AIRPORT LAYOUT PLAN

Final Report

BRUSH MUNICIPAL AIRPORT

BRUSH, COLORADO | OCTOBER 2014

ARMSTRONG

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Chapter One
Inventory

Brush Municipal Airport
Airport Layout Plan

ARMSTRONG

CHAPTER ONE
INVENTORY

1.1 INTRODUCTION

Brush Municipal Airport is a general aviation (GA) airport located in northeastern Colorado, approximately two miles east of the City of Brush in Morgan County. The airport is situated on approximately 109 acres of land at an elevation of 4,317 feet above mean sea level (MSL). The City of Brush is a Statutory City. Statutory Cities have an elected Mayor and a City Council composed of the Mayor and two members elected from each ward. Brush is located in the South Platte River Valley which is known for its rich soil and bountiful crops of corn, soy, sugar beets, and wheat. The Brush Municipal Airport is a critical resource to business within the region and serves as a vital link between the local and surrounding communities.

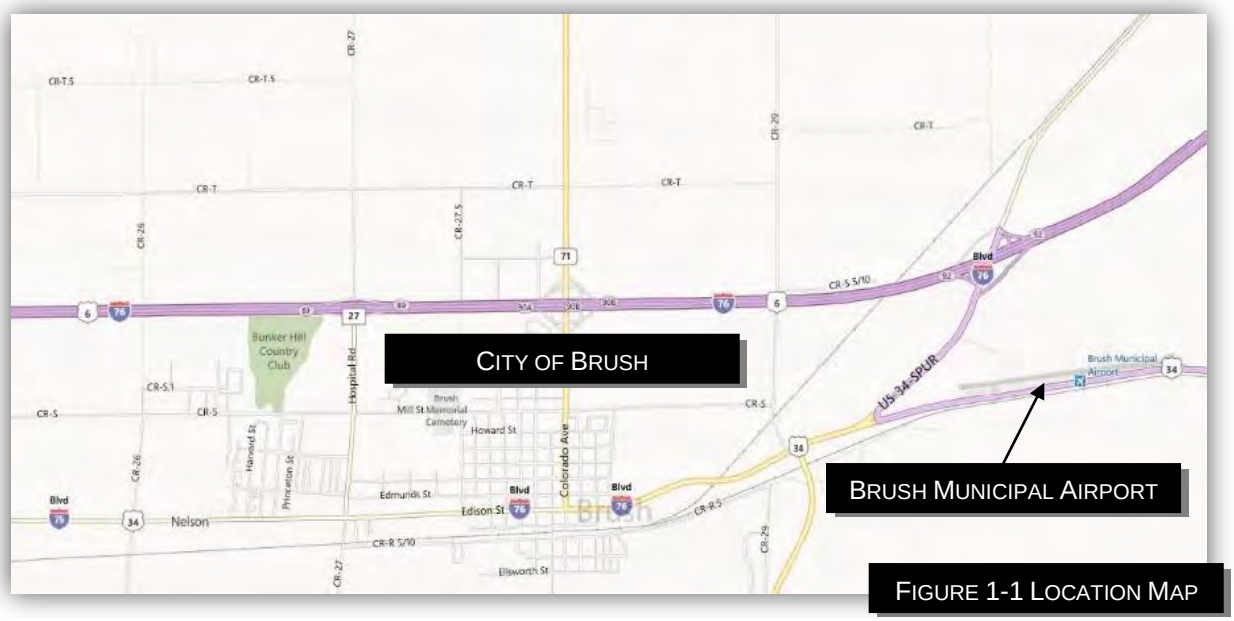


FIGURE 1-1 LOCATION MAP

1.2 PURPOSE

This Airport Layout Plan (ALP) narrative report describes and depicts the overall concept for the short, medium and long-term development of the airport. The concepts are shown graphically in the ALP drawing set contained within the report and the following narrative chapters present the data and logic upon which the plan is based. The goal of the plan is to provide direction for future airport development that will satisfy aviation demand in a financially feasible manner and meet the needs of the community with respect to the airport.

1.3 OBJECTIVES

The primary objectives of the ALP are to produce an attainable phased development plan concept that will satisfy the airport needs in a safe, efficient, economical and environmentally sound manner. The plan serves as a guide to decision makers, airport users and the general public for implementing airport development actions while considering both airport and community goals and objectives. There are a number of objectives that Brush Municipal Airport would like to achieve as a result of this ALP Update.

Objectives of the airport layout plan include:

- Document the issues that the proposed development will address.
- Justify the proposed development through the technical, economic and investigation of concepts and alternatives.
- Provide an effective graphic presentation of the development of the airport and anticipated land uses in the vicinity of the airport.
- Establish a realistic schedule for the implementation of the development proposed in the plan, particularly the short-term capital improvement program.
- Present a plan that adequately addresses the issues and satisfies local, state and Federal regulations.
- Document policies and future aeronautical demand to support municipal or local deliberations on spending, debt, land use controls and other policies necessary to preserve the integrity of the airport and its surroundings.
- Set the stage and establish the framework for a continuing planning process that will monitor key conditions and permit changes in plan recommendations as required.

1.4 AIRPORT LAYOUT PLAN PROCESS

Airport planning takes place at the national, state, regional and local levels. These plans are formulated on the basis of overall transportation demands and are coordinated with other transportation planning and comprehensive land use planning. Statewide Integrated Airport Systems Planning identifies the general location and characteristics of new airports and the general expansion needs of existing airports to meet statewide air transportation goals. This planning is performed by state transportation or aviation planning agencies. Needs are stated in general terms and incorporated into statewide systems plans. ALPs are prepared by the operators of individual airports and are usually completed with the assistance of consultants. Brush Municipal Airport is completing this ALP with the assistance of Armstrong Consultants, Inc. The ALP process involves collecting data, determining facility requirements, studying various alternatives and developing plans and schedules. The flow chart in **Figure 1-2** depicts the steps in the ALP process. This process will take into consideration the needs and concerns of the airport sponsor, airport tenants and users, as well as the general public.

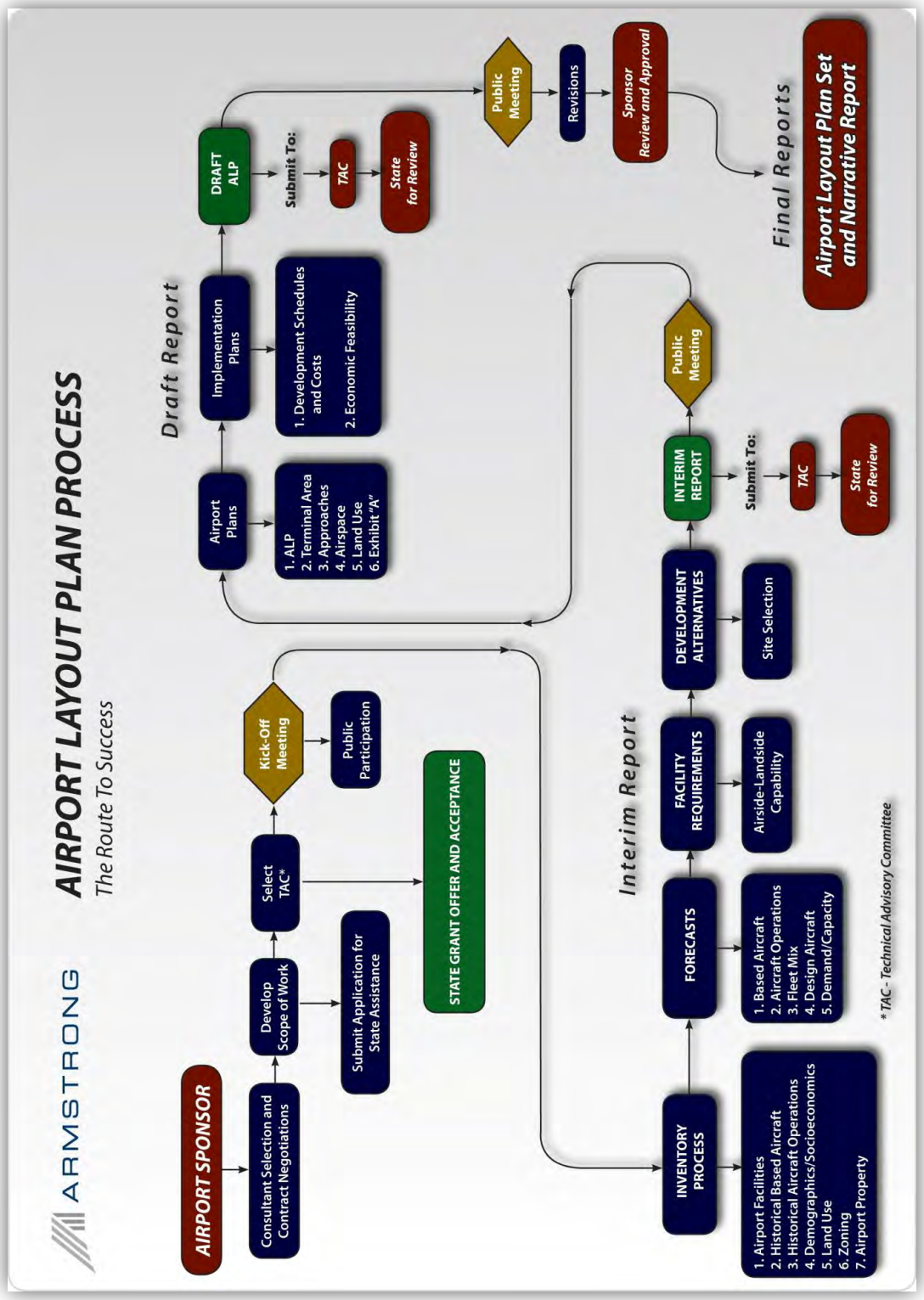


FIGURE 1-2 PLANNING FLOW CHART

1.5 AIRPORT DESIGN STANDARDS

FAA Advisory Circular (AC) 150/5300-13A, *Airport Design*, recommends design standards based for use in the design of civil airports. Each runway and operational area serving the particular design aircraft must be identified. Each runway is assigned a Runway Design Code (RDC). The Aircraft Approach Category (AAC), Airplane Design Group (ADG) and approach visibility minimums are combined to determine the RDC. The RDC provides the information needed to determine design standards that apply. The first component, depicted by a letter is the AAC and relates to aircraft approach speed (operational characteristic) see **Table 1-1**. The second component, depicted by a Roman numeral, is the ADG and relates to either the aircraft wingspan or tail height (physical characteristics) whichever is most restrictive (see **Table 1-2**). The third component relates to the visibility minimum expressed by RVR values in feet of 1,200, 1,600, 2,400, and 4,000 (corresponding to lower than ¼-mile, lower than ½-mile but not lower than ¼-mile, lower than ¾-mile but not lower than ½-mile and lower than 1-mile but not lower than ¾-mile respectively) see **Table 1-3**. The third component will read "VIS" for runway designed with visual approaches only. Generally, runway standards are related to aircraft approach speed, aircraft wingspan and designated or planned approach visibility minimums.

The Airport Reference Code (ARC) of the airport signifies the airport's highest RDC. The ARC is used for planning and design purpose only and does not limit the aircraft that may be able operate safely on the airport. The current RDC for Runway 7/25 and ARC for the Brush Municipal Airport is B-I (Small) which accommodates aircraft with an approach speed of greater than 91 knots but less than 121 knots, a wingspan less than 49 feet wide, a tail height less than 20 feet and a maximum takeoff weight less than 12,500 pounds. A more detailed discussion of RDCs and ARCs is included in Chapter Three, *Facility Requirements*. A list of the existing FAA design standards are contained in **Table 1-10.**

TABLE 1-1 AIRCRAFT APPROACH CATEGORY (AAC)

Aircraft Approach Category	Approach Speed
A	<91 knots
B	>91 knots but <121 knots
C	>121 knots but <141 knots
D	>141 knots but <166 knots
E	166 knots or greater

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

TABLE 1-2 AIRPLANE DESIGN GROUP (ADG)

Group #	Wingspan (ft.)	Tail Height (ft.)
I	< 49'	< 20'
II	49' - < 79'	20' - < 30'
III	79' - < 118'	30' - < 45'
IV	118' - < 171'	45' - < 60'
V	171' - < 214'	60' - < 66'
VI	214' - < 262'	66' - < 80'

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

TABLE 1-3 VISIBILITY MINIMUMS

RVR (ft.)	Flight Visibility Category (statue mile)
4,000	Lower than 1 mile but not lower than 3/4 mile (APV ≥ 34 but < 1 mile)
2,400	Lower than 3/4 mile but not lower than 1/2 (CAT - I PA)
1,600	Lower than 1/2 mile but not lower than 1/4 mile (CAT - II PA)
1,200	Lower than 1/4 mile (CAT - III PA)

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

FIGURE 1-3 APPROACH END OF RUNWAY 7

1.6 CERTIFICATED PILOTS AND REGISTERED AIRCRAFT

The FAA databases of certificated airmen and registered aircraft were reviewed to determine the current distribution of pilots and registered aircraft in Brush, Colorado. This data indicates there to be eight certificated pilots and 11 aircraft registered in Brush, Colorado as shown in **Table 1-4**. Of the 11 registered aircraft in Brush, eight are based at Brush Municipal Airport.

TABLE 1-4 CERTIFICATED PILOTS AND REGISTERED AIRCRAFT

	Aircraft Registered	Certified Pilots
Brush, Colorado	11	8

Source: FAA, 2013

1.7 BASED AIRCRAFT AND OPERATIONS

The Brush Municipal Airport is predominately used by single engine aircraft, however the airport is also used by multi-engine piston, turbo-prop, and rotorcraft aircraft. Based on conversations with airport tenants and based aircraft owners, users include a mix of business, leisure, flight training, air taxi, and air ambulance operations that provide valuable services to the City of Brush and surrounding communities.
The airport also provides for a variety of special use activities including skydiving. Although none are presently located at the airport, the airport has historically served as a base of operations for a variety of skydiving operations. One of the airport tenants owning two hangars on the airfield mentioned that they are actively seeking to lease out hangars to a skydiving company to utilize the airport and the hangars as a base of operations.

Other activities include the Brush Municipal Airport being used occasionally by air ambulance operators to aid in the transfer of patients to surrounding hospitals west of the Brush. Business activities include the use of the airport by a local business operator (MMI) that utilizes the airport on a weekly basis to visit its base of operations in Brush. These operations also include the occasional use of the airport by King Air and Cessna Citation aircraft. **Table 1-5** shows the existing based aircraft and **Table 1-6** shows the estimated annual aircraft operations at the Brush Municipal Airport.

TABLE 1-5 BASED AIRCRAFT

	Based Aircraft
Single Engine	8
Total	**8**

Source: FAA Form 5010-1, *Airport Master Record* & Airport Tenant Discussions, 2013

TABLE 1-6 ANNUAL OPERATIONS

	Operations
Air Taxi	31
GA- Local	1,170
GA- Itinerant	260
Total	**1,461**

Source: FAA Form 5010-1, *Airport Master Record*, 2013

1.8 BRUSH MUNICIPAL AIRPORT SERVICE AREA

An airport service area is defined by the communities and surrounding areas served by the airport facility. Factors such as the airport's surrounding topographical features (mountains, rivers, etc.), proximity to its users, quality of ground access, required driving time to the airport and the proximity of the facility to other airports that offer the same or similar services can all affect the size of a particular airport's service area. The primary service area includes the area within half the distance of the nearest public use general aviation airport with the same or similar services. The secondary service area is the area within 30-minute drive time of Brush Municipal Airport. **Figure 1-7** depicts the primary and secondary general aviation service area for the Brush Municipal Airport.

TABLE 1-7 BRUSH MUNICIPAL AIRPORT AND SURROUNDING AIRPORTS

Airport Name and Location	Identifier	Distance /Drive Time From Brush	Direction From Brush	NPIAS Status	Runway Length(s) Width(s)	Pavement Type	Instrument Approach	Fuel
Brush Municipal Airport, Brush, CO	7V5	2 SM/ 4 min.	East	N/A	RW 7/25 4,444' x 60'	Asphalt	Visual	None
Fort Morgan Municipal Airport, Fort Morgan, CO	FMM	16 SM/ 17 min.	Northwest	GA	RW 14/32 5,219' x 60'	Asphalt	GPS	100LL Jet-A
					RW 17/35 3,800' x 30'	Turf		
					RW 8/26 2,467' x 100'	Turf		
Colorado Plains Regional Airport, Akron, CO	AKO	24 SM/ 26 min.	Southeast	GA	RW 11/29 7,001' x 60'	Asphalt	GPS, VOR	100LL Jet-A
Sterling Municipal Airport, Sterling, CO	STK	41 SM/ 44 min.	Northeast	GA	RW 15/33 5,201' x 75'	Asphalt	GPS, NDB	100LL Jet-A
					RW 3/21 2,810' x 150'	Turf		

Source: Airnav.com, 2013

GA - General Aviation VOR - Very High Frequency Omni-directional Range
NDB - Non-Directional Radio Homing Beacon GPS - Global Positioning System
DME- Distance Measuring Equipment

To define the service area for Brush Municipal Airport, airports in the area and their specific services and facilities were reviewed. As identified within **Figure 1-4** and **Table 1-7** there are two public use airports within a 30 minute-drive time of the Brush Municipal Airport that have fuel and instrument approach procedures. The two airports include the Fort Morgan Municipal Airport and Colorado Plains Regional Airport which are located within a 17 minute drive to the northwest and 26 minute to the southeast respectively.

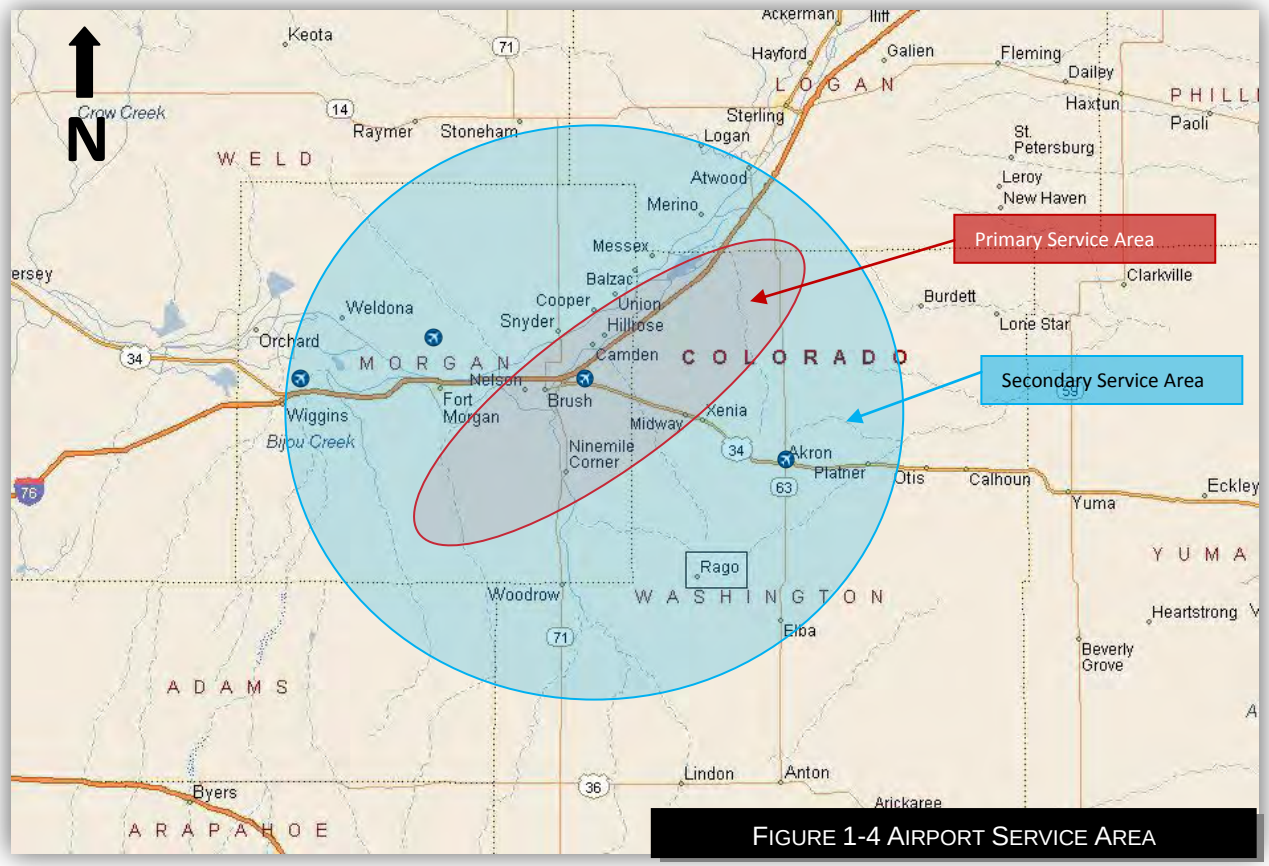


FIGURE 1-4 AIRPORT SERVICE AREA

1.9 FACILITY INVENTORY

Brush Municipal Airport is located along the north side of U.S. Route 34 and is accessed by driving two miles east from downtown Brush along U.S. Route 34. The City of Brush provides snow removal, pavement maintenance, mowing, sweeping, servicing of airfield lighting and general maintenance at the airport.

AIRSIDE FACILITIES

The Brush Municipal Airport is served by a single 4,445 by 60 foot asphalt runway, Runway 7/25, and has a turn around on each runway end. Runway 7/25 has a published length of 4,300 feet; however, this has been determined to be inaccurate. The Runway 7 threshold was previously relocated 818 feet, reducing the runway from 5,263 feet to 4,445 feet and resulting in a 818 foot aligned taxiway to Runway 7. The takeoff and landing distance for Runway 7 is 4,445 feet. The takeoff distance for Runway 25 is 4,445 feet. Due to a 182 foot displaced threshold, the landing distance for Runway 25 is 4,263 feet. The runway has a published pavement strength of 6,000 pounds Single Wheel Gear (SWG). Runway 7/25's pavement is in poor to failed condition with significant thermal cracking. Runway 7 and Runway 25 are marked with visual markings. There are no published instrument approach procedures available at the airport.

Runway 7/25 is equipped with Low Intensity Runway Lights (LIRLs) and one threshold light on each runway end. The existing runway lighting system is in poor condition. The LIRLs are pilot controlled by the Common Traffic Advisory Frequency (CTAF) 122.8 Mega Hertz. Visual aids include a lighted wind cone.

RUNWAY WIND COVERAGE

An analysis of wind is essential in determining the desired alignment and configuration of the runway system. It is beneficial to align runways as closely as practicable in the direction of the prevailing winds. Aircraft land and takeoff into the wind and, therefore, can only tolerate limited crosswind components (winds that blow perpendicular to the runway centerline). The maximum allowable crosswind depends on the aircraft size, design characteristics and pilot proficiency. **Table 1-8** shows allowable crosswind components for aircraft according to their Airport Reference Code. According to discussions with existing tenants, the airport has a consistent crosswind. A wind analysis for the Brush Municipal Airport is contained within Chapter Three.

TABLE 1-8 ALLOWABLE CROSSWIND COMPONENT

Crosswind (knots)	Airport Reference Code
10.5	A-I, B-I
13.0	A-II, B-II
16.0	A-III, B-III, C-I through D-III
20.0	A-IV through D-VI

LANDSIDE FACILITIES

Landside facilities are currently accessed by aircraft off the sides of the aligned taxiway to Runway 7. Landside facilities consist of six privately owned conventional/box hangars, one private T-hangar and one City owned conventional/box hangar with an attached office. The aircraft parking apron at Brush Municipal Airport is approximately 1,800 square yards of pavement with no marked tiedowns.

As previously discussed, the airport is classified with an ARC of B-I (Small), meaning the airfield is designed for aircraft with approach speeds up to but less than 121 knots and wingspans of up to but not including 49 feet. **Figure 1-5** shows the existing airside facilities and **Figure 1-6** shows the existing landside facilities. An inventory of the Brush Municipal Airport is contained in **Table 1-9**.

TABLE 1-9 BRUSH MUNICIPAL AIRPORT INVENTORY

Identifier	FAA Site Number	ARC	Owner/Sponsor	Airport Elevation
7V5	02528.1*A	B-I (Small)	City of Brush	4,317' MSL
Runway 7/25				
	Length	4,445'		
	Width	60'		
	Surface	Asphalt		
	Pavement Strength	6,000 lbs. SWG		
	Marking	Visual		
	Runway Lighting	LIRL		
Taxiway				
	Taxiway Width	40’		
	Taxiway Lighting	None		
Apron				
	Aircraft Apron	1,800 sq yd		
	Tie Down	Not Marked		
Other				
	Navigational Aids	None		
	Approach Minimums	Visual		
	Visual Aids	Segmented Circle and Lighted Wind cone		
	Weather Equipment	None		
	Fuel	None		
	Terminal Building	Office/Transient Overnight Hangar		
	Hangars	8 Hangars		
	Automobile Parking	15 (Gravel)		
	Perimeter Fencing	4 Strand Barbed Wire 4' Fence		
	Utilities	Electricity, Water and Telephone		
	Vehicle Access Gates	None		

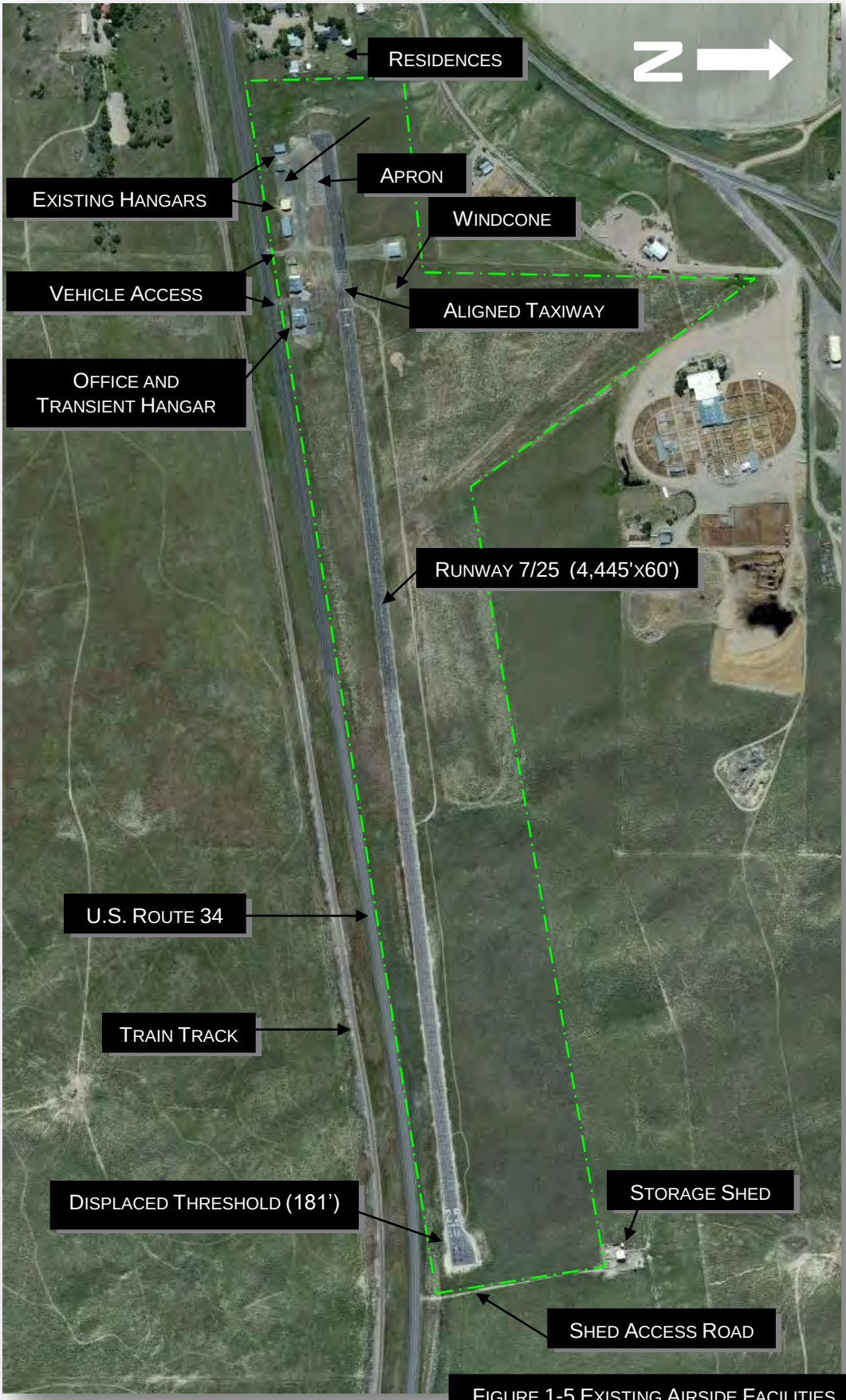


FIGURE 1-5 EXISTING AIRSIDE FACILITIES

FIGURE 1-6 EXISTING LANDSIDE FACILITIES

1.10 DESIGN STANDARDS

The FAA has established recommended design standards to ensure safety and efficiency at all the nation's public-use airports. FAA AC 150/5300-13A, *Airport Design*, establishes guidelines for runway and taxiway designs, surface gradients, site requirements for navigational aids and air traffic control facilities, wind analysis, threshold siting requirements, airport reference points, aircraft parking, aircraft tie downs and various other factors affecting airport design. The existing FAA design standards for Brush are contained in **Table 1-10**. The red text listed in **Table 1-10** indicates deficiency to existing airport design standards.

