACCORDING TO FAA AC 150/5300-13 CHANGE 16 PLUS THE REQUIREMENTS OF A FAVORABLE ENVIRONMENTAL FINDING AND FAA NRA STUDY PRIOR TO THE START OF ANY LAND ACQUISITION OR CONSTRUCTION ON AIRPORT PROPERTY.

DAVID FULTON, DIRECTOR, AVIATION DIVISION — DATE

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F.972-542-6750
www.ksaeng.com

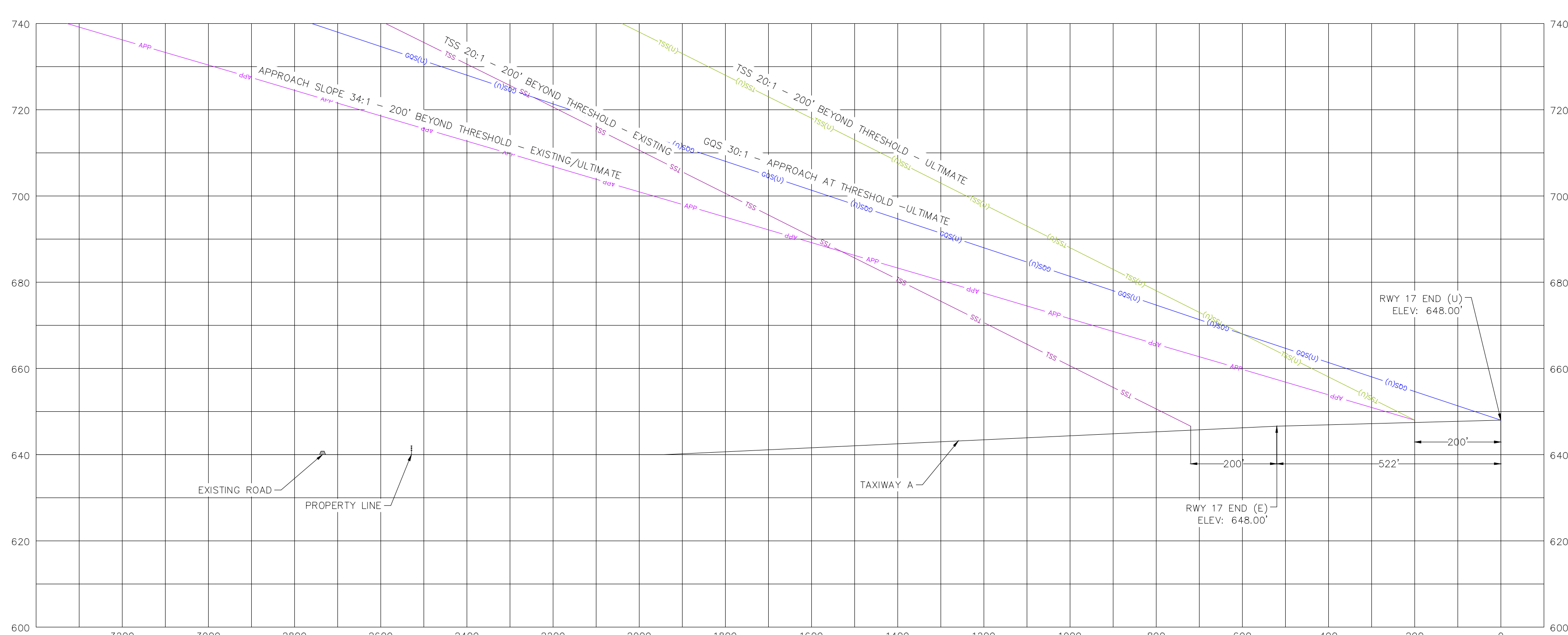
M. MALLONEE — DESIGNED BY — SEPTEMBER 2018 — DATE

C. MOERI — DRAWN BY — SEPTEMBER 2018 — DATE

IPASD RWY 31
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division

RWY 17 OBSTRUCTION TABLE													
No.	Object Description	Latitude (N)	Longitude (W)	Distance fm RW end (E)	Offset fm RW C/L*	Top Elevation**	Amt of Penetration (TSS)(E)	Amt of Penetration (TSS)(U)	Amt of Penetration (GQS)(E)	Amt of Penetration (GQS)(U)	Amt of Penetration (APP)(E)	Amt of Penetration (APP)(U)	REMEDIATION
1	NONE												



MAGNETIC
DECLINATION
3° 56' E
CHANGING BY
0° 7' W
PER YEAR
(SEP 2018)

200 100 0 200

REV	DESCRIPTION	DATE	APPROVED

TEXAS DEPARTMENT OF TRANSPORTATION
AVIATION DIVISION

ALP APPROVED ACCORDING TO FAA AC 150/5300-13 CHANGE 16 PLUS THE REQUIREMENTS OF A FAVORABLE ENVIRONMENTAL FINDING AND FAA NRA STUDY PRIOR TO THE START OF ANY LAND ACQUISITION OR CONSTRUCTION ON AIRPORT PROPERTY.

DAVID FULTON, DIRECTOR, AVIATION DIVISION DATE

AIRPORT SPONSOR

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SIGNATURE DATE

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www.ksaeng.com

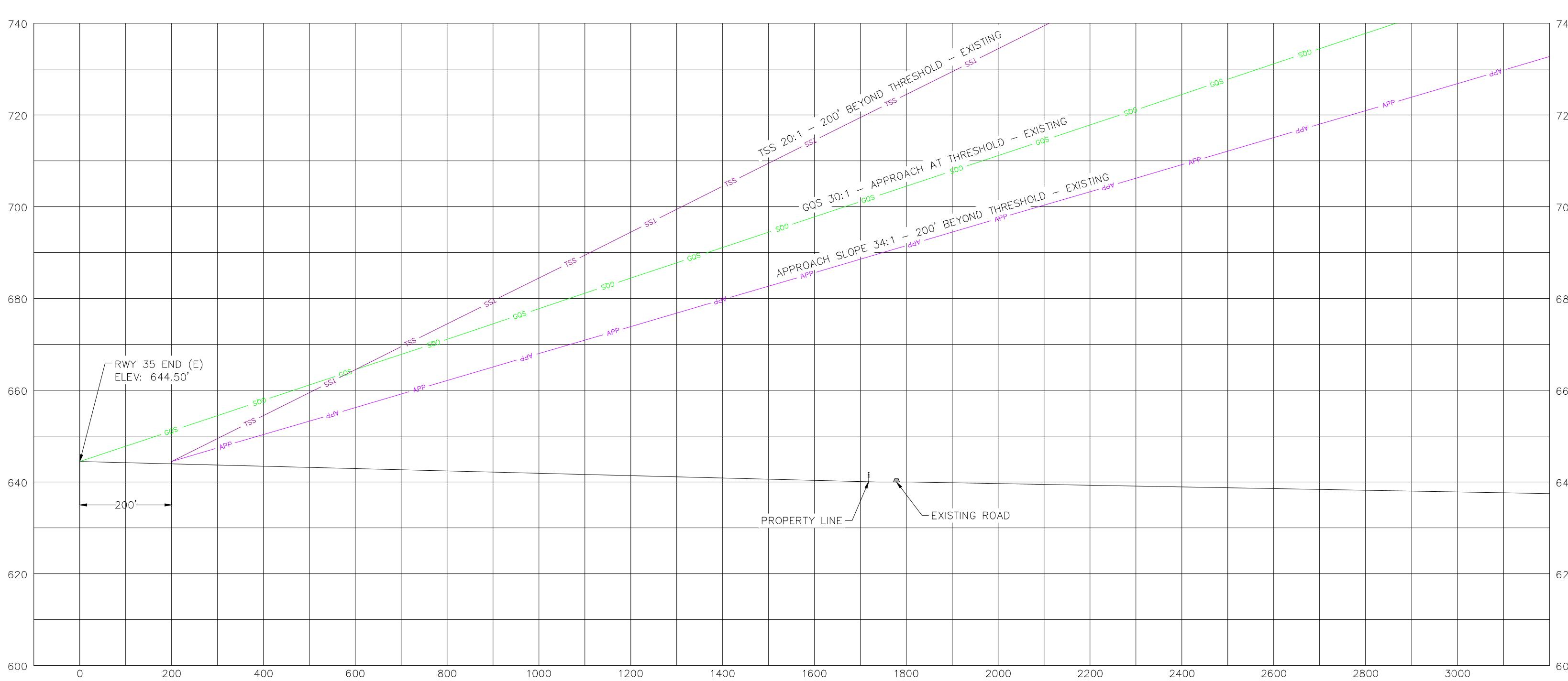
M MALLONEE SEPTEMBER 2018
DESIGNED BY DATE

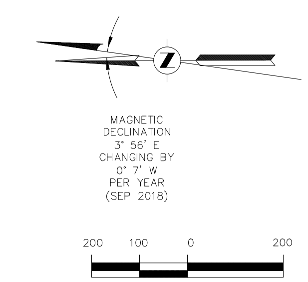
C MOERI SEPTEMBER 2018
DRAWN BY DATE

IPASD RWY 17
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division

RWY 35 OBSTRUCTION TABLE													
No.	Object Description	Latitude (N)	Longitude (W)	Distance fm RW end (E)	Offset fm RW C/L*	Top Elevation**	Amt of Penetration (TSS)(E)	Amt of Penetration (TSS)(U)	Amt of Penetration (GQS)(E)	Amt of Penetration (GQS)(U)	Amt of Penetration (APP)(E)	Amt of Penetration (APP)(U)	REMEDIATION
1	NONE												





REV	DESCRIPTION	DATE	APPROVED

TEXAS DEPARTMENT OF TRANSPORTATION
AVIATION DIVISION

ALP APPROVED ACCORDING TO FAA AC 150/5300-13 CHANGE 16 PLUS THE REQUIREMENTS OF A FAVORABLE ENVIRONMENTAL FINDING AND FAA NRA STUDY PRIOR TO THE START OF ANY LAND ACQUISITION OR CONSTRUCTION ON AIRPORT PROPERTY.

DAVID FULTON, DIRECTOR, AVIATION DIVISION DATE

AIRPORT SPONSOR

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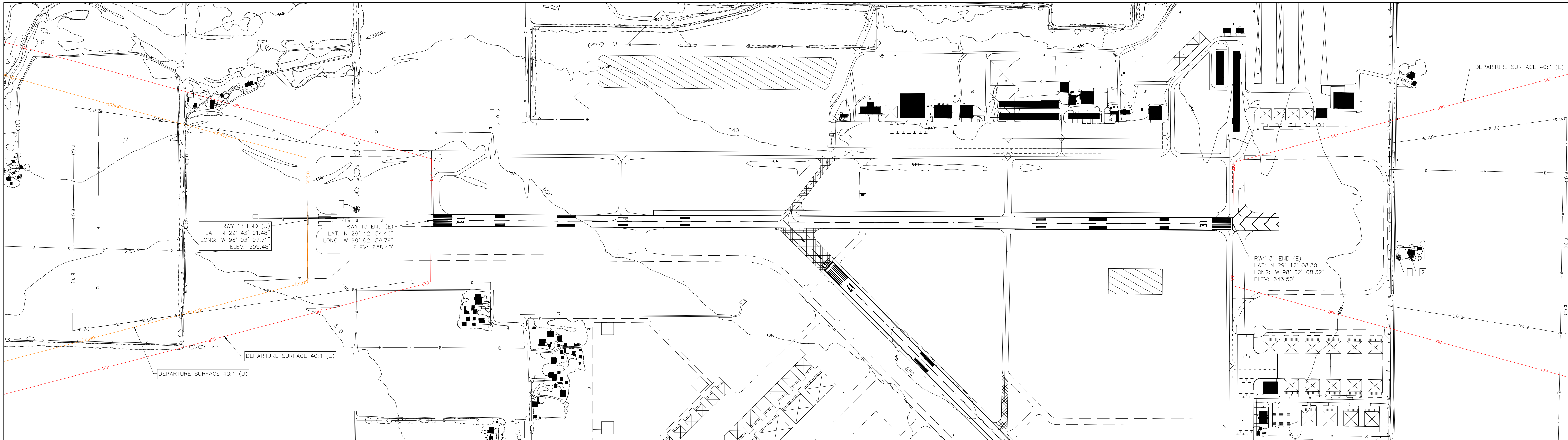
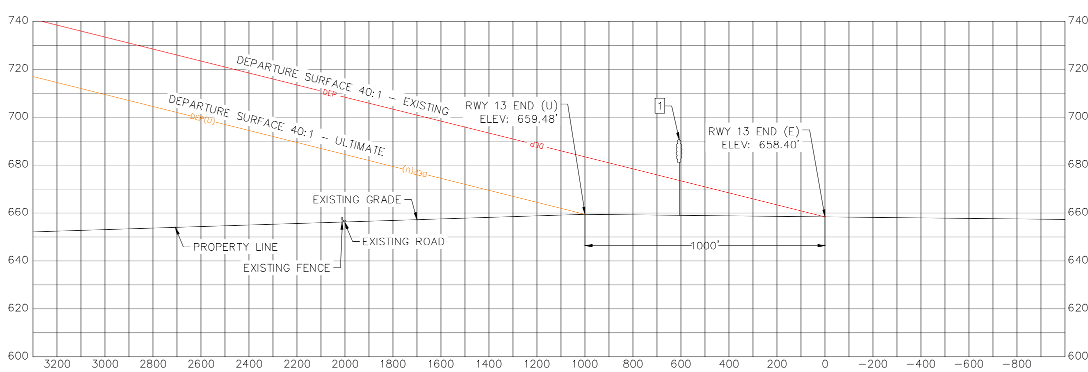
M MALLONEE — SEPTEMBER 2018
DESIGNED BY — DATE

C MOERI — SEPTEMBER 2018
DRAWN BY — DATE

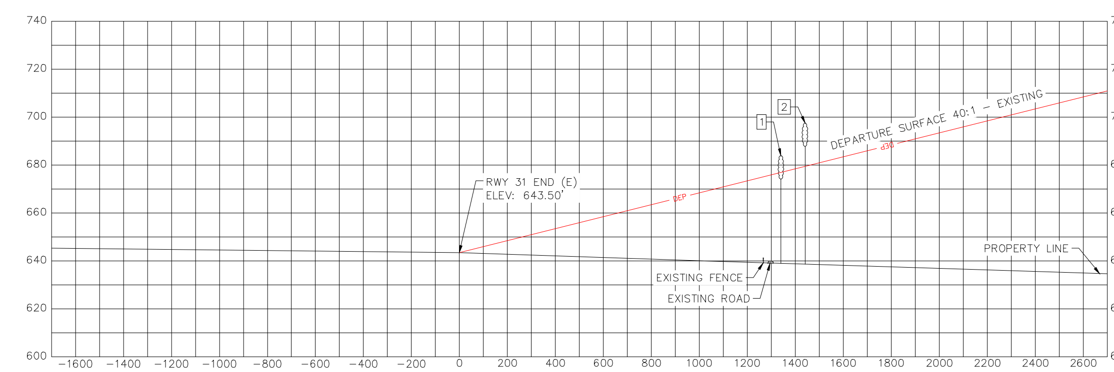
IPASD RWY 35
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division





RUNWAY 13 DEPARTURE SURFACE PROFILE



RUNWAY 31 DEPARTURE SURFACE PROFILE

RWY 13 OBSTRUCTION TABLE									
No.	Object Description	Latitude (N)	Longitude (W)	Distance fm RW end (E)	Offset fm RW C/L*	Top Elevation**	Amt of Penetration (DEP)(E)	Amt of Penetration (DEP)(U)	REMEDIATION
1	TREE	29° 42' 59.30"	98° 03' 03.90"	607.59'	86.99'	690.60'	17.01'	0'	TO BE REMOVED

RWY 31 OBSTRUCTION TABLE									
No.	Object Description	Latitude (N)	Longitude (W)	Distance fm RW end (E)	Offset fm RW C/L*	Top Elevation**	Amt of Penetration (DEP)(E)	Amt of Penetration (DEP)(U)	REMEDIATION
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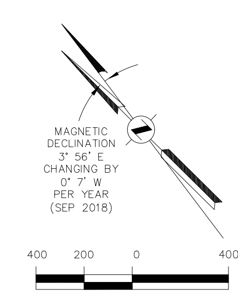
2	TREE	29° 41' 56.31"	98° 01' 58.99"	1441.85'	256.84'	697.50'	17.98'	0'	TO BE REMOVED



REV	DESCRIPTION	DATE	APPROVED

TEXAS DEPARTMENT OF TRANSPORTATION AVIATION DIVISION

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DAVID FULTON, DIRECTOR, AVIATION DIVISION — DATE

AIRPORT SPONSOR

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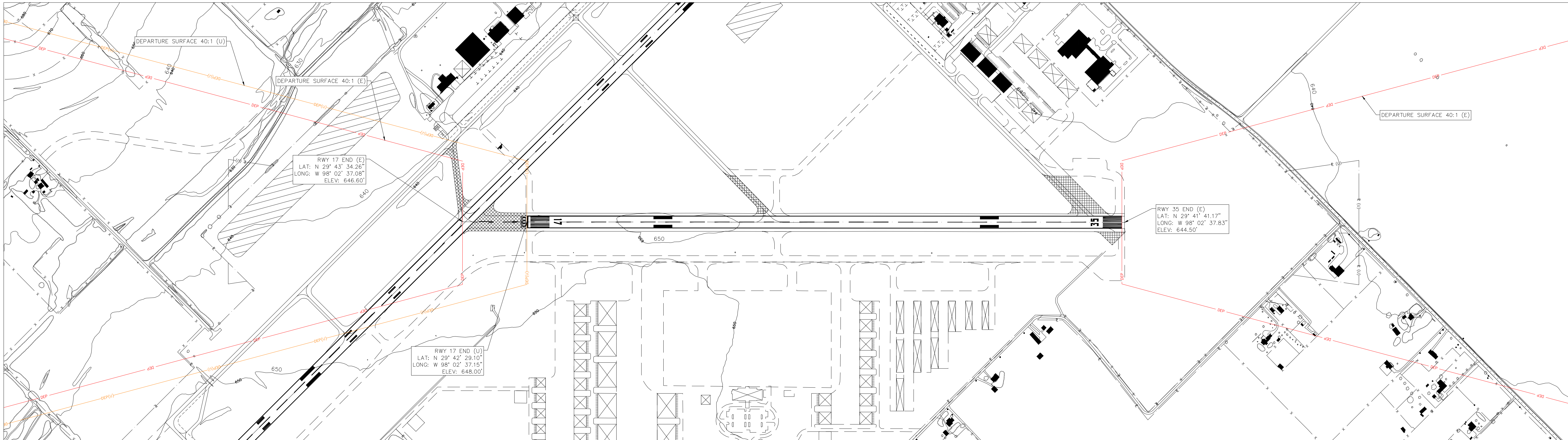
F.972-542-6750
www.ksaeng.com

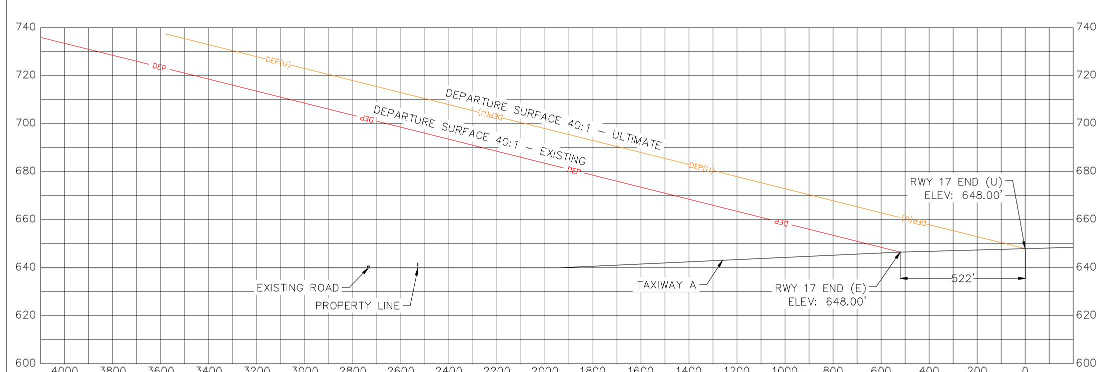
M MALLONEE — SEPTEMBER 2018
DESIGNED BY — DATE

C MOERI — SEPTEMBER 2018
DRAWN BY — DATE

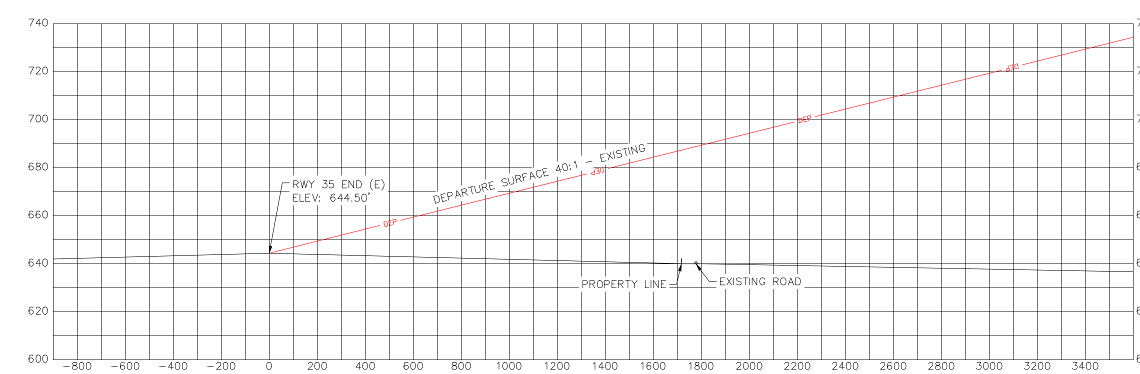
DEPARTURE SURFACE DRAWING 13-31
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division





RUNWAY 17 DEPARTURE SURFACE PROFILE



RUNWAY 35 DEPARTURE SURFACE PROFILE

REV	DESCRIPTION	DATE	APPROVED

TEXAS DEPARTMENT OF TRANSPORTATION AVIATION DIVISION

ALP APPROVED ACCORDING TO FAA AC 150/5300-13 CHANGE 16 PLUS THE REQUIREMENTS OF A FAVORABLE ENVIRONMENTAL FINDING AND FAA NRA STUDY PRIOR TO THE START OF ANY LAND ACQUISITION OR CONSTRUCTION ON AIRPORT PROPERTY.