TABLE 1-10 EXISTING DESIGN STANDARDS

Description	Required Standard
Approach Category	B-I (Small)
RW Centerline to Parallel TW Centerline	Not Applicable
RW Centerline to Aircraft Parking Apron	125' (50' off extended RW centerline inside RPZ)
RW Width	60'
RW Safety Area Width	120'
RW Safety Area Length Beyond RW End	240' (RW 7: 93' Actual - Fence)[1]
RW Object Free Area Width	250' (RW 7: 44' Actual - Fence)[1]
RW Object Free Area Length Beyond RW End	240' (RW 7: 93' Actual - Fence)[1]
RW Obstacle Free Zone Width	250' (RW 7: 44' Actual - Fence)[1]
RW Obstacle Free Zone Length Beyond RW End	200' (RW 7: 93' Actual - Fence)[1]
RW Protection Zone	250' x 450' x 1000'
TW Width	25'
TW Safety Area Width	49'
TW Object Free Area Width	89'
Taxilane Object Free Area Width	79'
RW Centerline to Aircraft Hold Lines	125' (Not Marked)

Source: FAA AC 150/5300-13A, *Airport Design*
[1] RW 7 RSA,ROFA, and OFZ extend beyond existing property line/perimeter fence.

SAFETY AREAS

Runway and Taxiway Safety Areas (RSAs and TSAs) are surfaces surrounding the runway and taxiways that are designed specifically to minimize bodily injury and reduce damage to aircraft and property in the event of an under-shoot, over-shoot or excursion from a runway or taxiway.

In general, safety areas must be:

- Cleared and graded of potentially hazardous surface variations.
- Drained so as to prevent water accumulation.
- Capable, under dry conditions of supporting snow removal equipment, ARFF equipment and the occasional passage of aircraft without causing structural damage to the aircraft.
- Free of objects, except for objects that need to be located in the runway or taxiway safety area because of their function.

The RSA off the departure end of Runway 7 extends beyond existing airport property (See **Figure 1-7)** and is penetrated by the airport perimeter fence and a private access road.

OBSTACLE FREE ZONE (OFZ) AND OBJECT FREE AREA (OFA)

The OFZ is a three dimensional volume of airspace which supports the transition of ground to airborne aircraft operations. The clearing standard precludes taxiing and parked airplanes and object penetrations, except for frangible visual NAVAIDs that need to be located in the OFZ because of their function. The runway OFZ is similar to the Part 77 Primary Surface insofar that it

represents the volume of space longitudinally centered on the runway. The OFA is a two-dimensional area surrounding the runway. The OFA precludes parked aircraft, agricultural operations and all other non-aeronautical function related objects. The existing OFZ and OFA extend beyond existing airport property and are penetrated by the airport perimeter fence on the departure end of Runway 7 (See **Figure 1-7).**

DISPLACED THRESHOLD

A displaced threshold is a threshold located at a point other than that of the physical end of the runway. The displaced portion of the runway maybe used for takeoff in the direction of displacement but not for landing.

The Brush Municipal Airport has an existing displaced threshold for Runway 25. The threshold to Runway 25 has been displaced to maintain the 20:1 threshold siting surface clear of the private access road that runs north and south along the east end of airport property (See **Figure 1-7).**

Due to the displaced threshold and the proximity of the ditch to the runway end, the use of declared distances is required. According to the FAA, declared distances represent the maximum distances available and suitable for meeting takeoff, rejected takeoff and landing performance requirements. The declared distances for takeoffs are the Takeoff Run Available (TORA) which represents the runway length available for the takeoff run and the Takeoff Distance Available (TODA) which is the TORA distance combined with a clearway length, if available. The declared distance for a rejected takeoff is the Accelerate Stop Distance Available (ASDA) which is the TORA distance combined with a stopway length, if available. The declared distance for landing is the Landing Distance Available (LDA) which represents the runway length available for a landing aircraft. According to FAA AC 150/5300-13A, *Airport Design*, each distance is treated independently and may vary for each operational direction. **Table 1-11** lists the resulting declared distances appropriate for the runways at Brush Municipal Airport. The declared distances are not published for the airport.

TABLE 1-11 RUNWAY 7/25 DECLARED DISTANCES

Distance	Runway 7	Runway 25
Takeoff Run Available (TORA)	4,445’	4,445’
Takeoff Distance Available (TODA)	4,445’	4,445’
Accelerate Stop Distance Available (ASDA)	4,445’	4,445’
Landing Distance Available (LDA)	4,445’	4,263’

RELOCATED THRESHOLD

A relocated threshold is a threshold located at a point other than that of the physical end of the runway. The displaced portion of the runway may be used for taxi, but not for takeoff or landing. Runway 7 has a relocated threshold to maintain the approach slope clear of residences located on the approach end of Runway 7 (See **Figure 1-8).**

ALIGNED TAXIWAY

An aligned taxiway is one whose centerline coincides with a runway centerline. Such taxiways have often been established due to the relocation of a runway end without constructing a new entrance taxiway at the relocated threshold.

An existing aligned taxiway exists on the departure end of Runway 25 and is utilized to access the aircraft parking apron, hangars and other landside facilities. The aligned taxiway results from the relocated threshold to Runway 7.

NON-STANDARD CONDITIONS

The RSA is to provide an obstruction free surface within 200 feet of the pavement end. This is to ensure in the event of an overshoot or an undershoot the aircraft does not impact any structure which could cause further damage. The Runway 7 departure end does not have an adequate RSA. The existing wildlife mitigation fence and a roadway currently penetrate the RSA creating a non-standard condition for Runway 7 departures.

RUNWAY PROTECTION ZONES (RPZ)

The RPZ is trapezoidal in shape and centered on the extended runway centerline. It begins 200 feet beyond the end of the area usable for takeoff or landing. The RPZ dimensions are functions of the design aircraft, type of operation and visibility minimums. While it is desirable to clear all objects from the RPZ, uses such as agricultural operations and golf courses are normally acceptable unless any byproducts of development which could be considered wildlife attractants exist. Land uses that are prohibited within the RPZ include residences and places of public assembly, such as churches, schools, hospitals, office buildings and shopping centers.

The RPZs are partly owned fee simple with the remaining portions being uncontrolled and located over private land. There are currently incompatible land uses within the RPZs which include a residence located within the approach to Runway 7 (See **Figure 1-8).**

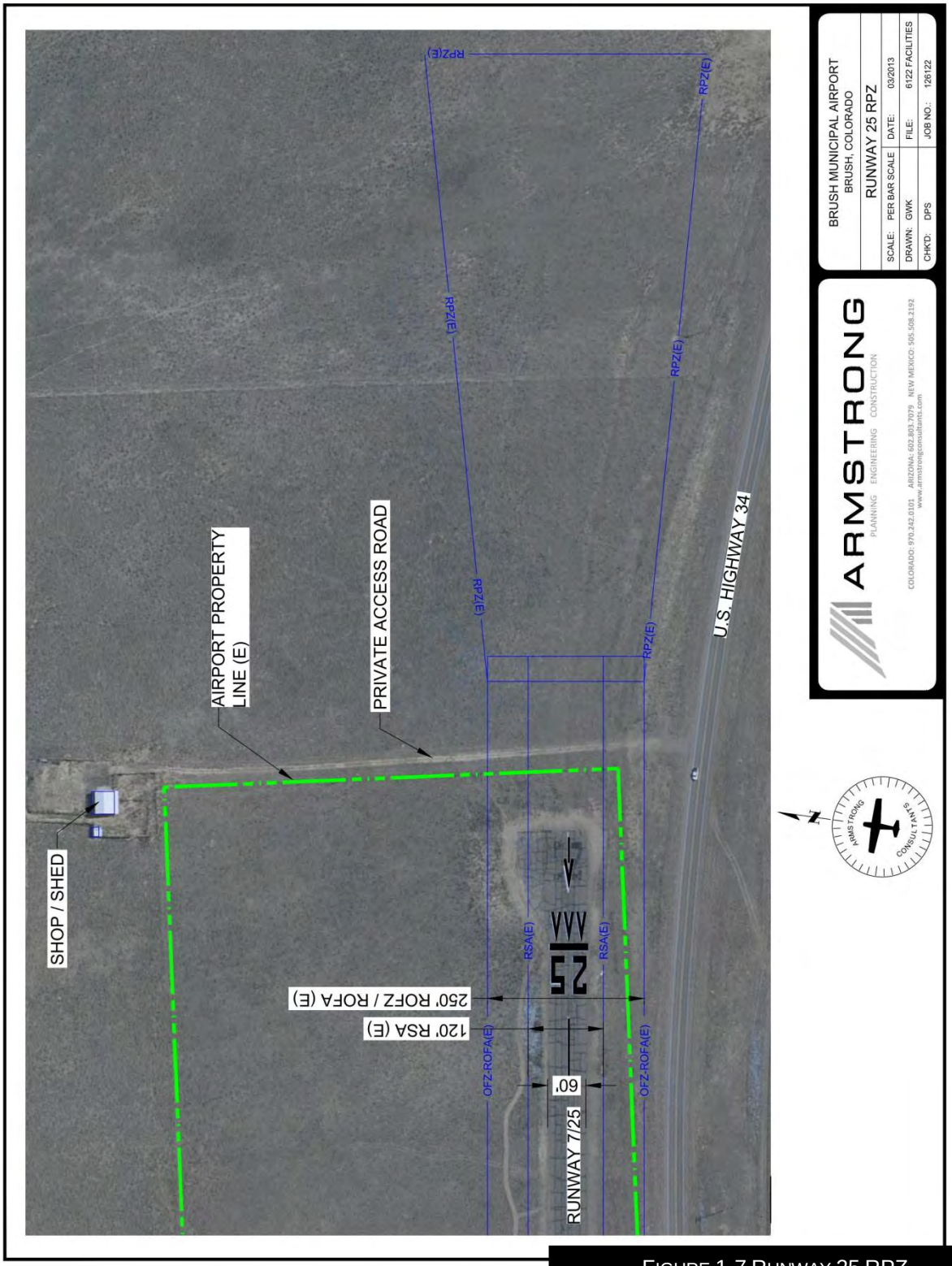


FIGURE 1-7 RUNWAY 25 RPZ

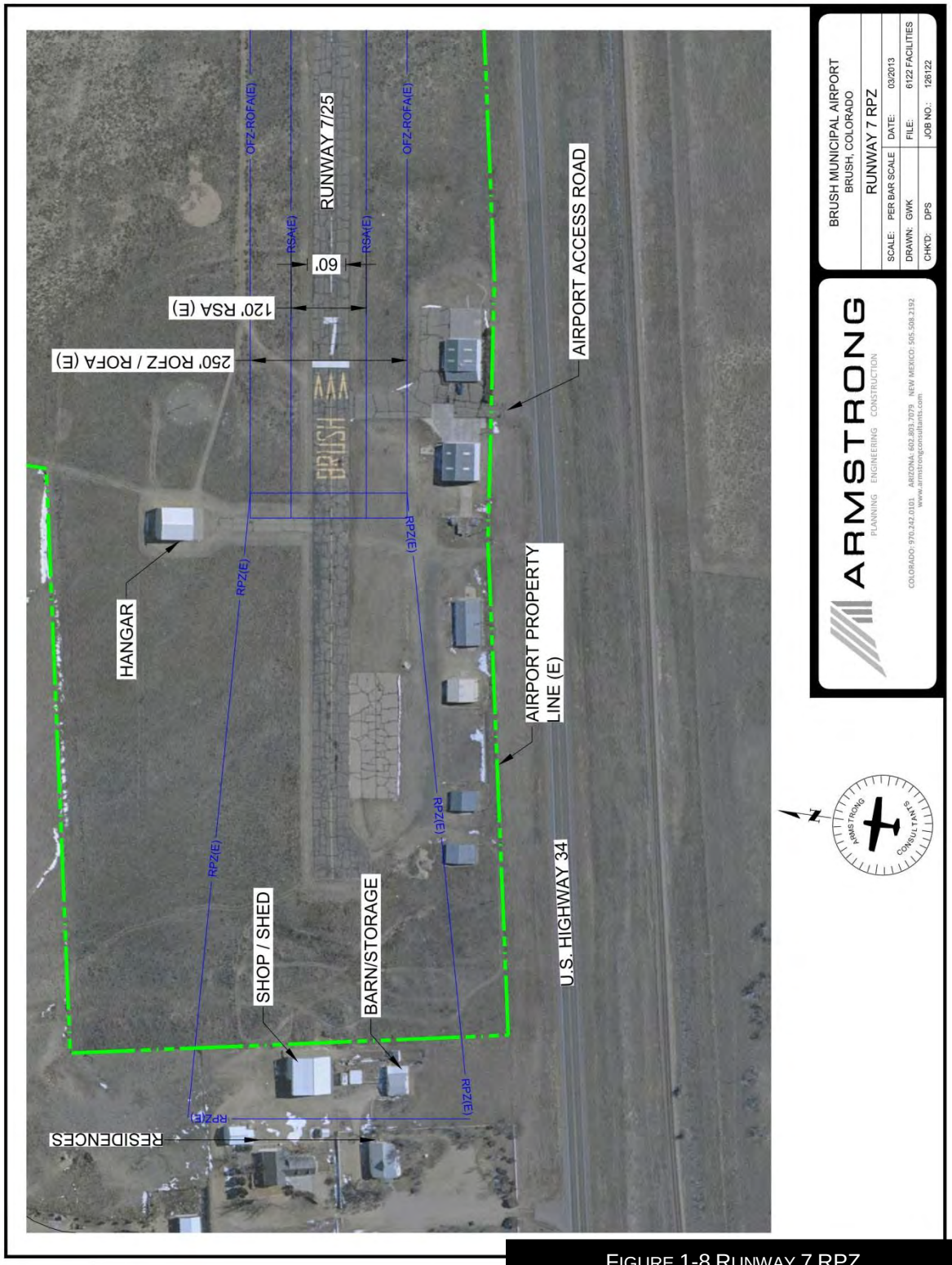


FIGURE 1-8 RUNWAY 7 RPZ

1.11 PART 77 AIRSPACE SURFACES

Title 14 Code of Federal Regulations (CFR) Part 77, *Safe, Efficient Use, and Preservation of Navigable Airspace*, establishes several imaginary surfaces that are used as a guide to provide a safe and unobstructed operating environment for aviation. These surfaces, which are typical for civilian airports, are shown in **Figure 1-9 and Figure 1-10**. The primary, approach, transitional, horizontal and conical surfaces identified in Part 77 are applied to each runway at both existing and new airports on the basis of the type of approach procedure available or planned for that runway and the specific Part 77 runway category criteria. For the purpose of this section, a utility runway is a runway that is constructed for and intended for use by propeller driven aircraft of a maximum gross weight of 12,500 pounds or less. A visual runway is a runway intended for the operation of aircraft using only visual approach procedures, with no straight-in instrument approach procedure and no instrument designation indicated on an FAA approved airport layout plan. A non-precision instrument runway is a runway with an approved or planned straight-in instrument approach procedure that has no existing or planned precision instrument approach procedure. The existing Part 77 surfaces are for a visual approach, utility runway (<12,500 pounds) to both runway ends. The Part 77 airspace surfaces for these classifications are described in the following paragraphs.

PRIMARY SURFACE

The primary surface is an imaginary surface of specific width, longitudinally centered on a runway. The primary surface extends 200 feet beyond each end of the paved surface of runways, but does not extend past the end of unpaved runways. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline. The width is 1,000 feet for precision runways, 250 feet for visual-utility runways and 500 feet for visual larger than utility runways.

The existing primary surface width at the Brush Municipal Airport is 250 feet and extends 200 feet beyond the end of the runway pavement. The primary surface is penetrated by the airport perimeter fence and a private access road.

APPROACH SURFACE

The approach surface is a surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of the runway based upon the type of approach available or planned for that runway, with approach gradients of 20:1, 34:1 or 50:1. The inner edge of the surface is the same width as the primary surface. It expands uniformly to a width corresponding to the Part 77 runway classification criteria.

At Brush Municipal Airport, these dimensions are 250 feet by 1,250 feet by 5,000 feet, with a 20:1 approach surface gradient.

TRANSITIONAL SURFACE

The transitional surfaces extend outward and upward at right angles to the runway centerlines from the sides of the primary and approach surfaces at a slope of 7:1 and end at the horizontal surface.

HORIZONTAL SURFACE

The horizontal surface is considered necessary for the safe and efficient operation of aircraft in the vicinity of an airport. As specified in Part 77, the horizontal surface is a horizontal plane 150 feet above the established airport elevation. The airport elevation is defined as the highest point of an airport's useable runways, measured in feet above mean sea level. The perimeter is constructed

by arcs of specified radius from the center of each end of the primary surface of each runway. The radius of each arc is 5,000 feet for runways designated as utility or visual and 10,000 feet for all other runways.

CONICAL SURFACE

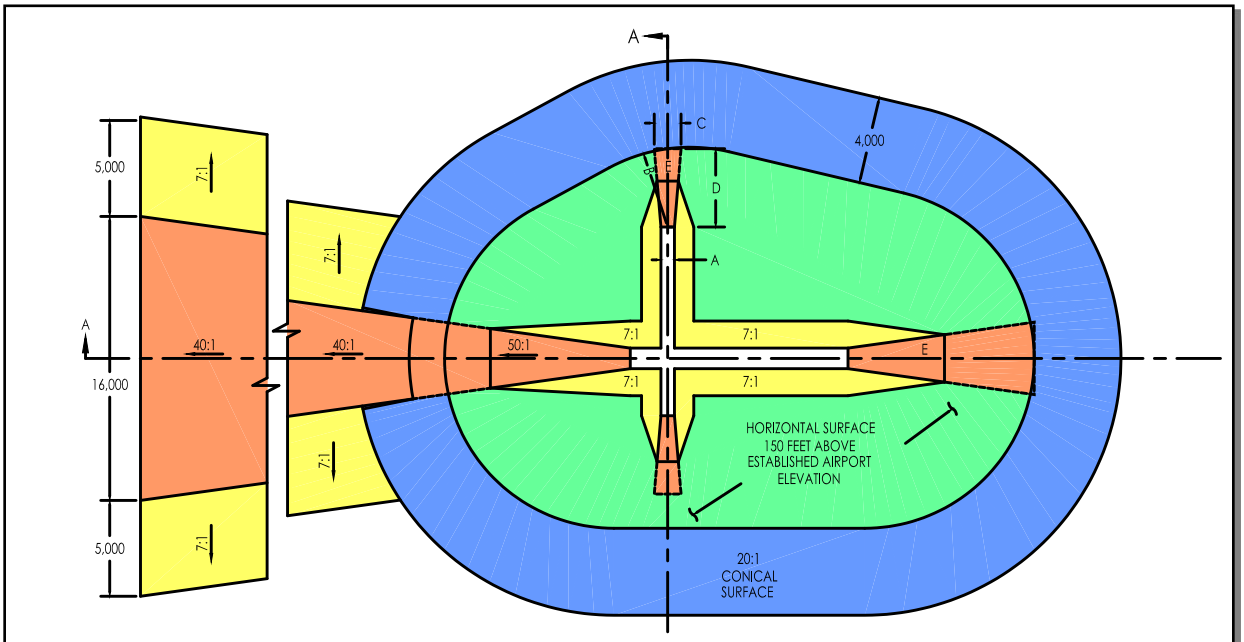
The conical surface extends outward and upward from the periphery of the horizontal surface at a slope of 20:1 for a horizontal distance of 4,000 feet.

SUMMARY OF DIMENSIONAL CRITERIA

Table 1-12 summarizes the current Part 77 surfaces described above for the Brush Municipal Airport.

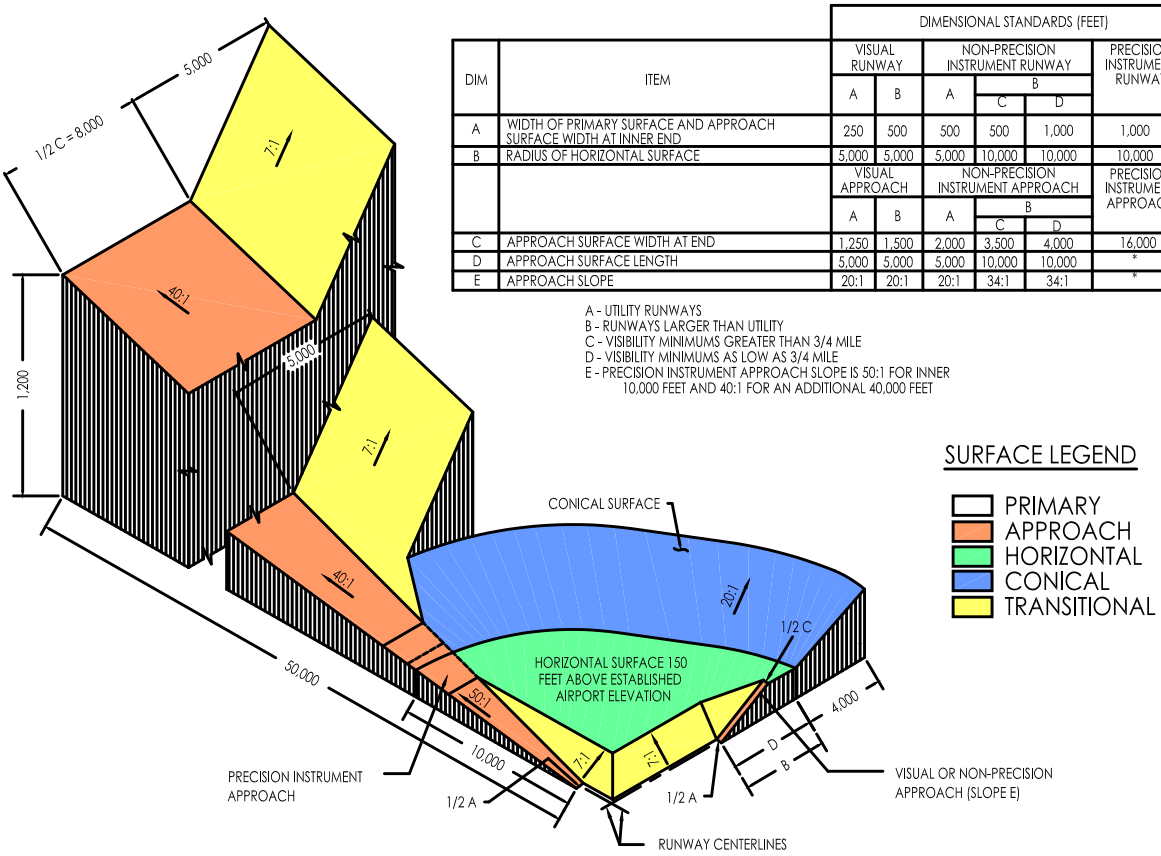
TABLE 1-12 PART 77 SURFACES	Runway 7/25
Primary Surface width	250’
Primary Surface beyond RW end	200’
Approach Surface dimensions	250’ x 1,250’ x 5,000’
Approach Surface slope	20:1
Transitional Surface slope	7:1

Source: 14 CFR Part 77



DIM	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B		
					C	D	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END	250	500	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT APPROACH			PRECISION INSTRUMENT APPROACH
		A	B	A	B		
					C	D	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	*

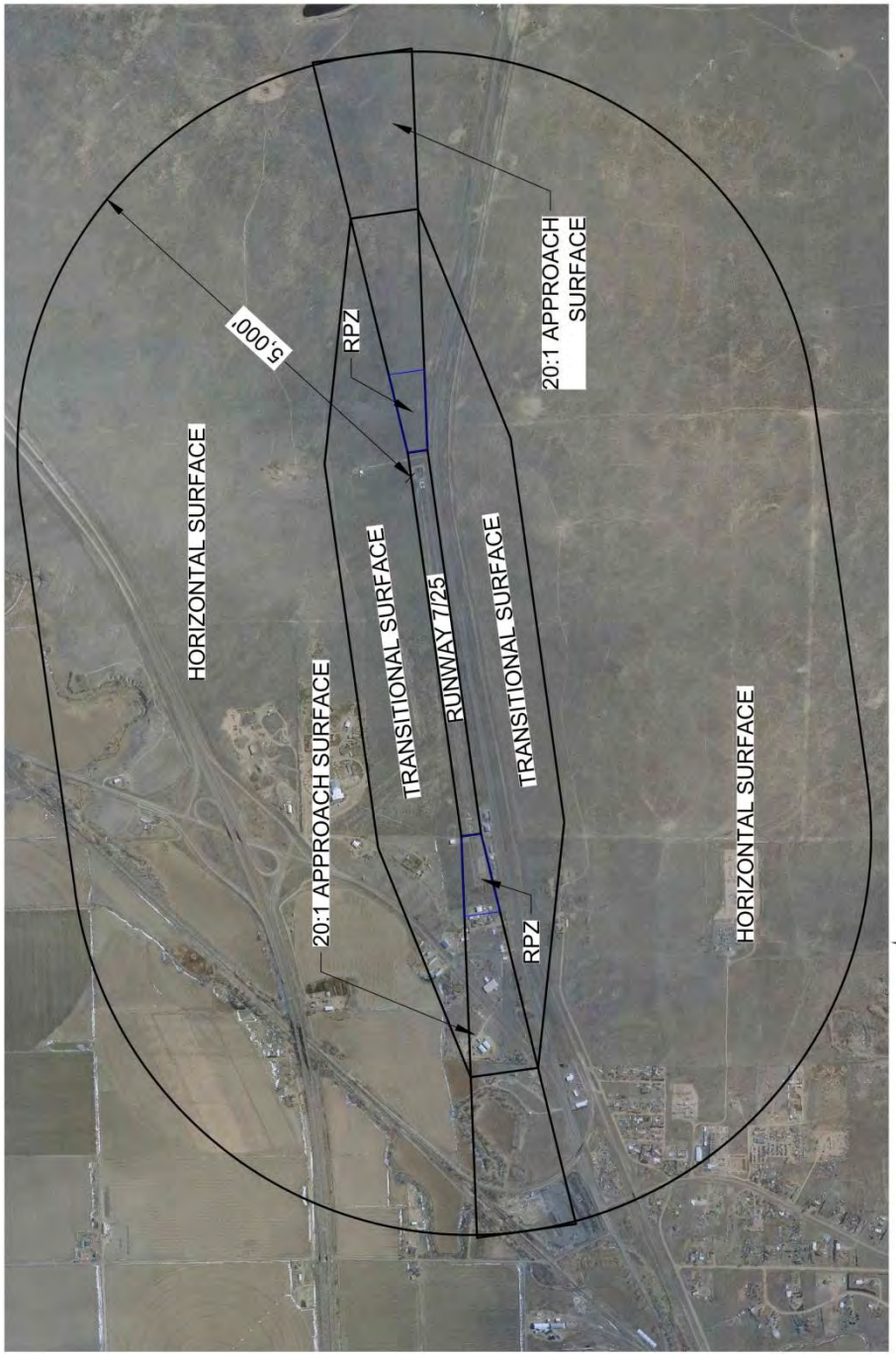
A - UTILITY RUNWAYS
B - RUNWAYS LARGER THAN UTILITY
C - VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
D - VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
E - PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET



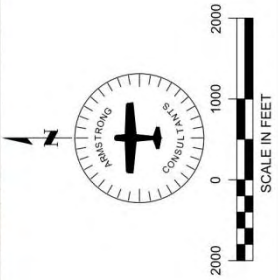
SURFACE LEGEND

- PRIMARY
- APPROACH
- HORIZONTAL
- CONICAL
- TRANSITIONAL

ISOMETRIC VIEW OF SECTION A-A



Note: 14 CFR Part 77 Airspace surfaces only. Obstructions not depicted.