DAVID FULTON, DIRECTOR, AVIATION DIVISION — DATE

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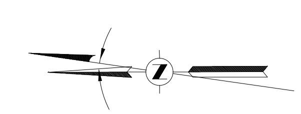
www.ksaeng.com

M. MALLONEE — SEPTEMBER 2018
DESIGNED BY — DATE

C. MOERI — SEPTEMBER 2018
DRAWN BY — DATE



DEPARTURE SURFACE DRAWING 17-35
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division

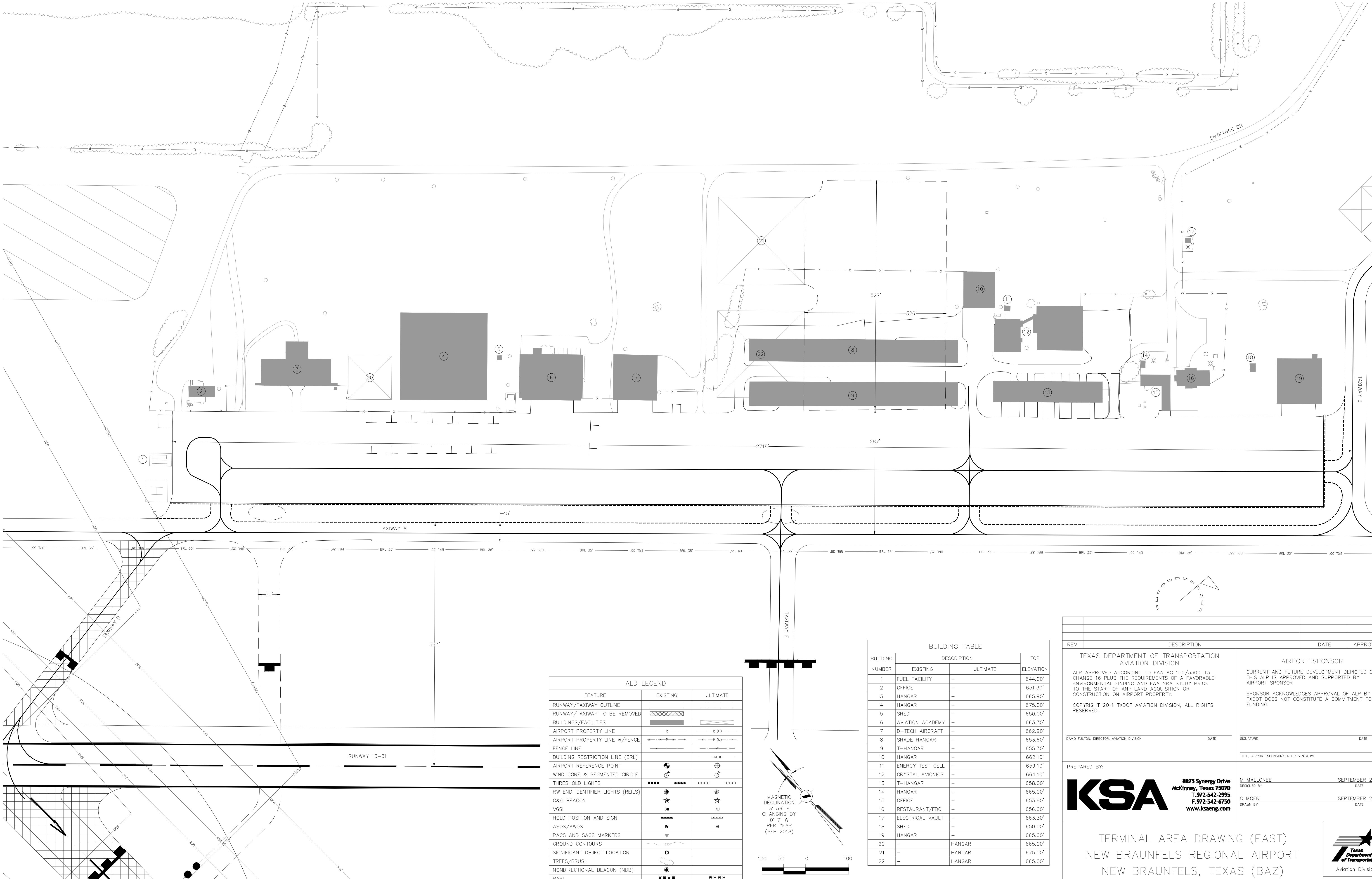
SHEET 8 OF 13

RWY 17 OBSTRUCTION TABLE

No.	Object Description	Latitude (N)	Longitude (W)	Distance fm RW end (E)	Offset fm RW C/L*	Top Elevation**	Amt of Penetration (DEP)(E)	Amt of Penetration (DEP)(U)	REMEDIATION
1	NONE								

RWY 35 OBSTRUCTION TABLE

No.	Object Description	Latitude (N)	Longitude (W)	Distance fm RW end (E)	Offset fm RW C/L*	Top Elevation**	Amt of Penetration (DEP)(E)	Amt of Penetration (DEP)(U)	REMEDIATION
1	NONE								



ALD LEGEND		
FEATURE	EXISTING	ULTIMATE
RUNWAY/TAXIWAY OUTLINE		
RUNWAY/TAXIWAY TO BE REMOVED		
BUILDINGS/FACILITIES		
AIRPORT PROPERTY LINE		
AIRPORT PROPERTY LINE w/FENCE		
FENCE LINE		
BUILDING RESTRICTION LINE (BRL)		BRL 0'
AIRPORT REFERENCE POINT		
WIND CONE & SEGMENTED CIRCLE		
THRESHOLD LIGHTS		
RW END IDENTIFIER LIGHTS (REILS)		
C&G BEACON		
VGSI		
HOLD POSITION AND SIGN		
ASOS/AWOS		
PACS AND SACS MARKERS		
GROUND CONTOURS	1620	
SIGNIFICANT OBJECT LOCATION		
TREES/BRUSH		
NONDIRECTIONAL BEACON (NDB)		
PAPI		

BUILDING TABLE			
BUILDING NUMBER	DESCRIPTION		TOP ELEVATION
	EXISTING	ULTIMATE	
1	FUEL FACILITY	–	644.00'
2	OFFICE	–	651.30'
3	HANGAR	–	665.90'
4	HANGAR	–	675.00'
5	SHED	–	650.00'
6	AVIATION ACADEMY	–	663.30'
7	D–TECH AIRCRAFT	–	662.90'
8	SHADE HANGAR	–	653.60'
9	T–HANGAR	–	655.30'
10	HANGAR	–	662.10'
11	ENERGY TEST CELL	–	659.10'
12	CRYSTAL AVIONICS	–	664.10'
13	T–HANGAR	–	658.00'
14	HANGAR	–	665.00'
15	OFFICE	–	653.60'
16	RESTAURANT/FBO	–	656.60'
17	ELECTRICAL VAULT	–	663.30'
18	SHED	–	650.00'
19	HANGAR	–	665.60'
20	–	HANGAR	665.00'
21	–	HANGAR	675.00'
22	–	HANGAR	665.00'

REV	DESCRIPTION	DATE	APPROVED

TEXAS DEPARTMENT OF TRANSPORTATION
AVIATION DIVISION

ALP APPROVED ACCORDING TO FAA AC 150/5300–13 CHANGE 16 PLUS THE REQUIREMENTS OF A FAVORABLE ENVIRONMENTAL FINDING AND FAA NRA STUDY PRIOR TO THE START OF ANY LAND ACQUISITION OR CONSTRUCTION ON AIRPORT PROPERTY.

DAVID FULTON, DIRECTOR, AVIATION DIVISION — DATE

AIRPORT SPONSOR

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SIGNATURE — DATE

TITLE, AIRPORT SPONSOR'S REPRESENTATIVE

PREPARED BY:

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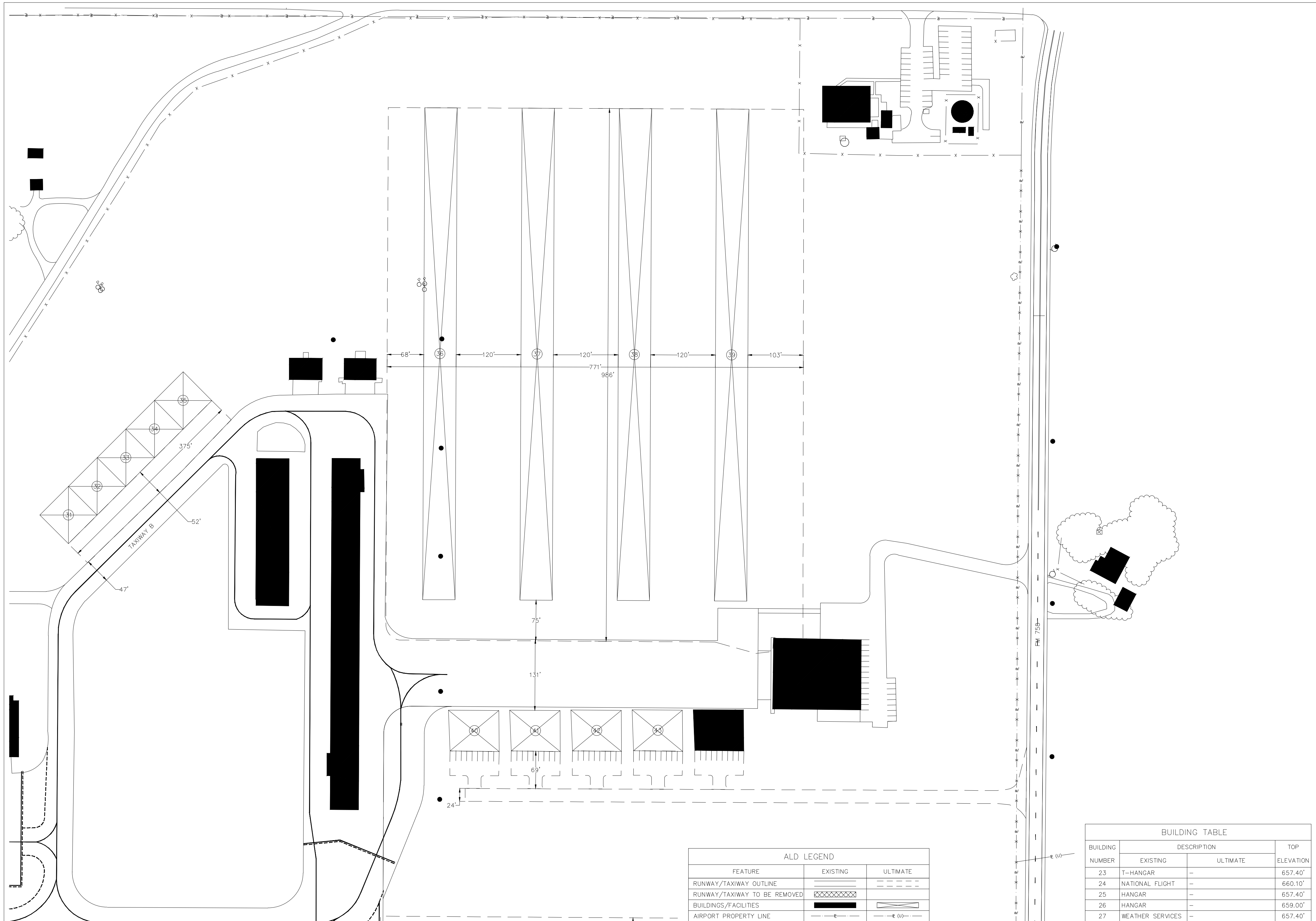
T.972-542-2995
F.972-542-6750
www.ksaeng.com

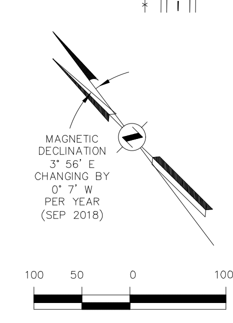
M MALLONEE — SEPTEMBER 2018
DESIGNED BY — DATE

C MOERI — SEPTEMBER 2018
DRAWN BY — DATE

TERMINAL AREA DRAWING (EAST)
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division





ALD LEGEND		
FEATURE	EXISTING	ULTIMATE
RUNWAY/TAXIWAY OUTLINE		
RUNWAY/TAXIWAY TO BE REMOVED		
BUILDINGS/FACILITIES		
AIRPORT PROPERTY LINE		(U)
AIRPORT PROPERTY LINE w/FENCE		(U)
FENCE LINE		
BUILDING RESTRICTION LINE (BRL)		BRL 0'
AIRPORT REFERENCE POINT		
WIND CONE & SEGMENTED CIRCLE		
THRESHOLD LIGHTS		
RW END IDENTIFIER LIGHTS (REILS)		
C&G BEACON		
VGSI		
HOLD POSITION AND SIGN		
ASOS/AWOS		
PACS AND SACS MARKERS		
GROUND CONTOURS	1620	
SIGNIFICANT OBJECT LOCATION		
TREES/BRUSH		
NONDIRECTIONAL BEACON (NDB)		
PAPI		

BUILDING TABLE			
BUILDING NUMBER	DESCRIPTION		TOP ELEVATION
	EXISTING	ULTIMATE	
23	T–HANGAR	–	657.40'
24	NATIONAL FLIGHT	–	660.10'
25	HANGAR	–	657.40'
26	HANGAR	–	659.00'
27	WEATHER SERVICES	–	657.40'
28	WEATHER SERVICES	–	750.10'
29	HANGAR	–	665.00'
30	HANGAR	–	675.00'
31	–	HANGAR	665.00'
32	–	HANGAR	665.00'
33	–	HANGAR	665.00'
34	–	HANGAR	665.00'
35	–	HANGAR	665.00'
36	–	T–HANGAR	665.00'
37	–	T–HANGAR	665.00'
38	–	T–HANGAR	665.00'
39	–	T–HANGAR	665.00'
40	–	HANGAR	665.00'
41	–	HANGAR	665.00'
42	–	HANGAR	665.00'
43	–	HANGAR	665.00'

REV	DESCRIPTION	DATE	APPROVED

TEXAS DEPARTMENT OF TRANSPORTATION
AVIATION DIVISION

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DAVID FULTON, DIRECTOR, AVIATION DIVISION — DATE

AIRPORT SPONSOR

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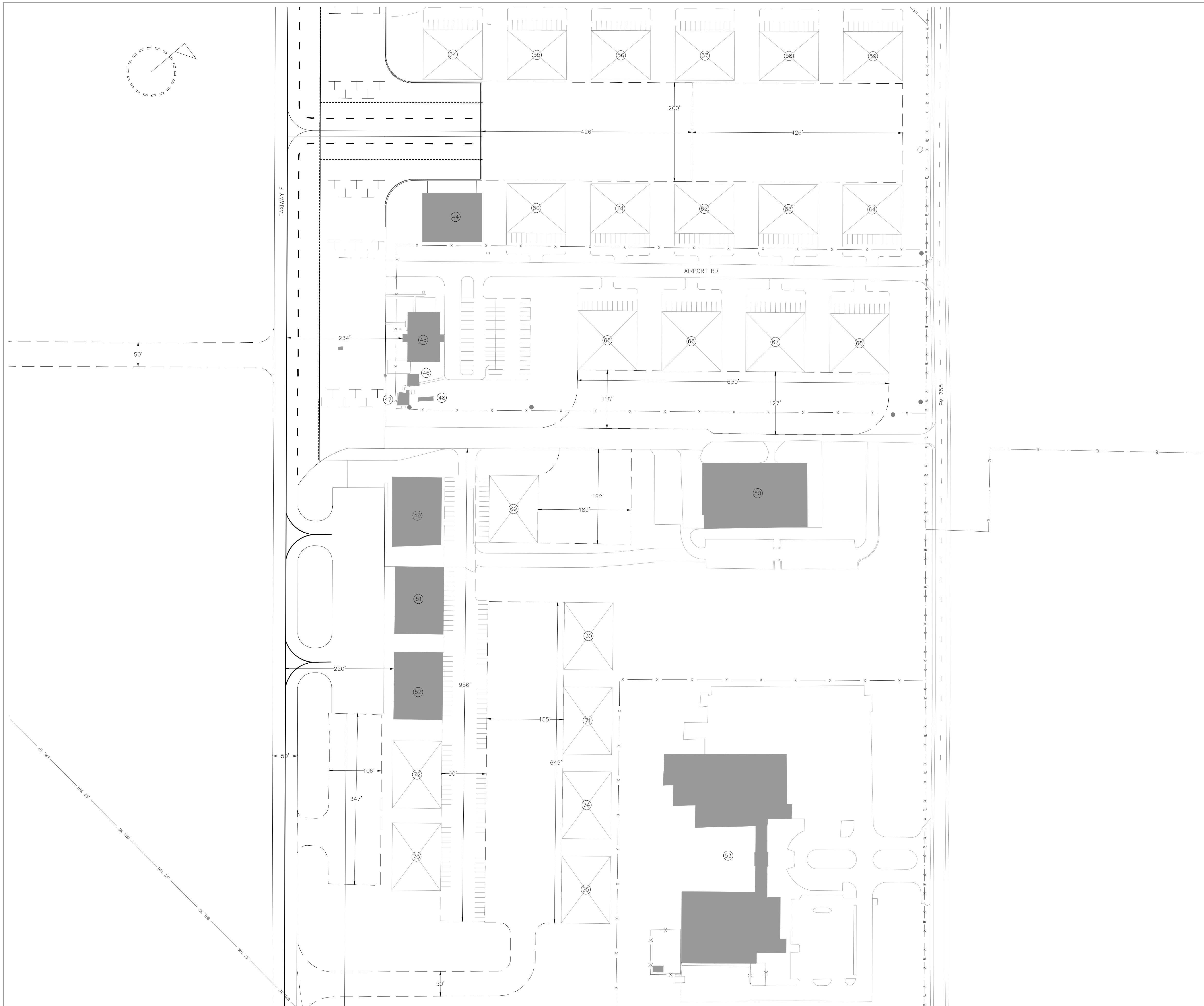
F.972-542-6750
www.ksaeng.com

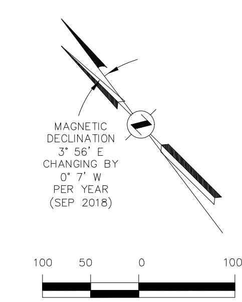
M MALLONEE — SEPTEMBER 2018
DESIGNED BY — DATE

C MOERI — SEPTEMBER 2018
DRAWN BY — DATE

TERMINAL AREA DRAWING (SOUTHEAST)
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division





ALD LEGEND		
FEATURE	EXISTING	ULTIMATE
RUNWAY/TAXIWAY OUTLINE		
RUNWAY/TAXIWAY TO BE REMOVED		
BUILDINGS/FACILITIES		
AIRPORT PROPERTY LINE		
AIRPORT PROPERTY LINE w/FENCE		
FENCE LINE		
BUILDING RESTRICTION LINE (BRL)		
AIRPORT REFERENCE POINT		
WIND CONE & SEGMENTED CIRCLE		
THRESHOLD LIGHTS		
RW END IDENTIFIER LIGHTS (REILS)		
C&G BEACON		
VGSI		
HOLD POSITION AND SIGN		
ASOS/AWOS		
PACS AND SACS MARKERS		
GROUND CONTOURS		
SIGNIFICANT OBJECT LOCATION		
TREES/BRUSH		
NONDIRECTIONAL BEACON (NDB)		
PAPI		