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BRUSH MUNICIPAL AIRPORT
BRUSH, COLORADO
FAR PART 77 EXHIBIT

SCALE:	PER BAR SCALE	DATE:	03/2013
DRAWN:	GWK	FILE:	6122 PART 77
CHK'D:	DPS	JOB NO.:	126122

FIGURE 1-10 EXISTING PART 77 SURFACES

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Chapter Two
Forecasts of Aviation Activity

Brush Municipal Airport
Airport Layout Plan

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CHAPTER TWO
FORECASTS OF AVIATION ACTIVITY

2.1 INTRODUCTION

Forecasts of aviation activity serve as a guideline for the timing required for implementation of airport improvement programs. While such information is necessary for successful comprehensive airport planning, it is important to recognize that forecasts are only approximations of future activity, based upon historical data and viewed through present situations. They must therefore, be used with careful consideration, as they may lose their validity with the passage of time.

For this reason, an ongoing program of examination of local airport needs and national and regional trends is recommended and encouraged in order to promote the orderly development of aviation facilities at the Brush Municipal Airport.

At airports not served by air traffic control towers, estimates of existing aviation activity are necessary in order to form a basis for the development of realistic forecasts. Unlike towered airports, non-towered general aviation airports have historically not tracked or maintained comprehensive logs of aircraft operations. Estimates of existing aviation activity are based upon a review of based aircraft, available historical data, available local information and regional, state and national data that form the baseline to which forecasted aviation activity trends are applied.

Activity projections are made based upon estimated growth rates, area demographics, industry trends and other indicators. Forecasts are prepared for the Initial-Term (0-5 years), the Intermediate-Term (6-10 years) and the Long-Term (11-20 years) time frames. Utilizing forecasts within these time frames will allow airport improvements to be timed to meet demand, but not so early as to remain idle for an unreasonable length of time.

There are four types of aircraft operations considered in the planning process. These are termed “local, based, itinerant and transient.” They are defined as follows:

Local operations are defined as arrivals and departures that originate and terminate at the airport under study. These operations typically consist of touch-and-go operations, parachute jumping operations, practice approaches, crop dusting operations, flights to and within local practice areas and pleasure site seeing flights.

Based aircraft operations are operations made by aircraft which are stored at the airport more than six months out of the year.

Itinerant operations are defined as arrivals and departures other than local operations and generally originate or terminate at another airport. These types of operations are closely tied to local demographic indicators, such as local industry and business use of aircraft and usage of the facility for recreational purposes.

Transient operations are defined as the total operations made by aircraft other than those based at the airport under study. These operations typically consist of business or pleasure flights originating at other airports, with termination or a stopover at the study airport. The terms transient and itinerant are sometimes erroneously used interchangeably. This study will confine analysis to local and itinerant operations.

2.2 NATIONAL AND REGIONAL TRENDS

According to indicators such as aircraft production, pilot activity and hours flown, general aviation activity reached a peak in the late 1970s. This peak was followed by a long downturn that persisted through most of the 1980s and the early 1990s has been primarily attributed to high manufacturing costs associated with product liability issues. The General Aviation Revitalization Act (GARA) of 1994 was enacted with the goal of revitalizing the industry by limiting product liability costs. GARA established an 18-year statute of repose on liability related to the manufacture of all general aviation aircraft and their components. According to a 2001 report to Congress by the Government Accountability Office (GAO), trends in general aviation suggest that liability costs have been less burdensome to manufacturers, shipments of new aircraft have increased and technological advances have been made since GARA was enacted. The previously mentioned indicators have also increased in the years since GARA's enactment.

The FAA annually convenes expert panels in aviation and develops forecasts for future activity in all areas of aviation, including general aviation. The FAA's 2012-2032 forecast predicts that the total general aviation fleet will increase at an average annual rate of 0.7 percent during the 20-year forecast period, growing from 222,690 aircraft in 2012 to 253,205 aircraft in 2032. The fleet of jet turbine aircraft is expected to increase at a greater rate than the fleet of piston aircraft; as a result, the number of piston aircraft, while continuing to increase, it is expected to represent a smaller percentage of the total general aviation fleet. **Figures 2-1** and **2-2** illustrate this forecasted change to the general aviation fleet that is forecast to occur over the 20-year period.

In 2005 the category of "light sport" aircraft was created. At the end of 2006 a total of 1,273 aircraft were included in this category. In 2011, the number of sport aircraft increased to 6,645. By 2032 a total of 10,195 light sport aircraft are projected to be in the fleet.

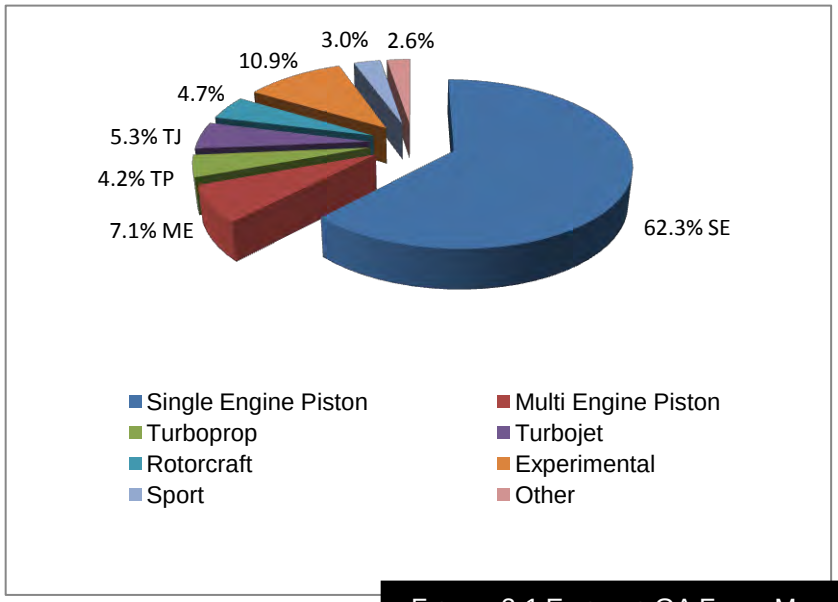
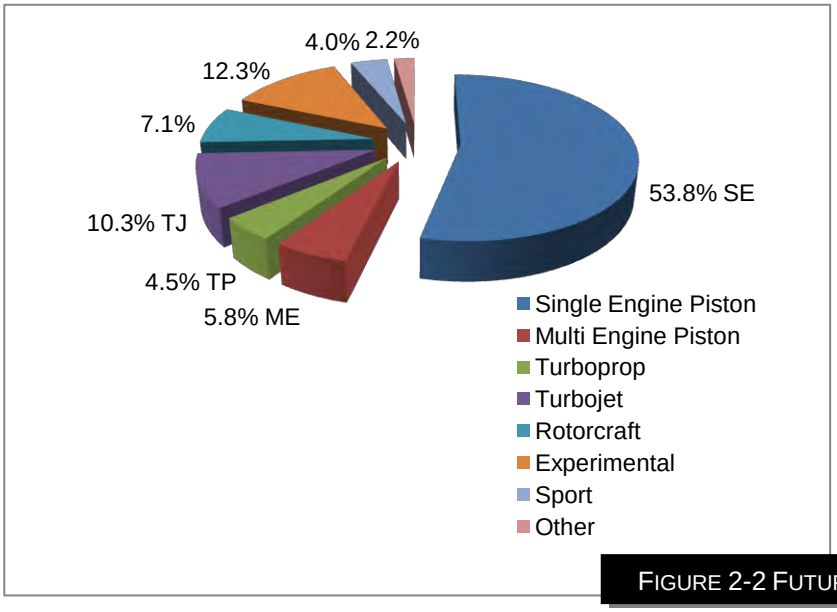


FIGURE 2-1 EXISTING GA FLEET MIX

Source: FAA Aerospace Forecast Fiscal Years 2012-2032



Source: FAA Aerospace Forecast Fiscal Years 2012-2032

FIGURE 2-2 FUTURE GA FLEET MIX

The General Aviation Manufacturer's Association (GAMA) produces activity forecasts based on general aviation hours flown. As shown in **Table 2-1**, the number of turbojet (TJ) hours is forecast to increase by an average annual growth rate of 29.8 percent between 2012 and 2032, while the number of multiengine (ME) hours flown is projected to decrease at 0.1 percent. GAMA projects a 32.4 percent average annual growth rate in total hours flown.

The relatively inexpensive twin-engine very light jets (VLJs) (priced between $1 and $2 million) were believed by many to have the potential to redefine the business jet segment by expanding business jet flying and offering performance that could support a true on-demand air-taxi business service. However events since that time have dampened expectations for a rapid penetration of VLJs (**Figure 2-3**) into the market.

TABLE 2-1 NATIONAL GENERAL AVIATION FORECAST

	Hours Flown (in millions)				
Year	**SE**	**ME**	**TP**	**TJ**	**Total**
2012	11.4	1.8	2.4	4.0	6.4
2013	11.1	1.8	2.5	4.3	6.8
2014	10.8	1.7	2.5	4.6	7.1
2015	10.6	1.7	2.6	4.9	7.4
2016	10.4	1.7	2.6	5.1	7.7
2017	10.3	1.7	2.6	5.3	7.9
2018	10.2	1.7	2.7	5.6	8.2
2019	10.2	1.7	2.7	5.8	8.5
2020	10.1	1.7	2.7	6.0	8.7
2021	10.1	1.7	2.7	6.3	9.0
2022	10.1	1.7	2.7	6.5	9.3
2023	10.2	1.7	2.8	6.8	9.6
2024	10.2	1.7	2.8	7.1	9.9
2025	10.4	1.7	2.8	7.4	10.2
2026	10.5	1.7	2.8	7.7	10.5
2027	10.7	1.7	2.8	8.0	10.9
2028	10.9	1.7	2.9	8.4	11.2
2029	11.0	1.7	2.9	8.8	11.6
2030	11.1	1.7	2.9	9.1	12.0
2031	11.3	1.7	2.9	9.6	12.5
2032	11.5	1.8	2.9	10.0	12.9
Avg. Annual Growth	**-0.2%**	**-0.1%**	**1.1%**	**5.3%**	**3.25%**

Despite the challenging economy and the uncertainty surrounding the future of Eclipse and other VLJ manufactures, the forecast assumes that about 440 VLJs will enter the active fleet in the U.S. over the next 3 years, with an average of 216 aircraft a year for the balance of the forecast period.

The number of active general aviation pilots (excluding air transport pilots) is projected to be 510,295 in 2032, an increase of 39,335 (up 0.4 percent yearly) over the forecast period. Commercial pilots are projected to increase from 119,200 in 2012 to 130,100 in 2032, an average annual increase of 0.5 percent. The number of student pilots is forecast to decrease at an average annual rate of 0.03 percent over the forecast period, decreasing from 117,340 in 2012 to 116,720 in 2032. The number of private pilots is projected to grow at an average yearly rate of 0.1 percent over the forecast period to a total of 199,300 in 2032 from 194,441 in 2012.

FIGURE 2-3 VERY LIGHT JET (VLJ)

The FAA is also projecting that by the end of the forecast period that a total of 13,900 sport pilots will be certified which is up from 4,800 sport pilots in 2012. The growth in the sport pilot classification shows the interest in this “entry level’ pilot certificate which was developed in 2005.

INTRODUCTION TO NEXTGEN

Next Generation Air Transportation System (NextGen) is a new era in flight that is transforming how aircraft navigate the sky and is a replacement to the World War II era technology that has until recently been the primary navigation technology. NextGen utilizes satellite technology (**Figure 2-4**) which allows pilots to know the precise locations of other aircraft around them. This allows more planes in the sky while enhancing the safety of air travel. Satellite landing procedures also allow pilots arrive at airports more efficiently by providing for more direct flight routes.

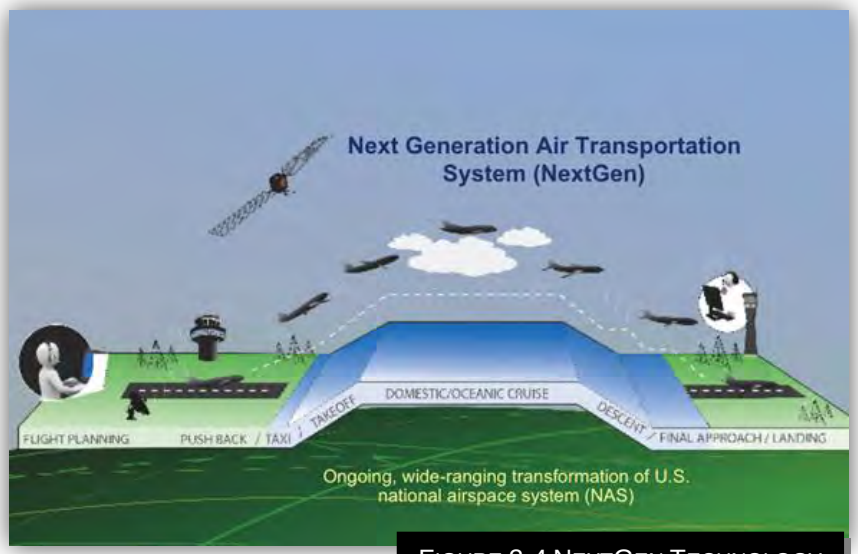


FIGURE 2-4 NEXTGEN TECHNOLOGY

HOW NEXTGEN MAY IMPACT THE BRUSH MUNICIPAL AIRPORT

The primary manner in which NextGen could influence operations at Brush Municipal Airport is the feasibility of the airport being provided with an instrument approach to accommodate flight during periods of low visibility as needed to accommodate air ambulance operations and business flight operations in the future. This would be possible due to the decreased cost associated with the creation of a published instrument approach procedures and the use of remote satellite technology in place of onsite facilities **Figure 2-5**.

FIGURE 2-5 NEXTGEN PRECISION

2.3 EXISTING ACTIVITY LEVELS

The FAA Form 5010-1, *Airport Master Record*, is the official record kept by the FAA to document an airport's physical conditions and other pertinent information. The information is typically collected from the airport sponsor and includes an annual estimate of aircraft activity as well as the number of based aircraft. The current Form FAA 5010-1 for the Brush Municipal County Airport indicates six based aircraft, however based on discussion with airport tenants there are currently eight based aircraft and 1,461 annual operations (**Table 2-2**).

It is recommended that a system be implemented to track aircraft operations at the airport. Acoustical monitoring or video surveillance are two measures that airport management can utilize to accurately track aircraft operations.

TABLE 2-2 EXISTING BASED AIRCRAFT AND ANNUAL OPERATIONS

Year	Based Aircraft	GA – Local	GA – Itinerant	Total
2012	8	1,170	291	1,461

2.4 FACTORS INFLUENCING AVIATION DEMAND

There are several factors influencing aviation demand at Brush Municipal Airport. These factors include, flight training, business traffic, agricultural operations, air ambulance, and leisure activities. The Brush Municipal Airport should be developed to meet the existing and future special use, recreational and business traffic.

According to discussions with existing airport tenants it was identified that the owner of two of the eight existing hangars is actively seeking a skydiving operator to conduct operations out of the Brush Municipal Airport. The Brush Municipal Airport has a history of skydive operators utilizing the airport and is identified for such operations on aeronautical section charts utilized by pilots to notify pilots of skydiving operations located at the airport.

Other factors influencing demand at the Brush Municipal Airport include the airport being consistently utilized by local businesses, such as MMI investors. The airport is also attractive for ultra-light operators, sport pilot aircraft and special use operators.

2.5 EXISTING AVAILABLE FORECASTS

Existing available forecasts for Brush Municipal Airport include the 2011 Colorado Aviation System Plan Update (CASPU) forecast. The CASPU reported 11 based aircraft and 1,120 operations at the Brush Municipal Airport in 2010 and forecasts 11 based aircraft and 1,130 operations in 2030.

2.6 BASED AIRCRAFT FORECAST

Forecasts of based aircraft for the Brush Municipal Airport were derived from utilizing the existing eight based aircraft as discussed in the Chapter One, *Inventory*, combined with existing forecasts considering growth rates for the City, County and State. A comparative analysis of based aircraft forecasts was accomplished using three methodologies to derive a preferred forecast of based aircraft for the Brush Municipal Airport.

A market share forecast was developed by comparing the 2012 FAA Terminal Area Forecast (TAF) for the State of Colorado. According to the 2012 State of Colorado TAF there are 4,655-based airplanes in the State of Colorado of which eight are based at Brush Municipal Airport. This results in Brush having a 0.17 percent market share (8/4,655) of Colorado based aircraft. The TAF for the State of Colorado forecasts the based aircraft to increase to 5,517 aircraft by 2032. By applying this growth to the based aircraft at Brush, there would be nine based aircraft at the airport in 2032. The results of the market share are shown in **Table 2-3**.

TABLE 2-3 MARKET SHARE FORECAST

Year	2013 TAF Forecast of Aircraft Based in Colorado	Based Aircraft
2012	4,655	8
2017	4,871	8
2022	5,096	9
2027	5,326	9
2032	5,517	9

A per capita forecast that projects the number of based aircraft in direct proportion to the projected population growth of the Eastern Plains of Colorado was developed for Brush Municipal Airport. According to the Colorado Department of Local Affairs Office the population of the Eastern Plains is projected to increase 39 percent from 160,615 in 2012 to 222,842 in 2032. Using the per capita forecast method 11 aircraft would be based at the Brush Municipal Airport by 2032. The results of the per capita forecast are shown in **Table 2-4**.

TABLE 2-4 PER CAPITA FORECAST

Year	Eastern Plains – Region 6 Population	Based Aircraft
2012	160,615	8
2017	174,053	9
2022	191,843	10
2027	208,388	10
2032	222,842	11

A cohort forecast which uses the results of the market share forecast combined with the 2011 Colorado Aviation System Plan Update (CASPU) forecast was developed. The results of the cohort forecast result in ten based aircraft at the Brush Municipal Airport by 2032. The results of the cohort forecast are show in **Table 2-5**.

TABLE 2-5 COHORT FORECAST

Year	Market Share Method Based Aircraft	2011 Colorado Aviation System Plan forecast	Based Aircraft
2012	8	8	8
2017	8	11	10
2022	9	11	10
2027	9	11	10
2032	9	11	10

The forecasts provide a likely range for future based aircraft growth at the Brush Municipal Airport over the 20 year planning period. The cohort forecast has been selected as the preferred forecast for the airport. The development of additional facilities at the airport is expected to increase the number of based aircraft located at the airport.

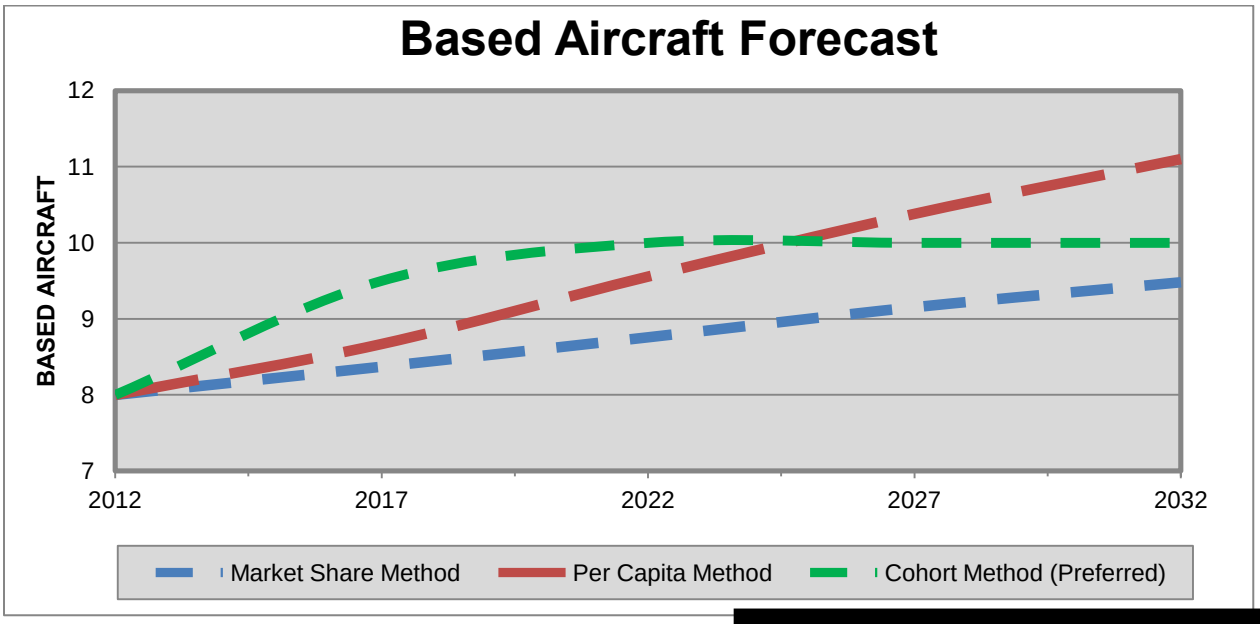


FIGURE 2-6 BASED AIRCRAFT FORECAST

2.7 ANNUAL AIRCRAFT OPERATIONS FORECAST

Forecasts of annual aircraft operations for Brush Municipal Airport have been derived by applying the preferred based aircraft forecast of ten based aircraft to the projected number of operations per based aircraft.

FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems (NPIAS), states that the appropriate number of Operations Per Based Aircraft (OPBA) to use when estimating operations at a non-towered airport ranges from 250 to 450, with some very busy general aviation airports experiencing up to 750 operations per based aircraft. Currently, with eight based aircraft and approximately 1,461 operations, the airport has an OPBA of 183 (note: this is not to imply that each based aircraft conducts 183 operations per year but that all aircraft utilizing the airport, including transient aircraft and touch-and-goes accumulate an average of 183 OPBA). By comparison, the 2011 CASPU forecasts respectively reports 103 OPBA.

In order to develop a preferred forecast of aircraft operations at the Brush Municipal Airport, three different methods were analyzed. Each method utilizes the preferred based aircraft forecast of ten aircraft in 2032 and applies varying OPBA to the based aircraft forecast. These methods are summarized as follows:

Method 1: Existing operations per based aircraft (183 OPBA)

Method 2: FAA Order 5090.3C (350 OPBA)

Method 3: 2011 Colorado Aviation System Plan Update (CASPU) (103 OPBA)

For the first method, the 2012 base year level of operations per based aircraft of 183 was applied to the preferred based aircraft forecast. Applying 183 to the preferred based aircraft forecast in **Table 2-4**, results in 1,830 annual operations in 2032 (183 x 10 = 1,830).

The second method, utilizes the general guideline contained in FAA Order 5090.3C, Field Formulation of the National Plan of Integrated Airport Systems (NPIAS) that recommends the use of 350 OPBA for busier non-towered general aviation airports. Applying 350 OPBA to the preferred based aircraft forecast results in 3,500 annual operations by 2032 (350 x 10 = 3,500).

The third method, applies the CASPU base year level forecast of operations per based aircraft of 103 for the Brush Municipal Airport. Applying 103 OPBA to the preferred based aircraft forecast results in 1,030 annual operations in 2032 (103 x 10 = 1,030).

These estimates provide a likely range of activity for future operations at the Brush Municipal Airport. As reflected in the preferred method, improvements to the facilities and services such as the reconstruction or resurfacing of Runway 7/25, it is reasonable to expect the OPBA to remain consistent over the 20-year planning period. **Figure 2-7** graphs the results of each method. Based on an evaluation of operations forecast methods, the first method was selected as the preferred method as it maintains the existing OPBA for based aircraft of 183 and it is reasonable to expect the OPBA to remain the same or higher.