BUILDING TABLE			
BUILDING NUMBER	DESCRIPTION		TOP ELEVATION
	EXISTING	ULTIMATE	
44	TODDCOE AVIATION	–	665.00'
45	TERMINAL	–	665.00'
46	SHED	–	650.00'
47	ATCT	–	715.00'
48	SHED	–	650.00'
49	ALFA AIRCRAFT	–	665.00'
50	HANGAR	–	665.00'
51	HANGAR	–	665.00'
52	HANGAR	–	675.00'
53	ALAMO COLLEGE	–	675.00'
54	–	HANGAR	665.00'
55	–	HANGAR	665.00'
56	–	HANGAR	665.00'
57	–	HANGAR	665.00'
58	–	HANGAR	665.00'
59	–	HANGAR	665.00'
60	–	HANGAR	665.00'
61	–	HANGAR	665.00'
62	–	HANGAR	665.00'
63	–	HANGAR	665.00'
64	–	HANGAR	665.00'
65	–	HANGAR	665.00'
66	–	HANGAR	665.00'
67	–	HANGAR	665.00'
68	–	HANGAR	665.00'
69	–	HANGAR	665.00'
70	–	HANGAR	665.00'
71	–	HANGAR	665.00'
72	–	HANGAR	665.00'
73	–	HANGAR	665.00'
74	–	HANGAR	665.00'
75	–	HANGAR	665.00'

REV	DESCRIPTION	DATE	APPROVED

TEXAS DEPARTMENT OF TRANSPORTATION
AVIATION DIVISION

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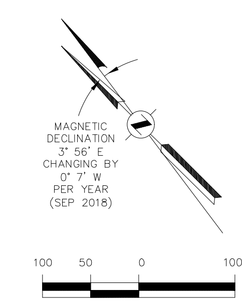
M MALLONEE — SEPTEMBER 2018
DESIGNED BY — DATE

C MOERI — SEPTEMBER 2018
DRAWN BY — DATE

TERMINAL AREA DRAWING
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division



ALD LEGEND

FEATURE	EXISTING	ULTIMATE
RUNWAY/TAXIWAY OUTLINE		
RUNWAY/TAXIWAY TO BE REMOVED		
BUILDINGS/FACILITIES		
AIRPORT PROPERTY LINE		
AIRPORT PROPERTY LINE w/FENCE		
FENCE LINE		
BUILDING RESTRICTION LINE (BRL)		
AIRPORT REFERENCE POINT		
WIND CONE & SEGMENTED CIRCLE		
THRESHOLD LIGHTS		
RW END IDENTIFIER LIGHTS (REILS)		
C&G BEACON		
VGSI		
HOLD POSITION AND SIGN		
ASOS/AWOS		
PACS AND SACS MARKERS		
GROUND CONTOURS		
SIGNIFICANT OBJECT LOCATION		
TREES/BRUSH		
NONDIRECTIONAL BEACON (NDB)		
PAPI		

BUILDING TABLE

BUILDING NUMBER	DESCRIPTION EXISTING	DESCRIPTION ULTIMATE	TOP ELEVATION
76	–	ATCT	715.00'
77	–	TERMINAL	665.00'
78	–	HANGAR	665.00'
79	–	HANGAR	665.00'
80	–	HANGAR	665.00'
81	–	HANGAR	665.00'
82	–	HANGAR	665.00'
83	–	HANGAR	665.00'
84	–	HANGAR	665.00'
85	–	HANGAR	665.00'
86	–	HANGAR	665.00'
87	–	T-HANGAR	665.00'
88	–	T-HANGAR	665.00'
89	–	T-HANGAR	665.00'
90	–	T-HANGAR	665.00'
91	–	T-HANGAR	665.00'
92	–	T-HANGAR	665.00'
93	–	T-HANGAR	665.00'
94	–	T-HANGAR	665.00'
95	–	T-HANGAR	665.00'
96	–	T-HANGAR	665.00'
96A	ASR	–	–

REV	DESCRIPTION	DATE	APPROVED

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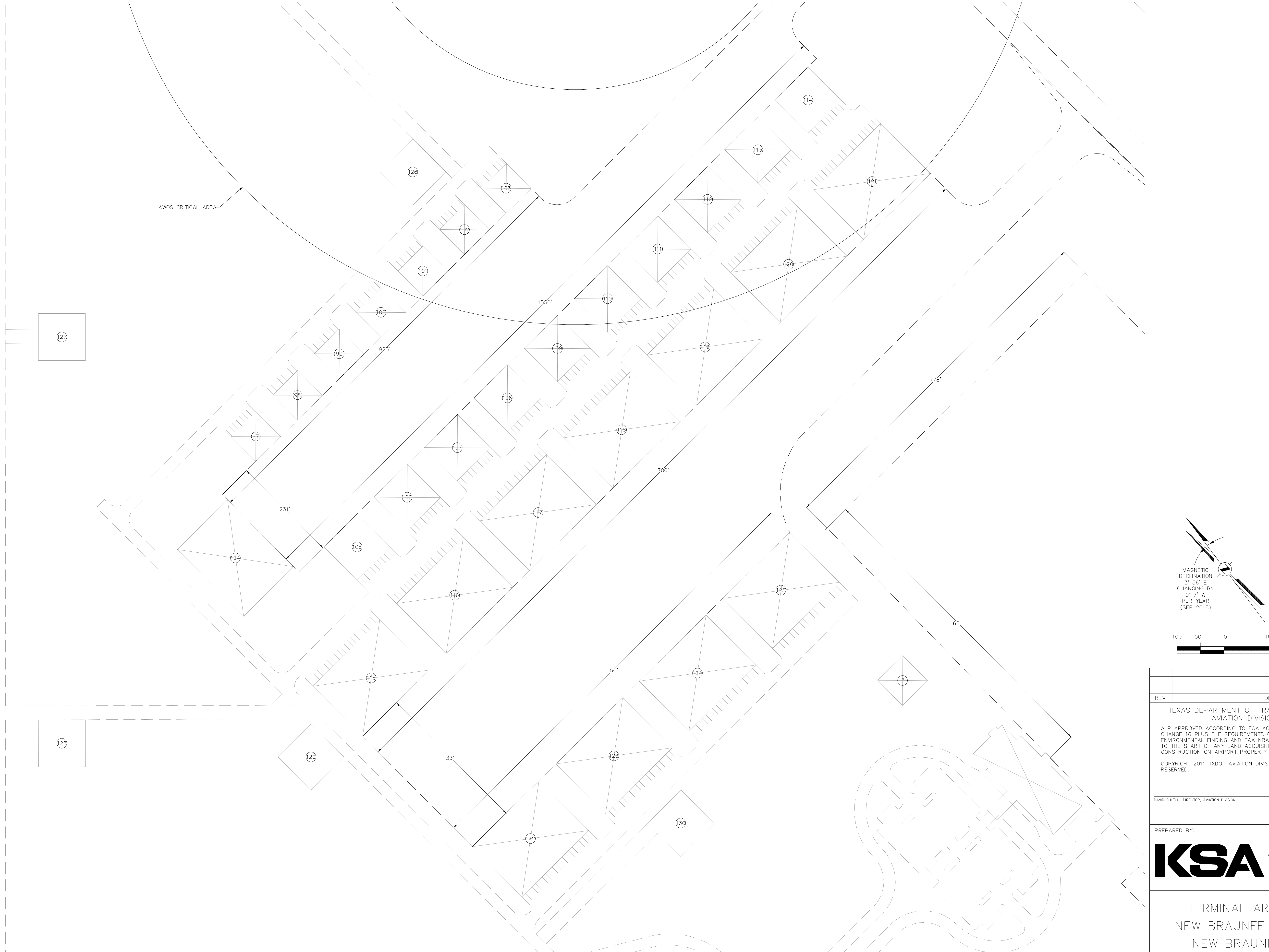
C. MOERI — SEPTEMBER 2018
DRAWN BY — DATE

TERMINAL AREA DRAWING (WEST)
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division



ALD LEGEND		
FEATURE	EXISTING	ULTIMATE
RUNWAY/TAXIWAY OUTLINE		
RUNWAY/TAXIWAY TO BE REMOVED		
BUILDINGS/FACILITIES		
AIRPORT PROPERTY LINE		
AIRPORT PROPERTY LINE w/FENCE		
FENCE LINE		
BUILDING RESTRICTION LINE (BRL)		BRL 0'
AIRPORT REFERENCE POINT		
WIND CONE & SEGMENTED CIRCLE		
THRESHOLD LIGHTS		
RW END IDENTIFIER LIGHTS (REILS)		
C&G BEACON		
VGSI		
HOLD POSITION AND SIGN		
ASOS/AWOS		
PACS AND SACS MARKERS		
GROUND CONTOURS	1620	
SIGNIFICANT OBJECT LOCATION		
TREES/BRUSH		
NONDIRECTIONAL BEACON (NDB)		
PAPI		

BUILDING TABLE			
BUILDING NUMBER	DESCRIPTION		TOP ELEVATION
	EXISTING	ULTIMATE	
97	–	HANGAR	665.00'
98	–	HANGAR	665.00'
99	–	HANGAR	665.00'
100	–	HANGAR	665.00'
101	–	HANGAR	665.00'
102	–	HANGAR	665.00'
103	–	HANGAR	665.00'
104	–	HANGAR	665.00'
105	–	HANGAR	665.00'
106	–	HANGAR	665.00'
107	–	HANGAR	665.00'
108	–	HANGAR	665.00'
109	–	HANGAR	665.00'
110	–	HANGAR	665.00'
111	–	HANGAR	665.00'
112	–	HANGAR	665.00'
113	–	HANGAR	665.00'
114	–	HANGAR	665.00'
115	–	HANGAR	665.00'
116	–	HANGAR	665.00'
117	–	HANGAR	665.00'
118	–	HANGAR	665.00'
119	–	HANGAR	665.00'
120	–	HANGAR	665.00'
121	–	HANGAR	665.00'
122	–	HANGAR	665.00'
123	–	HANGAR	665.00'
124	–	HANGAR	665.00'
125	–	HANGAR	665.00'
126	ASR	–	–
127	ASR	–	–
128	ASR	–	–
129	ASR	–	–
130	ASR	–	–
131	–	HANGAR	665.00'

REV	DESCRIPTION	DATE	APPROVED

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M MALLONEE SEPTEMBER 2018
DESIGNED BY DATE

C MOERI SEPTEMBER 2018
DRAWN BY DATE

TERMINAL AREA DRAWING (WEST)
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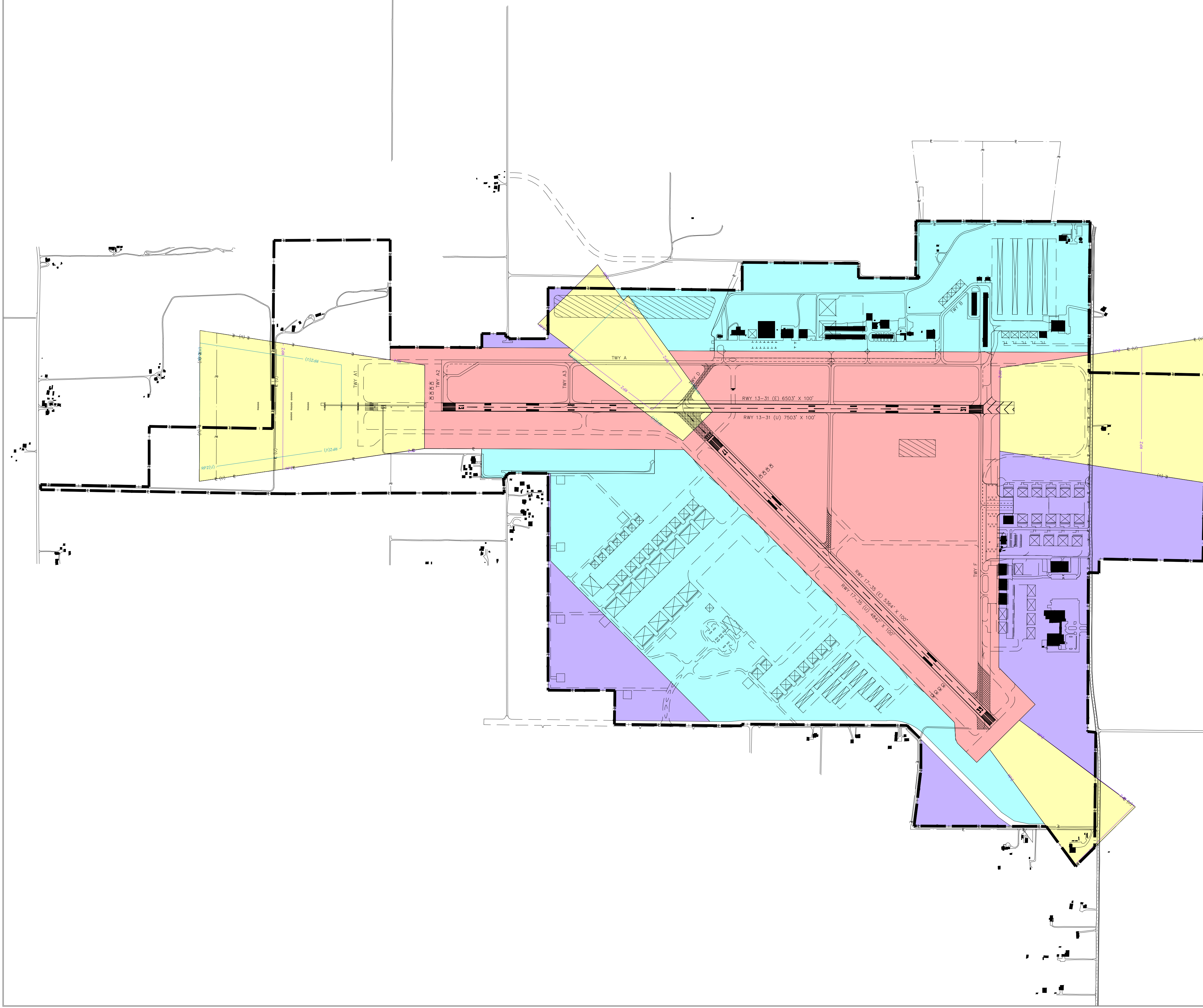

LEGEND

(pink)	AVIATION MOVEMENT AREA (ON AIRPORT)
(cyan)	AVIATION DEVELOPMENT AREA (ON AIRPORT)
(purple)	AVIATION RELATED/AVIATION COMPATIBLE DEVELOPMENT AREA (ON AIRPORT)
(yellow)	RPZ/NON-DEVELOPMENT AREA (ON AIRPORT)

MAGNETIC DECLINATION 3° 56' E CHANGING BY 0° 7' W PER YEAR (SEP 2018)

600 300 0 600

REV	DESCRIPTION	DATE	APPROVED

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M MALLONEE SEPTEMBER 2018
DESIGNED BY DATE

C MOERI SEPTEMBER 2018
DRAWN BY DATE

LAND USE DRAWING
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division

AIRPORT PROPERTY DATA TABLE						
TRACT	ACRES	TITLE	GRANTOR/REMARKS	COUNTY RECORD VOL./PAGE	DATE	FUNDING
1	919.18	INDENTURE	UNITED STATES OF AMERICA	VOL. 419, PAGE 022	APRIL 29, 1969	
2	0.40	DRAINAGE EASEMENT	UNITED STATES OF AMERICA	VOL. 419, PAGE 025	APRIL 29, 1969	
3	0.47	DRAINAGE EASEMENT	UNITED STATES OF AMERICA	VOL. 419, PAGE 025	APRIL 29, 1969	
4	17.47	AVIGATION EASEMENT	UNITED STATES OF AMERICA	VOL. 419, PAGE 026	APRIL 29, 1969	
5	19.35	AVIGATION EASEMENT	UNITED STATES OF AMERICA	VOL. 419, PAGE 027	APRIL 29, 1969	
6	72.50	AVIGATION EASEMENT	WESTMEYER, ALWIN & LONIE	VOL 547, PAGE 375	APRIL 29, 1969	
7	12.297	AVIGATION EASEMENT	THOR 1101, LTD	201006004165	FEBRUARY 8, 2010	
8	100.007	WARRANTY DEED	P&W RANCH	201006008069	MARCH 11, 2010	
9	26.462	WARRANTY DEED	THOR, 1101, LTD	201006008221	MARCH 11, 2010	
10	13.94	FEE SIMPLE, WARRANTY DEED	KRUEGER, WAYMAN & NANCY MAE	201306003149	JANUARY 18, 2013	
11	9.60	FEE SIMPLE, WARRANTY DEED	KRUEGER, WAYMAN & NANCY MAE	VOL. 4031, PAGE 926	JANUARY 18, 2013	
12	9.54	FEE SIMPLE, WARRANTY DEED	KRUEGER, WAYMAN & NANCY MAE	201306003150	JANUARY 18, 2013	
13	0.46	FEE SIMPLE, WARRANTY DEED	KRUEGER, NANCY W	VOL. 4031, PAGE 926	JANUARY 18, 2013	
14	1.0	FEE SIMPLE, WARRANTY DEED	KRUEGER, NANCY MAE	VOL. 4031, PAGE 926	JANUARY 18, 2013	
15	5	FEE SIMPLE, WARRANTY DEED	BURRIS, HAROLD & TUBBS, JAMES	VOL. 4087 & 0904	MAY 17, 2013	
16	45.53	FEE SIMPLE, WARRANTY DEED	DEERING, ELAINE V	VOL. 25376 & 26447	OCTOBER 21, 2016	
17	1	FEE SIMPLE, WARRANTY DEED	DEERING, ELAINE V	VOL 25376 & 26447	OCTOBER 21, 2016	
18	1.506	GIFT DEED	DEERING, ELAINE V	VOL. 2120, PAGE 475	DECEMBER 18, 2016	
19	0.619	UTILITY EASEMENT	CITY OF NEW BRAUNFELS	201006008069	FEBRUARY 12, 2018	

AIRPORT PROPERTY MAP LEGEND		
FEATURE	EXISTING	ULTIMATE
RUNWAY/TAXIWAY OUTLINE		
BUILDINGS/FACILITIES		
AIRPORT PROPERTY LINE		
RUNWAY PROTECTION ZONE (RPZ)	RPZ	
PARCEL BOUNDARY		

REV	DESCRIPTION	DATE	APPROVED

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DRAWN BY — DATE

EXHIBIT A PROPERTY MAP
NEW BRAUNFELS REGIONAL AIRPORT
NEW BRAUNFELS, TEXAS (BAZ)

Texas Department of Transportation
Aviation Division

IMPLEMENTATION PLAN

Chapter 6. Implementation Plan

With the selection of the Recommended Development Plan, this chapter presents a summary of the airport improvements identified in the master plan capital improvement program (CIP), its anticipated phasing, and funding sources. The analysis provides estimates of the local share of project costs and the total amount of capital investment that may be required from the airport sponsor over the planning period. These costs and associated funding sources are for planning purposes and may change at the time of implementation based on current construction costs, bidding, and project scope.

Additionally, the phasing and timing for future projects is important and will be subject to funding availability, sponsor contributions, and needs of the users of the airport. Projects may be chosen from this plan and implemented accordingly based on dynamic market conditions and needs. The chapter is intended to be a guide for implementing the recommended development and may be flexible based on real word factors and conditions.

6.1 Capital Improvement Program

The Capital Improvement Program (CIP) identifies improvement projects that are recommended for an airport over a specific period of time, estimates the order in which the projects are to take place, and calculates the total costs and funding sources of the projects. As the CIP progresses from projects planned in the current year to those planned in future years, it becomes less detailed and more flexible. Additionally, the CIP is typically modified on an annual basis as new projects are identified or as projects and priorities change. Table 6.1 summarizes projects for this plan.

Table 6.1 Airport Development Summary	
Runway	• Runway 17-35 Rehab (Mill and Overlay) • Conduct aeronautical obstruction survey to R/W 13-31 • Conduct Environmental Assessment for runway extension • Runway 13-31 – 100’ x 1,000’ extension • Conduct pavement strength analysis to determine weight bearing capacity at Runway 13-31 • General lifecycle pavement rehabilitation
Taxiway	• Extend T/W “A” and connector to coincide with R/W 13-31 extension • Construct and realign Taxiway “D” to R/W 17 end • Remove R/W 17 relocated threshold marking and associated pavement • Construct mid-field connector • Re-align south end of Taxiway “F” • General lifecycle pavement rehabilitation

	• Construct west side full-length parallel taxiway and connectors (50' x 5,973')
Apron	• Expand corporate terminal apron (51,000 sq. ft.) • East side apron reconstruction • Construct west side apron to coincide with new terminal building
Hangars	• Infill and re-develop east side hangar area • Construct T-hangars in proposed southeast development area • Add various sized hangars (dependent on market and demand) • West side development hangars
Auto Parking	• Expand existing terminal auto parking • Add auto parking to proposed west side terminal area
Lighting	• Relocate MALS to coincide with R/W 13-31 extension • Install PAPI light system on R/W 17-35 • Upgrade T/W MTIL to LED type and upgrade electrical vault
Fuel Storage	• Install 12,000 gallon aboveground tank for Jet-A • Add self-serve fuel dispenser to coincide with new terminal area
Miscellaneous	• Construct Detention Pond • Construct perimeter road around R/W 31 end and other areas as needed by the airport • Expand existing terminal building • Construct new west side terminal building and airport entrance road • Land acquisition in fee simple for RPZ control and runway extension • Construct new fire and rescue access road • Update Airport Master Plan periodically • Construct new ATCT and install RADAR equipment • Acquire airport maintenance equipment as needed • Install perimeter security fencing • Annual RAMP Grant Maintenance Program • Strategic Marketing Plan

Source: KSA

6.2 Cost Estimates

Projects presented in the Recommended Development Plan involve many variables and phases. Costs associated with these projects usually include preliminary engineering, design, construction, and administration oversight. The lifecycle of each project will be determined by the type and associated complexity of each project. For instance, runway projects may involve many phases and detailed engineering plans will be scoped and estimated at the time of project implementation. Due to these variables most estimates of costs are on a scale comparable to airports with similar types of projects and requirements. However, for planning purposes, these estimates are usually conservative to allow for adequate budgeting in future years.

In addition to raw material costs – other factors are usually rolled in to each project to give a total estimated cost to include the following:

- Preliminary Engineering Reports
- Design (usually estimated at 10% of construction costs)
- Construction including mobilization costs for contractors
- Construction Administration (usually estimated at 12% of construction costs)

Given the uncertainty of future material costs and other variables, most estimates also include 10% contingency buffer. When planning for projects as far as 20 years in the future this will help offset any errors or changes in pricing. In an effort not to skew high priority safety and maintenance projects with lower priority funded support projects, aircraft storage hangars costs will be shown separately. Additionally, due to the size and "sticker shock" potential for build out costs within the proposed west side development area, this area will also be shown separately. **Table 6.2** describes estimated total costs for projects included in the CIP, while **Tables 6.3** and **6.4** reflect cost estimates for various sized hangars and the west side development.

Traditionally, hangars are not typically considered high priority projects and are often times constructed with private or third party funds; however, they are an integral component for attracting operators and / or businesses to the field and one of the few primary revenue sources generated at the field. While there are federal assisted funding programs in place for hangars, other priority items at an airport usually preclude these from being constructed in short- and intermediate-time frames. Additionally, hangars are constructed based on marked demands. Costs for hangars are provided for information purposes and are variable depending on the potential tenants needs and lease agreement with the airport.

Table 6.2
Cost Estimates

Project Description	Design (10%)	Construction Admin (12%)	Construction	Total Construction	Total Project
Construct Detention Pond	$67,500	$81,000	$675,000	$756,000	$823,500
Runway 17-35 Rehabilitation (Crack Seal / Sealant)	$404,100	$484,920	$4,041,000	$4,525,920	$4,930,020
Conduct aeronautical obstruction survey (Runway 13)	--	--	$100,000	--	$100,000
Conduct Environmental Assessment for runway extension	--	--	$150,000	--	$150,000
Construct perimeter road around R/W 31 end	$124,300	$149,160	$1,243,000	$1,392,160	$1,516,460
Expand existing terminal building and associated aircraft parking apron	$246,000	$296,400	$2,460,000	$2,755,200	$3,000,000
Conduct pavement strength analysis to determine weight bearing capacity of Runway 13-31	--	--	$50,000	--	$50,000
Runway 13-31 – 100' x 1,000' extension	$144,400	$173,280	$1,444,000	$1,617,280	$1,761,680
Extend T/W "A" and connector to coincide with R/W 13-31 extension (50' x 1,500')	$120,600	$144,720	$1,206,000	$1,350,720	$1,471,320
Construct and re-align T/W "D" to R/W 17 end	$65,560	$78,672	$655,600	$734,272	$799,832
Construct and extend T/W "E" as a mid-field connector	$169,300	$203,160	$1,693,000	$1,896,160	$2,065,460
Re-align south end of T/W "F"	$109,200	$131,040	$1,092,000	$1,223,040	$1,332,240
East side aircraft apron re-construction	$680,000	$816,000	$6,800,000	$7,616,000	$8,296,000
Expand existing terminal auto parking	$14,000	$16,800	$140,000	$156,800	$170,800
Relocate MALS to coincide with R/W 13-31 extension	$25,000	$30,000	$250,000	$280,000	$305,000
Install PAPI-4 lights to R/W 17-35	$6,500	$7,800	$65,000	$72,800	$79,300
Upgrade T/W MITL to LED type	$12,500	$15,000	$125,000	$140,000	$152,500
Install 12,000 gallon aboveground Jet-A fuel tank in existing fuel farm	$27,500	$33,000	$275,000	$308,000	$335,500
Construct Air Traffic Control Tower	$100,000	$120,000	$1,000,000	$1,120,000	$1,220,000
Update Airport Master Plan	--	--	$325,000	--	$325,000
Conduct Strategic Marketing Plan	--	--	$275,000	--	$275,000
TOTAL	$2,322,460	$2,786,952	$24,124,600	$26,911,552	$29,234,012

Source: KSA

Table 6.3
Aircraft Storage Hangars Cost Estimates

Project Description	Design (10%)	Construction Admin (12%)	Construction	Total Construction	Total Project
Infill and East side hangar re-development area and pavement • 75' x 75' (9) • 100' x 100' (11) • 100' x 140' (7) • 120' x 120' (4) • 200' x 200' (2)	$7,033,000	$8,439,720	$899,000 (ea) $1,728,000 (ea) $2,692,000 (ea) $2,486,000 (ea) $7,222,000 (ea)	$78,770,720	$85,803,820
Construct 20-unit T-hangars in southeast development area and pavement • 60' x 910' (4)	$3,910,800	$4,692,960	$9,777,000 (ea)	$43,800,960	$47,711,760
West side hangar development and pavement • T-hangars (10 – 60' x 264') • 75' x 75' (7) • 120' x 120' (19) • 150' x 200' (12)	$14,497,900	$17,397,480	$2,898,000 (ea) $899,000 (ea) $2,486,000 (ea) $5,206,000 (ea)	$162,376,480	$176,874,380
TOTAL	$25,441,800	$30,530,160		$284,948,160	$310,389,960

Source: KSA

Table 6.4
West Side Development Area Cost Estimates

Project Description	Design (10%)	Construction Admin (12%)	Construction	Total Construction	Total Project
Construct new west side terminal building, auto parking, and access road	$564,300	$677,160	$5,643,000	$6,320,160	$6,884,460
Construct west side parallel T/W and connectors (50' x 9,500')	$877,300	$1,052,760	$8,773,000	$9,825,760	$10,703,060
Construct new fuel farm in west side terminal area (tanks and self-serve dispenser)	$50,000	$60,000	$500,000	$560,000	$610,000
Construct west side apron to coincide with new terminal building	$1,470,000	$1,764,000	$14,700,000	$16,464,000	$17,934,000
Construct new ATCT	$150,000	$180,000	$1,500,000	$1,680,000	$1,830,000
TOTAL	$3,111,600	$3,733,920	$31,116,000	$34,849,920	$37,961,520

Source: KSA

6.3 Project Schedule

As detailed in the cost estimates, the anticipated funding needed to enact the airport master plan development will be substantial. This is not expected to be completed in a singular time frame and is included in a schedule and phased implementation. With a total of over $318 million in improvements, projects must be done incrementally to be financially feasible. Projects are broken into phases below to help airport and municipal staff prioritize projects and plan accordingly. Certain projects may be shifted into other phases as needed depending on funding priority and user needs over the duration of the planning period.

Short Term - (Current to 5 years):

Projects listed in this phase are considered high priority and will need to be addressed soon after the adoption of the plan. As previously mentioned, this is dependent on funding levels. Eliminating or minimizing the amount of ponding or drainage within the infield, a small detention pond will be constructed west of Runway 13-31, between Taxiways "E" and "F". Because Runway 17-35 pavement has deteriorated to a point of becoming a potential hazard to existing aircraft operators and FOD (foreign object damage) issues, this runway necessitates a complete rehabilitation. Additionally, this runway is absent any visual approach navigational equipment, thus, in the short-term, it is recommended the airport install a set of PAPI-4 lights to each runway end.

In addition to efficient aircraft mobility, it is also essential for airport operations and maintenance vehicles be afforded the same, therefore, as part of the short-term projects, it is recommended the airport construct a perimeter road around the Runway 31 end. This will not only allow airport vehicles the opportunity to transition around the airfield without the need to be in contact with ATCT personnel, it will allow the mobile fuel dispensing trucks the same courtesy.

The following projects are expected to occur in this short-term planning period:

- Rehabilitate Runway 17-35 (mill / overlay)
- Construct detention pond
- Install PAPI-4 to Runway 17-35
- Construct airport perimeter road south of Runway 31 end
- Expand terminal building and aircraft parking apron
- Install additional aboveground Jet-A fuel tank in fuel farm
- Auto parking expansion in existing terminal area
- Conduct Pavement Strength Analysis – Runway 13-31

Mid-Term - (6 to 10 years):

This phase of the plan is usually the most difficult to project. Projects that do not get funded as planned in the first phase can fall into this timeline quite often. However, it is important to keep these in mind as development progresses on the airport to ensure proper sequential development.

In this planning period, the majority of the projects are focused on the runway extension to Runway 13-31 – aeronautical survey, environmental assessment, 1,000' extension to Runway 13 and the associated parallel Taxiway "A", and the existing approach lighting system. However, there is a need for the airport to concentrate on areas of the east aircraft parking apron. This apron is in need of re-construction as the pavement has debilitated to a point of major cracking, loose aggregate, and other related items. Additionally, to maximize safe and efficient maneuverability of taxiing aircraft, Taxiways "D", "E", and "F" are recommended to be re-aligned or extended.

The following projects are expected to occur in this planning period:

- East side aircraft apron reconstruction
- Realign Taxiway "D" and south end of Taxiway "F" and remove old pavement
- Extend Taxiway "E" to become mid-field taxiway
- Conduct Aeronautical Survey for Runway 13
- Conduct Environmental Assessment for Runway 13-31 extension
- Extend Runway 13-31, 100' x 1,000 to the north
- Extend Runway 13-31 parallel taxiway – Taxiway "A" – 50' x 1,500'
- Relocate existing MALS and PAPI-4 to coincide with extension

Long-Term - (11 to 20 years):

These projects are lumped into a ten year period in the last part of the master plan horizon. These projects tend to be large scale and will include more development given the expected timeline. However, inherently, these projects also provide for the most flexibility as they are far into the future of the airport. Long-term capacity enhancements and development are shown and will be dependent on forecasted demand in the future. Airport pavement maintenance will continue to be provided, along with upgrading the MITL to LED type or installation of MITL in those areas that are presently without lighting capabilities. As referenced previously, this planning time-frame primarily focuses on the west side development area and includes a new terminal building, terminal auto parking, a new access road to the new terminal building, construction of a new terminal aircraft parking apron, and construction of a west side parallel taxiway system.

The following projects are expected to occur in this planning period:

- Construct West side development area terminal building, parking, and access road
- Construct West side aircraft parking apron
- Construct West side parallel taxiway and connectors
- Construct West side fuel farm
- Upgrade MITL to LED type equipment
- Update Airport Master Plan
- Conduct Strategic Marketing Plan

- Pavement rehabilitation (various locations)

Routine Maintenance Projects:

As airport infrastructure ages, routine maintenance will be required throughout the 20-year planning period including on-going pavement, lighting, NAVAID, and other projects. For runway, taxiway, and apron areas this includes pavement crack and seal or rehabilitation projects necessary to maintain a safe environment for aircraft operations. The airport will need to routinely assess the condition of the pavement and airside operational requirements such as marking and lighting to ensure sound operational condition. It has been identified in this master plan that the runways and taxiways will need rehabilitation during the planning period along with enhanced lighting, marking and signage. This will need to be rolled into in the CIP along with new capital projects.

The runways, taxiways and apron areas at New Braunfels are a vast undertaking to maintain. It will be important the airport stay active in the TxDOT Aviation Pavement Management Programs to help assist with managing the pavement and keeping track of airport pavement conditions. The Airport should take advantage of state grants in order to gain as much funding assistance for routine airport pavement maintenance as well as minor capital improvement projects.

Beyond Master Plan Horizon:

Certain development has been identified in future phases that may be included in subsequent master planning efforts. These phases are not expected to be completed in the 20 year planning horizon, however have been detailed to examine ultimate build-out potential of both the east and west side of the airfield. Development shown is largely hangar based that may be funded in part by local / private developers and could be expanded independently from the rest of the airport as required.

As previously mentioned, it is important to keep this long range development in the plan as it may influence how development is expanded in the near team. Space will need to be preserved to allow for access taxiways that lead to the ultimate proposed development. Hangar development previously identified in the alternatives chapter and labeled on the Recommended Development Plan will include large hangar development areas with subsequent apron space.

6.4 Funding Sources

This section describes sources and eligibility criteria for funding programs the Airport may take advantage of to aid in the funding of future development projects. It is not guaranteed all funding sources will be available and used on airport projects, however lists the general options and funding criteria. During financial implementation of projects at the airport, all funding sources should be evaluated and coordinated with the appropriate funding source for eligibility.

FAA Funding

To promote the development of airports a comprehensive program was established to provide grants for airport under what is now the Airport Improvement Program (AIP). Established by the Airport and Airway Improvement Act of 1982, initial AIP provided funding legislation through fiscal year 1992. Since then, the AIP has been authorized and appropriated on a yearly basis. Funding for this program is generated from a tax on airline tickets, freight waybills, international departure fees, and a tax on aviation fuel. Currently, the approved funding level for AIP is approximately $3.35 Billion.

The FAA issues and administers AIP grants through its regional offices and airport district offices. The AIP provides up to 90 percent funding for AIP eligible project costs, with the airport sponsors being responsible for the remaining 10 percent share. AIP funding must be spent on FAA eligible projects as defined in FAA Order 5100.38 "Airport Improvement Program (AIP) Handbook." In general, the handbook states:

- An airport must be in the currently approved National Plan of Integrated Airport Systems (NPIAS),
- AIP provides up to 90 percent federal funding for most eligible public-use airport improvements, and
- General aviation terminal buildings, T-hangars, and corporate hangars and other private-use facilities are not eligible for federal funding.

In addition, most revenue-producing items are not typically eligible for federal funding, and all eligible projects must be depicted on an FAA-approved Airport Layout Plan. Other sources of FAA funding include Facilities and Equipment (F&E) funding for facilities such as air traffic control towers and some runway instrumentation. This funding is separate from the AIP program and typically requires no local match.

State Funding

The Texas Department of Transportation (TxDOT) Aviation Division oversees grant funding for General Aviation and Reliever Airports in the state of Texas, known as a block grant state. Texas is one of 10 Block Grant states that allocate funding on behalf of the FAA. Funding is eligible for cities and counties to obtain and disburse federal and state funds for these airports included in the 300-airport Texas Airport System Plan (TASP).

Aviation Capital Improvement Program (CIP)

The ACIP is a plan for general aviation airport development in Texas. This program details anticipated airport projects based on the projected funding levels of the FAA AIP program and the Texas Aviation Facilities Development Program. This multi-year program is amended annually and designed to give airport sponsors, the FAA, and TxDOT a realistic plan for potential projects including scope, cost, and schedule. However, inclusion of a project in the Aviation CIP is not a commitment for future funding; and will not guarantee that the project will be implemented during the year it is programmed. Continued justification and local sponsor cost share are determining factors in the timely implementation of these projects. Projects identified in the current year will go before the Texas Transportation Commission for approval prior to going out for proposals and funding. Most grant items funded through this program are a 90 / 10 cost share.

This program will fund the largest share of the airport's capital improvement needs over the duration of the master plan. Airport sponsors should consistently engage TxDOT Aviation staff on airport project needs for consideration in the ACIP.

RAMP Program

TxDOT Aviation Division also administers the Routine Airport Maintenance Program (RAMP), which matches local government grants (50/50) up to $50,000 for basic improvements such as parking lots, fencing, and other airside and landside needs. This program is aimed at assisting airports continue to provide quality services and infrastructure through an annual maintenance basis. Projects that may not be eligible under other funding sources may be used here after other obligations are met. The local government match is 50% of actual costs plus any excess of $100,000 total costs.

This program includes smaller budget airside and landside airport improvements such as:

- construction of airport entrance roads
- pavement of airport public parking lots
- installation of security fencing
- replacement of rotating beacon

TxDOT determines the eligibility of specific items and insists that airside improvements are secure before requesting assistance with landside maintenance and improvements.

Hangar Program

This program allows an airport to utilize a four-year bank of NPE for the construction of hangar. However, in order to qualify, all of an airport's airside and safety deficiency needs must be met. Other considerations that must be met include: justification for the additional hangar need, site specific location based on an approved Airport Layout Plan (ALP), fair market hangar lease and rate structure in place, and adoption of airport minimum standards. This program assists airport sponsors with funding these structures with a local share of 10%, with the state contributing 90% up to a state maximum contribution of $600,000.

Terminal Program

One additional program that TxDOT Aviation provides is specific to general aviation terminal buildings. Many airports across the state are in need of upgrading or new terminal facilities for pilot lounges, FBO facilities, and airport staff administration. This program assists airport sponsors that have not previously been awarded funding for new terminal buildings at a local share of 50% up to a state maximum contribution of $500,000.

Sponsor Funding

The City of New Braunfels has a dedicated enterprise fund for the airport. The Airport Fund is approved annually through the city's budgeting process and funds are allocated to account for airport facilities operations and all activities necessary to provide services at the airport. As such, revenues collected by the airport such as lease rental income and other services are used to match expenses and match grant requirements. It is important to maximize revenues in order to continue to fund such activities with directly revenue generate from the airport. This fund will be critical to maintain in order to match future large capital improvement projects.

Alternative Funding Sources

Often when traditional aviation funding sources are not eligible or have been expended, other local and alternative funding options should be considered. Innovative financial strategies can be evaluated with the support of local elected officials and the general public. In addition to traditional municipal debt services such as general bond elections, other funding sources may be applicable.

Texas Enterprise Fund – The Texas Enterprise Fund (TEF) is the largest fund of its kind in the nation. The fund is used as a final incentive tool for projects that offer significant projected job creation and capital investment and where a single Texas site is competing with another viable out-of-state option. This may be useful in attracting aeronautical companies to the airport from other states that will significantly impact the local and state economy.

State Financing – Texas is committed to facilitating funding for companies and communities with expansion and relocation projects in the state. Asset-based loans for companies, leveraged loans to communities, and tax-exempt bond financing are just a few means of obtaining the capital necessary for a successful project.

Tax Incentives – The state also offers a variety of tax incentives and innovative solutions for businesses expanding in or relocating to Texas. Programs include Enterprise Zone sales tax refunds, manufacturing sales tax exemptions, property tax value limitation, and "freeport" inventory tax exemptions.

In addition to possible funding sources mentioned above, there are federal programs that assist with workforce and job creation along with research and innovation. Partnerships with area universities and junior colleges may be an exciting way to involve education in the airports development goals.

6.5 Capital Improvement Program Summary

This program will not be solely funded by the airport sponsor. The cost estimates previously presented are broken down by phase and give an estimated cost share based on eligibility. Subject to approval and funding, the following cost estimates by project type are listed in Table 6.5.