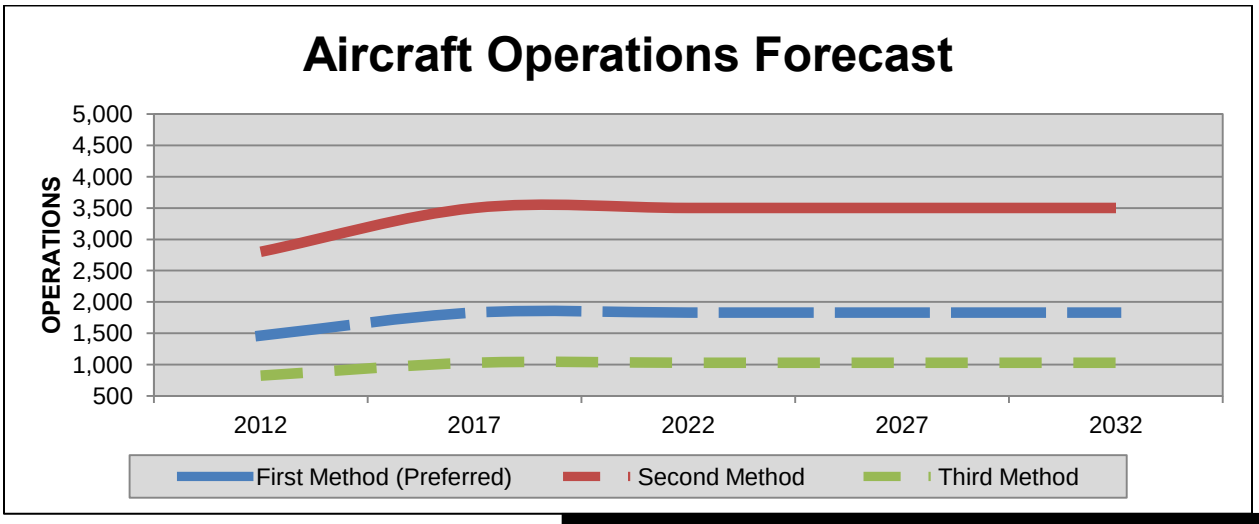


FIGURE 2-7 ANNUAL AIRCRAFT OPERATIONS FORECAST

2.8 FORECAST SUMMARY

The recommended forecast for Brush Municipal Airport is summarized in **Table 2-6**. Activity estimates are currently 80 percent local and 20 percent itinerant and are expected to remain at these percentages through 2032. However, if an aviation related business such as a flight training or maintenance facility were located at the Brush Municipal Airport, operations would exceed that which is forecasted.

TABLE 2-6 FORECAST SUMMARY OF AVIATION ACTIVITY

Year	Based Aircraft	Local Operations	Itinerant Operations	Total Operations
2012	8	1,170	291	1,461
2017	10	1,464	366	1,830
2022	10	1,464	366	1,830
2027	10	1,464	366	1,830
2032	10	1,464	366	1,830

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Chapter Three
Facility Requirements

Brush Municipal Airport
Airport Layout Plan

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CHAPTER THREE
FACILITY REQUIREMENTS

3.1 INTRODUCTION

One of the primary objectives of the ALP Update is to determine the size and configuration of airport facilities required to accommodate existing and forecast aircraft operations. Inventory data and forecast projections have been coupled with established planning criteria in order to determine the airside and landside facilities that would be needed to accommodate the existing and forecasted aircraft demand.

3.2 DESIGN STANDARDS

FAA AC 150/5300-13A, *Airport Design*, specifies standards for the planning and design of airport facilities. The design standards are based on the ARC, which is based on the most critical aircraft or group of aircraft utilizing the airport on a regular basis (500 operations a year). Airport design standards exist to promote efficient and safe air transit.

Although the airport is not included in the NPIAS, does not receive FAA grant funding and is not required to meet FAA design standards, it is prudent for the City of Brush to meet FAA design standards to the maximum extent practical. This would maximize the safety, efficiency, and utility of the airport. Existing non-standard conditions should be remedied in order to comply with state grant assurances and to promote a safe and efficient configuration of facilities.

The existing design standards for Runway 7/25 are based on an ARC of B-I (small) with visual approach minimums. Based on the forecasts, the future design standards are expected to remain B-I (small) with future approach visibility minimums of 1-mile.

3.3 AIRSIDE FACILITIES

3.3.1 RUNWAY LENGTH REQUIREMENTS

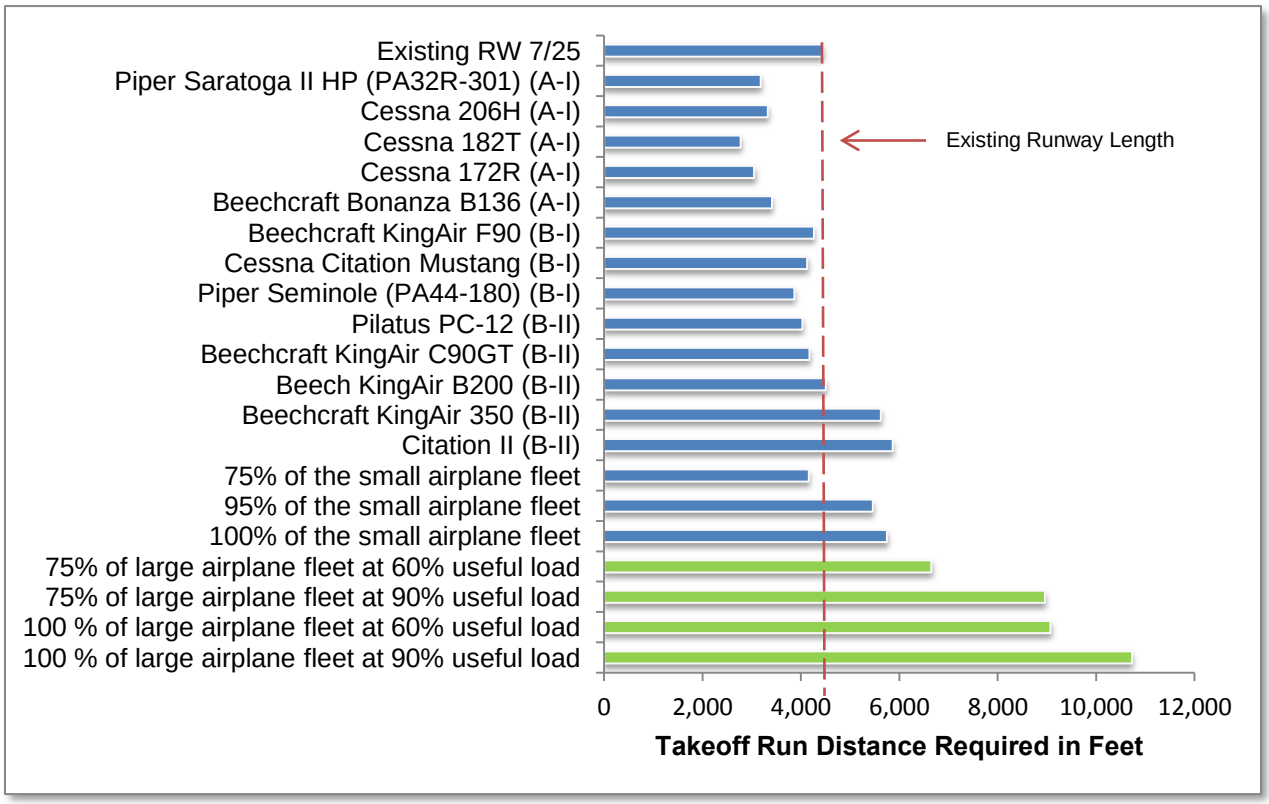
FAA AC 150/5325-4B, *Runway Length Requirements for Airport Design*, provides guidance for determining runway length requirements. The FAA Advisory Circular was used to calculate recommended runway length requirements using the specific airport elevation, mean maximum temperature of the hottest month and the effective gradient for the runway. The input data for the Brush Municipal Airport is listed below (**Table 3-1**). A summary of the runway length requirements are listed in **Table 3-1**.

The required runway lengths for several aircraft are contained within **Figure 3-1**. Based on the runway length analysis, a runway length of 4,160 feet accommodates 75 percent of small airplanes and a runway length of 5,460 feet would be required to accommodate 95 percent of small airplanes. The existing 4,445 foot runway accommodates 78 percent of the small airplanes and is considered adequate for the existing and forecasted fleet mix.

As discussed Chapter One, *Inventory*, the existing declared distances should be published. It is recommended to remove the displaced threshold and convert the pavement into a blast pad to avoid confusion during the next runway reconstruction project.

TABLE 3-1 RUNWAY LENGTH ANALYSIS	
Airport and Runway Data	
Airport Elevation	4,317 feet
Mean daily maximum temperature of the hottest month	88.6° F
Maximum difference in runway centerline elevation	36 feet
Small airplanes with less than 10 passenger seats, < 12,500 pounds	
75 percent of these small airplanes	4,160 feet
95 percent of these small airplanes	5,460 feet
100 percent of these small airplanes	5,750 feet
Small airplanes with 10 or more passenger seats	5,750 feet
Large airplanes of 60,000 pounds or less	
75 percent of these large airplanes at 60 percent useful load	6,650 feet
75 percent of these large airplanes at 90 percent useful load	8,960 feet
100 percent of these large airplanes at 60 percent useful load	9,070 feet
100 percent of these large airplanes at 90 percent useful load	10,730 feet

(Note: The actual difference in feet from runway end to runway end is required to run the FAA software program and is listed as the effective gradient. However, the effective gradient is usually shown as a percent.)



*At Maximum Takeoff Weight, 88.6 ℉ and 4,317 feet MSL

FIGURE 3-1 RUNWAY LENGTH REQUIREMENTS

3.3.2 RUNWAY STRENGTH

Runway pavement strength requirements are normally based upon the design aircraft expected to utilize the airport on a regular basis. The existing pavement strength is 6,000 pounds SWG. It is recommended to reconstruct Runway 7/25 within the next one to four years due to its current condition. As a direct result of the runway reconstruction project and the re-use of

existing material, the runway pavement strength will increase from 6,000 pounds SWG to 12,500 pounds SWG.

3.3.3 CROSSWIND RUNWAY REQUIREMENTS

The FAA recommends that a runway's orientation provide at least 95 percent crosswind coverage. Based on the wind analysis data obtained from the Colorado Plains Regional Airport in Akron, Colorado between 1993 and 2002, Runway 7/25 is unable to provide 95 percent wind coverage at 10.5 knots, which is the crosswind coverage recommended by the FAA for the A-I and B-I aircraft that regularly use the airport. A crosswind runway is recommended for the Brush Municipal Airport. However, due to funding priorities and constraints caused by U.S. Route 34 and surrounding development, the construction of a crosswind runway with the necessary wind alignment is not considered to be a realistic project for the airport.

3.3.4 APRON AREA PARKING

The key to optimum aircraft circulation and efficiency is to provide the shortest taxiing distance from the terminal area or apron to the departure ends of the runway, and to minimize the taxiing distance of landing aircraft as much as possible. Developing a functional apron layout plan involves evaluating aircraft parking and tiedown requirements, taxilanes, hangar and building development and overall apron space, in conjunction with physical and topographical constraints, to accommodate existing and forecasted aircraft.

Aircraft tiedowns should be provided for those small and medium sized aircraft utilizing the airport. These aircraft risk damage in sudden wind gusts if not properly secured. A number of tiedowns are required to accommodate the peak daily transient and overnight transient aircraft plus based aircraft that are not hangared. Generally speaking, an apron tiedown area for small aircraft should allow approximately 360 square yards per transient aircraft and 300 square yards per based aircraft. This square yardage per aircraft provides adequate space for tiedowns, circulation and fuel truck movement. The utilization of hangars may reduce the number of tie-downs required.

Additional aircraft parking apron is recommended during the 20 year planning period in order to accommodate additional based aircraft as well as the increased activity forecasted by transient aircraft. The existing apron is 1,800 square yards and an expansion to a total of 10,850 square yards is recommended. The apron pavement strength is also recommended to be 12,500 pounds SWG.

3.3.5 TAXIWAYS

The airport has an existing connector taxiway between Runway 7/25 and the office and transient hangar on the approach end of Runway 7. There is also an aligned taxiway located at the approach end of Runway 7 which serves the hangars and apron on the west end of the airport, as well as the hangar located on the north side of the airport.

According to the FAA AC 150/5300-13A, *Airport Design* aligned taxiways are prohibited. It is recommended that, if feasible, the aligned taxiway be removed and replaced with taxiways that provide access from the side of the runway.

It is recommended that phased construction of a future partial parallel taxiway and an ultimate parallel taxiway with bypass taxiways and/or holding bays be constructed on each runway end to improve circulation and increase safety by allowing aircraft to remain clear of the runway while conducting run-up operations. If there is sufficient room, the taxiways should be

constructed 240 feet from the runway centerline to the taxiway centerline, as opposed to 150 feet for B-I small in order to protect for a future upgrade to B-II. The taxiway should be constructed to a width of 25 feet. All taxiway development should be completed to a pavement strength of 12,500 pounds SWG.

3.3.6 AIRFIELD LIGHTING, MARKING, SIGNAGE AND VISUAL AIDS

Airport lighting enhances safety during periods of inclement weather and nighttime operations by providing visual guidance to pilots in the air and on the ground. Lighting and visual aids can consist of a variety of equipment or a combination thereof as described in Chapter One, *Inventory*. The airport's existing lighting and visual aids are limited to low intensity runway lights (LIRLs), and a lighted wind cone. Airport lighting is pilot controlled and is activated on the CTAF at 122.8 MHz. It is recommended that a rotating beacon and Precision Approach Path Indicators (PAPIs) be installed. Lighted hold position signs are also recommended to be installed along with retroflectors along all taxiways. It is recommended to replace the existing LIRLs with Medium Intensity Runway Lights (MIRLs) as the current lighting system is in poor condition. Wherever possible and financially feasible, Light Emitting Diode (LED) Lighting should also be considered as an alternative. It is recommended that a segmented circle with a lighted wind cone be installed and maintained for the airport. Both ends of the runway should be marked with nonprecision instrument approach markings in order to support future instrument approach development at the airport.

3.3.7 AIRPORT PROPERTY

It is recommended the City of Brush own the RPZs fee simple to avoid incompatible land use such as residential development. This would ensure obstructions would not interfere with any of the 14 CFR Part 77 Surfaces. If fee simple acquisition is not feasible, avigation easements are recommended.

3.4 LANDSIDE FACILITIES

Landside facilities are an important compliment to airside facilities. Landside facilities serve as the processing interface between the surrounding community and the airport operating environment and often offer travelers the first impression of the area. These facilities house the support and infrastructure for airside operations and typically generate the majority of revenues for the airport.

3.4.1 OFFICE AND TRANSIENT HANGAR

The office and transient hangar offers several amenities to local and transient pilots and passengers. The office space includes a pilot's lounge and restrooms. The existing building is often locked since the airfield is unattended. It is recommended that the office be provided with combination or key pad locks that allow local and transient pilots with 24 hour access to the restroom and public facilities.

3.4.2 AIRCRAFT FUEL FACILITIES

No aircraft fueling facilities are currently available at the airport. Existing based aircraft owners and operators must carry extra fuel and refuel at other airports. It is recommended that a public-use 10,000 gallon AvGas above ground storage tank (AST) with a credit card reader be made available to provide 24 hour self-serve fuel service to local and transient operators.

3.4.3 HANGARS

Hangars are typically constructed in two forms: box hangars or T-hangars. Box hangars are inherently more flexible and can accommodate larger aircraft while T-hangars offer significant space savings and cost efficiency.

Hangars can be constructed through a variety of means. The airport sponsor can construct them with their own funds or choose to lease out portions of the airport property (i.e. a ground lease) for hangars. In this case, an interested party obtains a long-term lease on the land and constructs a hangar (or hangars) on the airport property. This is beneficial to both parties because it provides a needed facility to the aircraft owner at no capital cost to the airport and generates airport revenue from the lease from the hangar and based aircraft. An interested party may construct several T-hangars, using one while leasing out the remaining hangars as an aeronautical business. It is recommended that future hangar lease areas be identified on the ALP for a mix of T-hangars, small/individual sized box hangars and larger corporate-sized box hangars. An existing box hangar at the Brush Municipal Airport is shown in **Figure 3-2**.

FIGURE 3-2 EXISTING BOX HANGAR

3.4.4 ACCESS AND PARKING

There are currently 15 automobile parking spaces at the airport. Vehicles and pedestrians currently have uncontrolled access to the aircraft operating areas. It is recommended that landside and airside operations be separated by fencing in order to prevent vehicle and pedestrians from inadvertently entering the airside operations area. A chain link fence with controlled vehicle and pedestrian access gates is recommended to enhance safety and security.

3.4.5 UTILITIES

The airport is currently provided with electricity, natural gas, water, and telephone. The City hangar and office utilizes a septic system for waste water. Presently, electricity and natural gas is provided by Xcel Energy, water by Morgan County Quality Water, and telephone by Century Link. The available utilities are sufficient for the existing operations and should be extended as needed to accommodate hangar development.

3.4.6 WEATHER REPORTING

An Automated Weather Observation Station (AWOS) uses sensors, a voice synthesizer, and a radio transmitter to provide real-time weather data. The AWOS-III provides the highest level of information by reporting altimeter setting, wind speed direction, gusts, temperature, dew point, visibility, and cloud/ceiling data. Brush Municipal Airport has no weather reporting information and is limited to a lighted wind cone for local wind speed and direction. For additional information, airport users currently use weather information provided by the Fort Morgan Municipal Airport AWOS and Colorado Plains Regional Airport Automated Surface Observation System (ASOS) which are located 11 nautical miles to the west and 17 nautical miles to the east, respectively. The development of an instrument approach procedure will require a local altimeter setting. Local altimeter settings from either Fort Morgan or Akron could be used; however, the minimum cloud ceiling may be increased thereby reducing the utility of the instrument approach. However, no reliable data exists to show similarities between current weather conditions at Brush and Fort Morgan or Akron. The installation of an AWOS-I is recommended initially with an upgrade to an AWOS-III concurrent with the implementation of an instrument approach procedure.

3.4.7 SNOW REMOVAL EQUIPMENT STORAGE BUILDING

An equipment storage building is recommended to protect airport maintenance equipment. The structure will provide a secure area to store items such as a mower, sweeper, and Snow Removal Equipment (SRE). Having a dedicated facility will maximize operational performance for the necessary support items for the airport.

3.5 AIRSPACE AND LAND USE

3.5.1 NAVAIDS & INSTRUMENT APPROACHES

Navigational aids assist the pilot with enroute navigation and approaches into and out of airports. There are several types of navigational aids commonly used at general aviation airports and by general aviation aircraft. The most common approach is the global positioning system (GPS) instrument approach. This approach utilizes a system of orbiting satellites and receivers to provide the location of aircraft and airport facilities. It requires no additional land-based facilities. The development of an instrument approach procedure would require an Aeronautical Survey in order to evaluate the existing airport layout and obstacles surrounding the airport. It is recommended that a future GPS instrument approach with visibility minimums of 1-mile be developed. The recommended lighting, visual aids, weather reporting and runway markings discussed throughout this section would be needed to support the implementation of an instrument approach at the airport.

3.5.2 TITLE 14 CODE OF FEDERAL REGULATIONS PART 77 IMAGINARY SURFACES

14 CFR Part 77 Imaginary Surfaces establishes imaginary surfaces and standards for the maintenance of safe airspace in and around an airport. It identifies potential obstructions in an effort to provide safe operating areas for aircraft. These surfaces are described below. The dimensions are included in **Table 3-2** and the surfaces are illustrated in **Figure 3-3.**

The overall goal is to prevent or minimize objects of height above ground level that penetrate the Part 77 airspace surfaces, especially within the approach surfaces. When objects do penetrate these surfaces they are known as obstructions. The FAA reviews obstructions in the vicinity of an airport and makes determinations as to whether they are hazards to air navigation and negatively affect the approach minimums or aircraft operations or whether they can be appropriately marked and lighted with minimal impacts to the airport.

3.5.3 PRIMARY SURFACE

The primary surface is an imaginary surface of specific width longitudinally centered on a runway. The primary surface extends 200 feet beyond each end of the paved surface of runways, but do not extend beyond the end of non-paved runways. The elevation of any point on the primary surface is the same as the elevation of the nearest point on the runway centerline. The width is 250 feet for visual-utility runways, 500 feet for visual larger than utility and nonprecision runways and 1,000 feet for precision runways.

3.5.4 APPROACH SURFACE

The approach surface is a surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of the runway based upon the type of approach available or planned for that runway, with gradients of 20:1, 34:1 or 50:1. The inner edge of the surface is the same width as the primary surface. It expands uniformly to a width corresponding to the Part 77 runway classification criteria.

3.5.5 TRANSITIONAL SURFACE

The transitional surfaces extend outward and upward at right angles to the runway centerlines from the sides of the primary and approach surfaces at a slope of 7:1 and end at the horizontal surface 150 feet above the airport elevation.

3.5.6 HORIZONTAL SURFACE

The horizontal surface is considered necessary for the safe and efficient operation of aircraft in the vicinity of an airport. As specified in Part 77, the horizontal surface is a horizontal plane 150 feet above the established airport elevation. The airport elevation is defined as the highest point of an airport's useable runway, measured in feet above mean sea level. The perimeter is constructed by arcs of specified radius from the center of each end of the primary surface of each runway. The radius of each arc is 5,000 feet for runways designated as utility or visual and 10,000 feet for all other runways.

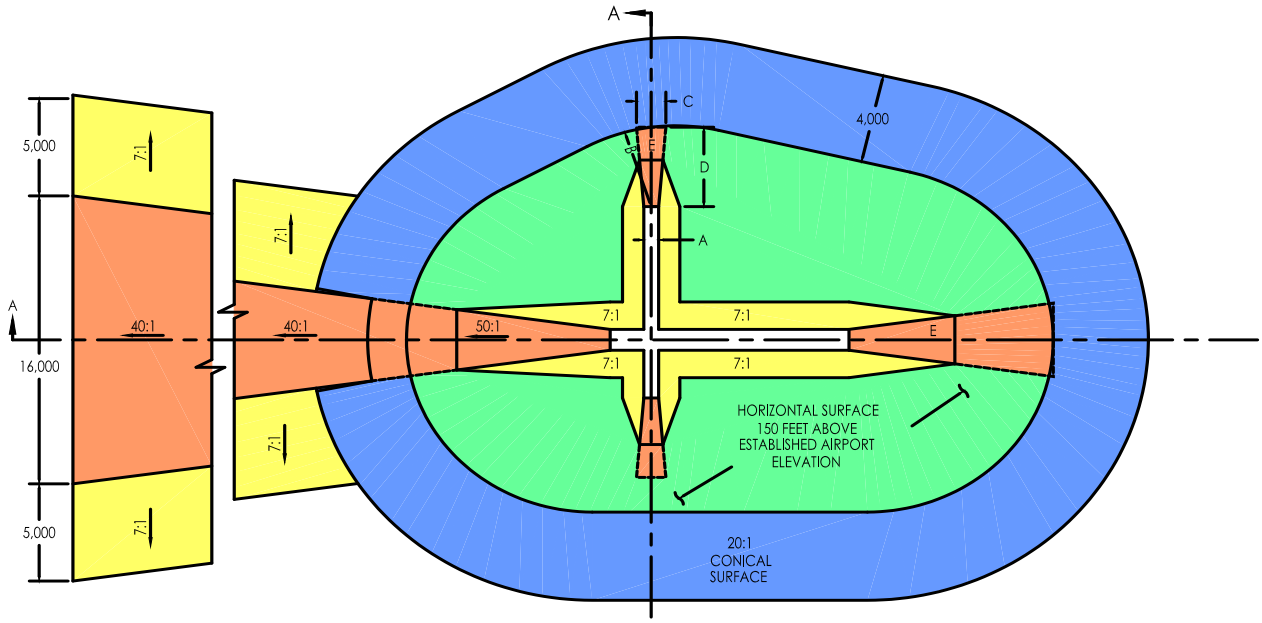
3.5.7 CONICAL SURFACE

The 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.