Table 6.5 Project Cost Summary			
Project Description	Total	Federal / State Share	Local / Private Share
Runway 17-35 Rehabilitation (Mill / Overlay)	$4,041,000	$3,636,900	$404,100
Construct detention pond	$823,500	$741,150	$82,350
Install PAPI-4 to Runway 17-35	$152,500	$137,250	$15,250
Construct airport perimeter road south of Runway 31 end	$1,516,460	$1,364,814	$151,646
Install additional aboveground Jet-A fuel tank in fuel farm	$335,500	$301,950	$33,550
Conduct pavement analysis Runway 13-31	$50,000	$45,000	$5,000
Expand existing terminal (approx. 2,000' sq. ft.) and associated aircraft parking apron (51,000 sq. ft.)	$3,000,000	$2,000,000	$1,000,000
Expand auto parking in existing terminal area	$170,800	$153,720	$17,080
Construct five Box Hangars (100' x 100')	$10,545,000	$7,908,750	$2,636,250
Construct two Box Hangars (100' x 140')	$6,545,000	$4,908,750	$1,636,250
Construct one 20-unit T-hangar (60' x 910')	$10,872,000	$8,154,000	$2,718,000
TxDOT RAMP	$250,000	$125,000	$125,000
Short-term Subtotal	$38,301,760	$29,477,284	$8,824,476
East side aircraft apron reconstruction	$8,296,000	$7,466,400	$829,600
Realign Taxiway "D" and south end of Taxiway "F"	$799,832	$719,849	$79,983
Extend Taxiway "E" to become mid-field connector	$2,065,460	$1,858,914	$206,546
Conduct Aeronautical Survey for Runway 13-31 extension	$122,000	$109,800	$12,200
Extend Runway 13-31, 100' x 1,000' to the north	$1,761,680	$1,585,512	$176,168
Extend Runway 13-31 parallel taxiway, 50' x 1,500' to the north	$1,471,320	$1,324,188	$147,132
Relocate existing MALS and PAPI-4 to coincide with runway extension	$305,000	$274,500	$30,500
Construct four Box Hangars (120' x 120')	$12,134,000	$9,100,500	$3,033,500
Construct one 20-unit T-hangar (60' x 910')	$10,872,000	$8,154,000	$2,718,000
TxDOT RAMP	$250,000	$125,000	$125,000
Intermediate-term Subtotal	$38,077,292	$30,718,663	$7,358,629
Construct new west side terminal building, auto parking, and access road [1]	$6,884,460	$4,621,014	$2,263,446
Construct west side aircraft parking apron	$17,934,000	$16,140,600	$1,793,400
Construct west side parallel taxiway and connectors	$10,703,060	$9,632,754	$1,070,306
Construct west side fuel farm	$610,000	$549,000	$61,000

Construct west side hangars	$171,273,360	$128,455,020	$42,818,340
Upgrade MITL to LED type equipment	$152,500	$137,250	$15,250
Update Airport Master Plan	$300,000	$247,500	$27,500
Conduct Strategic Marketing Plan	$275,000	$247,500	$27,500
Construct Air Traffic Control Tower	$1,220,000	$1,098,000	$122,000
TxDOT RAMP	$500,000	$250,000	$250,000
Long-term Subtotal	$209,852,380	$161,401,138	$48,451,242
TOTALS	$286,231,432	$221,597,085	$64,634,347

Source: KSA. [1] Proposed terminal building based on 100% local funding.

Of the local share, approximately $8.8 million is required during the short-term period, $7.3 million during the intermediate-time period, and $48.4 million during the long-term period. Conversely, the federal / state share of projects is approximately $29.4 million in the short-term, $30.7 million in the intermediate time period, and $161.4 million in the long-term.

6.6 Phasing Plan

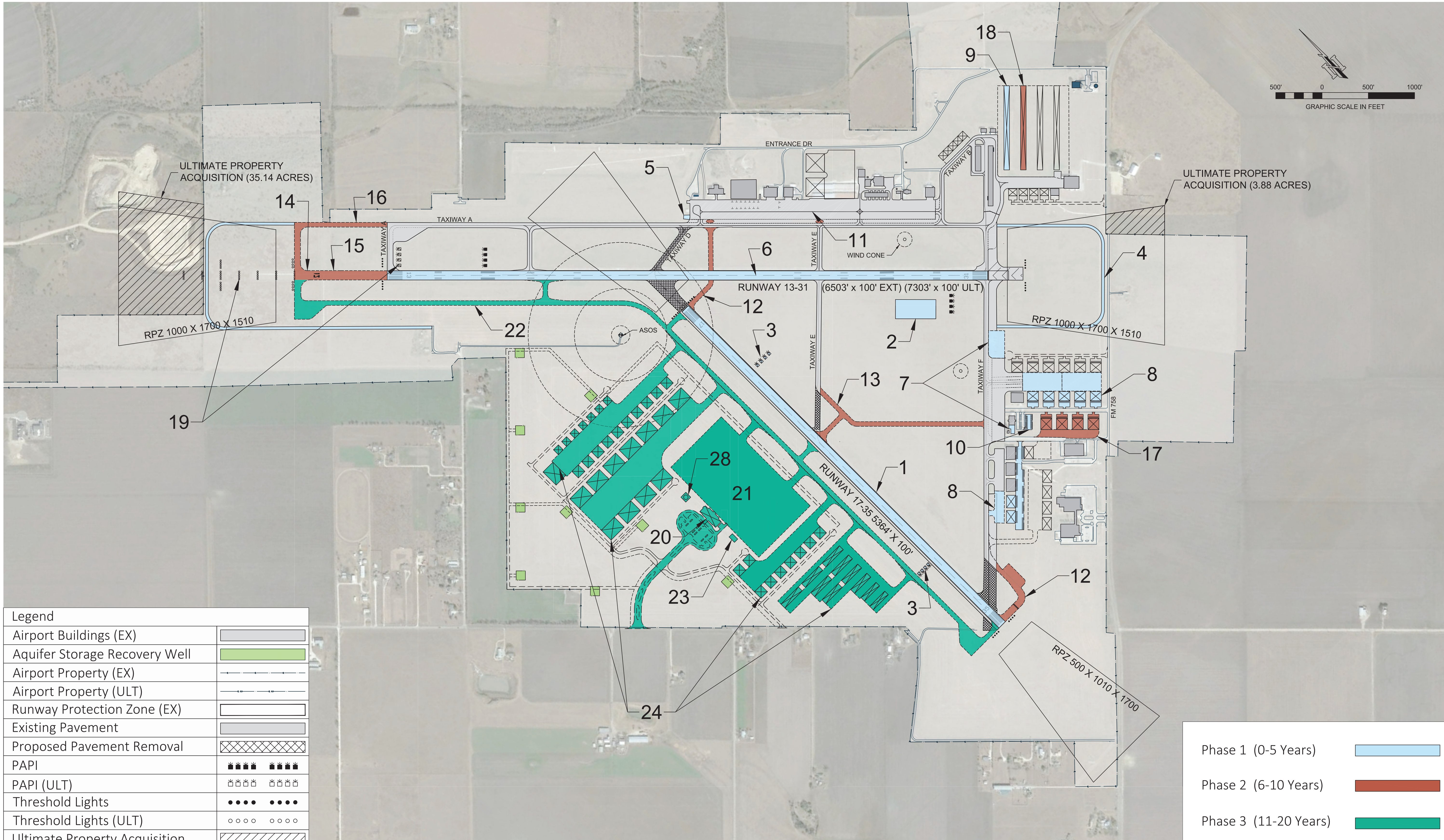
The cost estimates indicate the suggested phasing for projects during the short-, intermediate-, and long-range planning periods. The proposed improvements for each phase are illustrated graphically by time period. These are suggested schedules and variance from them will almost certainly be likely, particularly during latter time frames. Attention has been given to the first five years as being most critical, and the scheduled projects outlined in this time frame should be adhered to as much as possible. The demand for certain facilities and the economic feasibility of their development are the prime factors influencing the timing of individual project implementation. Care must be taken to provide for adequate lead-time for detailed planning and construction of facilities in an effort to meet aviation demands. **Table 6.6** and **Exhibit 6.1** presents the phasing plan.

Table 6-5
Project Cost Summary Justification

Project Description			Justification	Total Cost
SHORT-TERM (0-5 YEARS)	1	Runway 17-35 Rehabilitation (Mill / Overlay)	Safety / Standards	$4,041,000
	2	Construct detention pond	Safety	$823,500
	3	Install PAPI-4 to Runway 17-35	Safety	$152,500
	4	Construct airport perimeter road south of Runway 31 end	Safety	$1,516,460
	5	Install additional aboveground Jet-A fuel tank in fuel farm	Capacity	$335,500
	6	Conduct pavement analysis Runway 13-31	Standards	$50,000

	7	Expand existing terminal building and associated aircraft parking apron	Capacity	$3,000,000
	8	Construct Box Hangars	Safety / Landside Capacity	$17,090,000
	9	Construct T-Hangars	Safety / Landside Capacity	$10,872,000
	10	Expand auto parking in existing terminal area	Capacity	$170,800
INTERMEDIATE-TERM (6-11 YEARS)	11	East side aircraft apron reconstruction	Safety / Standards	$8,296,000
	12	Realign Taxiway "D" and south end of Taxiway "F"	Safety / Standards / Airside Capacity	$799,832
	13	Extend Taxiway "E" to become mid-field connector	Safety / Standards / Airside Capacity	$2,065,460
	14	Conduct Aeronautical Survey for Runway 13-31 extension	Capacity	$122,000
	15	Extend Runway 13-31, 100' x 1,000' to the north	Safety / Airside Capacity	$1,761,680
	16	Extend Runway 13-31 parallel taxiway, 50' x 1,500' to the north	Safety / Airside Capacity	$1,471,320
	17	Construct Box Hangars	Safety / Landside Capacity	$12,134,000
	18	Construct T-Hangars	Safety / Landside Capacity	$10,872,000
	19	Relocate existing MALS and PAPI-4 to coincide with runway extension	Safety	$305,000
LONG-TERM (11-20 YEARS)	20	Construct new west side terminal building, auto parking, and access road [1]	Landside Capacity	$6,884,460
	21	Construct west side aircraft parking apron	Landside Capacity	$17,934,000
	22	Construct west side parallel taxiway and connectors	Safety / Airside Capacity	$10,703,060
	23	Construct west side fuel farm	Capacity	$610,000
	24	Construct west side hangars	Safety / Landside Capacity	$171,273,360
	25	Upgrade MITL to LED type equipment	Safety / Standards	$152,500
	26	Update Airport Master Plan	Standards	$300,000
	27	Conduct Strategic Marketing Plan	Standards	$275,000
	28	Construct ATCT	Safety	$1,220,000

Source: KSA.



New Braunfels Regional Airport

Phasing Plan

FINANCIAL PLAN

Chapter 7. Financial Plan

This section focuses on methods of financing the Sponsor's share of the capital improvement program. The financial plan includes a forecast of expenses and revenues that can be used to determine whether a baseline level of funds will be available to pay for the local share of the capital development program over the planning period. This initial forecast assumes that the current rates and charges will keep pace with inflation and projects revenues and expenses into the future based upon a combination of short historical trends and City policy objectives.

7.1 Historical Revenues and Expenses

New Braunfels Regional Airport is operated by the City of New Braunfels under an Airport Enterprise Fund. Enterprise funds are used to account for the acquisition, operation and maintenance of governmental facilities and services that are entirely or predominantly self-supporting by user charges. The operation of enterprise funds is accounted for in such a manner as to show a profit or loss similar to comparable private enterprises. Enterprise funds are typically created to ensure that no tax dollars go towards providing for the annual operating cost and future capital improvements of the activity that is operated as such.

The City's objective is for the Airport to continue to be self-sustaining - meaning that the revenue generated by the Airport provides enough funding to pay for all current expenditures and other financial requirements related to the Airport. This includes regular costs such as operating expenditures, personnel costs, equipment purchases, and routine facilities maintenance and repair. It also includes paying any debt service associated with new or expanded facilities, maintaining a fund balance reserve equal to or greater than twenty five percent of annual operating expenditures, paying the City's General Fund for administrative support (such as information technology, payroll, purchasing, human resources), and developing a reserve for facility upkeep.

Table 7-1 shows the historical revenues and expenses for FY 2007-08 through FY 2016-17. This information was taken from the statements of revenues and expenses for New Braunfels Regional Airport provided by the City of New Braunfels. Many of the revenue and cost categories represent aggregated totals of several accounting sub-categories. Revenues from Airport operations are derived from the following:

- *Airport Leases:* This includes hangar, tie-down, and agricultural leases.
- *City Leases:* This includes two city leases paid by the general fund
- *Charges for Service:* This category includes commercial activities fees and fuel flowage fees collected from an FBO before they left the Airport in FY 2010-11.
- *Airport Fuel and Oil Sale:* These revenues are derived from the City-operated FBO fuel farm for both Jet A and Avgas, and the sale of oil.

- *Airport Miscellaneous Revenues:* This category captures all revenue that is not attributable to the other categories.

Airport Operating Expenses were made up of the following cost items:

- *Salary and Benefits:* This includes salary and benefits of Airport workers.
- *City Administrative Overhead*: Payment to the City's General Fund for administrative support (such as information technology, payroll, purchasing, human resources) for the Enterprise fund.
- *Professional Services:* Purchased professional and technical services that can be performed only by persons or firms with specialized skills and knowledge. This includes contracted labor if the services provided are professional in nature.
- *Phone and Utilities:* Costs for Telecommunications and Utilities.
- *Purchased Services:* Services purchased to operate, repair, maintain and rent property owned or used by the Airport. These services are performed by persons other than Airport or City employees.
- *Other Purchased Services:* Amounts paid for services rendered by organizations or personnel not on the payroll of the Airport and City.
- *Insurance:* Includes the commercial insurance premiums and self-insurance premiums for the Airport.
- *Fuel and Oil for Resale:* Includes cost of fuel and oil as well as related supplies.
- *Supplies and Materials:* This includes office/building supplies, postage, and machinery etc.

Current Airport debt obligations are made up of the following:

- *Certificates of Obligation 2014:* The original issue amount was $3,300,000 and was used for the purchase and improvement of Airport property and facilities formerly held by the fixed base operator that no longer operates at the Airport.
- *Certificates of Obligation 2006:* The original issue amount was $1,600,000 and was used to construct a hangar at New Braunfels Regional Airport.
- *Enterprise Maintenance and Equipment Replacement Fund:*
  - In FY 2014-15, the City purchased a hangar at New Braunfels Regional Airport ($74,061). All lease revenue generated from the hangar will be transferred back into the fund until the initial cost of the hangar purchase is fulfilled.
  - FY 2015-16, a Jet Re-fueler was purchased out of this fund for the Airport ($231,400). The Airport will pay back the fund over the next five years.

Not included in these operating revenue and expense statements are the annual contributions to the Airport from the FAA, TxDOT, or the City. Those contributions are not considered operating revenues by this analysis. Rather, this analysis is geared to identify the actual revenue producing ability of the Airport, along with its actual operating costs. In this regard, surplus operating revenues can be used to pay the local share of capital development or other non-operating costs.

Prior to FY 2013-14, the Airport was not making contributions to the General Fund for administrative services and, for several years, was not contributing to the debt service associated with the hangar that was constructed at the Airport in 2006. These costs were offset by the value of the administrative services provided to the Airport by other City departments (human resources, information technology, legal, etc.) and by the value of two City ground leases at the Airport. Under FAA Grant assurances, the Airport must be compensated for all land and asset use occurring

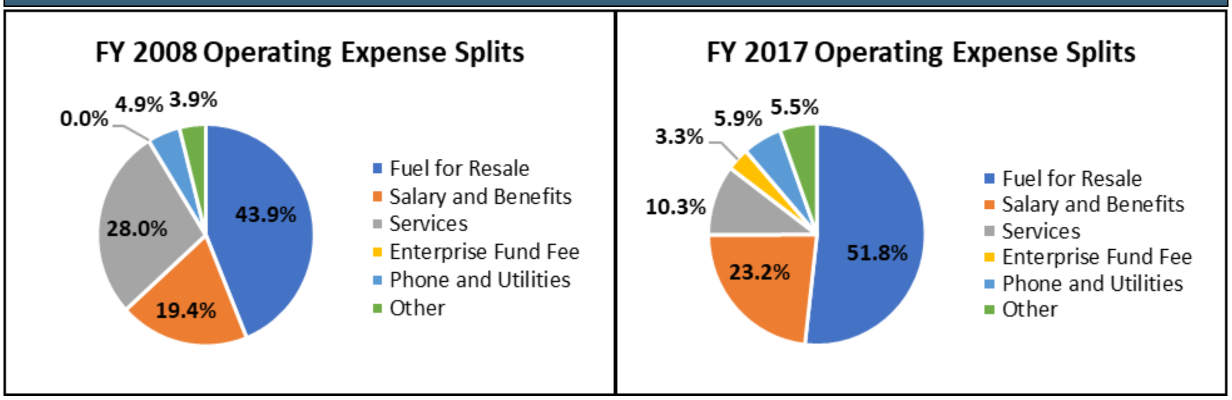
Table 7.1
New Braunfels Regional Airport Historical Revenues and Expense FY 2007-08 to FY 2016-17

Operating Revenue	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	CAGR[1]	Growth
Airport Leases	$298,476	$264,120	$317,266	$306,059	$297,295	$336,194	$429,785	$586,975	$589,547	$691,544	9.8%	131.7%
City Leases	$0	$0	$0	$0	$0	$0	$90,000	$146,500	$150,529	$157,370		
Charges for Services	$152,527	$46,815	$44,290	$29,569	$21,583	$16,403	$55,130	$57,966	$19,662	$24,596	-18.4%	-83.9%
Fuel Sales	$570,279	$403,320	$615,471	$1,025,940	$1,337,133	$1,396,077	$1,878,237	$1,635,285	$1,407,377	$1,630,613	12.4%	185.9%
Miscellaneous Revenue	$7,801	$4,622	$29,237	$48,034	$33,564	$25,175	$25,640	$37,242	$63,235	$41,436	20.4%	431.2%
Total Operating Revenues	$1,029,082	$718,876	$1,006,264	$1,409,601	$1,689,576	$1,773,849	$2,478,792	$2,463,968	$2,230,351	$2,545,560		
Operating Expenses	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	CAGR[1]	Growth
Salary and Benefits	$224,218	$221,109	$285,797	$329,928	$361,480	$378,467	$417,339	$409,070	$463,869	$481,798	8.9%	114.9%
City Administrative Overhead	$0	$0	$0	$0	$0	$0	$51,010	$55,426	$60,594	$69,524	n/a	n/a
Fuel and Oil for Resale	$508,294	$257,605	$461,787	$867,879	$1,068,762	$1,138,698	$1,437,488	$1,068,822	$772,707	$1,075,787	8.7%	111.6%
Professional Services*	$264,682	$134,329	$329,875	$98,521	$40,660	$76,169	$60,788	$19,052	$71,155	$37,493	-19.5%	-85.8%
Phone and Utilities	$56,377	$47,509	$50,714	$50,618	$50,165	$60,130	$72,950	$83,685	$101,001	$121,909	8.9%	116.2%
Purchased Services	$42,692	$50,640	$90,168	$95,652	$88,005	$88,653	$93,005	$92,067	$110,961	$94,326	9.2%	120.9%
Other Purchased Services	$16,665	$24,644	$29,457	$54,917	$58,414	$61,497	$68,441	$71,882	$82,315	$82,071	19.4%	392.5%
Insurance	$21,112	$22,874	$22,073	$23,102	$18,901	$22,061	$29,212	$27,497	$25,632	$25,196	2.0%	19.3%
Supplies and Materials	$24,565	$41,970	$57,758	$40,240	$57,754	$63,603	$64,521	$100,653	$72,059	$89,770	15.5%	265.4%
Total Operating Expenses	$1,158,604	$800,679	$1,327,628	$1,560,857	$1,744,141	$1,889,278	$2,294,753	$1,928,153	$1,760,292	$2,077,874	6.7%	79.3%
Net Operating Revenues	($129,522)	($81,803)	($321,364)	($151,256)	($54,566)	($115,429)	$184,038	$535,815	$470,059	$467,686		
Non-Operating Expenses	FY 2008	FY 2009	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017		
Debt Service	$0	$0	$0	$0	$0	$0	$40,000	$317,145	$319,532	$408,582		
Capital Expenses	$0	$0	$0	$0	$0	$0	$0	$0	$153,692	$115,820		
Total Non-Operating Expenses	$0	$0	$0	$0	$0	$0	$40,000	$317,145	$473,224	$524,402		
Operating Position	($129,522)	($81,803)	($321,364)	($151,256)	($54,566)	($115,429)	$144,038	$218,670	($3,165)	($56,716)		

CAGR: Compound Annual Growth Rate FY 2008-17 on Airport property. This includes the ground leases for the Central Texas Technology Center and the storage of City road materials which are paid from the City's General Fund. Beginning in FY 2013-14, both these revenues (payments from the General Fund for the ground leases) and expenditures (administrative costs to the General Fund) were recognized and budgeted. In addition, the Airport began making debt service payments again.