TABLE 3-2 BRUSH MUNICIPAL AIRPORT DESIGN STANDARDS

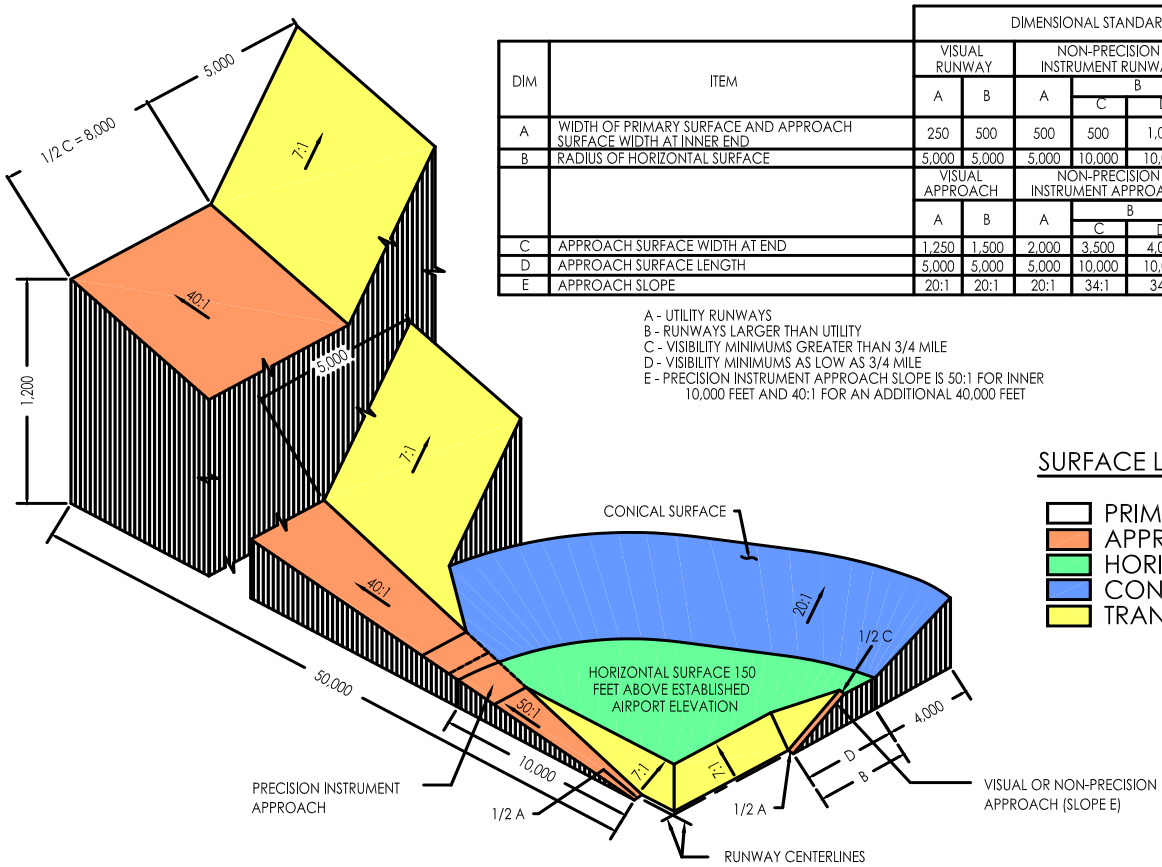
	Runway 7/25	Runway 7/25
Design Criteria	Existing	Future
Airport Reference Code	B-I (small)	B-I (small)
Approach Type RW 7	Visual	Nonprecision
Approach Visibility Minimums	Visual	1-mile
Approach Type RW 25	Visual	Nonprecision
Approach Visibility Minimums	Visual	1-mile
Pavement Strength (lbs.)	6,000 SWG	12,500 SWG
FAA Airport Design Standards (AC 150/5300-13A)		
Runway Centerline to Parallel Taxiway Centerline	150’	150’ (240’ recommended)
Runway Centerline to Edge of Aircraft Parking Apron	125’ (50’ actual)	125’
Runway Width	60’	60’
Runway Shoulder Width	10’	10’
Runway Safety Area Width	120’	120’
Runway Safety Area Length Beyond Runway End	240’ (RW 7: 93' Actual - Fence)[1]	240’
Runway Object Free Area Width	250’ (RW 7: 44’ Actual - Fence)[1]	250’
Runway Object Free Area Length Beyond Runway End	240’ (RW 7: 93' Actual - Fence)[1]	240’
Runway Obstacle Free Zone Width	250’ (RW 7: 44’ Actual - Fence)[1]	250’
Runway Obstacle Free Zone Length Beyond the Runway	200’ (RW 7: 93' Actual - Fence)[1]	200’
Runway Protection Zone (RW 7)	250’ x 450’ x 1,000’	250’ x 450’ x 1,000’
Runway Protection Zone (RW 25)	250’ x 450’ x 1,000’	250’ x 450’ x 1,000’
Taxiway Width	25’ (40’ actual)	25’
Taxiway Safety Area Width	49’	49’
Taxiway Object Free Area Width	89’	89’
Taxilane Object Free Area Width	79’	79’
Airspace Surfaces (14 CFR Part 77)		
	RW 7 Visual-Utility	RW 7 NPI-Utility
	RW 25 Visual-Utility	RW 25 NPI-Utility
Primary Surface Width	250’	500’
Primary Surface Length Beyond Runway Ends	200’	200’
Approach Surface Dimensions RW 7 RW 25	 250’ x 1,250’ x 5,000’ 250’ x 1,250’ x 5,000’	 500’ x 2,000’ x 5,000’ 500’ x 2,000’ x 5,000’
Approach Surface Slope RW 7 RW 25	 20:1 20:1	 20:1 20:1
Transitional Surface Slope	7:1	7:1
Horizontal Surface Radius from RW	5,000’	5,000’
Conical Surface Width	4,000’	4,000’
Conical Surface Slope	20:1	20:1

Source: FAA AC 150/5300-13A, *Airport Design* & 14 CFR Part 77



DIM	ITEM	DIMENSIONAL STANDARDS (FEET)					
		VISUAL RUNWAY		NON-PRECISION INSTRUMENT RUNWAY			PRECISION INSTRUMENT RUNWAY
		A	B	A	B		
					C	D	
A	WIDTH OF PRIMARY SURFACE AND APPROACH SURFACE WIDTH AT INNER END	250	500	500	500	1,000	1,000
B	RADIUS OF HORIZONTAL SURFACE	5,000	5,000	5,000	10,000	10,000	10,000
		VISUAL APPROACH		NON-PRECISION INSTRUMENT APPROACH			PRECISION INSTRUMENT APPROACH
		A	B	A	B		
					C	D	
C	APPROACH SURFACE WIDTH AT END	1,250	1,500	2,000	3,500	4,000	16,000
D	APPROACH SURFACE LENGTH	5,000	5,000	5,000	10,000	10,000	*
E	APPROACH SLOPE	20:1	20:1	20:1	34:1	34:1	*

A - UTILITY RUNWAYS
B - RUNWAYS LARGER THAN UTILITY
C - VISIBILITY MINIMUMS GREATER THAN 3/4 MILE
D - VISIBILITY MINIMUMS AS LOW AS 3/4 MILE
E - PRECISION INSTRUMENT APPROACH SLOPE IS 50:1 FOR INNER 10,000 FEET AND 40:1 FOR AN ADDITIONAL 40,000 FEET



SURFACE LEGEND

- PRIMARY
- APPROACH
- HORIZONTAL
- CONICAL
- TRANSITIONAL

ISOMETRIC VIEW OF SECTION A-A

3.6 SUMMARY OF FACILITY REQUIREMENTS

In summary, the facility requirements for the Brush Municipal Airport are based on the types and volume of aircraft expected to use the airport in the short, medium and long-term timeframes. These facilities will enable the airport to serve its users in a safe, secure and efficient manner. The recommended airside and landside facilities are summarized below in **Table 3-3.**

TABLE 3- 3 SUMMARY OF AIRPORT FACILITY REQUIREMENTS

		EXISTING	FUTURE	ULTIMATE
Runway 7/25				
	Length (feet)	4,445’	4,128’	4,128’
	Width (feet)	60’	60’	60’
	Strength (pounds)	6,000 SWG	12,500 SWG	12,500 SWG
	Pavement	Asphalt	Asphalt	Asphalt
Markings	Runway 7	Visual	Nonprecision	Nonprecision
	Runway 25	Visual	Nonprecision	Nonprecision
Taxiways	Parallel	None	Partial	Full Length
	Bypass Taxiways/Turnarounds	Turnaround	Bypass	Bypass
	Width (feet)	25'	25'	25'
	Strength (pounds)	6,000 SWG	12,500 SWG	12,500 SWG
Apron	Tie Downs	Not Marked	10*	15*
NAVAID	Approaches	Visual	GPS	GPS
	Minimums	Visual	1-mile	1-mile
Lighting & Visual Aids	Signs	None	Lighted	Lighted
	Runway Edge	LIRL	MIRL	MIRL
	Taxiway/Apron Edge	None	Retroflectors	Retroflectors
	Threshold Lights	Yes	Yes	Yes
	REILs	No	Yes	Yes
	Approach Slope Indicator (PAPI)	No	PAPI	PAPI
	Segmented Circle/Wind Cone	No/Yes	Yes/Yes	Yes/Yes
	Rotating Beacon	No	Yes	Yes
	Approach Lighting System	No	No	No
Access & Parking	Automobile	15	20	25
Hangar Facilities	Hangars	8	10*	15*
Fuel Storage	AvGas (Public)	No	10,000 Gallon Tank	10,000 Gallon Tank
	Jet-A (Public)	No	No	10,000 Gallon Tank
Other	AWOS	No	Yes	Yes
	Unicom	No	Yes	Yes
	Pilot Lounge/Terminal Building	Yes	Yes	Yes

*As required based on demand

Chapter Four
Development Alternatives

Brush Municipal Airport
Airport Layout Plan

ARMSTRONG

CHAPTER FOUR
DEVELOPMENT ALTERNATIVES

4.1 INTRODUCTION

The preceding discussion of facility requirements provides the basis for formulating project development concepts and alternatives. Chapter Three, *Facility Requirements*, provided recommended development for the majority of needs for the airport. This chapter will focus on the configuration of future facilities and projects the sponsor should consider for existing, future and ultimate airport development. The future facilities include:

- Reconstruct Runway 7/25
- Parallel Taxiway Development
- Apron Expansion
- Rotating Beacon and PAPI Installation
- Instrument Approach To Runway 7/25
- AWOS-III Installation
- 5,000 Gallon Avgas and Jet-A Above Ground Fuel Storage Tank Installation
- Upgrade Perimeter Fencing and Gates
- Correct Non-Standard Conditions

4.2 DEVELOPMENT ALTERNATIVES

4.2.1 RECONSTRUCT RUNWAY 7/25

As discussed in Chapter One, *Inventory*, Runway 7/25 has a Pavement Condition Index (PCI) in the poor to failed rating. Signs of significant cracking are evident on the runway surface. Therefore a runway reconstruction is recommended. It is recommended to pulverize the existing pavement and add a three inch layer of asphalt. This will renew the useful life of the pavement and provide a suitable surface for aircraft operations. The runway pavement strength will indirectly be increased to 12,500 pounds SWG. The increase of pavement strength will enhance the utility of the airport and extend the useful life of the runway surface. It is also recommended to remove the displaced threshold and convert the previous area to a blast pad to eliminate any potential pilot confusion.

4.2.2 CORRECT NON-STANDARD CONDITIONS

Several options for correcting existing non-standard conditions were evaluated. The non-standard conditions include a lack of RSA and ROFA beyond the approach end of Runway 25 and existing residential development located within the RPZ to Runway 7. The options to correct the non-standard condition include a combination of shortening one or both ends of the runway, acquiring the residence on the west end of the RPZ, shifting the runway to the east, utilizing declared distances to have the Runway 7 RPZ entirely on existing airport property. The recommended option to correct the non-standard conditions includes converting the existing displaced threshold to Runway 25 to blast pad and reducing the runway length to 4,128 feet. The acquisition of an avigation easement on 16.6 acres of property to the northeast for the future RPZ will be needed. This will provide the airport with direct control of the RPZ to ensure these areas are free of obstructions to maintain FAA design standards.

The aligned taxiway to Runway 7 is not consistent with FAA design standards and requires a higher level of awareness and caution by pilots. It is recommended once the landside facilities

on the south apron have reached their useful life no future developments occur in the area. Ultimately, the aligned taxiway pavement should be removed.

4.2.3 PARALLEL TAXIWAY DEVELOPMENT

As discussed in Chapter Three, *Facility Requirements*, the phased construction of a parallel taxiway is recommended. Initial bypass taxiways and holding bay development would be completed, followed by a partial parallel taxiway with ultimate full length parallel taxiway development in the long-term. The parallel taxiway development will increase safety and efficiency by minimizing back taxiing on the runway. The minimum runway/taxiway separation for B-I (small) is 150 feet and a width of 25 feet in order to meet Group-I design standards. However, the airport currently owns enough land to accommodate the taxiway development at 240 feet. It is recommended to develop the taxiway at 240 feet to avoid future relocation if the airport upgrades to B-II design standards.

4.2.4 NORTH LANDSIDE DEVELOPMENT

Aircraft apron expansion will accommodate increased based and transient aircraft forecasted for the airport. To meet aircraft operation demands, it is recommended a total of 15 tiedowns be installed over the 20 year planning period. The size of the apron will need to be expanded from 1,800 square yards to 10,850 square yards to accommodate the forecasted tiedowns and hangars. It is also recommended the pavement should match the runway's 12,500 pounds SWG rating.

The proposed location of the apron expansion is to the north of Runway 7. This location would allow for the development of future hangars and additional landside development. Additionally, it would provide the shortest route to the proposed parallel taxiway and associated runway access. An access road to connect the airport to Highway 6 would be required. An easement for the construction of the access road would also be required. The exisiting southern hangar and apron development area was evaluated and eliminated from further development consideration due to the lack of available space and the need to meet FAA design standards. Once the exsiting facilities reach the end of their useful life, future rennovation or development on the south apron is not recommended.

4.2.5 VISUAL AIDS AND LIGHTING

It is recommended to install a rotating airport beacon, lighted windcone, segmented circle and PAPIs. The PAPIs will provide visual vertical guidance to aid in landing. The rotating beacon will identify the physical location of the airfield at night. During day light hours, the rotating beacon is utilized when weather conditions become Instrument Flight Rules (IFR). It is also recommended to install lighted hold position signs and install retroflectors on the taxiways. This will enhance safety at the airport.

4.2.6 INSTRUMENT APPROACH TO RUNWAY 7/25

The future instrument approach to Runway 7/25 should consist of a GPS instrument approach with visibility minimums of 1-mile. As previously described, the development of approach procedures to one or both ends of the runway would increase the utility and enhance the safety at the airport. An instrument approach with minimums of less than 1-mile would result in larger Part 77 Surfaces, increased runway setbacks and larger RPZs. Given the limited space available, an approach with visibility minimums of less than 1-mile would not be practical.

4.2.7 AWOS-III INSTALLATION

Depending on available funding an AWOS-I could be installed initially, then upgraded to an AWOS-III when an instrument approach is published, or if financially feasible an AWOS-III could be simply installed initially. AWOS siting criteria specifies the unit to be located 500 feet from the runway centerline and between 1,000 feet and 3,000 feet down from the runway threshold. The station would also require a criticial area that has a 500 foot radius that is clear of any fixed objects over 17 feet that would obstruct the wind sensor. There are no suitable sites on the south side of the runway. The optimum location would be along the north side of Runway 7/25 near the north-central area of the airport to prevent future constraints on hangar development.

FIGURE 4-1 AWOS-III

4.2.8 FENCING AND GATES

It is recommended to upgrade the perimeter fence surrounding the airport to enhance safety and security by preventing unauthorized access to airside operation areas by persons and/or wildlife. A chain link security fence would surround the terminal area and an 8-foot wildlife fence would cover the remainder of the airport. It is also recommended that electric gates with keypad controllers be placed in locations at the north and south aprons to allow authorized personnel and vehicle access to the airfield nearest to future and existing landside facilities.

4.2.9 CROSSWIND RUNWAY

Chapter Three, *Facility Requirements*, recommended the construction of a crosswind runway to meet the 95 percent crosswind coverage for A/B-I aircraft. In order for the airport to attain a crosswind coverage of 95 percent or greater, a runway would need to be constructed utilizing a north-south orientation. Due to constraints caused by proximity of U.S. Route 34 south of the airport and existing commercial properties to the north, the cost associated with the construction would be significant. Furthermore, the low funding priority of crosswind runway development would make the construction of a crosswind runway unfeasible. Therefore, the construction of the crosswind runway has been eliminated from further evaluation.

4.3 ACCOMMODATION OF AVIATION DEMAND LEVELS

Each development project recommended would meet FAA safety and design standards for the existing and future ARC of B-I (small). This will allow the airport to accommodate the existing and projected types of aircraft.

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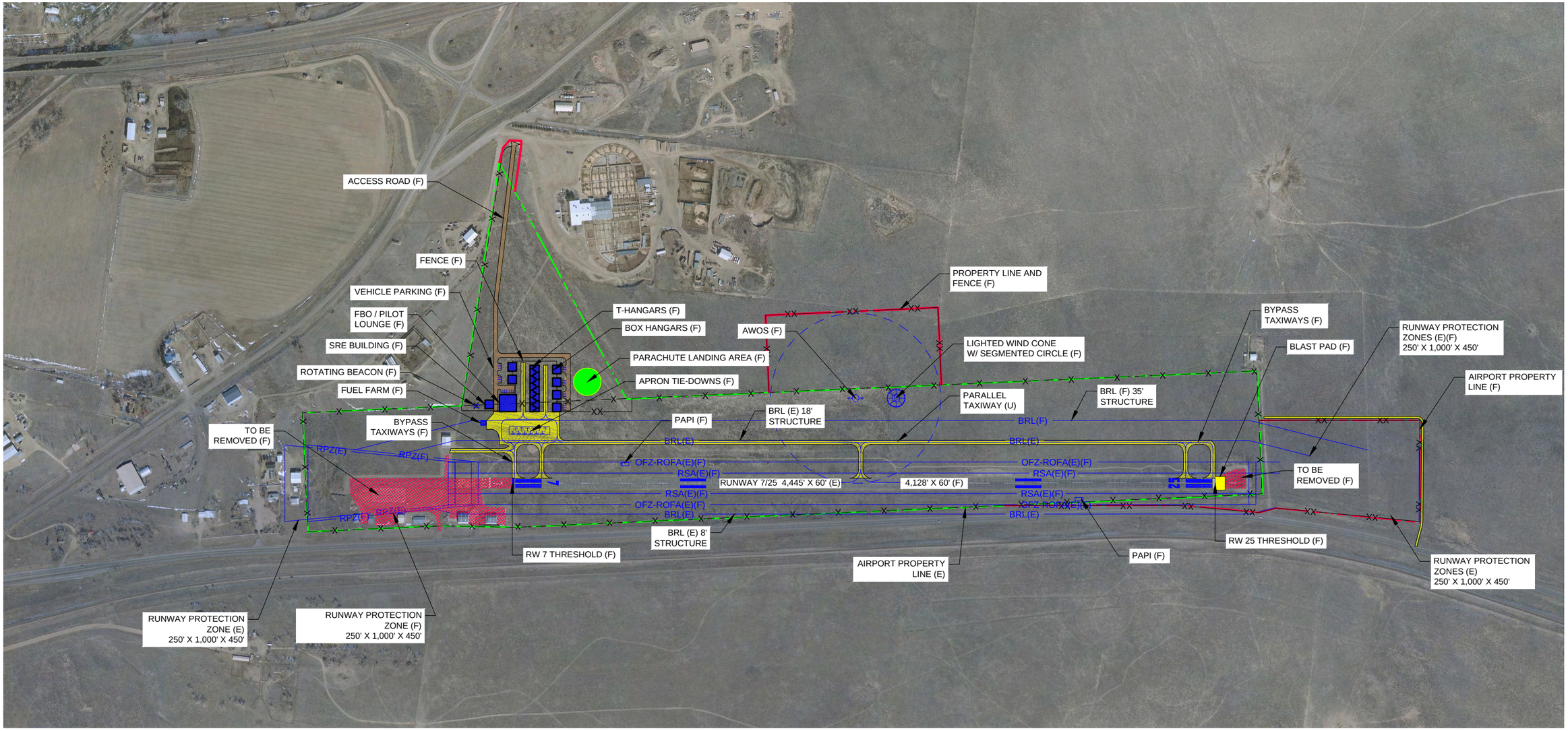

NOTE: PUBLISHED LENGTH IS 4,300' SURVEYED LENGTH IS 4,445'

LEGEND

- FUTURE ASPHALT DEVELOPMENT
- FUTURE AIRPORT ACCESS DEVELOPMENT
- FUTURE HANGARS/STRUCTURES
- FUTURE AIRFIELD MARKINGS
- FUTURE LIGHTED WIND CONE W/ SEGMENTED CIRCLE
- FUTURE AWOS
- FUTURE ROTATING BEACON
- RPZ — RUNWAY PROTECTION ZONE
- RSA — RUNWAY SAFETY AREA
- OFZ / ROFA — OBSTACLE FREE ZONE / RUNWAY OBJECT FREE AREA
- BRL — BUILDING RESTRICTION LINE
- (E) / (F) — (E) = EXISTING / (F) = FUTURE
- AIRPORT PROPERTY LINE EXISTING
- AIRPORT PROPERTY LINE / EASEMENT FUTURE
- TO BE REMOVED

N

0 300 600
SCALE IN FEET

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BRUSH MUNICIPAL AIRPORT
BRUSH, COLORADO

DEVELOPMENT ALTERNATIVES

SCALE:	PER BAR SCALE	DATE:	SEPT., 2013
DRAWN:	JOS/GWK	FILE:	6122257
CHK'D:	JMR	JOB NO.:	136122

FENCE (F)
ACCESS ROAD (F)
VEHICLE PARKING (F)
T-HANGARS (F)
BOX HANGARS (F)
PARACHUTE LANDING AREA (F)
79'
79'
FBO / PILOT LOUNGE (F)
SRE BUILDING (F)
ROTATING BEACON (F)
GATE (F)
44.5'
44.5'
FENCE (F)
AIRPORT PROPERTY LINE (E)
FUEL FARM (F)
BRL(F)
BRL(F)
BRL(F)
BRL(F)
BRL(F)
APRON TIE-DOWNS (F)
RUNWAY PROTECTION ZONE (E) 250' X 1,000' X 450'
44.5'
44.5'
44.5'
PARALLEL TAXIWAY (U)
BRL(E)
BRL(E)
BRL(E)
BRL(E)
25'
RUNWAY PROTECTION ZONE (F) 250' X 1,000' X 450'
370' BRL (F) 35' STRUCTURE
BYPASS TAXIWAYS (F)
OFZ-ROFA(E)
OFZ-ROFA(E)
OFZ-ROFA(E)
OFZ-ROFA(E)
240'
PAPI (F)
RW 7 THRESHOLD (F)
RSA(E)
RSA(E)
RSA(E)
RSA(E)
RSA(E)
RSA(E)
RUNWAY 7/25 4,445' X 60' (E)

LEGEND

- FUTURE ASPHALT DEVELOPMENT
- FUTURE AIRPORT ACCESS DEVELOPMENT
- FUTURE HANGARS/STRUCTURES
- FUTURE AIRFIELD MARKINGS
- FUTURE LIGHTED WIND CONE W/ SEGMENTED CIRCLE
- FUTURE AWOS
- FUTURE ROTATING BEACON
- RPZ — RUNWAY PROTECTION ZONE
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- OFZ / ROFA — OBSTACLE FREE ZONE / RUNWAY OBJECT FREE AREA
- BRL — BUILDING RESTRICTION LINE
- (E) / (F) — (E) = EXISTING / (F) = FUTURE
- AIRPORT PROPERTY LINE EXISTING
- AIRPORT PROPERTY LINE FUTURE
- RUNWAY PROTECTION ZONE

N

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0 50 100
SCALE IN FEET

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BRUSH MUNICIPAL AIRPORT
BRUSH, COLORADO

DEVELOPMENT ALTERNATIVES

SCALE:	PER BAR SCALE	DATE:	AUGUST, 2013
DRAWN:	JOS	FILE:	6122257
CHK'D:	JMR	JOB NO.:	136122

RUNWAY 7 END LAYOUT EXISTING

0 100 200
SCALE IN FEET

RUNWAY 25 END LAYOUT EXISTING

0 100 200
SCALE IN FEET

LEGEND

	FUTURE ASPHALT DEVELOPMENT	RPZ	RUNWAY PROTECTION ZONE
	FUTURE AIRPORT ACCESS DEVELOPMENT	RSA	RUNWAY SAFETY AREA
	FUTURE HANGARS/STRUCTURES	OFZ / ROFA	OBSTACLE FREE ZONE / RUNWAY OBJECT FREE AREA
	FUTURE AIRFIELD MARKINGS	BRL	BUILDING RESTRICTION LINE
	FUTURE LIGHTED WIND CONE W/ SEGMENTED CIRCLE	(E) / (F)	(E) = EXISTING / (F) = FUTURE
	FUTURE AWOS		AIRPORT PROPERTY LINE EXISTING
	FUTURE ROTATING BEACON		TO BE REMOVED

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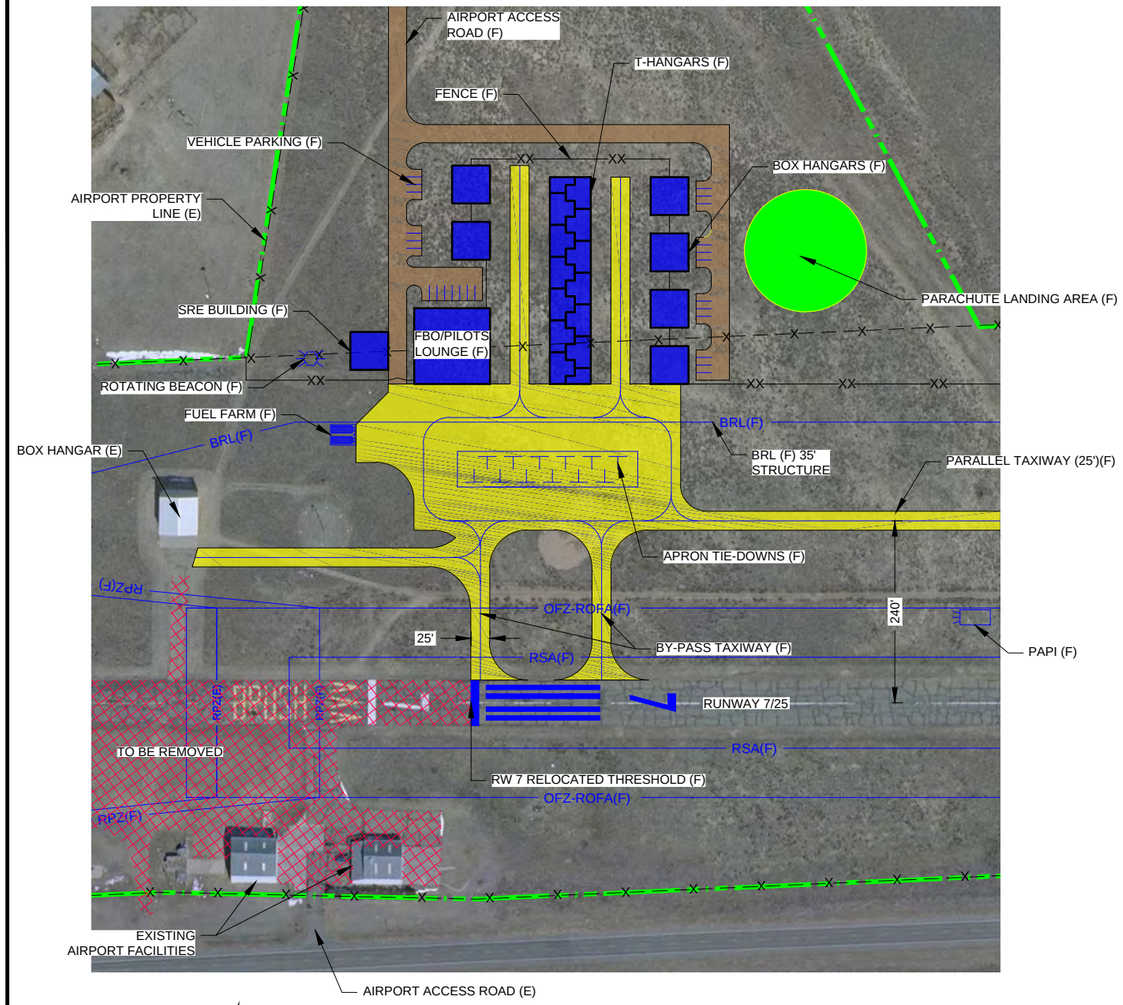
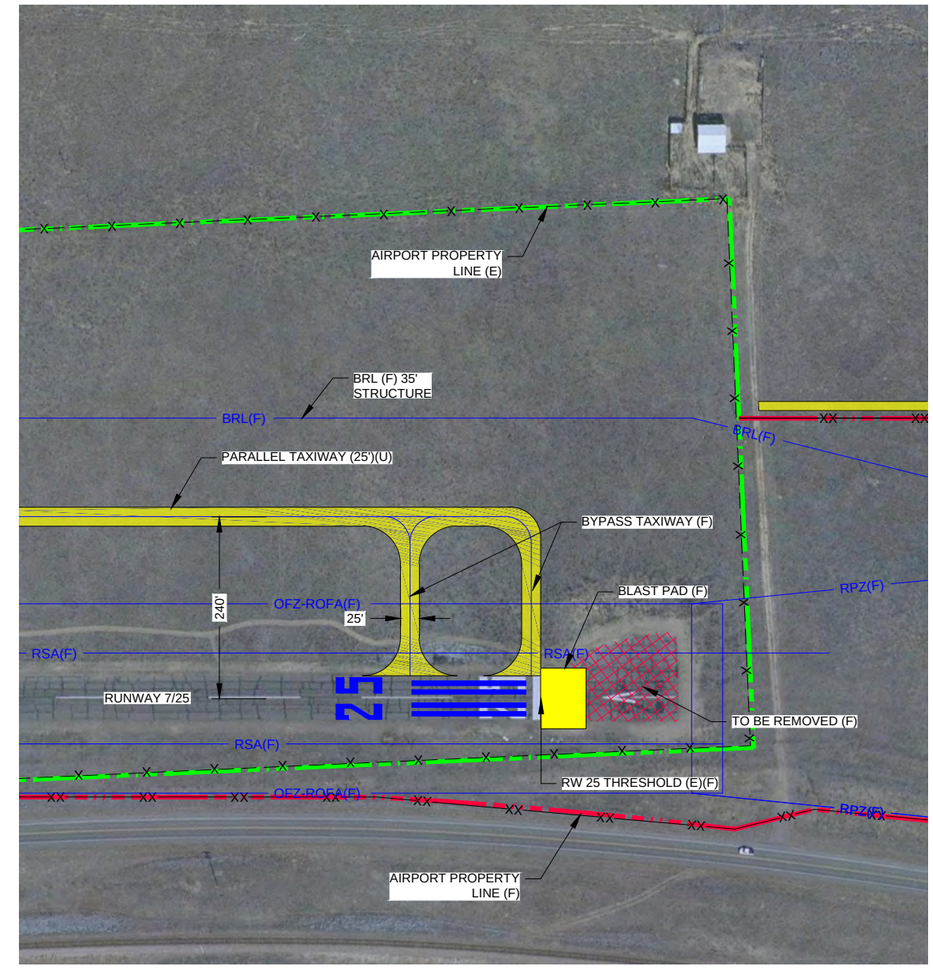
BRUSH MUNICIPAL AIRPORT
BRUSH, COLORADO