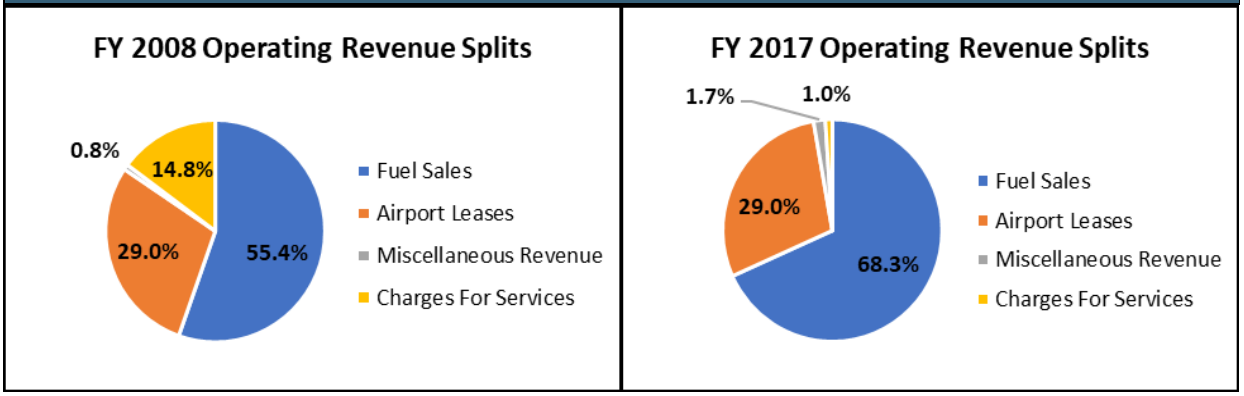
From the historical financial information, operating expenses have fluctuated from year-to-year, ranging from a low of $800,679 in FY 2008-09 to a high of $2,294,753 in FY 2013-14. Over the past four years operating expenses declined from $2,294,753 in FY 2013-14 to $2,077,874 in FY 2016-17- a total decrease of -9.5 percent (-3.3 percent annual growth rate), even though there was an increase in FY 2016-17 of $317,582 over FY-2015-2016. This was mainly due to higher costs for fuel. The Airport's three largest expenses are fuel and oil for resale ($1,075,787), salary and benefits ($463,869), and phone and utilities ($121,909). Shifts in operating expense categories are shown in Exhibit 7-1.

Exhibit 7.1
Percentage Shifts in Operating Expenses



Operating revenues have had positive growth since FY 2008-09, ranging from a low of $718,876 in to a high of $2,545,560 in FY 2016-17. One reason for the lower operating revenues and expenses in FY 2008-09 is that a major tenant went bankrupt, causing a significant loss of revenue. Over the past four years, operating revenues grew from $2,478,792 in FY 2013-14 to $2,545,560 in FY 2016-17 - a total increase of 2.7 percent (0.9 percent annual growth rate). The four-year average of operating revenues was $2,429,668 per year. Operating revenues in FY 2016-17 were 4.77 percent above that average. In FY 2016-17, revenues increased by $315,209, or by 14.1 percent with the largest increases in fuel sales and lease revenues. Shifts in operating revenue categories are shown in Exhibit 7-2.

Exhibit 7.2
Percentage Shifts in Operating Revenues



Fuel revenues and expenses have the largest influence over the financial profitability of the Airport. In FY 2016-17 fuel income was 68.3 percent of total operating revenues while fuel and oil for resale was 51.8 percent of total operating expenses. Because fuel may be bought and sold in different years and because of changes in fuel prices, there can be significant fluctuations in revenue and expenses. Although net revenues from fuel was down in FY 2016-17, Overall net fuel revenues have grown at an average yearly growth rate of 21.4 percent since FY 2012-13 (Table 7-2). Exhibit 7-3 shows a graphical comparison of revenues and expenses by year.

Table 7.2
Fuel Revenues and Expenses

	FY 2013	FY 2014	FY 2015	FY 2016	FY 2017	CAGR[1]
Fuel Revenue	$1,392,966	$1,875,901	$1,632,080	$1,405,112	$1,628,293	3.98%
Fuel Expense	$1,138,698	$1,437,488	$1,068,822	$772,707	$1,075,787	-1.41%
Fuel Net Revenue	$254,269	$438,413	$563,258	$632,404	$552,507	21.41%
Fuel Margin[2]	18.3%	23.4%	34.5%	45.0%	33.9%	

[1]Compound Annual Growth Rate FY 2012-13 to FY 2016-17

[2]Average fuel margin for the year based on revenues and expenses. Does not consider inventories or if fuel was bought and sold in different years.

Exhibit 7.3
BAZ Historical Fuel Reserves and Expenses

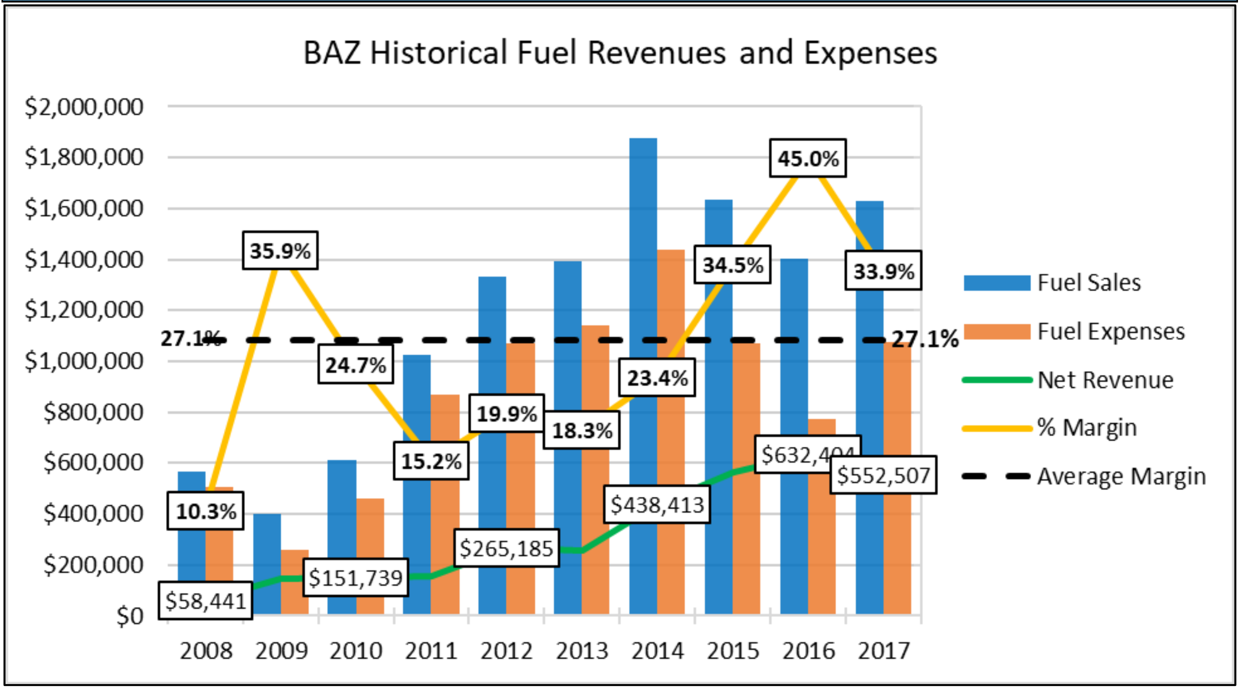


Table 7-3 shows the comparison of historical operating revenues and expenses. The Airports current debt service obligations and past capital expenses are also included to show any funding shortfalls. Prior to FY 2013-14 the Airport did not pay non-operating expenses out of the Airport budget.

Table 7.3
Comparison of Historical Operating Revenues and Expenses

Year	Operating Revenues	Operating Expenses	Non-Operating Expenses	Net Gain/(Loss)
FY 2008	$1,029,082	$1,158,604	$0	($129,522)
FY 2009	$718,876	$800,679	$0	($81,803)
FY 2010	$1,006,264	$1,327,628	$0	($321,364)
FY 2011	$1,409,601	$1,560,857	$0	($151,256)
FY 2012	$1,689,576	$1,744,141	$0	($54,566)
FY 2013	$1,773,849	$1,889,278	$0	($115,429)
FY 2014	$2,478,792	$2,294,753	$40,000	$144,038
FY 2015	$2,463,968	$1,928,153	$317,145	$218,670
FY 2016	$2,230,351	$1,760,292	$473,224	($3,165)
FY 2017	$2,545,560	$2,077,874	$524,402	($56,716)

It is against this historical backdrop that the forecast of revenues and expenses for New Braunfels Regional Airport is developed.

7.2 Forecast of Operating Revenues and Expenses

The forecast of operating revenues and expenses presents a look at revenues and expenses, influenced primarily by historical activity and revenue-producing capital investments. To determine the historical trend, a five-year historical period was used. This time period takes into account the shift from two FBOs to one FBO on the Airport. By using average growth, any major fluctuation during any one year did not unduly affect the overall trend. Assumptions used in developing the forecast included the following:

- *Rate of Inflation/Consumer Price Index (CPI):* Historically, the rate of inflation/CPI has been used to escalate prices when making forecasts of revenues and expenses. For this forecast, an annual growth rate of 2.0 percent was used throughout the planning period.
- *FY 2017-18 Revenues and Expenses:* The forecast utilized 8 months of revenues and expenses incurred in FY2017-18 in addition to the Airport Budget as input for revenues and expenses in FY2017-18. These were then increased by CPI throughout the planning period unless otherwise stated.
- *Airport Leases:* Airport existing leases were increased by CPI throughout the period. The City's two ground leases were combined in this category. This projection also assumed future hangars would be privately developed through land leases based on demand in the facility needs chapter.
- *Miscellaneous Revenue*: Due to fluctuations in this category, the five-year average (2013-2017) of historical revenues was used to calculate FY2018-19 revenues. It was then increased by CPI throughout period.
- *Fuel Sales:* Extrapolated FY2013-17 fuel revenues and expenses were used to estimate FY 2017-18 results, and then the forecast was increased by CPI throughout the period. Growth rates from FAA's Jet A fuel price forecast in the *FAA Aerospace Forecast 2018-2038* were used to estimate the increase in fuel expenses.
- *Salary and Benefits:* Airport budget numbers were used to estimate FY 2017-18 levels. This was then increased by 4.0 percent throughout the planning period (twice the rate of CPI).
- *Phone and Utilities:* Phone and Utilities were increased by 4.0 percent throughout the period to reflect historical growth.
- *All Other Costs:* All other expenses were increased by CPI.
- *Debt Service:* No debt service was included in the forecast of operating revenues and expenses to determine whether surplus net operating revenues (if available) could be used to help pay debt service costs.

Drawing on these assumptions, and taking a conservative approach to Airport financial performance, a reasonable forecast was developed. The baseline projection of revenues and expenses was forecast through FY2037. As shown in **Table 7-4**, operating revenues are anticipated to grow from $2,559,761 in FY 2017-18 to $6,573,859 by FY2036-37 - an average yearly increase of 5.1 percent and an overall increase of 156 percent for the period. Baseline operating expenses are expected to increase from $2,114,579 in FY 2017-18 to $5,478,477 by FY2036-37 - an average yearly increase of 5.1 percent and an overall increase of 159 percent. **Table 7-5** shows the summary forecast of net operating revenues.

Table 7.4
Forecast of Operating Revenues and Expenses

	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Operating Revenue										
Airport Leases	$827,471	$844,020	$860,901	$878,119	$895,681	$913,595	$931,867	$950,504	$969,514	$988,904
Additional Land Leases	$0	$3,443	$13,265	$19,898	$38,562	$45,957	$53,633	$64,355	$72,672	$88,198
Charges for Services	$31,587	$32,219	$32,863	$33,521	$34,191	$34,875	$35,572	$36,284	$37,010	$37,750
Fuel Sales	$1,662,157	$1,717,873	$1,853,761	$2,015,288	$2,207,818	$2,363,210	$2,511,080	$2,685,710	$2,839,675	$3,031,886
Miscellaneous Revenue	$38,546	$39,317	$40,103	$40,905	$41,723	$42,557	$43,409	$44,277	$45,162	$46,066
Total Operating Revenues	$2,559,761	$2,636,872	$2,800,893	$2,987,730	$3,217,975	$3,400,194	$3,575,561	$3,781,130	$3,964,033	$4,192,803
Operating Expenses	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Salary and Benefits	$539,315	$560,888	$583,323	$606,656	$630,922	$656,159	$682,406	$709,702	$738,090	$767,613
City Administrative Overhead	$71,159	$74,005	$76,966	$80,044	$83,246	$86,576	$90,039	$93,640	$97,386	$101,281
Fuel and Oil for Resale	$1,062,522	$1,100,177	$1,196,298	$1,311,074	$1,448,419	$1,558,589	$1,663,204	$1,787,286	$1,896,215	$2,032,993
Professional Services*	$53,040	$54,101	$55,183	$56,286	$57,412	$58,560	$59,732	$60,926	$62,145	$63,388
Phone and Utilities	$122,385	$127,280	$132,372	$137,666	$143,173	$148,900	$154,856	$161,050	$167,492	$174,192
Purchased Services	$95,802	$97,718	$99,673	$101,666	$103,699	$105,773	$107,889	$110,047	$112,248	$114,492
Other Purchased Services	$84,550	$86,241	$87,966	$89,725	$91,520	$93,350	$95,217	$97,121	$99,064	$101,045
Insurance	$25,718	$26,233	$26,757	$27,292	$27,838	$28,395	$28,963	$29,542	$30,133	$30,736
Supplies and Materials	$60,088	$61,289	$62,515	$63,765	$65,041	$66,342	$67,668	$69,022	$70,402	$71,810
Total Operating Expenses	$2,114,579	$2,187,933	$2,321,052	$2,474,176	$2,651,270	$2,802,645	$2,949,973	$3,118,336	$3,273,174	$3,457,551
Net Operating Revenues	$445,182	$448,939	$479,841	$513,554	$566,704	$597,550	$625,589	$662,794	$690,859	$735,252
Non-Operating Expenses	FY 2018	FY 2019	FY 2020	FY 2021	FY 2022	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027
Debt Service	$457,787	$383,552	$379,372	$384,834	$264,044	$264,169	$264,144	$263,750	$262,869	$261,478
Total Non-Operating Expenses	$505,873[1]	$383,552	$379,372	$384,834	$264,044	$264,169	$264,144	$263,750	$262,869	$261,478
Operating Position	($60,691)	$65,387	$100,469	$128,720	$302,660	$333,381	$361,445	$399,044	$427,990	$473,774

[1] Includes CIP Local Share ($17,000) and Capital Expenses ($31,086) already spent in 2018

Table 7.4
Forecast of Operating Revenues and Expenses, Con't

	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037
Operating Revenue										
Airport Leases	$1,008,683	$1,028,856	$1,049,433	$1,070,422	$1,091,830	$1,113,667	$1,135,940	$1,158,659	$1,181,832	$1,205,469
Additional Land Leases	$100,494	$113,247	$125,023	$138,701	$149,391	$152,379	$163,664	$180,064	$196,005	$212,512
Charges for Services	$38,505	$39,275	$40,060	$40,862	$41,679	$42,512	$43,363	$44,230	$45,114	$46,017
Fuel Sales	$3,221,748	$3,385,515	$3,577,510	$3,747,890	$3,947,107	$4,124,316	$4,304,895	$4,515,247	$4,702,989	$5,053,708
Miscellaneous Revenue	$46,987	$47,927	$48,885	$49,863	$50,860	$51,877	$52,915	$53,973	$55,053	$56,154
Total Operating Revenues	$4,416,416	$4,614,820	$4,840,912	$5,047,737	$5,280,867	$5,484,752	$5,700,776	$5,952,173	$6,180,994	$6,573,859
Operating Expenses	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037
Salary and Benefits	$798,318	$830,251	$863,461	$897,999	$933,919	$971,276	$1,010,127	$1,050,532	$1,092,553	$1,136,255
City Administrative Overhead	$105,333	$109,546	$113,928	$118,485	$123,224	$128,153	$133,279	$138,611	$144,155	$149,921
Fuel and Oil for Resale	$2,167,988	$2,283,860	$2,420,264	$2,540,816	$2,682,341	$2,807,723	$2,935,484	$3,084,899	$3,217,727	$3,469,442
Professional Services*	$64,655	$65,949	$67,268	$68,613	$69,985	$71,385	$72,813	$74,269	$75,754	$77,269
Phone and Utilities	$181,160	$188,406	$195,942	$203,780	$211,931	$220,408	$229,225	$238,394	$247,930	$257,847
Purchased Services	$116,782	$119,118	$121,500	$123,930	$126,409	$128,937	$131,516	$134,146	$136,829	$139,566
Other Purchased Services	$103,066	$105,127	$107,230	$109,374	$111,562	$113,793	$116,069	$118,390	$120,758	$123,173
Insurance	$31,350	$31,977	$32,617	$33,269	$33,935	$34,613	$35,305	$36,012	$36,732	$37,466
Supplies and Materials	$73,246	$74,711	$76,206	$77,730	$79,284	$80,870	$82,487	$84,137	$85,820	$87,536
Total Operating Expenses	$3,641,898	$3,808,945	$3,998,415	$4,173,996	$4,372,590	$4,557,159	$4,746,306	$4,959,390	$5,158,258	$5,478,477
Net Operating Revenues	$774,518	$805,875	$842,497	$873,741	$908,277	$927,593	$954,470	$992,783	$1,022,736	$1,095,383
Non-Operating Expenses	FY 2028	FY 2029	FY 2030	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037
Debt Service	$259,563	$262,000	$262,750	$262,000	$260,750	$263,875	$61,375	$0	$0	$0
Total Non-Operating Expenses	$259,563	$262,000	$262,750	$262,000	$260,750	$263,875	$61,375	$0	$0	$0
Operating Position	$514,955	$543,875	$579,747	$611,741	$647,527	$663,718	$893,095	$992,783	$1,022,736	$1,095,383

Table 7.5 Forecast of Operating Net Revenue				
Year	Operating Revenues	Operating Expenses	Operating Net Revenues	Operating Position[1]
FY 2018	$2,559,761	$2,114,579	$445,182	($60,691)
FY 2019	$2,636,872	$2,187,933	$448,939	$65,387
FY 2020	$2,800,893	$2,321,052	$479,841	$100,469
FY 2021	$2,987,730	$2,474,176	$513,554	$128,720
FY 2022	$3,217,975	$2,651,270	$566,704	$302,660
FY 2023	$3,400,194	$2,802,645	$597,550	$333,381
FY 2024	$3,575,561	$2,949,973	$625,589	$361,445
FY 2025	$3,781,130	$3,118,336	$662,794	$399,044
FY 2026	$3,964,033	$3,273,174	$690,859	$427,990
FY 2027	$4,192,803	$3,457,551	$735,252	$473,774
FY 2028	$4,416,416	$3,641,898	$774,518	$514,955
FY 2029	$4,614,820	$3,808,945	$805,875	$543,875
FY 2030	$4,840,912	$3,998,415	$842,497	$579,747
FY 2031	$5,047,737	$4,173,996	$873,741	$611,741
FY 2032	$5,280,867	$4,372,590	$908,277	$647,527
FY 2033	$5,484,752	$4,557,159	$927,593	$663,718
FY 2034	$5,700,776	$4,746,306	$954,470	$893,095
FY 2035	$5,952,173	$4,959,390	$992,783	$992,783
FY 2036	$6,180,994	$5,158,258	$1,022,736	$1,022,736
FY 2037	$6,573,859	$5,478,477	$1,095,383	$1,095,383

[1]Includes debt service obligations from agreements prior to 2018.

7.3 Capital Costs

When the capital improvement plan, local share requirements are paired with the anticipated net revenues from airport operations, it can be seen that a funding shortfall will continue into the immediate future (Table 7.6). As shown, $597,430 will be needed to fund the local share of capital improvements in Phase 1 of the recommended plan. The Airport will be able to fund their local share portion of both the intermediate phase and the third phase from operational revenue surpluses.

Table 7.6 Overall Cash Flow from New Revenues and Capital Costs				
Year	Operating Revenues	Operating Expenses	Non-Operating Expenses	Net Deficit
FY 2018	$2,559,761	$2,114,579	$505,873	($60,691)
FY 2019	$2,636,872	$2,187,933	$667,046	($218,107)
FY 2020	$2,800,893	$2,321,052	$662,866	($183,025)
FY 2021	$2,987,730	$2,474,176	$668,328	($154,774)
FY 2022	$3,217,975	$2,651,270	$547,538	$19,166
Subtotals Phase 1	$14,203,231	$11,749,010	$3,051,651	($597,430)
FY 2023	$3,400,194	$2,802,645	$585,595	$11,955
FY 2024	$3,575,561	$2,949,973	$585,570	$40,019
FY 2025	$3,781,130	$3,118,336	$585,176	$77,618
FY 2026	$3,964,033	$3,273,174	$584,295	$106,565
FY 2027	$4,192,803	$3,457,551	$582,904	$152,348
Subtotals Phase 2	$18,913,722	$15,601,679	$2,923,539	$388,504
FY 2028	$4,416,416	$3,641,898	$420,276	$354,242
FY 2029	$4,614,820	$3,808,945	$422,713	$383,162
FY 2030	$4,840,912	$3,998,415	$423,463	$419,034
FY 2031	$5,047,737	$4,173,996	$422,713	$451,028
FY 2032	$5,280,867	$4,372,590	$421,463	$486,814
FY 2033	$5,484,752	$4,557,159	$424,588	$503,006
FY 2034	$5,700,776	$4,746,306	$222,088	$732,382
FY 2035	$5,952,173	$4,959,390	$160,713	$832,070
FY 2036	$6,180,994	$5,158,258	$160,713	$862,023
FY 2037	$6,573,859	$5,478,477	$160,713	$934,670
Subtotals Phase 3	$54,093,306	$44,895,434	$3,239,442	$5,958,430

While the recommended plan shows significant hangar development ($227 million), the assumption that private enterprise would fund all future hangar development makes the financial plan feasible. This does not mean that the City cannot or should not finance or develop hangar facilities on their own. However, from the following section, it can be seen that grant funding is a needed component of any City hangar development.

7.4 Financial Planning Strategies for Hangar Development

Given the need for capital development in the future, there are at least two primary strategies that can be used by the City of New Braunfels to provide hangar development on the Airport – the largest unfunded need. One method is to have the City fund all the development and take all the rental revenues. Another method is to have third parties develop the hangars with private capital. This removes debt service, but also lowers revenues to simple land leases. Also, that method assumes builders will appear when needed.

The financial plan assumes hangar development in all three Phases will be funded by private enterprise. Land leases for these hangars are assumed, along with a reversion of all improvements to the City after 30 years.

To compare the relative return on each hangar development scenario, a baseline cases for a 10,000 square foot hangar and a 20-unit T-hangar were considered. These cases included:

- City development of hangars and other revenue producing facilities – to move away from simple land leases. This would help get the full market rate of return on those capital investments.
- Private development of hangars, using a land lease with the City on Airport property.

Tables 7.7 and 7.8 present the pro forma comparisons.

Table 7.7
Conventional Hangar Development Option: 30 Year Net Revenues

Options: Conventional Hangar $6.00 per s.f.	Airport-Developed	Ground Lease
Hangar Size/ lease footprint	10,000 sf	21,780 sf
Hangar Cost	$2,070,000	$0
Additional Maintenance@ 5% of Revenue	$121,704	0
Total Cost with debt (30 yr@ 4.0% Interest)	$3,766,871	0
Breakeven/SF/ with annual escalation @ 2.0%	$9.29	$0
Opportunity Cost		
Airport rates	$6.00 sf	$0.20 sf
30 Year Net Revenue	($1,245,318)	$176,715

Table 7.8
T-Hangar Development Options: 30 Year Net Revenues

Options: 20 Unit T-hangar	Airport	Ground Lease
Hangar Size/ lease footprint	25,000 sf	50,000 sf
Hangar Cost	$4,978,022	$0
Additional Maintenance@ 5% of Revenue	$219,068	0
Total Cost with debt (30 yr@ 4.0% Interest)	$8,932,212	0
Breakeven/unit/Month with annual escalation @ 2.0%	$916.88	$0
Opportunity Cost		
Airport rates	$450/month	$0.20 sf
30 Year Net Revenue	($4,393,417)	$405,681

As shown, the cost for the City to develop hangars is not profitable until after the debt service is paid. At that point, the City could earn market rates for their hangar investments. However, it would take a decade or more to fully retire the debt.

On the other hand, if the City were to lease land to private developers for 30 years, with all improvements reverting to the City, they could charge market rates in year 31, not having incurred any residual debt to pay. From this analysis, it would appear that ground leases for hangar development work better than City financing of hangar development.

There are several caveats that need to be made in explaining these scenarios:

- Airport rates shown in the pro formas could be significantly higher, thereby making the City investment more feasible than shown.
- Grants of any nature (4B Corporation investments, Non-primary entitlement grants, etc.) will make the City investment more feasible than shown.
- Costs of development may be less than shown, which could make the City investment more feasible.

Assuming there are no other sources of funds, the ground lease option shows the greatest feasibility for hangar development at BAZ.

APPENDICES

Appendix One:

FAR Part 139 Airport Certification Evaluation

Introduction

An overview of the anticipated process, implications, airport safety standards, and benefits is provided to the airport sponsor as an appendix to the 2018 airport master plan update to help adequately evaluate the implications of Title 14, Code of Federal Regulations (CFR), Part 139 (14 CFR Part 139) Airport Certification. This includes a review of:

- Future capabilities of the airport to serve commercial air service
- Required improvements necessary to obtain certification
- Benefits of certification
- Associated costs for maintaining certification

As of 2018, New Braunfels Regional Airport (BAZ) does not offer commercial air carrier service necessitating the need for the airport to meet Part 139 requirements. However, should the airport pursue such endeavor, the following information is to be used as a reference for implications and certification.

What is FAA PART 139?

Generally speaking, this federal rule applies standards for safety of airport facilities that conduct commercial air operations. In 2004, the Federal Aviation Administration (FAA) issued a final rule that revised the Federal airport certification regulation Part 139 and established certification requirements for airports serving scheduled air carrier operations in aircraft designed for more than 9 passenger seats but less than 31 passenger seats. This federal regulation requires the FAA to issue airport operating certificates to airports that:

- Serve scheduled and unscheduled air carrier aircraft with more than 30 seats;
- Serve scheduled air carrier operations in aircraft with more than 9 seats but less than 31 seats; and
- The FAA Administrator requires to have a certificate.

Under FAR Part 139, the FAA requires an Airport Operating Certificate (AOC) for any airport supporting commercial air service. After certification, airport sponsors are required to maintain the certificate standards and requirements. If the FAA finds that an airport is not meeting its obligations, it can impose an administrative action and a financial penalty for each day the airport continues to violate a Part 139 requirement. In extreme cases, FAA may revoke the airport's certificate or limit the areas of an airport where air carriers can land or takeoff.

Under the certification process, airports are classified into four (4) classes based upon the type of air carrier operations served:

Table A.1 FAR Part 139 Air Carrier Classes	
Class I	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	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	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	An airport certificated to serve unscheduled passenger operations of large air carrier aircraft. A Class IV airport cannot serve scheduled large or small air carrier aircraft.
Scheduled Operation	Any common carriage passenger-carrying operation for compensation or hire conducted by an air carrier for which the air carrier or its representatives offers in advance the departure location, departure time, and arrival location. It does not include any operation that is conducted as a supplemental operation under 14 CFR part 121 or public charter operations under 14 CFR part 380.
Unscheduled Operations	Any common carriage passenger-carrying operation for compensation or hire, using aircraft designed for at least 31 passenger seats, conducted by an air carrier for which the departure time, departure location, and arrival location are specifically negotiated with the customer or the customer's representative. It includes any passenger-carrying supplemental operation conducted under 14 CFR part 121 and any passenger-carrying public charter operation conducted under 14 CFR part 380.
Note:	Special Statutory Requirements to Operate to or From a Part 139 Airport. Each air carrier that provides—in an aircraft designed for more than 9 passenger seats—regularly scheduled charter air transportation for which the public is provided in advance a schedule containing the departure location, departure time, and arrival location of the flight must operate to and from an airport certificated under part 139 of this chapter in accordance with 49 U.S.C. 41104(b)… Certain operations by air carriers that conduct public charter operations under 14 CFR part 380 are covered by the statutory requirements to operate to and from part 139 airports. See 49 U.S.C. 41104(b).

Source: Part 139 Handbook *§139.5 Definitions*

For purposes of this report, it is assumed that the airport's (BAZ) associated classification would fall within Class IV.

Required Airport Certification Manual (ACM) Elements

Much of FAR Part 139 is designed to be broad ranging and generic in nature, so as to be applicable to any civil-use airport. Each individual airport is required, then, to create operational procedures specific to its unique environment that comply with the regulations listed in Part 139. For airports to be in full compliance, a comprehensive list of operational procedures are required to be compiled into an Airport Certification manual (ACM). FAR Part 139 provides a listing of the specific areas of airfield operations that must meet particular compliance standards. These areas include airfield pavement management, ARFF, snow and ice control, safety inspections, airport emergency plans, and wildlife hazard management. **Table A.2** provides a breakdown of the elements required by Part 139 and the associated airport class.

Table A.2
FAR Part 139 Airport Certification Manual (ACM) Elements

Manual Elements	Airport Certificate Class			
	Class I	Class II	Class III	Class IV
Lines of succession of airport operational responsibility	X	X	X	X
Each current exemption issued to the airport from the requirements of this part	X	X	X	X
Any limitations imposed by the Administrator	X	X	X	X
A grid map or other means of identifying locations and terrain features on and around the airport that are significant to emergency operations	X	X	X	X
The location of each obstruction required to be lighted or marked within the airport's area of authority	X	X	X	X
A description of each movement area available for air carriers and its safety areas and each road described in § 139.319(k) that serves it	X	X	X	X
Procedures for avoidance of interruption or failure during construction work of utilities serving facilities or NAVAIDs that support air carrier operations	X	X	X	
A description of the system for maintaining records, as required under § 139.301	X	X	X	X
A description of personnel training, as required under § 139.303	X	X	X	X
Procedures for maintaining the paved areas, as required under § 139.305	X	X	X	X
Procedures for maintaining the unpaved areas, as required under § 139.307	X	X	X	X
Procedures for maintaining the safety areas, as required under §139.309	X	X	X	X
A plan showing the runway and taxiway identification system, including the location and inscription of signs, runway markings, and holding position markings, as required under §139.311	X	X	X	X
A description of, and procedures for maintaining, the marking, signs, and lighting systems, as required under § 139.311	X	X	X	X
A snow and ice control plan, as required under § 139.313	X	X	X	
A description of the facilities, equipment, personnel, and procedures for meeting the aircraft rescue and fire-fighting requirements, in accordance with §§ 139.317 and 139.31	X	X	X	X
A description of any approved exemption to aircraft rescue and fire-fighting requirements, as authorized under § 139.111	X	X	X	X

Source: Part 139 Handbook

Whether at a small general aviation airport or a large commercial service airport, the proper management of operations on the airfield is essential to the safety and efficiency of aircraft operations. For airports serving most air carrier operations, a written plan of operations management, addressing specific areas of operations and certain mandated specifications, is required by the FAA as written in FAR Part 139. For all airports, however, it is suggested the areas of operations described in FAR Part 139 be addressed, because the hazards that accompany wildlife, climate, and the potential for accidents resulting from aircraft operations have the potential of occurring regardless of the presence of commercial air carrier service.

Newly Certified Airports

Airport operators wanting to apply for an AOC must initiate the application process as prescribed in §139.103 and typically follows:

- Contacting the appropriate FAA Regional Airports Division Office;
- Regional Airports Division Office interviews the airport operator to obtain information about the airport and air carrier operations served (or anticipated to be served);
- If FAA determines that a certificate is necessary, FAA staff will provide the airport operator, FAA Form 5280-1, *Application for Certificate*, and other guidance materials;
- Airport operator submits a completed application, along with two copies of the airport's proposed ACM and written documentation as to when air carrier service with begin;
- FAA reviews the application and associated documentation to ensure completed properly and inspect the airport for compliance. The FAA will work with the airport operator to tailor the ACM to ensure compliance;
- FAA will issue AOC if required documentation meets Part 139 provisions and / or provide provisions to ensure additional safety measures.

After certification, the FAA will conduct annual inspections to ensure that airports with an AOC are meeting the requirements of Part 139. Per the FAA, the certification inspections include the following steps:

- **Pre-inspection review** of office airport files and airport certification manual.
- **In-briefing with airport management.** Organize inspection time schedule, meet with different airport personnel.
- **Administrative inspection of airport files, paperwork, etc.** Also includes updating the Airport Master Record (FAA Form 5010) and review of the Airport Certification Manual/Specifications (ACM/ACS), Notices to Airmen (NOTAM), airfield self-inspection forms, etc.
- **Movement area inspection.** Check the approach slopes of each runway end; inspect movement areas to find out condition of pavement, markings, lighting, signs, abutting shoulders, and safety areas; watch ground vehicle operations; ensure the public is protected against inadvertent entry and jet or propeller blast; check for the presence of any wildlife; check the traffic and wind direction indicators.
- **Aircraft rescue and firefighting (ARFF) inspection.** Conduct a timed-response drill; review aircraft rescue and firefighting personnel training records, including annual live-fire drill and documentation of basic emergency medical care training; check equipment and protective clothing for operation, condition, and availability.

- **Fueling facilities inspection.** Inspection of fuel farm and mobile fuelers; check airport files for documentation of their quarterly inspections of the fueling facility; review certification from each tenant fueling agent about completion of fire safety training.
- **Night inspection.** Evaluate runway/taxiway and apron lighting and signage, pavement marking, airport beacon, wind cone, lighting, and obstruction lighting for compliance with Part 139 and the ACM/ACS. A night inspection is conducted if air carrier operations are conducted or expected to be conducted at an airport at night or the airport has an instrument approach.
- **Post inspection briefing with airport management.** Discuss findings; issue Letter of Correction noting violations and/or discrepancies if any are found; agree on a reasonable date for correcting any violations, and give safety recommendations.

Capital Improvement Needs

Airfield projects may be required to meet certification standards and would represent a significant capital expense. Part of a certification inspection is an assessment of existing facilities measured against current design, safety, and maintenance standards. If the airfield does not meet current design guidelines, upgrades are required in order to meet the design and maintenance standards identified. Inspectors use the Airport ACM to outline needed improvements for inspection on their next visit. Then, through stand-alone City funding or partnerships with state and federal agencies through the Airport Improvement Program (AIP), these upgrades are budgeted and completed.

Airfield

Typically, the FAA does not grant waivers for non-compliant airfield geometries, safety areas, runway protection zones, and other design criteria. Therefore these safety related improvement projects are high priority projects and programmed to be funded as quickly as practicable. As regulations and design criteria evolve, an airport could face challenges to adapt and comply. While compliance with evolving criteria makes an airfield safer, such changes can also make the field less capable and/or efficient.

ARFF

Certified airports must meet emergency response capability related to Aircraft Rescue and Firefighting (ARFF) equipment and personnel training requirements. Therefore, an airport wishing to achieve certification must be able to provide a facility can provide these services. *Chapter One - Inventory* provided details about the various ARFF Classes and associated equipment. Ultimately, it is assumed the airport would fall within Index B criteria for firefighting equipment, which services aircraft more than 90 feet in length but less than 126 feet in length. Based on §139.319 (h)(2)(i), response times required for emergency vehicles should be a maximum of "3 minutes from the time of the alarm, at least one required aircraft rescue and firefighting vehicle must reach the midpoint of the farthest runway serving air carrier aircraft from its assigned post or reach any other specified point of comparable distance on the movement area that is available to air carriers, and begin application of extinguishing agent".

When planning an ARFF station, the primary consideration is that the site be able to meet, or exceed FAR Part 139 requirements for vehicle response times. A response time analysis will need to be conducted to ensure the site can adequately meet the Part 139 requirements. During the planning phase a comprehensive analysis would need to be completed to determine which potential sites can provide the fastest response time and comply with the certification requirements. In addition, there are other factors to consider when evaluating locations.

Per *FAA Advisory Circular 150/5210-15A - AIRCRAFT RESCUE AND FIREFIGHTING STATION BUILDING DESIGN* – considerations for locating an ARFF station should include:

1. Operational Factors
2. Site Size
3. Proximity to Utilities and Roads
4. Topography and Station Orientation

Currently, city plans propose a new city owned fire station to be constructed just northwest of the Runway 13 end. It is proposed this facility be housed with ARFF equipment and trained personnel to double as designated city and airport fire services should emergencies arise. Exhibit A.1 graphically illustrates the proposed location of the proposed station, which accounts for the overall future footprint of the airport – including any potential runway extension or imaginary airspace services associated with instrument approaches.

Note: This assessment makes no determination that the proposed site will be adequate to meet the FAR Part 139 requirements without further investigation and study.

Miscellaneous

Other capital expenditures include projects associated with compliance of airfield lighting, marking, and signage requirements. Additionally, certificated airports are also required to maintain a security plan, which is a document that spells out how the airport will secure against outside threats. These facility requirements vary according to the airport and its activity, however, certified airports are typically required to address airport security fencing and similar perimeter issues. This may apply to upgrading all secure access points on the airport and ensuring proper signage, access gates, and badging

Future unknowns, such as changes to Part 139 Certification requirements, could result in some unanticipated future capital costs for the Airport such as terminal buildings, security requirements, and other facility upgrade requirements to meet standards. Additionally, the FAA is now considering the best way to introduce Safety Management Systems (SMS) requirements at Part 139 certificated airports in an effort to continue to improve aviation safety. The safety policies and objectives identified in the SMS could result in additional unanticipated administrative and capital expenses.

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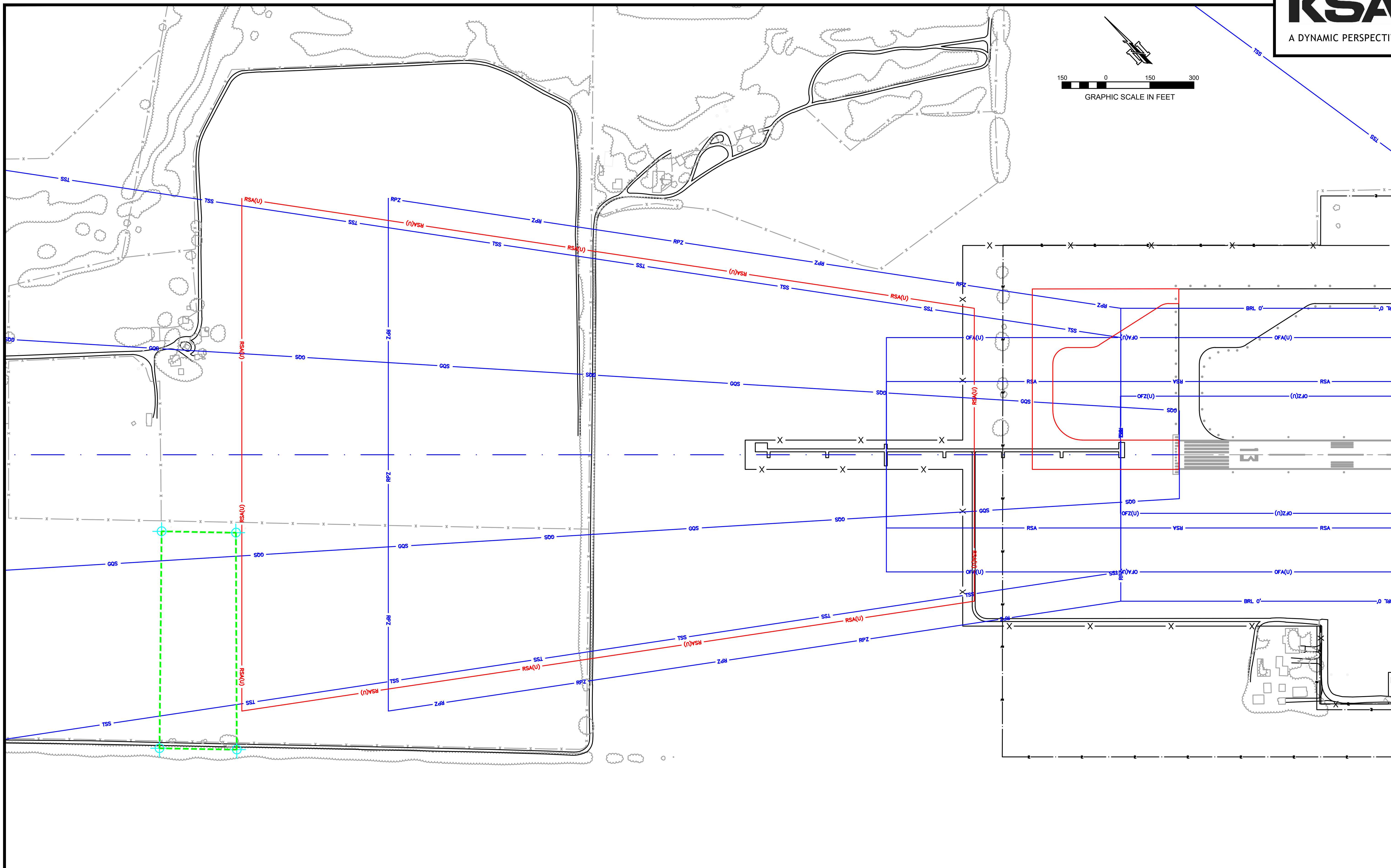

Costs of Maintaining an Airport Operating Certificate

Costs for maintaining the AOC vary according to size of the airport, size of the aircraft accommodated, size of the staff, and class of airport. Because of their very nature, Class I airport require more capital outlay than those that fall within Class IV. In addition to the capital requirements previously detailed, there will be ongoing costs associated with keeping certification.