RUNWAY 7/25 END LAYOUT (EXISTING)

SCALE:	PER BAR SCALE	DATE:	AUGUST, 2013
DRAWN:	JOS/GWK	FILE:	6122257
CHK'D:	JMR	JOB NO.:	136122





RUNWAY 7 END LAYOUT FUTURE

0 100 200
SCALE IN FEET

RUNWAY 25 END LAYOUT FUTURE

0 100 200
SCALE IN FEET

LEGEND

FUTURE ASPHALT DEVELOPMENT	RPZ — RUNWAY PROTECTION ZONE	RUNWAY PROTECTION ZONE
FUTURE AIRPORT ACCESS DEVELOPMENT	RSA — RUNWAY SAFETY AREA	
FUTURE HANGARS/STRUCTURES	OFZ / ROFA — OBSTACLE FREE ZONE / RUNWAY OBJECT FREE AREA	
FUTURE AIRFIELD MARKINGS	BRL — BUILDING RESTRICTION LINE	
FUTURE LIGHTED WIND CONE W/ SEGMENTED CIRCLE	(E) / (F) — (E) = EXISTING / (F) = FUTURE	
FUTURE AWOS	AIRPORT PROPERTY LINE EXISTING	
FUTURE ROTATING BEACON	AIRPORT PROPERTY LINE FUTURE	

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BRUSH MUNICIPAL AIRPORT
BRUSH, COLORADO

RUNWAY 7/25 END LAYOUT (FUTURE)

SCALE:	PER BAR SCALE	DATE:	AUGUST, 2013
DRAWN:	JOS/GWK	FILE:	6122257
CHK'D:	JMR	JOB NO.:	136122

Chapter Five
Airport Layout Plans

Brush Municipal Airport
Airport Layout Plan

ARMSTRONG

BRUSH MUNICIPAL AIRPORT

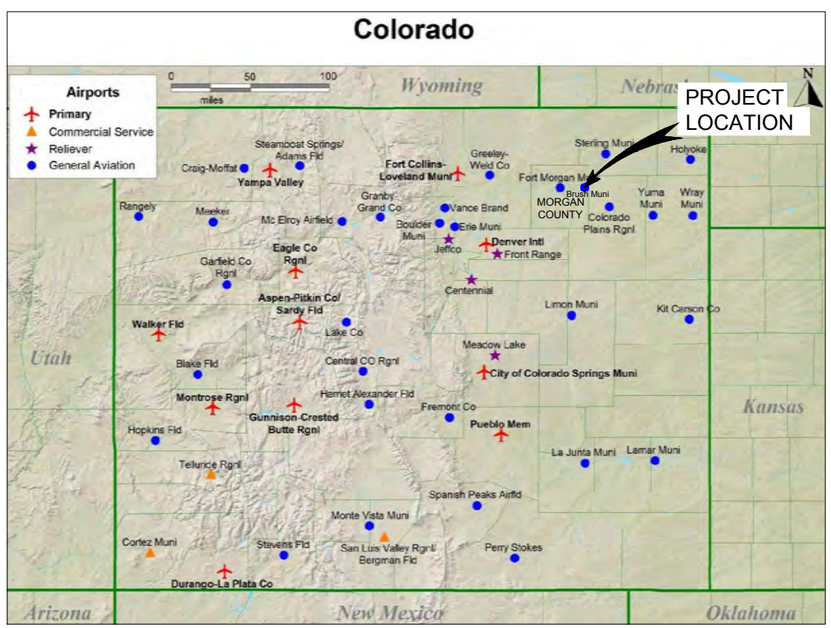
BRUSH, COLORADO

AIRPORT LAYOUT PLANS

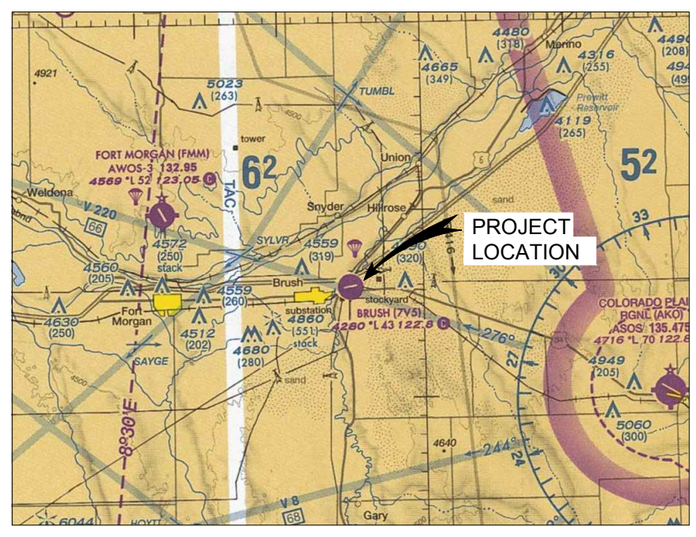
PREPARED BY:

ARMSTRONG CONSULTANTS, INC.

CDAG No. 12-7V5-01
A.C.I. PROJECT NO. 126122
DATE: OCTOBER 23, 2014



LOCATION MAP



VICINITY MAP

INDEX TO SHEETS

DRAWING	SHEET	REVISION DATE
COVER SHEET	1	10/2014
AIRPORT LAYOUT PLAN	2	
AIRPORT DATA SHEET	3	
TERMINAL AREA DRAWING	4	
FAR PART "77" AIRSPACE DRAWING	5	
EXHIBIT "A" PROPERTY MAP	6	
AERIAL PHOTOGRAPH	7	

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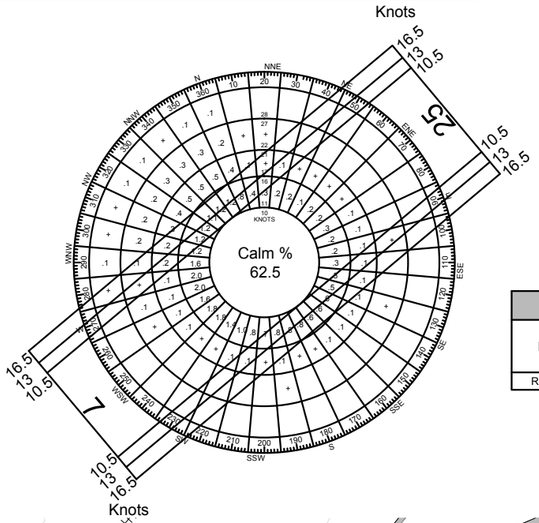


SPONSOR APPROVAL

City of Brush DATE

ALL WEATHER WIND ROSE DATA			
RUNWAY	10.5 KNOTS (12 MPH)	13 KNOTS (15 MPH)	16 KNOTS (18 MPH)
RUNWAY 7/25	84.9%	92.1%	97.8%

NOTE: SOURCE: NATIONAL CLIMATIC DATA CENTER.
STATION: AKRON, COLORADO
PERIOD OF RECORD: 1993 - 2002, 24 OBS/DAY

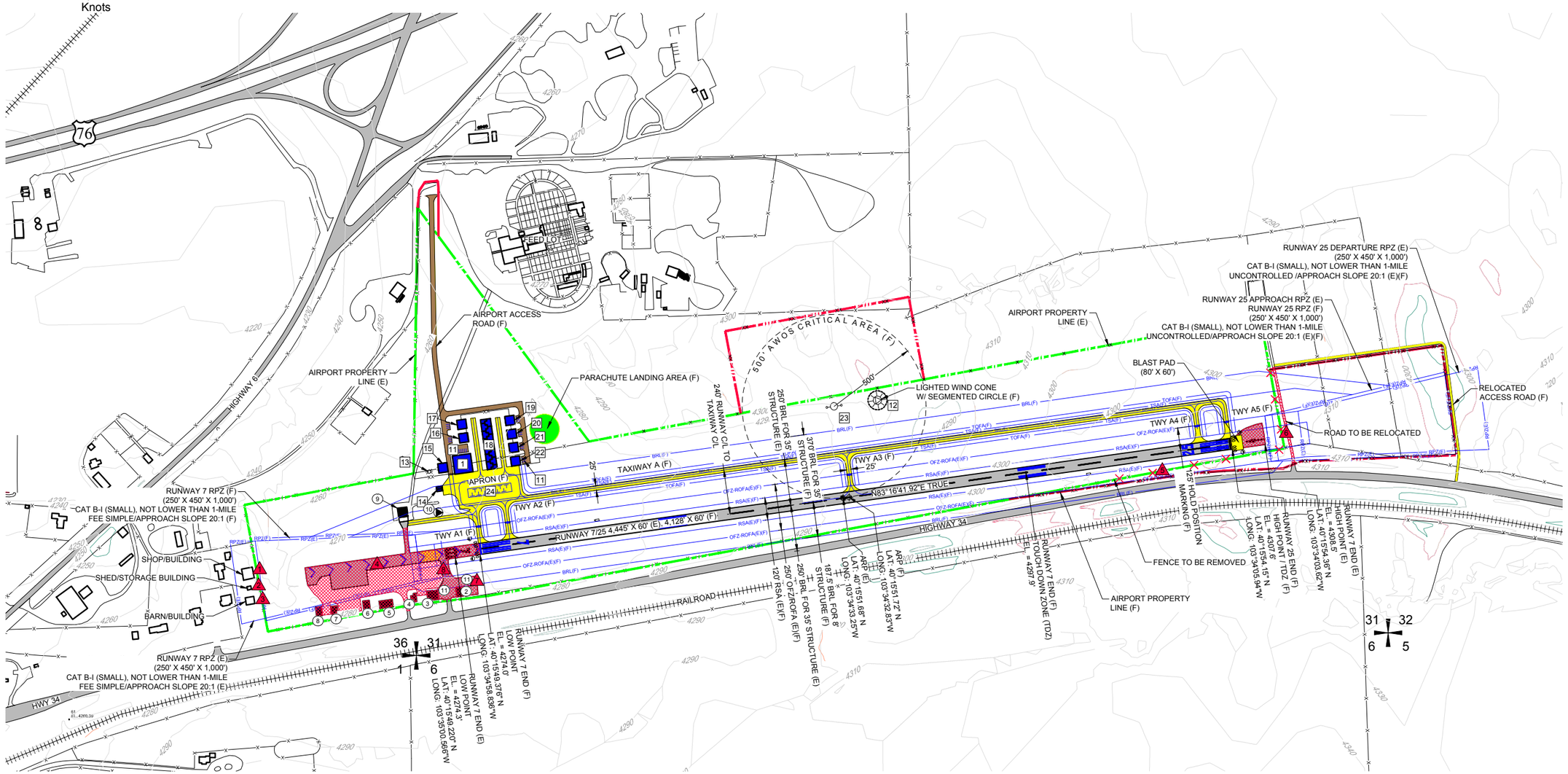
7°50'22"E

MAGNETIC NORTH SOURCE: NOAA
GEOPHYSICAL DATA CENTER 03.04.14
RATE OF CHANGE 0° 7.9' W/YEAR

300 0 300 600
SCALE IN FEET

LEGEND					
EXISTING	FUTURE	DESCRIPTION	EXISTING	FUTURE	DESCRIPTION
		AIRFIELD DEVELOPMENT (ASPHALT)			THRESHOLD LIGHTS
		STRUCTURE/FACILITIES (BUILDING)			REIL
		AIRPORT PROPERTY LINE (APL)			VASI/PAPI
RSA(E)	RSA(F)	RUNWAY SAFETY AREA (RSA)			AIRPORT BEACON
OFZ(E)	OFZ(F)	OBSTACLE FREE ZONE (OFZ)			WIND CONE & SEGMENTED CIRCLE
ROFA(E)	ROFA(F)	RUNWAY OBJECT FREE AREA (ROFA)			AWOS
RPZ(E)	RPZ(F)	RUNWAY PROTECTION ZONE (RPZ)			LIGHTED WINDCONE
BRL(E)	BRL(F)	BUILDING RESTRICTION LINE (BRL)		N/A	SECTION CORNER
TSA(E)	TSA(F)	TAXIWAY SAFETY AREA (TSA)			DRAINAGE/CULVERT
TOFA(E)	TOFA(F)	TAXIWAY OBJECT FREE AREA (TOFA)	4125	N/A	CONTOURS
		AIRPORT REFERENCE POINT (ARP)			ROADS
		PACS/SACS MONUMENT			MARKINGS
		TO BE REMOVED			FENCING
		SECTIONS			HELIPAD

NOTE:
FUTURE BUILDING RESTRICTION LINE (BRL) DEPICTS REQUIRED SETBACKS FOR A TYPICAL 35' STRUCTURE. HEIGHTS OF EXISTING AND FUTURE BUILDINGS WITHIN THE BRL REMAIN CLEAR OF THE OFA'S AND AREA BELOW THE 7:1 TRANSITIONAL SURFACE (OR ARE OBSTRUCTION MARKED AND LIGHTED ACCORDINGLY).



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BRUSH MUNICIPAL AIRPORT
BRUSH, COLORADO

AIRPORT LAYOUT PLANS

No.	Project No.	Date	Revision / Description	File	Drwn.	Chkd.	Apprvd.
1	126122	10/2014	ORIGINAL ISSUE	6122552	GWK	JMR	JZP

AIRPORT LAYOUT PLAN

Sheet: 2 of: 7

RUNWAY DATA

ITEM		RW 7/25 EXISTING (E)	RW 7/25 FUTURE (F)
AIRPORT REFERENCE CODE		B-I (SMALL)	SAME
APPROACH MINIMUMS	RW 7	VISUAL	VISUAL
	RW 25	VISUAL	VISUAL
APPROACH TYPE	RW 7	VISUAL, UTILITY	CIRCLING, UTILITY
	RW 25	VISUAL, UTILITY	CIRCLING, UTILITY
FAR PART 77 APPROACH SLOPE	RW 7	20:1	SAME
	RW 25	20:1	SAME
RUNWAY LENGTH		4,444'	4,128'
RUNWAY WIDTH		60'	SAME
RUNWAY & TAXIWAY PAVEMENT		ASPHALT	SAME
PAVEMENT STRENGTH (LBS)		6,000 SWG	12,500 SWG
RUNWAY LIGHTING		LIRL	MIRL
RUNWAY MARKING	RW 7	VISUAL	NPI
	RW 25	VISUAL	NPI
% EFFECTIVE GRADIENT		0.77%	SAME
% MAXIMUM GRADE		1.14%	SAME
LINE OF SIGHT REQUIREMENTS MET		YES	SAME
VISUAL APPROACH AIDS	RW 7	NONE	PAPI'S/REIL'S
	RW 25	NONE	PAPI'S/REIL'S
INSTRUMENT APPROACH AIDS		NONE	GPS
DESIGN AIRCRAFT	CRITICAL AIRCRAFT	KING AIR 90	SAME
	APPROACH SPEED (KNOTS)	100	SAME
	WINGSPAN (FEET)	45.9	SAME
	MAX. CERTIFIED TAKEOFF WT. (LBS)	10,950	SAME
	MAIN GEAR WIDTH(MGW)	13'	SAME
RUNWAY SAFETY AREA (RSA)	WIDTH	120'	SAME
	LENGTH BEYOND RW END	240'	SAME
RUNWAY OBJECT FREE AREA (ROFA)	WIDTH	250'	SAME
	LENGTH BEYOND RW END	240'	SAME
OBSTACLE FREE ZONE (OFZ)	WIDTH	250'	SAME
	LENGTH BEYOND RW END	200'	SAME
RUNWAY ELEVATIONS (NAVD 88)			
RUNWAY END	RW 7	4274.3'	4274.0'
	RW 25	4307.6'	SAME
TOUCHDOWN ZONE (TDZ)	RW 7	N/A	4297.9'
	RW 25	N/A	4307.6'
HIGH POINT		4308.4'	4307.6'
LOW POINT		4274.3'	4274.0'
RW INTERSECTION		N/A	N/A
RUNWAY PROTECTION ZONE DIMENSIONS	RW 7	250' X 450' X 1,000'	SAME
	RW 25	250' X 450' X 1,000'	SAME
APPROACH SURFACE DIMENSIONS	RW 7	250' x 1,250' x 5,000'	500' x 2,000' x 5,000'
	RW 25	250' x 1,250' x 5,000'	500' X 2,000' X 5,000'
RUNWAY C/L TO HOLD BARS AND SIGNS		125'	SAME
RUNWAY / PARALLEL TAXIWAY C/L SEPARATION		150'	SAME
TAXIWAY OBJECT FREE AREA WIDTH		89'	SAME
TAXIWAY SAFETY AREA WIDTH		49'	SAME
TAXIWAY WING TIP CLEARANCE		10'	SAME
TAXIWAY C/L TO FIXED OR MOVABLE OBJECT		44.5'	SAME
TAXIWAY WIDTH		25' (40' ACTUAL)	25'

AIRPORT DATA

ITEM		EXISTING (E)	FUTURE (F)
AIRPORT ELEVATION (NAVD 88)		4308.5'	4307.6'
AIRPORT REFERENCE POINT (ARP) COORDINATES (NAD 83)	LATITUDE	40° 15' 51.68"	40° 15' 51.72"
	LONGITUDE	103° 34' 33.25"	103° 34' 32.83"
MEAN MAX. TEMP: HOTTEST MONTH (JULY)		89° F	
		RUNWAY 7/25	RUNWAY 7/25
RUNWAY WIND COVERAGE	12 MPH / 10.5 kts	84.90%	SAME
	15 MPH / 13kts	92.10%	SAME
	18 MPH / 16kts	97.80%	SAME
AIRPORT REFERENCE CODE		B-I (SMALL)	B-I (SMALL)
MAGNETIC VARIATION		07° 50' 22" E (2014) CHANGING BY 0° 7.9' W PER YEAR	
TAXIWAY LIGHTING		NONE	RETRO-REFLECTORS
AIRPORT IDENTIFIER		7V5	
AIRPORT & TERMINAL NAVAIDS		NONE	BEACON

RUNWAY END COORDINATES (NAD 83)

	EXISTING		FUTURE	
	LATITUDE	LONGITUDE	LATITUDE	LONGITUDE
RUNWAY 7	40°15'49.22"	103°35'00.57"	40°15'49.38"	103°34'58.84"
RUNWAY 25	40°15'54.36"	103°34'03.62"	40°15'54.15"	103°34'05.94"

RUNWAY END COORDINATES PROVIDED BY OLYMPUS AERIAL SURVEY INC. ON MARCH 15, 2013

NOTES

1. NO THRESHOLD SITING SURFACE OBJECT PENETRATIONS.
2. SEE TERMINAL AREA DRAWING FOR HANGAR/TERMINAL/FBO DETAILS.
3. AERIAL SURVEY PERFORMED BY OLYMPUS AERIAL SURVEY INC. MARCH 15, 2013.

AIRPORT FACILITIES LIST

EXISTING	FUTURE	FACILITY DESCRIPTION	TOP ELEVATION ESTIMATED (MSL)
-	1	PILOT LOUNGE / FBO	TBD
2	-	BOX HANGAR / OFFICE	4295'
3	-	BOX HANGAR	4300'
4	-	T-HANGAR	4293'
5	-	BOX HANGAR	4290'
6	-	BOX HANGAR	4292'
7	-	BOX HANGAR	4290'
8	-	BOX HANGAR	4289'
9	-	BOX HANGAR	4286'
10		WIND CONE	4284'
11	11	VEHICLE PARKING	--
-	12	LIGHTED WIND CONE W/ SEGMENTED CIRCLE	4293'
-	13	ROTATING BEACON	4316'
-	14	FUEL STORAGE	--
-	15	SRE BUILDING	TBD
-	16	BOX HANGAR	TBD
-	17	BOX HANGAR	TBD
-	18	T-HANGARS	TBD
-	19	BOX HANGAR	TBD
-	20	BOX HANGAR	TBD
-	21	BOX HANGAR	TBD
-	22	BOX HANGAR	TBD
-	23	AWOS	TBD
-	24	AIRCRAFT TIE DOWNS	-

NOTE: ALL BUILDING HEIGHT'S WERE OBTAINED FROM OLYMPUS AERIAL SURVEY INC. PERFORMED MARCH 15, 2013

NON-STANDARD CONDITIONS

NO.	ITEM	RUNWAY DESIGN CODE	STANDARD	NON-STD CONDITION	PROPOSED ACTION
1	RESIDENCE/BUILDING	B-I (SMALL)	COMPATIBLE LAND USE WITHIN RPZ	BUILDING LOCATED WITHIN RPZ	SHIFT RUNWAY
2	RESIDENCE/BUILDING	B-I (SMALL)	COMPATIBLE LAND USE WITHIN RPZ	BUILDING LOCATED WITHIN RPZ	SHIFT RUNWAY
3	RESIDENCE/BUILDING	B-I (SMALL)	COMPATIBLE LAND USE WITHIN RPZ	BUILDING LOCATED WITHIN RPZ	SHIFT RUNWAY
4	ALIGNED TAXIWAY	B-I (SMALL)	USE OF ALIGNED TAXIWAYS PROHIBITED	ALIGNED TAXIWAY SERVICING RUNWAY 7	RELOCATE/REMOVE
5	ROFA & ROFZ LENGTH & WIDTH	B-I (SMALL)	ROFA & ROFZ (LENGTH & WIDTH) MUST BE CLEAR OF OBJECTS	FENCE PENETRATES ROFA/ROFZ	RELOCATE/REMOVE
6	RSA & ROFA LENGTH	B-I (SMALL)	RSA & ROFA MUST BE CLEAR OF OBJECTS	FENCE & ROAD PENETRATES THE RSA & ROFA (93') FROM RUNWAY 25 APPROACH	RELOCATE ROAD & FENCE
7	RUNWAY CENTERLINE TO AIRCRAFT PARKING APRON	B-I (SMALL)	125' SEPARATION	50' SEPARATION OFF EXTENDED RUNWAY CENTERLINE	RELOCATE AIRCRAFT PARKING APRON
8	RUNWAY CENTERLINE TO HOLD POSITION MARKINGS	B-I (SMALL)	125' MARKED	HOLD POSITION MARKING MISSING	RE-MARK PAVEMENTS

DECLARED DISTANCES

ITEM	EXISTING	
	RW 7	RW 25
TAKEOFF RUN AVAILABLE (TORA) (FT)	4,445'	4,445'
TAKEOFF DISTANCE AVAILABLE (TODA) (FT)	4,445'	4,445'
ACCELERATE-STOP DISTANCE AVAILABLE (ASDA) (FT)	4,445'	4,445'
LANDING DISTANCE AVAILABLE (LDA) (FT)	4,445'	4,263'

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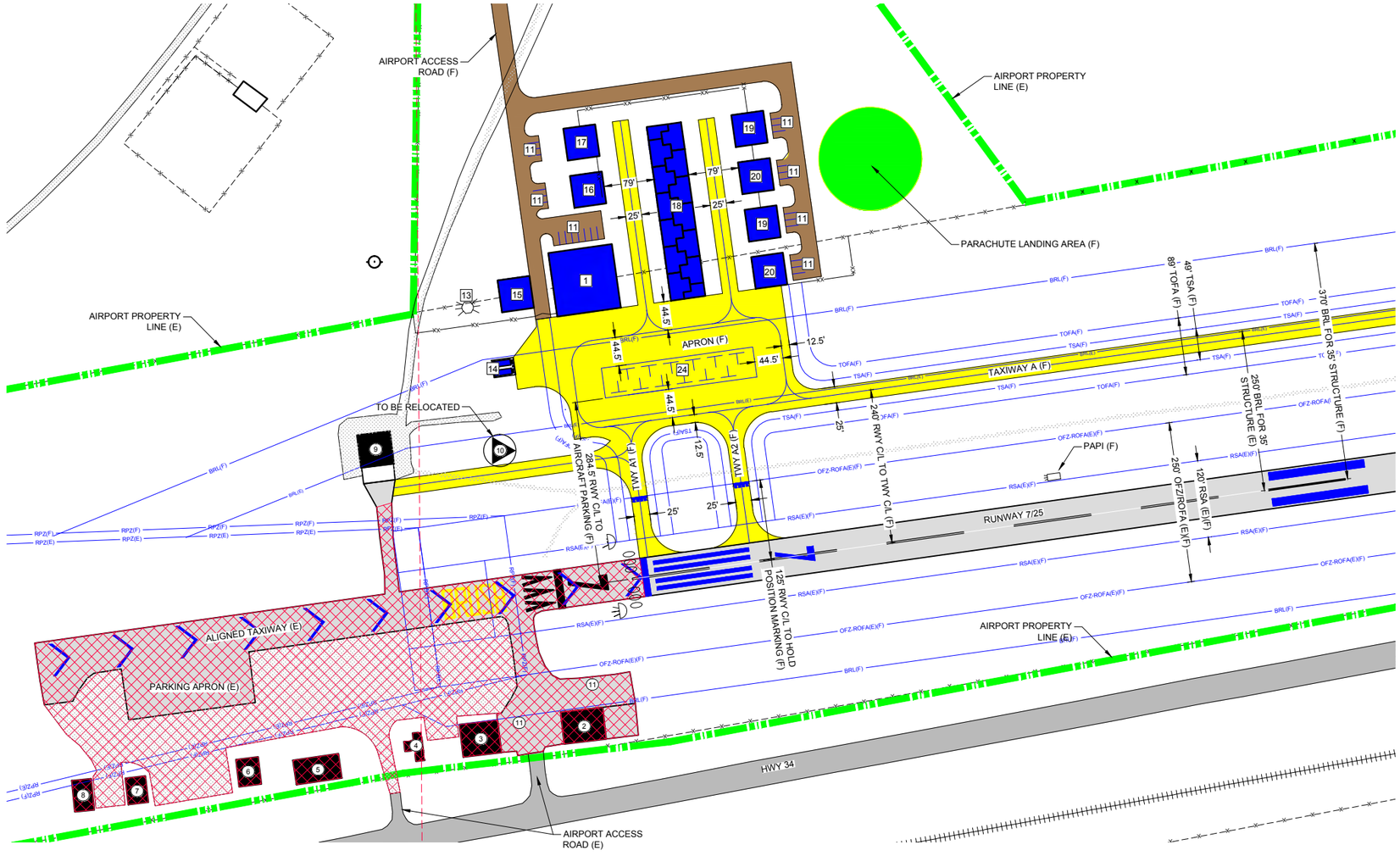
BRUSH MUNICIPAL AIRPORT
BRUSH, COLORADO

AIRPORT LAYOUT PLANS

No.	Project No.	Date	Revision / Description	File	Drwn.	Chkd.	Apprvd.
1	126122	10/2014	ORIGINAL ISSUE	6122502	GWK	JMR	JZP

AIRPORT DATA SHEET



LEGEND

EXISTING	FUTURE	DESCRIPTION	EXISTING	FUTURE	DESCRIPTION
		AIRFIELD DEVELOPMENT (ASPHALT)		0000 0000	THRESHOLD LIGHTS
		STRUCTURE/FACILITIES (BUILDING)			REIL
		AIRPORT PROPERTY LINE (APL)			VASI/PAPI
RSA(E)	RSA(F)	RUNWAY SAFETY AREA (RSA)			AIRPORT BEACON
OFZ(E)	OFZ(F)	OBSTACLE FREE ZONE (OFZ)			WIND CONE & SEGMENTED CIRCLE
ROFA(E)	ROFA(F)	RUNWAY OBJECT FREE AREA (ROFA)			AWOS
RPZ(E)	RPZ(F)	RUNWAY PROTECTION ZONE (RPZ)			LIGHTED WINDCONE
BRL(E)	BRL(F)	BUILDING RESTRICTION LINE (BRL)		N/A	SECTION CORNER
TSA(E)	TSA(F)	TAXIWAY SAFETY AREA (TSA)			DRAINAGE/CULVERT
TOFA(E)	TOFA(F)	TAXIWAY OBJECT FREE AREA (TOFA)	4125	N/A	CONTOURS
		AIRPORT REFERENCE POINT (ARP)			ROADS
		PACS/SACS MONUMENT			MARKINGS
		TO BE REMOVED	X	XX	FENCING
		SECTIONS			HELIPAD

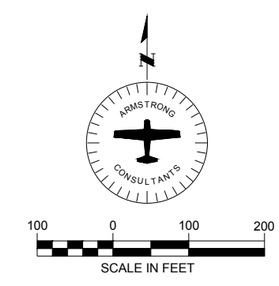
NOTE:

FUTURE BUILDING RESTRICTION LINE (BRL) DEPICTS REQUIRED SETBACKS FOR A TYPICAL 35' STRUCTURE. HEIGHTS OF EXISTING AND FUTURE BUILDINGS WITHIN THE BRL REMAIN CLEAR OF THE OFA'S AND AREA BELOW THE 7:1 TRANSITIONAL SURFACE (OR ARE OBSTRUCTION MARKED AND LIGHTED ACCORDINGLY).

AIRPORT FACILITIES LIST

EXISTING	FUTURE	FACILITY DESCRIPTION	TOP ELEVATION ESTIMATED (MSL)
-	1	PILOT LOUNGE / FBO	TBD
2	-	BOX HANGAR / OFFICE	4295'
3	-	BOX HANGAR	4300'
4	-	T-HANGAR	4293'
5	-	BOX HANGAR	4290'
6	-	BOX HANGAR	4292'
7	-	BOX HANGAR	4290'
8	-	BOX HANGAR	4289'
9	-	BOX HANGAR	4286'
10		WIND CONE	4284'
11	11	VEHICLE PARKING	--
-	12	LIGHTED WIND CONE W/ SEGMENTED CIRCLE	4293'
-	13	ROTATING BEACON	4316'
-	14	FUEL STORAGE	--
-	15	SRE BUILDING	TBD
-	16	BOX HANGAR	TBD
-	17	BOX HANGAR	TBD
-	18	T-HANGARS	TBD
-	19	BOX HANGAR	TBD
-	20	BOX HANGAR	TBD
-	21	BOX HANGAR	TBD
-	22	BOX HANGAR	TBD
-	23	AWOS	TBD
-	24	AIRCRAFT TIE DOWNS	-

NOTE: ALL BUILDING HEIGHT'S WERE OBTAINED FROM OLYMPUS AERIAL SURVEY INC. PERFORMED MARCH 15, 2013



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NEW MEXICO: 505.508.2192
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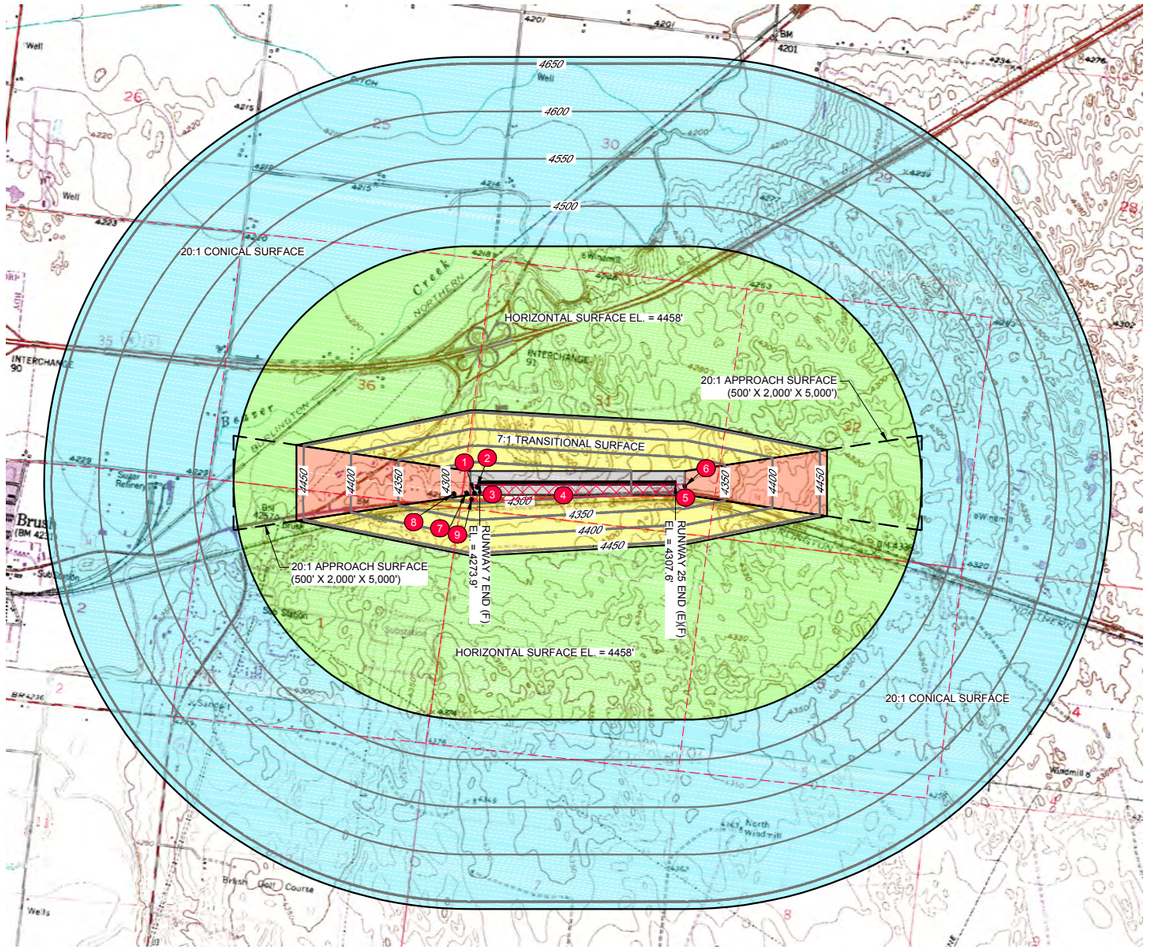
BRUSH MUNICIPAL AIRPORT
BRUSH, COLORADO

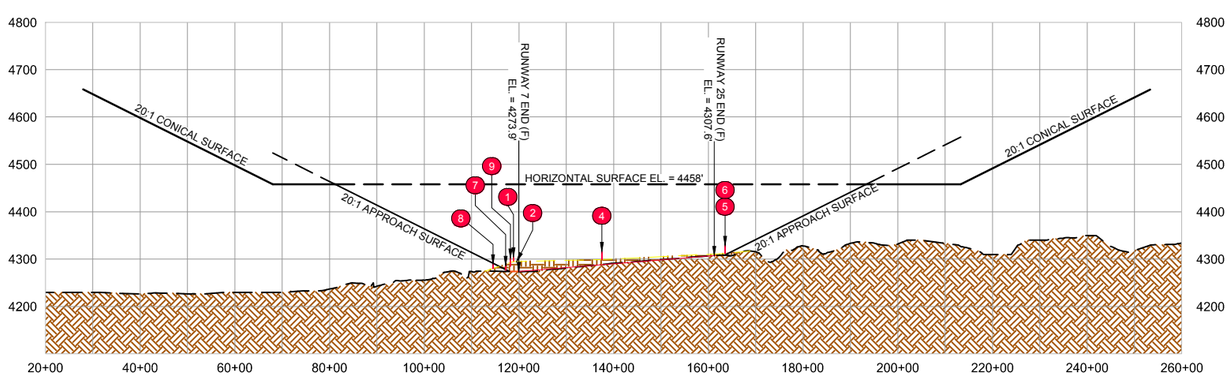
AIRPORT LAYOUT PLANS

No.	Project No.	Date	Revision / Description	File	Drwn.	Chkd.	Apprvd.
1	126122	10/2014	ORIGINAL ISSUE	6122503	GWK	JMR	JZP

TERMINAL AREA DRAWING



FAR PART 77 PLAN



RUNWAY 7/25 (F)

OBSTRUCTION CHART

SURFACE	DESCRIPTION	TOP ELEVATION	PENETRATION	REMARKS
PRIMARY	BUILDING	1 4,295'	21'	(4)
	TERRAIN	2 4,276'	2'	GRADE
	TERRAIN	3 4,280'	6'	GRADE
	ROAD	4 4,316'	27'	(4)
	ROAD	5 4,329'	20'	(4)
	TERRAIN	6 4,310'	1.5'	GRADE
APPROACH	BUILDING	7 4,277'	22'	(4)
	BUILDING	8 4,289'	-1'	(4)
TRANSITIONAL	ROAD	4 4,316'	27'	(4)
	ROAD	9 4,302'	14'	(4)
HORIZONTAL	NONE	----	----	----
CONICAL	NONE	----	----	----

NOTES

1) NO CURRENT HEIGHT RESTRICTION ZONING IN EFFECT.

2) PART 77 SURFACES BASED ON ULTIMATE CONDITION.

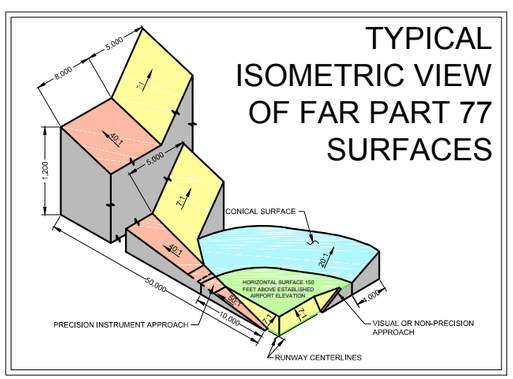
3) THE FAR PART 77 AIRSPACE DRAWING WAS BASED ON ESTIMATED TERRAIN ELEVATIONS AND ESTIMATED DEVELOPMENT HEIGHTS ALONG WITH THE USE OF AIRSPACE EVALUATION CASES THAT HAVE BEEN SUBMITTED THROUGH THE FAA OBSTRUCTION EVALUATION/AIRPORT AIRSPACE ANALYSIS (OE/AAA) PROCESS. NO SURVEYS OF THE FAR PART 77 SURFACES HAVE BEEN CONDUCTED.

4) LOWER/LIGHT/REMOVE PER FAA FLIGHT PROCEDURES OFFICE DETERMINATION.

TRANSITIONAL SURFACE
HORIZONTAL SURFACE
APPROACH SURFACE
CONICAL SURFACE
PRIMARY SURFACE
PENETRATION

N
ARMSTRONG CONSULTANTS

1600 0 1600 3200
SCALE IN FEET



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AIRPORT LAYOUT PLANS

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1	126122	10/2014	ORIGINAL ISSUE	6122502	GWK	JMR	JZP

FAR PART 77 AIRSPACE DRAWING

EXISTING AIRPORT PROPERTY

PARCEL	CURRENT OWNER	GRANTOR	INTEREST	LOCATION	BOOK/PAGE	DATE	ACREAGE	PURPOSE	FEDERAL PARTICIPATION
1	CITY OF BRUSH	T. H. REDIESS	WARRANTY DEED	S1/2, SEC. 21 T4N R55W / SW1/4, SEC. 36 T4N R56W	488/11	03/09/51	±108.6	AIRPORT	NONE

PROPERTY TO BE ACQUIRED

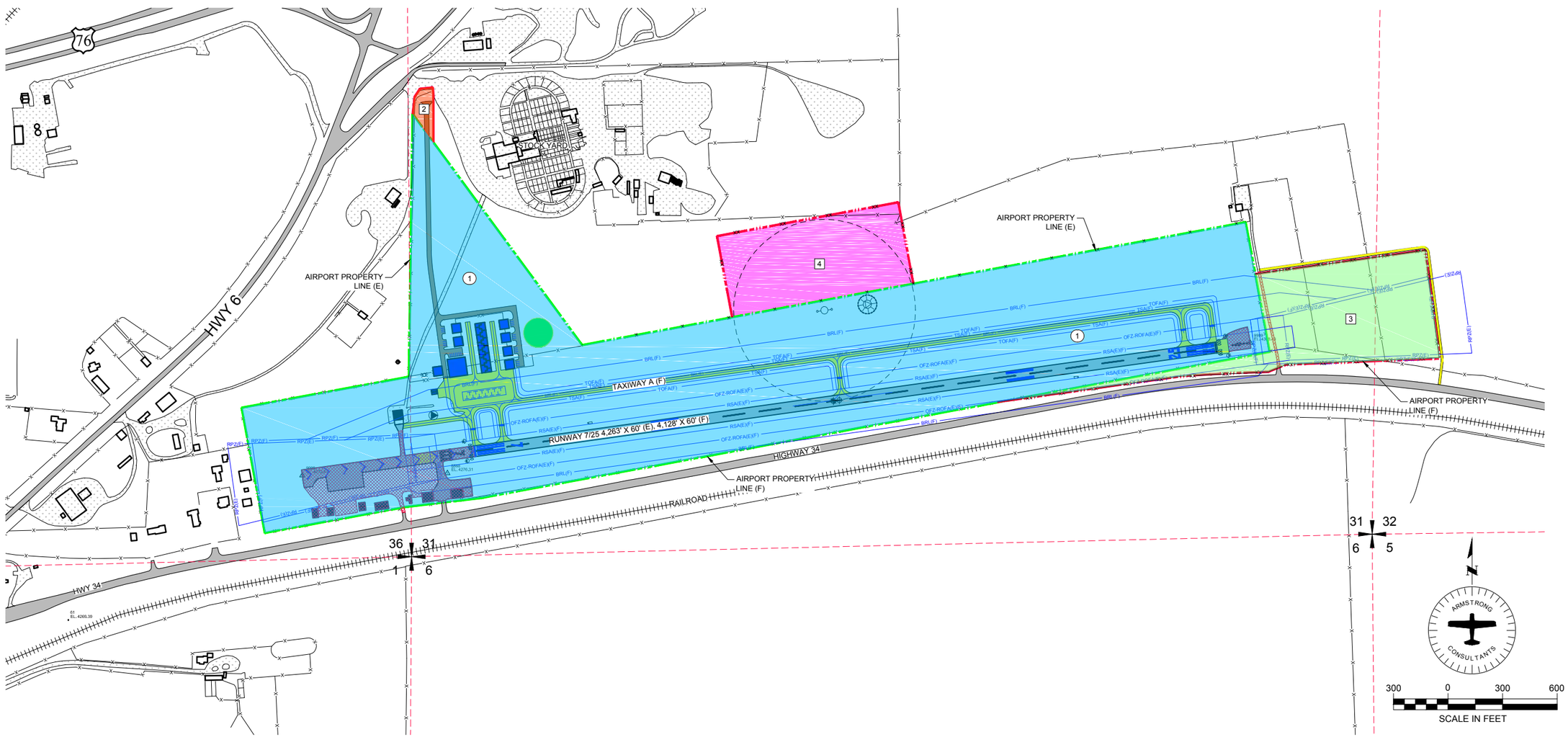
PARCEL	INTEREST	ACREAGE	PURPOSE
2	WARRANTY DEED OR EASEMENT	±.5	AIRPORT ACCESS ROAD
3	WARRANTY DEED	±20.8	RUNWAY PROTECTION ZONE
4	WARRANTY DEED	±10.6	AWOS PROTECTION

LEGEND

EXISTING	FUTURE	DESCRIPTION	EXISTING	FUTURE	DESCRIPTION
		AIRFIELD DEVELOPMENT (ASPHALT)			THRESHOLD LIGHTS
		STRUCTURE/FACILITIES (BUILDING)			REIL
		AIRPORT PROPERTY LINE (APL)			VASI/PAPI
RSA(E)	RSA(F)	RUNWAY SAFETY AREA (RSA)			AIRPORT BEACON
OFZ(E)	OFZ(F)	OBSTACLE FREE ZONE (OFZ)			WIND CONE & SEGMENTED CIRCLE
ROFA(E)	ROFA(F)	RUNWAY OBJECT FREE AREA (ROFA)			AWOS
RPZ(E)	RPZ(F)	RUNWAY PROTECTION ZONE (RPZ)			LIGHTED WINDCONE
BRL(E)	BRL(F)	BUILDING RESTRICTION LINE (BRL)		N/A	SECTION CORNER
TSA(E)	TSA(F)	TAXIWAY SAFETY AREA (TSA)			DRAINAGE/CULVERT
TOFA(E)	TOFA(F)	TAXIWAY OBJECT FREE AREA (TOFA)	4125	N/A	CONTOURS
		AIRPORT REFERENCE POINT (ARP)			ROADS
		PACS/SACS MONUMENT			MARKINGS
		TO BE REMOVED			FENCING
		SECTIONS			HELIPAD

NOTE:

FUTURE BUILDING RESTRICTION LINE (BRL) DEPICTS REQUIRED SETBACKS FOR A TYPICAL 35' STRUCTURE. HEIGHTS OF EXISTING AND FUTURE BUILDINGS WITHIN THE BRL REMAIN CLEAR OF THE OFA'S AND AREA BELOW THE 7:1 TRANSITIONAL SURFACE (OR ARE OBSTRUCTION MARKED AND LIGHTED ACCORDINGLY).



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BRUSH MUNICIPAL AIRPORT
BRUSH, COLORADO

AIRPORT LAYOUT PLANS

No.	Project No.	Date	Revision / Description	File	Drwn.	Ckd.	Apprvd.
1	126122	10/2014	ORIGINAL ISSUE	6122508	GWK	JMR	JZP

EXHIBIT A
PROPERTY
MAP

Sheet: 6 of: 7

AERIAL PHOTOGRAPH DATED MARCH 15, 2013

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BRUSH MUNICIPAL AIRPORT
BRUSH, COLORADO

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AERIAL PHOTOGRAPH

Sheet: 7 of: 7

Chapter Six
Airport Development and Financial Plan

Brush Municipal Airport
Airport Layout Plan

ARMSTRONG

CHAPTER SIX
FINANCIAL PLAN

6.0 INTRODUCTION

A program of recommended airport development has been formulated to guide the City of Brush in the systematic development of the Brush Municipal Airport and to aid the Colorado Department of Transportation (CDOT) Aeronautics Division and the City of Brush in allocating funding over the planning period. The recommended airport development plan is based on the facility requirements identified earlier in this report.

6.1 AIRPORT DEVELOPMENT PLAN

Future airport development at the Brush Municipal Airport, as included in this study, covers a 20-year planning period. Development items are grouped into three phases:

- Phase I is short-term (1-5 years)
- Phase II is medium-term (6-10 years)
- Phase III is long-term (11-20 years)

The phasing of projects (shown on the airport layout plan) assists the airport sponsor in budgetary planning for construction projects. A drawing showing the phasing of each project is included at the end of this Chapter. The sequence in which the projects are completed is important as the ultimate configuration of the airport will require numerous projects. Estimated development costs are included in **Table 6-1** for each of the recommended improvements.

Phase I (1-5 Years) Short-Term Development Items

- A1: Pavement Maintenance
- A2: Reconstruct Runway 7/25
- A3: Runway Lighting Replacement/Install Signage
- A4: Bypass Taxiways
- A5: Land Acquisition - RPZ
- A6: Install PAPIs

Phase II (6-10 Years) Medium-Term Development Items

- B1: Land Acquisition – North Landside Development and Access Road
- B2: North Landside Development – Initial Apron Construction
- B3: Partial Parallel Taxiway (West)
- B4: AWOS-III
- B5: Instrument Approach Procedure Development
- B6: SRE Building Construction
- B7: SRE Acquisition
- B8: Pavement Maintenance
-

Phase III (11-20 Years) Long-Term Development Items

- C1: Partial Parallel Taxiway (East)
- C2: North Landside Development – Apron Expansion
- C3: Terminal Area/Wildlife Fencing and Access Gates
- C4: Fuel Tanks

- C5: ALP Update
- C6: Pavement Maintenance

TABLE 6-1 RECOMMENDED DEVELOPMENT COSTS

DEVELOPMENT		TOTAL	STATE 90%	LOCAL 10%
PHASE I (1-5 YEARS)				
A1	Pavement Maintenance	$150,000	$135,000	$15,000
A2	Reconstruct RW 7/25	$1,250,000	$1,125,000	$125,000
A3	Bypass Taxiways	$267,000	$240,300	$26,700
A4	Runway Lighting Replacement/Install Signage (Includes electrical vault and regulator)	$150,000	$135,000	$15,000
A5	Land Acquisition - RPZ	$223,000	$200,700	$22,300
A6	Install PAPIs	$69,000	$62,100	$6,900
	TOTAL	**$2,109,000**	**$1,898,100**	**$210,900**
PHASE II (6-10 YEARS)				
B1	Land Acquisition - North Landside and Access Road	$159,000	$143,100	$15,900
B2	North Landside Development - Initial Apron Construction	$802,000	$721,800	$80,200
B3	Partial Parallel Taxiway (West)	$545,000	$490,500	$54,500
B4	AWOS-III	$240,000	$216,000	$24,000
B5	Instrument Approach Procedure Development (Aeronautical Survey)	$100,000	$90,000	$10,000
B6	SRE Building Construction	$380,000	$342,000	$38,000
B7	SRE Equipment	$115,000	$103,500	$11,500
B8	Pavement Maintenance	$150,000	$135,000	$15,000
	TOTAL	**$2,491,000**	**$2,241,900**	**$249,100**
PHASE III (11-20 YEARS)				
C1	Partial Parallel Taxiway (East)	$545,000	$490,500	$54,500
C2	North Landside Development - Apron Expansion	$118,000	$106,200	$11,800
C3	Terminal Area/Wildlife Fencing and Access Gates	$222,000	$199,800	$22,200
C4	Fuel Tank	$150,000	$135,000	$15,000
C5	Pavement Maintenance	$150,000	$135,000	$15,000
	TOTAL	**$1,185,000**	**$1,066,500**	**$118,500**
	TOTAL PROJECT DEVELOPMENT	**$5,785,000**	**$5,206,500**	**$578,500**

6.2 CAPITAL DEVELOPMENT

Primary funding sources come from the State and Local contribution. This section will identify and quantify the expected sources of capital funds. As previously indicated, State funds represent the majority of expected capital; however, a number of sources are identified and described below.

6.2.1 STATE OF COLORADO

The CDOT Aeronautics Division participates in funding airport development and maintenance projects in the State of Colorado. CDOT normally contributes 80 to 90 percent on state fund airport improvement projects.

6.2.2 CITY OF BRUSH

The airport sponsor has several methods available for funding the capital required to meet the local share of airport development costs which are typically 10 to 20 percent of the total project costs. The most common methods involve debt financing (which amortize the debt over the useful life of the project), force accounts, in-kind service, third-party support and donations.

Bank Financing: Some airport sponsors use bank financing as a means of funding airport development. Generally, two conditions are required. First, the sponsor must show the ability to repay the loan plus interest and second, capital improvements must be less than the value of the present facility or some other collateral used to secure the loan. These are standard conditions which are applied to almost all bank loan transactions.

General Obligation Bonds: General Obligation bonds (GO) are a common form of municipal bonds whose payment is secured by the full faith credit and taxing authority of the issuing agency. GO bonds are instruments of credit and because of the community guarantee, reduce the available debt level of the sponsoring community. This type of bond uses tax revenues to retire debt and the key element becomes the approval of the voters to a tax levy to support airport development. If approved, GO bonds are typically issued at a lower interest rate than other types of bonds.

Self-liquidating General Obligation Bonds: As with General Obligation bonds, Self-liquidating General Obligation Bonds are secured by the issuing government agency. They are retired, however, by cash flow from the operation of the facility. Providing the state court determines that the project is self-sustaining, the debt may be legally excluded from the community's debt limit. Since the credit of the local government bears the ultimate risk of default, the bond issue is still considered, for the purpose of financial analysis, as part of the debt burden of the community. Therefore, this method of financing may mean a higher rate of interest on all bonds sold by the community. The amount of increase in the interest rate depends, in part, upon the degree of risk of the bond. Exposure risk occurs when there is insufficient net airport operating income to cover the level of service plus coverage requirements, thus forcing the community to absorb the residual.

Revenue Bonds: Revenue Bonds are payable solely from the revenues of a particular project or from operating income of the borrowing agency, such as an airport commission which lacks taxing power. Generally, they fall outside of constitutional and statutory limitations and in many cases do not require voter approval. Because of the limitations on the other public bonds, airport sponsors are increasingly turning to revenue bonds whenever possible. However, revenue bonds normally carry a higher rate of interest because they lack the guarantees of municipal bonds. It should also be noted that the general public would usually be wary of the

risk involved with a revenue bond issue for a general aviation airport. Therefore, the sale of such bonds could be more difficult than other types of bonds.

Combined Revenue/General Obligation Bonds: These bonds, also known as "Double-Barrel Bonds", are secured by a pledge of back-up tax revenues to cover principal and interest payments in cases where airport revenues are insufficient. The combined Revenue/General Obligation Bond interest rates are usually lower than Revenue Bonds, due to their back-up tax provisions.

Force Accounts, In-kind Service, Donations: Depending on the capabilities of the Sponsor, the use of force accounts, in-kind service, or donations may be approved by the State for the Sponsor to provide their share of the eligible project costs. An example of force accounts would be the use of heavy machinery and operators for earthmoving and site preparation of runways or taxiways; the installation of fencing; or the construction of improvements to access roads. In-kind service may include surveying, engineering or other services. Donations may include land or materials such as gravel or water needed for the project. The values of these items must be verified and approved by the State prior to initiation of the project.