Direct costs associated with an AOC at a new airport vary include, but not limited to:

- ARFF equipment (trucks and facility)
- ARFF trained personnel and associated salaries / benefits
- Adequate access to the airport
- Annual firefighting training and recordkeeping
- Vehicle maintenance
- Firefighting agents
- ARFF inspections
- Airport staff maintenance and training
- Part 139 certificate administration

Comparison of Part 139 Certification Options

To help determine a path forward for accommodating Part 139 Certification, a comparison analysis to help guide future decisions is provided in the following table, **Table A.3**. This table compares those items that have a cost requirement as part of Part 139 and those due to FAA Grant Assurance. Grant Assurances are a set of requirements the City agrees to maintain with each Airport Improvement Program (AIP) grant the City accepts. There are a total of 39 grant assurances, incumbent for 20-years after accepting a grant, each covering a separate area of airport operation. These “assurances” or “obligations” cover areas of airport management, record keeping, field maintenance, and public outreach. Grant Assurances are independent of the Part 139 standards; whether the City has an active AOC, it is required to maintain grant assurances at the same level of quality.

Table A.3
FAR Part 139 and Grant Assurance Requirements

Airport Administration Requirements	Required Per Part 139 Certification	Required Per FAA Grant Obligations	Notes
Training	X	X	Not as much training needed under grant assurances
Training Records	X	X	Not as many training records needed under grant assurances.
Administration	X	X	Less record keeping required by grant assurances.
Field Maintenance	X	X	Different time-frame to make repairs.
ARFF Support	X		Not required by grant assurances.
Security	X	X	
Airport Design	X	X	Not as stringent under grant assurances.
# of Personnel	X	X	The same.
Airport Certification Manual	X		
FAA Certification Inspection	X		
NPE's	X	X	Same qualifications under both guiding documents.
NPIAS Status	X	X	Same qualifications under both guiding documents.
AIP Funding	X	X	Same qualifications under both guiding documents.
1-9 Seat Commuter Air Service		X	Most likely for smaller communities with current air service business models.
10-30 Seat Commuter Air Service	X		Less likely for smaller communities with air service business models.
Future TSA Costs	X		Potentially needed with commuter service.
Operating FBO	X	X	Independent of airfield requirements.

The table shows that the Grant Assurances require much of the same record keeping and training involved with maintaining the Part 139 Certificate but to a much lesser extent. With fewer training requirements, no Airport Certification Manual to update, fewer forms to maintain, and no ARFF inspections, grant assurance requirements have a reduced management time compared to AOC obligations.

Benefits of FAR Part 139 Certification

Airports accrue a number of benefits by maintaining a Part 139 Certificate in good standing. The primary benefit is the ability to allow air carriers to operate at an airport with aircraft that have more than nine seats. Even though there are additional requirements for airports, depending on the type of scheduled passenger service proposed; simply holding a certificate keeps the airport on a list of airports that maintain their fields to a higher standard and that remain qualified to accommodate airline activity.

Further benefits to holding the AOC is the enhanced safety for all normal aircraft operations and the emergency response capability for any on-field incident. Airfield safety features required of all AOC holders include enhanced marking and lighting standards along with more stringent airfield design, maintenance, and condition reporting requirements. These requirements allow pilots entering an airfield to expect the same standardized operating environment at all certificated airports with confidence that maintenance at these airports is to the same high standards along with the availability of emergency services on the Airport.

The final benefit of 139 Certification is the perception of the airport's commitment to safety, security, and standardization in the pilot community, especially among professional pilots and charter companies. This insight requires an awareness of the obligations placed on AOC holders, including how each airport meets those obligations. For those operators who understand the differences among airports, they would likely view a certificated airport as a preferred location to operate.

Appendix Two:

Strengths, Weaknesses, Opportunities, and Threats (SWOT) Analysis

A key component of the beginning of the airport master plan will be a Strengths, Weaknesses, Opportunities, and Threats (SWOT) analysis. The SWOT analysis is being performed to determine the internal and external influences on the operation and management of the airport. This exercise will help determine facility requirements and identify the vision for the New Braunfels Regional Airport in the future, forming the framework for the master planning process.

The primary objective of the SWOT is to produce tangible, identifiable, focus areas for the business objectives. In this case, it applies to improving the airport's services, development areas, and key market drivers. As previously mentioned, SWOT stands for strengths, weaknesses, opportunities and threats. In order to accurately determine how to apply factors in each category, we must first understand each factor.

Internal Factors: These factors are the most easily understood in most SWOT analysis because they are internal to the business/entity. The airport can (even if indirectly) control most of these factors and are directly related to the airport. When determining initial action items related to a SWOT, these internal factors can be prioritized and easily influenced by direct airport action. For example, if an airport has identified that airport staffing levels are a weakness they may be able to directly change the factor by adding staff.

- Strengths: These are the characteristics of the airport that give it an advantage over others or are perceived by customers as a positive asset. We must first understand what gives the airport an advantage.

- Weaknesses: Similar to strengths, these are the characteristics that may be limiting the success of the airport. These may be perceived as negative aspects or areas of needed improvement compared to others. These may be one of the most important aspects of creating a successful SWOT analysis and are usually the basis for improvement moving forward.

External Factors: It is important to note that these external factors present the environment for which the airport is operating within. Therefore, many of these factors can't be directly changed by the airport but influence how the objectives of the airport may be impacted.

- Opportunities: After clearly identifying what the airport's strengths and weaknesses are, the sponsor must identify opportunities that can help growth the success of the airport. These factors serve as a catalyst to improve upon the airport and help realize future goals.

- Threats: The last element in the analysis is the potential pitfalls or competitive disadvantages that may arise in the implementation of previously identified opportunities. This will ensure a reality based business approach for achieving the goals set forth in the analysis

Identifying SWOT factors is extremely important and can be applied to airports just as with any other business enterprise. In fact, most municipally owned and operated airports greatly benefit if the management and governance of the airport is influenced by business approaches such as a SWOT analysis. Often, new revenue streams, market opportunities, and partnership are realized by results of a SWOT. When combined with an airport planning exercise, the results of a SWOT can expedite the implementation of the plan.

A.1 Effective SWOT Analysis

There is no right or wrong way to conduct a SWOT analysis. The goal is to be engaging, diverse, and thorough. Brainstorming issues in each key area is a positive way to get thoughts and ideas down on paper that can be put in perspective. In this exercise, participants are encouraged to come up with as many ideas as possible even though they may apply in multiple areas in the SWOT.

Once ideas are documented, A SWOT diagram can be made in various shapes and sizes to help articulate the thoughts of the exercise. This diagram is helpful in organizing thoughts and visualizing the strengths, weaknesses, opportunities, and threats. Only after quantifying these and putting them into the diagram can focus and priority be given to improvement and capitalizing on these. When adding strengths and weaknesses, one must always keep in mind that they are internal factors that are generally easy to identify. Factors can vary significantly depending on the purpose of the business venture and consequent SWOT analysis.

A.1.1 Mission/Vision Statements

Part of the SWOT analysis for the airport master plan will be to create a mission and vision statement for the airport. This is a complimentary component and is derived as a result of identifying factors of the SWOT. It is helpful for defining goals and objectives while better understanding the current role of the airport. In order to best define these, we need to understand the difference and intent in each statement.

Mission Statement. Mission statements should define the airport's current role and services. What is the airport dedicated to providing? What do you want customers to know about New Braunfels Regional Airport? Characteristics of the mission statement include:

- Purpose – this should clearly define the purpose of the entity
- Target Market – define who the airport is intended to serve
- Services – clearly communicate the services the airport provides and how this may be attractive to the target market

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Example Mission Statement: New Braunfels Regional Airport is dedicated to providing a safe, secure, and high-quality operating environment for General Aviation in the Greater San Antonio-New Braunfels region.

Vision statement. Vision statements are intended to set goals and objectives for the airport while visualizing the future of the facility. Also one sentence statements, they should focus on attainable and tangible goals that will embody the hopes of the airport sponsor. Ideally, a vision statement should help lead decision making processes along the way and focus internal direction toward the vision. Typical characteristics of the vision statement should be:

- Concise - this will help resonate and stick with audience
- Understandable - defines a clear and understood goal
- Forward Focused - focused on action in the future, not current conditions
- Motivational - inspires staff and drives innovation

Example Vision Statement: By 2040, New Braunfels Regional Airport will be a vibrant General Aviation Reliever airport contributing to the local economy and facilitating tourism in greater San Antonio- New Braunfels region.

A.2 SWOT Results Matrix

The following results were compiled from stakeholders on the Planning Advisory Committee conducted on February 27, 2018. These are intended to be a list of the most applicable factors in each of the SWOT areas and not an exhaustive list of all possible factors.

Strengths

- Two Runway system
- Proximity to I-35, SAT, and AUS
- Available developable land footprint
- Solid tenant base, 100% hangar utilization, and robust waiting list
- Active EDC and 4B sales tax
- Fuel (Full and Self Serve)
- ATCT Class B airspace
- Competitive hangar and fuel rates
- Minimum Standards and Height Hazard Zoning in place
- Positive Cash Flow
- Professional and caring staff

Weaknesses

- Runway less than 7,000' in length
- Pavement strength is low and deteriorating (old infrastructure)
- Drainage issues
- Poor auto access
- Lack of RCO for direct link to controllers
- Lack of security and wildlife fencing and educational outreach
- Lack of maintenance and powerplant services on the field
- FBO / Terminal services are constrained - lack of space
- ATCT - hours of operation/Line of sight

Opportunties

- Available developable land (New west side infrastructure - NBU)
- Accessible market area
- Runway extension potential
- Tap into military ops for training and DOD fuel contract
- Population and business growth in city and region
- Destination airport
- Fuel farm expansion / radar control

Threats

- Security / Lack of fencing
- Residential (incompatible) land use
- Proximity to San Marcos and other large airports
- Potential lack of funding for contract tower program
- Lack of ARFF - longer response times in event of emergency
- FBO location - not optimal to business growth

Appendix Three:

Public Outreach

Planning Advisory Committee Roster

Project: Airport Master Plan
Sponsor: City of New Braunfels
Agency: TxDOT Aviation Division
Consultant Team: KSA, R.A. Wiedemann & Associates

Planning Advisory Committee Members				
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Ben Breck	Airport Planner	TXDOT Aviation Division	512-416-4555	ben.Breck@txdot.gov
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Randal Wiedemann	Forecast/Financial Planner	R.A. Wiedemann & Associates	502-535-6570	randal@rawiedemann.com

PAC Meeting Sign-In Sheet

Project:	New Braunfels Regional Airport Master Plan Update	**Meeting Date:**	February 27, 2018
Phase:	Kick-Off Meeting Inventory/SWOT	**Place/Room:**	Airport Terminal

New Braunfels REGIONAL AIRPORT

Name	Affiliation	Phone	E-Mail
Michael Mallonee	KSA	(972) 542-2995	mmallonee@ksaeng.com
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Eric Marshall	KBAZ Advisory board	830 237 5425	marshallt37@yahoo.com
Michael Meek	GNBCC, Inc.	830-608-2808	michael@innewbraunfels.com
Greg Malatek	City of NB	830-221-4020	gmalatek@nbtexas.org

Agenda

Planning Advisory Committee Meeting #2

May 23rd, 2018

3:30 p.m. **Working Paper Updates**

1. SWOT Results
2. Inventory
3. Forecast of Aviation Demand
4. Airside/Landside Facility Requirements
5. Next Steps

5:30 p.m. **Public Meeting (Optional Attendance)**

**Interactive – public input and education on the vision/goals for the master plan.*

New Braunfels Regional Airport – Terminal Conference Room
2333 FM 758, New Braunfels, TX 78130
www.flykbaz.com

MEETING SUMMARY AND WORKING PAPER REVIEW

PAC Meeting #2 Summary

May 23rd, 2018
New Braunfels Regional Airport – Terminal Conference Room
2333 FM 758, New Braunfels, TX 78130

1. Agenda

KSA staff presented on the status of the working papers for the airport master plan. This included review of the existing conditions of the airport, the aviation demand forecast, and the facility requirements. Staff noted that the forecast was positive and indicated a larger growth in business jet activity at the airport. Runway length needs indicated that 7,000' may be required during the planning period. Local tenants will need to provide comments on needs to help strengthen the justification.

2. Discussion

PAC members provided input on the current status of the working papers. Discussion was held regarding land compatibility around the airport and possible easement acquisition and or land acquisition for airport expansion needs. Recommendations were made regarding coordination with planning and zoning on development on the northwest side of the airport. Comments were made about coordination with the Alamo MPO on long range transportation plans and the condition of Saur Lane.

Public Comment:

- Comments indicated that close coordination with the county, city, and MPO should be had on the condition of the local transportation network and improvements to Saur Lane.
- Questions regarding air cargo potential at the airport came up. Airport staff indicated that no large scale air cargo is foreseen for the airport.
- Neighbors to the south ask about possible land acquisition and previous efforts by the airport to purchase land or easements around the airport.
- There was a question about the development along Saur Lane including new hangars on the west side of the airport.

New Braunfels Airport Master Plan Working Paper Review

Name: Date:

PAC members - Please see the sections below and provide comment and status of review for working papers. ***Note:*** *In addition to the comments section below, you may send a marked up version of the document to KSA and staff will review and edit as necessary.*

Chapter 1. Inventory

☐ I have not reviewed the document and have **no comments**.

☐ I have reviewed the document and have **no comments**.

☐ I have reviewed the document and **have comments**.

Comments:

Chapter 2. Forecast

☐ I have not reviewed the document and have **no comments**.

☐ I have reviewed the document and have **no comments**.

☐ I have reviewed the document and **have comments**.

Comments:

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Chapter 3. Facility Requirements

☐ I have not reviewed the document and have **no comments**.

☐ I have reviewed the document and have **no comments**.

☐ I have reviewed the document and **have comments**.

Comments:

Appendix A. SWOT Analysis

☐ I have not reviewed the document and have **no comments**.

☐ I have reviewed the document and have **no comments**.

☐ I have reviewed the document and **have comments**.

Comments:

MAY 23, 2018
PUBLIC WORKSHOP

New Braunfels Regional Airport Master Plan

A public workshop will be held to inform interested members of the community about plans for the New Braunfels Regional Airport. This is the first workshop held as part of the ongoing Airport Master Plan and will present anticipated needs for the airport over the next 20 years. Airport demand forecasts, anticipated airport facility needs, and development plans will be discussed including the vision of the airport. Share your input and learn about the future of the New Braunfels Regional Airport.

WHAT: New Braunfels Regional Airport Master Plan Public Workshop

WHEN: 5:30 p.m. May 23rd - 2018

WHERE: New Braunfels Regional Airport Terminal - 2333 FM 758
New Braunfels, TX 78130

We look forward to your input and thank you for your interest on this important effort.

New Braunfels
REGIONAL AIRPORT

WE NEED YOUR INPUT

Airport Master Plan

Long Range Development Concepts

Benefits and Impact to the Community

Learn About the Airport

AIRPORT TERMINAL
2333 FM 758
New Braunfels, TX 78130
(830) 221-4290
WWW.FLYKBAZ.COM
MAY 23 @ 5:30 P.M.

In conjunction with TXDOT Aviation and support from KSA Engineers.

KSA
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Agenda

Planning Advisory Committee Meeting #3

August 15th, 2018

1:00 p.m. Working Paper Updates

1. Review of Facility Requirements
2. Overview of Development Alternatives
3. Scoring Matrix
4. Discussion
5. Next Steps

Alamo Colleges – Central Texas Technology Center
College 2189 FM 758, New Braunfels, TX 78130
www.flykbaz.com

Airport master plan could be completed by year’s end

By Keri Heath The Herald-Zeitung | Posted: Tuesday, May 29, 2018 12:00 am

A comprehensive look at needed safety and facilities upgrades at the New Braunfels Municipal Airport should be ready by the end of this year.

During a public workshop at the airport on Wednesday, airport officials discussed a master plan already underway, which should anticipate the facility’s needs for the next 20 years.

Michael Mallonee, senior project manager with KSA Engineers, is on the master planning team and said these improvements could poise the New Braunfels airport for increased business over the next two decades.

“There’s a lot of value in improvements that go to the airport because … they create jobs,” Mallonee said. “Then they also help improve the capabilities of the airport to continue to serve the greater community.”

Mallonee said an up-to-date airport is important for attracting businesses and jobs to New Braunfels.

While no concrete projects have yet been identified as part of the master plan process, Airport Director Robert Lee has suggested potential long-term capital project at previous public presentations.

These could include a runway extension to accommodate different plane types or more corporate hangars. Lee said the master plan is the first step and more long-term development is still far into the future.

“There’s 600 acres … that would be delightful to make happen, but we’re not there yet,” Lee said.

The New Braunfels airport handles exclusively general aviation.

“We don’t anticipate at this stage that role will change,” Mallonee said. “That doesn’t mean it can’t happen … but that’s not what we see at this time.”

Instead of commercial or shipping operations, Mallonee said it is more likely to see New Braunfels airport handle some charter or niche operations.

“A lot of people want to come to New Braunfels as opposed to San Antonio,” Lee said. “New Braunfels is strategically placed to capture that corporate business.”

Currently, the airport is undergoing plans to extend the taxiway and add two more corporate hangars, which would bring the total to 16.

Saur Lane, the road running immediately southwest of the airport, was of major concern to those at the meeting. Residents worry airport expansion will only add to increased traffic seen in the last decade.

"Since they opened Creekside and subdivisions and schools, it's gotten terrible," area resident Jewell Pfeil said. "Now it has exploded."

John Cox, street and drainage manager with the city of New Braunfels, said there are plans for some improvements this summer to Saur Lane.

"We will be repairing the edges and some pavement from Farm-to-Market 758 to Westmeyer Road," Cox said.

The last master plan for the New Braunfels airport was completed 10 years ago. Another public workshop is planned for August, with completion of the master plan expected by the end of this year.

Agenda

Planning Advisory Committee Meeting #4

October 30th, 2018

3:00 p.m. **Working Paper Updates**

1. Review of Recommended Development Plan
2. Overview of Implementation Plan and Phasing Plan
3. Overview of Financial Plan
4. Discussion
5. Next Steps

OCT 30, 2018
PUBLIC WORKSHOP

New Braunfels Regional Airport Master Plan

A public workshop will be held to inform interested members of the community about plans for the New Braunfels Regional Airport. This is the second workshop held as part of the ongoing Airport Master Plan and will present anticipated needs for the airport over the next 20 years. The Airport Recommended Plan, Capital and Airport Improvement needs, and Financial Implementation will be discussed including the vision of the airport. Share your input and learn about the future of the New Braunfels Regional Airport.

WHAT: New Braunfels Regional Airport Master Plan Public Workshop

WHEN: 5:30 p.m. October 30th - 2018

WHERE: Alamo Community College - 2189 FM 758
New Braunfels, TX 78130

We look forward to your input and thank you for your interest on this important effort.

New Braunfels
REGIONAL AIRPORT

WE NEED YOUR INPUT

Airport Master Plan

Long Range Development Concepts

Benefits and Impact to the Community

Learn About the Airport

ALAMO COMMUNITY COLLEGE
2189 FM 758
New Braunfels, TX 78130
WWW.FLYKBAZ.COM
OCT 30 @ 5:30 P.M.

In conjunction with TXDOT Aviation and support from KSA Engineers.

KSA
A DYNAMIC PERSPECTIVE

New Braunfels Regional Airport Master Plan

Public Meeting – October 30, 2018

Public Questions:

1. If the terminal is relocated, what effect will that have on roadway access?
2. Is the control tower losing funding?
3. Is it possible to install “No Through Truck” signs to prevent trucks from damaging Saur Road repairs within weeks of being completed?
4. What determines which end of a road repairs will begin?
5. How do development fees support the surround roadway infrastructure?
6. Do the corporate hangars being privately built contribute to the roadways?
7. What is going to be done to repair Airport Road?
8. Where does Saur Road rank on the list needed of roadway repairs?
9. Have traffic studies been conducted to see where the traffic is originating that is causing these roads to be overutilized and under maintained?
10. Will the proposed airport development result in a change in fleet mix at the airport and will this impact noise levels?
11. Does the airport have plans to support cargo operations in the future?