Third-Party Support: Several types of funding fall into this category. For example, individuals or interested organizations may contribute portions of the required development funds (Pilot Associations, Economic Development Associations, Chambers of Commerce, etc.). Although not a common means of airport financing, the role of private financial contributions not only increases the financial support of the project, but also stimulates moral support to airport development from local communities. Because of the potential for hangar development, private developers may be persuaded to invest in hangar development. A suggestion would be that the City authorizes long-term leases to individuals interested in constructing a hangar on airport property. This arrangement generates revenue from the airport, stimulates airport activity, and minimizes the sponsor's capital investment requirements. Another method of third-party support involves permitting the fixed base operator (FBO) to construct and monitor facilities on property leased from the airport. Terms of the lease generally include a fixed amount plus a percentage of revenues and a fuel flowage fee. The advantage to this arrangement is that it lowers the sponsor's development costs, a large portion of which is building construction and maintenance

The Airport funds some or all of the cost of capital projects by generating revenue from tenants, users and other sources. These airport funds can come from annual surplus, reserves, or borrowing. While capital projects are usually funded from a variety of sources, in the end, Airport and City contributed funds have a role in almost all projects, particularly as seed money to initiate projects and to provide the match of State funds.

Other methods outside the traditional methods mentioned in the above paragraph are potential suppliers of money to construct capital improvements. These include users, tenants, investors, and other sources. Tenants often construct their own facilities particularly hangar facilities. Airport users such as corporate flight departments sometimes contribute funds for projects and agree to increased rents to recover the costs of improvements. Private capital can also be used for facilities such as general aviation and corporate hangar facilities.

Appendix A
Meeting Summary

Brush Municipal Airport
Airport Layout Plan

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BRUSH MUNICIPAL AIRPORT
AIRPORT LAYOUT PLAN UPDATE

DEVELOPMENT ALTERNATIVES PLANNING ADVISORY MEETING

October 29, 2013
10:00 A.M. – 11:30 A.M.
Brush City Council Chamber

MEETING SUMMARY

Purpose: Present the recommended development for the Airport Layout Plan (ALP) update to the Brush Municipal Airport (7V5) Planning Advisory Committee and garner feedback pertaining to the recommended airside and landside development.

Attendees:

Justin Pietz, ACI
Todd Green, CDOT
Chuck Schonberger, Brush City Council Member
Stan Gray, Airport Advisory Board
Mark Smith, Airport Advisory Board
Maurice Baker, Citizen
John Rostas, ACI
Karen Schminke, City of Brush
Dale Colerick, City of Brush Public Works
Tim Oakley, Airport Advisory Board
John Sweenie, Brush Grocery Kart
Cary Kembel, Citizen

A Planning Advisory Committee (PAC) meeting was held on October 29, 2013 to present the recommended development for the Airport Layout Plan update. Attendance at the meeting comprised of twelve individuals, including representatives from City of Brush staff, the Airport Advisory Board, the Brush City Council, Brush Businesses, Citizens of the City of Brush, Colorado Department of Transportation (CDOT) Aeronautics Division, and Armstrong Consultants, Inc. (ACI).

An introduction was given to the PAC as to the existing conditions of the Airport, the ALP process, design standards and the recommended forecast in terms of based aircraft and operations.

ACI presented and discussed the recommended airside development which consists of correcting for nonstandard conditions where applicable and to develop future airport facilities in a manner consistent with FAA design standards. Runway 7-25 is currently accessed via a lead-in taxiway which places taxiing aircraft in line with aircraft landing and taking off. The existing aircraft parking apron is 50 feet from the runway centerline which is 75 feet less than the required 125 foot distance requirement for a B-I (small) runway. Future airside development would include the removal of the lead-in taxiway. The threshold for Runway 25 is displaced due to the perimeter fence penetrating the Runway Safety Area and Runway Object Free Area. To eliminate the use of a displaced threshold, the pavement prior to the threshold bar would be converted to a blast-pad. The threshold for Runway 7 would be relocated to adjust the position of the Runway Protection Zone (RPZ). The existing RPZ includes two residential properties which are considered to be incompatible land uses within the RPZ. The initial development of bypass taxiways is recommended with and the ultimate development of a parallel taxiway to provide optimum circulation and maximize aircraft safety. The parallel taxiway would connect with future landside development and be completed in two phases. Additional projects would include the reconstruction of Runway 7-25.

ACI presented and discussed the recommended landside development which consists of a new apron to the north of Runway 7-25. The proposed north landside development would accommodate future hangar development. Facilities would allow for a Snow Removal Equipment (SRE) storage building, fuel farm, taxilanes, tiedowns, hangars, a Fixed Base Operator/pilot lounge and vehicle parking. A question was asked if a fuel tank could be placed in the existing apron south of Runway 7-25. ACI responded that a Form 7460-1, *Notice of Proposed Construction or Alteration*, could be filed if demand warranted, however, the existing apron is too close to the runway and a fuel tank could be determined a hazard.

CDOT affirmed the fuel tank would be too close to the runway, but as 7V5 is not required to adhere to Federal Aviation Administration (FAA) standards, there is some leeway if current demand required fuel services. The possibility of allowing a fuel tank on the south apron may be temporarily allowable but relocated after north development occurs. A question was asked regarding the parking ramp cost estimates. ACI responded the cost of the parking ramp is included in the document and used recent figures obtained from recent similar apron development projects within the region. A question was asked why aircraft using hangars on the east portion of the proposed north development would have to taxi around the perimeter of the future development. ACI clarified that the taxilane provides immediate access from each hangar to the apron and the path in question was for automobile vehicle operations only. A question was asked on how published and actual runway distances differ. ACI stated the accuracy of past surveys or lack of survey information contributed toward the runway length discrepancy. The updated runway end coordinates will be reflected in the final ALP drawings and FAA Form 5010-1, *Airport Master Record*.

The possible implementation of a GPS Localizer Performance with Vertical guidance (LPV) instrument approach for Runway 7-25 with visibility minimums of 1-statute mile was discussed. A LPV approach can increase the utility of the airport by allowing operations in Instrument Flight Rule (IFR) conditions without requiring the purchase of any ground based navigational equipment. Runway 7-25 would need to be remarked with nonprecision instrument approach markings. CDOT mentioned that they actively work towards achieving instrument approach procedures (IAP) and aeronautical surveys (required for IAP development) for airports across the State of Colorado. CDOT mentioned this is a planned future development for 7V5.

The next steps will be to carry the Recommended Development forward and complete the draft ALP drawings. The final narrative report and ALP drawings will be distributed to the City of Brush, Airport Advisory Board and CDOT for final review. Once the final review has been completed, the final narrative report and ALP drawings will be completed and submitted to the City of Brush and CDOT.

The formal presentation was concluded and a forum for questions and comments was held. The City of Brush stated that access onto the proposed north landside development area passes through a small portion of Salebarn property. The City of Brush stated that an access easement would be needed. ACI stated the access road location is optimal as it will not require to be connected to any existing roadway further increasing development costs.

A question was asked if there was enough space to have properties north of Runway 7-25 to allow for a residential airpark. ACI responded that public use airports should try to minimize the through-the-fence operations associated with a residential airpark. CDOT stated they do not recommend a residential airpark as the State does not want to provide funding which could benefit private enterprise. CDOT further stated they strongly discourage future residential airpark development.

A comment was made regarding the possibility of developing a crosswind runway. ACI stated that the wind coverage at 7V5 exceeds the 95% standard for the construction of a crosswind runway and therefore would not be eligible for funding. CDOT stated their desire to maintain the existing pavement at 7V5 and not construct a new runway. CDOT stated the Fort Morgan Municipal Airport (FMM) has received funding for a crosswind runway and with 7V5's proximity to FMM, 7V5 will not be able to compete for the necessary funding of a crosswind runway. However, 7V5 is allowed to construct a grass runway using local funding. A question was asked if the previous dirt crosswind runway could be reused as a future crosswind runway. ACI stated the location of the closed dirt runway would impede on the future landside development to the north.

A question was asked about fencing needs. ACI stated the fence is needed to keep the general public off the aircraft operations area while still allowing the public access to hangars and businesses. CDOT added that the development of fencing would be grant eligible at the airport including terminal area fencing and perimeter wildlife fencing. ACI also added the importance of wildlife mitigation.

A question was asked if this plan was conducive for skydiving or sail plane operations. ACI stated the plan is flexible and could accommodate such activities. The proposed north landside development would allow for the necessary staging areas.

A question was asked regarding the rules of remote controlled (RC) model aircraft using the airport. ACI stated that RC model aircraft must be restricted from the airport.

A question was asked if gliders could use 7V5. ACI stated that gliders can use the runway, but usually elect to land on turf surfaced landing areas.

A question was asked if the existing segmented circle met standards. ACI stated the existing segmented circle was nonstandard and has been identified to be relocated in the recommended development along with a rotating airport beacon. The development of a designated SRE building is also recommended. CDOT added that surplus SRE equipment from the Denver International Airport is available for discounted cost, but must be used for airport use only.

A question was asked if there were plans for an extension of Runway 7-25. ACI stated that it was a possibility but there is no justification for a runway extension based on existing and forecasted demand levels at this time. CDOT added the City of Brush could fund a runway extension using local funds, but unless there is a drastic change in operation numbers CDOT will not fund the extension. CDOT stated their funding priorities for 7V5 are the purchase of land within the RPZs, RSA compliance, bypass taxiway construction and runway reconstruction.

A question was asked if the ALP addresses the need for a dedicated manager for 7V5. ACI stated the need for management is not discussed in the ALP. The existing management structure is considered to be acceptable. CDOT added a lot of airports in Colorado are operated/managed in a similar manner.

A question was asked what does ownership of the RPZ mean. Establishing control of the RPZ provides enhanced protection of the people and protection of the property on the ground. According to the FAA, it is desirable to clear the entire RPZ of all above-ground objects. Ownership of the RPZ can be conducted through fee-simple or avigation easements which limit the use and development of the land. Control of the RPZs at 7V5 is recommended in the ALP.

CDOT commented that in-kind services can be used to provide the 10 percent local match for development projects. This could be done by allowing the City of Brush to complete some of the work tasks rather than coming up with cash for the local ten percent funding. CDOT expressed their desire to work with the City of Brush as much as possible.

A question was asked on how long the runway would be closed for reconstruction. ACI stated the project duration depends on several factors and usually requires a closure period of four to six months. CDOT added a major factor depends on the sub-base depth under the existing runway.

ACI stated that they will be carrying the recommended development forward on the Draft ALP drawing set, sending out the financial development section and Draft Report. Any additional comments will be incorporated into the Final documents and sent to the State and the City of Brush.

Meeting Sign-In Sheet

Project:	Brush Municipal Airport – Development Alternatives Meeting	Meeting Date:	10/29/2013

Name	Title	Company	Phone	Fax	E-Mail
Justin Pietz	Planning Manager	Armstrong Consultants, Inc.	(970) 242-0101	(970) 241-1769	justin@armstrongconsultants.com
John Rostas	Airport Planner	Armstrong Consultants, Inc.	(970) 242-0101	(970) 241-1769	jrostas@armstrongconsultants.com
SHAN GRAY	-	ADVISORY	970 768 2389		SGRAY47@HOTMAIL.COM
Todd Green	Aviation Planner	CDOT Aero	303-512-5260		todd.green@state.co.us
Chuck Schreiberger	council		970-370-1666		log49w@gmail.com
Karen Schmonke	~~City of B!~~ Asst City Admin	City of B!			
Cary Kowbel			970 768 2262		
DALE COLERICK	DIR PUBLIC WORKS	CITY OF BRUSH			
John Sweem		Brush Library Board	970 842-2622		Sweenie@hotmail.com
Marvin Baker			(970) 842-2186		
TIM OAKLEY	AP BOARD		970 842-2645		toakley72@hotmail.com
MARK D SMITH	AP BOARD		970 768 5856		

Appendix B
Acronyms

Brush Municipal Airport
Airport Layout Plan

ARMSTRONG

COMMONLY USED ACRONYMS

AC	Advisory Circular
AD	Airport Design
ADG	Airplane Design Group
AGL	Above Ground Level
AIP	Airport Improvement Program
ALP	Airport Layout Plan
ALS	Approach Lighting System
ARC	Airport Reference Code
ARP	Airport Reference Point
ARTCC	Air Route Traffic Control Center
ASDA	Accelerate Stop Distance
ASDE	Airport Surface Detection Equipment
ASR	Airport Surveillance Radar
ASV	Annual Service Volume
ATC	Air Traffic Control
ATCT	Airport Traffic Control Tower
AWOS	Automated Weather Observation system
BRL	Building Restriction Line
CAT	Category
CFR	Code of Federal Regulations
CWY	Clearway
CY	Calendar Year
DME	Distance Measuring Equipment
EL	Elevation
EMT	Emergency Medical Technician
FAA	Federal Aviation Administration
FAR	Federal Aviation Regulation
FBO	Fixed Base Operator
FSS	Flight Service System
FY	Fiscal Year
GA	General Aviation
GPS	Global Positioning System
HIRL	High Intensity Runway Lights
IEMT	Intermediate Emergency Medical Technician
IFR	Instrument Flight Rules
ILS	Instrument Landing System
IMC	Instrument Meteorological Conditions
LDA	Landing Distance Available
LOC	Localizer
MALS	Medium Intensity Approach Lighting System
MALSF	Medium Intensity Approach Lighting System
MALSR	Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
ME	Multi-Engine
MIRL	Medium Intensity Runway Lights
MITL	Medium Intensity Taxiway Lights
MLS	Microwave Landing System
MOA	Military Operating Area
MSL	Mean Sea Level
NAVAID	Navigational Aid
NDB	Nondirectional Beacon
NM	Nautical Mile
NPIAS	National Plan of Integrated Airport Systems
ODALS	Onmnidirectional Approach Lighting System
OFA	Object Free Area
OFZ	Obstacle Free Zone
PAPI	Precision Approach Path Indicator
PAR	Precision Approach Radar
RAIL	Runway Alignment Indicator Lights
REIL	Runway End Identifier Lights
ROFA	Runway Object Free Area
RPZ	Runway Protection Zone
RSA	Runway Safety Area
RVR	Runway Visual Range
RW	Runway
SWY	Stopway
TERPS	Terminal Instrument Procedures
TH	Threshold
TL	Taxilane
TODA	Takeoff Distance Available
TOFA	Taxiway Object Free Area
TORA	Takeoff Run Available
TSA	Taxiway Safety Area
TVOR	Very High Frequency Omnirange on an Airport
TW	Taxiway
USGS	United States Geological Society
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VOR	Very High Frequency Omnirange
WAAS	Wide Area Augmentation System

Appendix C
Glossary of Terms

Brush Municipal Airport
Airport Layout Plan

ARMSTRONG

GLOSSARY OF TERMS

Above Ground Level (AGL)	A height above ground as opposed to MSL (height above Mean Sea Level).
Advisory Circular (AC)	Publications issued by the FAA to provide a systematic means of providing non-regulator guidance and information in a variety of subject areas.
Airport Improvement Program (AIP)	The AIP of the Airport and Airways Improvement Act of 1982 as amended. Under this program, the FAA provide funding assistance for the design and development of airports and airport facilities.
Aircraft Mix	The number of aircraft movements categorized by capacity group or operational group and specified as a percentage of the total aircraft movements.
Aircraft Operation	An aircraft takeoff or landing.
Airport	An area of land or water used or intended to be used for landing and takeoff of aircraft, includes buildings and facilities, if any.
Airport Elevation	The highest point of an airport's useable runways, measured in feet above mean sea level.
Airport Hazard	Any structural or natural object located on or near a public airport, or any use of land near such airport, that obstructs the airspace required for flight of aircraft on approach, landing, takeoff, departure, or taxiing at the airport.
Airport Land Use Regulations	Are designed to preserve existing and/or establish new compatible land uses around airports, to allow land use not associated with high population concentration, to minimize exposure of residential uses to critical aircraft noise areas, to avoid danger from aircraft crashes, to discourage traffic congestion and encourage compatibility with non-motorized traffic from development around airports, to discourage expansion of demand for governmental services beyond reasonable capacity to provide services and regulate the area around the airport to minimize danger to public health, safety, or property from the operation of the airport, to prevent obstruction to air navigation and to aid in realizing the policies of a County Comprehensive Plan and Airport Master Plan.
Airport Layout Plan (ALP)	A graphic presentation, to scale, of existing and proposed airport facilities, their location on the airport and the pertinent applicable standards. To be eligible for AIP funding assistance, an airport must have an FAA-approved ALP.

Airport Master Record, Form 5010	The official FAA document, which lists basic airport data for reference and inspection purposes.
Airport Reference Code (ARC)	The ARC is a coding system used to relate airport design criteria to the operational and physical characteristics of the airplanes intended to operate at the airport.
Airport Reference Point (ARP)	The latitude and longitude of the approximate center of the airport.
Airspace	Space above the ground in which aircraft travel; divided into corridors, routes and restricted zones.
Air Traffic	Aircraft operating in the air or on an airport surface, excluding loading ramps and parking areas.
Approach Surface	A surface longitudinally centered on the extended runway centerline and extending outward and upward from each end of the primary surface. An approach surface is applied to each end of each runway based upon the type of approach available or planned for that runway end.
Automated Weather Observing System (AWOS)	This equipment automatically gathers weather data from various locations on the airport and transmits the information directly to pilots by means of computer generated voice messages over a discrete frequency.
Based aircraft	An aircraft permanently stationed at an airport.
Building Restriction Line	A line, which identifies suitable building area locations on airports.
Ceiling	The height above the earth's surface of the lowest layer of clouds or other phenomena which obscure vision.
Conical Surfaces	A surface extending outward and upward form the periphery of the horizontal surface at a slope of 20 to 1 for a horizontal distance of 4,000 feet.
Controlled Airspace	Airspace in which some or all aircraft may be subject to air traffic control to promote safe and expeditious flow of air traffic.
Critical/Design Aircraft	In airport design, the aircraft which controls one or more design items such as runway length, pavement strength, lateral separation, etc., for a particular airport. The same aircraft need not be critical for all design items.

Day Night Level (DNL)	24-hour average sound level, including a 10 decibel penalty for sound occurring between 10:00 PM and 7:00 AM
Decibel	Measuring unit for sound based on the pressure level.
Design Type	The design type classification for an airport refers to the type of runway that the airport has based upon runway dimensions and pavement strength.
Federal Aviation Administration (FAA)	The federal agency responsible for the safety and efficiency of the national airspace and air transportation system.
FAR Part 77	A definition of the protected airspace required for the safe navigation of aircraft.
Fixed Base Operator (FBO)	An individual or company located at an airport and providing commercial general aviation services.
Fuel Flowage Fees	A fee charged by the airport owner based upon the gallons of fuel either delivered to the airport or pump at the airport.
General Aviation (GA)	All aviation activity in the United States, which is neither military nor conducted by major, national or regional airlines.
Glider	A heavier-than-air aircraft that is supported in flight by the dynamic reaction of the air against its lifting surfaces and whose free flight does not depend principally on an engine (FAR Part 1),
Global Positioning System (GPS)	The global positioning system is a space based navigation system, which has the capability to provide highly accurate three-dimensional position, velocity and time to an infinite number of equipped users anywhere on or near the Earth. The typical GPS integrated system will provide: position, velocity, time, altitude, groundspeed and ground track error, heading and variation. The GPS measures distance, which it uses to fix position, by timing a radio signal that starts at the satellite and ends at the GPS receiver. The signal carries with it, data that discloses satellite position and time of transmission and synchronizes the aircraft GPS system with satellite clocks.
Hazard to Air Navigation	An object which, as a result of an aeronautical study, the FAA determines will have a substantial adverse effect upon the safe and efficient use of navigable airspace by aircraft, operation of air navigation facilities or existing or potential airport capacity.
Horizontal Surface	A horizontal plane 150 feet above the established airport elevation, the perimeter which is constructed by swinging arcs of specified radii form the center of each end of the primary surface of each runway of each airport and connecting the adjacent arcs by lines tangent to those arcs.

Imaginary Surfaces	Surfaces established in relation to the end of each runway or designated takeoff and landing areas, as defined in paragraphs 77.25, 77.28 and 77.29 of FAR Part 77, *Objects Affecting Navigable Airspace*. Such surfaces include the approach, horizontal, conical, transitional, primary and other surfaces.
Itinerant Operations	All operations at an airport, which are not local operations.
Jet Noise	The noise generated externally to a jet engine in the turbulent jet exhaust.
Knots	Nautical miles per hour, equal 1.15 statute miles per hour.
Large Airplane	An airplane of more than 12,500 pounds maximum certified takeoff weight.
Local Operations	Operations by aircraft flying in the traffic pattern or within sight of the control tower, aircraft known to be arriving or departing from flight in local practice areas, or aircraft executing practice instrument approaches at the airport.
Location Identifier	A three-letter or other code, suggesting where practicable, the location name that it represents.
Maneuvering Area	That part of an airport to be used for the takeoff and landing of aircraft and for the movement of aircraft associated with takeoff and landing, excluding aprons.
Master Plan	A planning document prepared for an airport, which outlines directions and developments in detail for 5 years and less specifically for 20 years. The primary component of which is the Airport Layout Plan.
Mean/Maximum Temperature	The average of all the maximum temperatures usually for a given period of time.
Mean Sea Level (MSL)	Height above sea level.
Medium Intensity Runway Lights (MIRL)	For use on VFR runways or runway showing a nonprecision instrument flight rule (IFR) procedure for either circling or straight-in approach.
Minimum Altitude	That designated altitude below which an IFR pilot is not allowed to fly unless arriving or departing an airport or for specific allowable flight operations.

National Airspace System	The common network of United States airspace, navigation aids, communications facilities and equipment, air traffic control equipment and facilities, aeronautical charts and information, rules, regulations, procedures, technical information and FAA manpower and material.
National Plan of Integrated Airport Systems (NPIAS)	A plan prepared annually by the FAA which identifies, for the public, the composition of a national system of airports together with the airport development necessary to anticipate and meet the present and future needs of civil aeronautics, to meet requirements in support of the national defense and to meet the special needs of the Postal Service. The plan includes both new and qualitative improvements to existing airports to increase their capacity, safety, technological capability, etc.
NAVAID	A ground based visual or electronic device used to provide course or altitude information to pilots.
Noise	Defined subjectively as unwanted sound. The measurement of noise involve understanding three characteristics of sound: intensity, frequency and duration.
Noise Contours	Lines drawn about a noise source indicating constant energy levels of noise exposure. DNL is the measure used to describe community exposure to noise.
Noise Exposure Level	The integrated value, over a given period of time of a number of different events of equal or different noise levels and durations.
Non-Precision Instrument	A runway having an existing instrument approach procedure utilizing air navigation facilities with only horizontal guidance for which a straight-in nonprecision instrument approach procedure has been approved.
Notice to Airmen (NOTAM)	A notice containing information (not known sufficiently in advance to publicize by other means concerning the establishment, condition or change in any component (facility, service, or procedure) of or hazard in the National Airspace System, the timely knowledge of which is essential to personnel concerned with flight operations.
Object	Includes, but is not limited to, above ground structures, NAVAIDs, people, equipment, vehicles, natural growth, terrain and parked aircraft.
Object Free Area (OFA)	A two-dimensional ground area-surrounding runways, taxiways and taxilanes which is clear of objects except for object whose location is fixed by function.

Obstacle Free Zone (OFZ)	The airspace defined by the runway OFZ and, as appropriate, the inner-approach OFZ and the inner-transitional OFZ, which is clear of object penetrations other than frangible NAVAIDs.
Obstruction	An object which penetrates an imaginary surface described in the FAA's Federal Aviation Regulations (FAR), Part 77.
Parking Apron	An apron intended to accommodate parked aircraft.
Pattern	The configuration or form of a flight path flown by an aircraft or prescribed to be flown, as in making an approach to a landing
Precision Approach Path Indicators (PAPI)	The visual approach slope indicator system furnishes the pilot visual slope information to provide safe descent guidance. It provides vertical visual guidance to aircraft during approach and landing by radiating a directional pattern of high intensity red and white focused light beams which indicate to the pilot that they are "on path" if they see red/white, "above path" if they see white/white and "below path" if they see red/red.
Primary Surface	A surface longitudinally centered on a runway. When the runway has a specially prepared hard surface, the primary surface extends 200 feet beyond each end of that runway, but when the runway has no specially prepared hard surface, or planned hard surface, the primary surface ends at each end of that runway.
Rotating Beacon	A visual navaid operated at many airports. At civil airports, alternating white and green flashes indicate the location of the airport.
Runway	A defined rectangular surface on an airport prepared or suitable for the landing or takeoff of airplanes.
Runway End Identifier Lights (REIL)	REILs are flashing strobe lights which aid the pilot in identifying the runway end at night or in bad weather conditions.
Runway Gradient	The average gradient consisting of the difference in elevation of the two ends of the runway divided by the runway length may be used provided that no intervening point on the runway profile lies more than five feet above or below a straight line joining the two ends of the runway. In excess of five feet the runway profile will be segmented and aircraft data will be applied for each segment separately.
Runway Lighting System	A system of lights running the length of a system that may be either high intensity (HIRL), medium intensity (MIRL), or low intensity (LIRL).
Runway Orientation	The magnetic bearing of the centerline of the runway.

Runway Protection Zone (RPZ)	An area off the runway end used to enhance the protection of people and property on the ground.
Runway Safety Area (RSA)	A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to airplanes in the event of an undershoot, overshoot, or excursion form the runway.
Segmented Circle	A basic marking device used to aid pilots in locating airports and which provides a central location for such indicators and signal devices as may be required.
Small Aircraft	An airplane of 12,500 pounds or less maximum certified takeoff weight.
Taxiway	A defined path established for the taxiing of aircraft from one part of an airport to another.
Terminal Area	The area used or intended to be used for such facilities as terminal and cargo buildings, gates, hangars, shops and other service buildings, automobile parking, airport motels, restaurants, garages and automobile services and a specific geographical area within which control of air traffic is exercised.
Threshold	The beginning of that portion of the runway available for landing.
Touch and Go Operations	Practice flight performed by a landing touch down and continuous takeoff without stopping.
Traffic Pattern	The traffic flow that is prescribed for aircraft landing at, taxiing on or taking off form an airport. The usual components are the departure, crosswind, downwind, and base legs; and the final approach.
Transitional Surface	These surfaces extend outward and upward at right angles to runway centerline extended at a slope of 7 to 1 from the sides of the primary surface and from the sides of the approach surfaces.
Universal Communications (UNICOM)	A private aeronautical advisory communications facility for purpose other than air traffic control. Only one such station is authorized in any landing area. Service available are advisory in nature primarily concerning the airport services and airport utilization. Locations and frequencies of UNICOMs are listed on aeronautical charts and publications.
Visual Flight Rules (VFR)	Rules that govern flight procedures under visual conditions.
Visual Runway	A runway intended for visual approaches only with no straight-in instrument approach procedure either existing or planned for that runway.

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