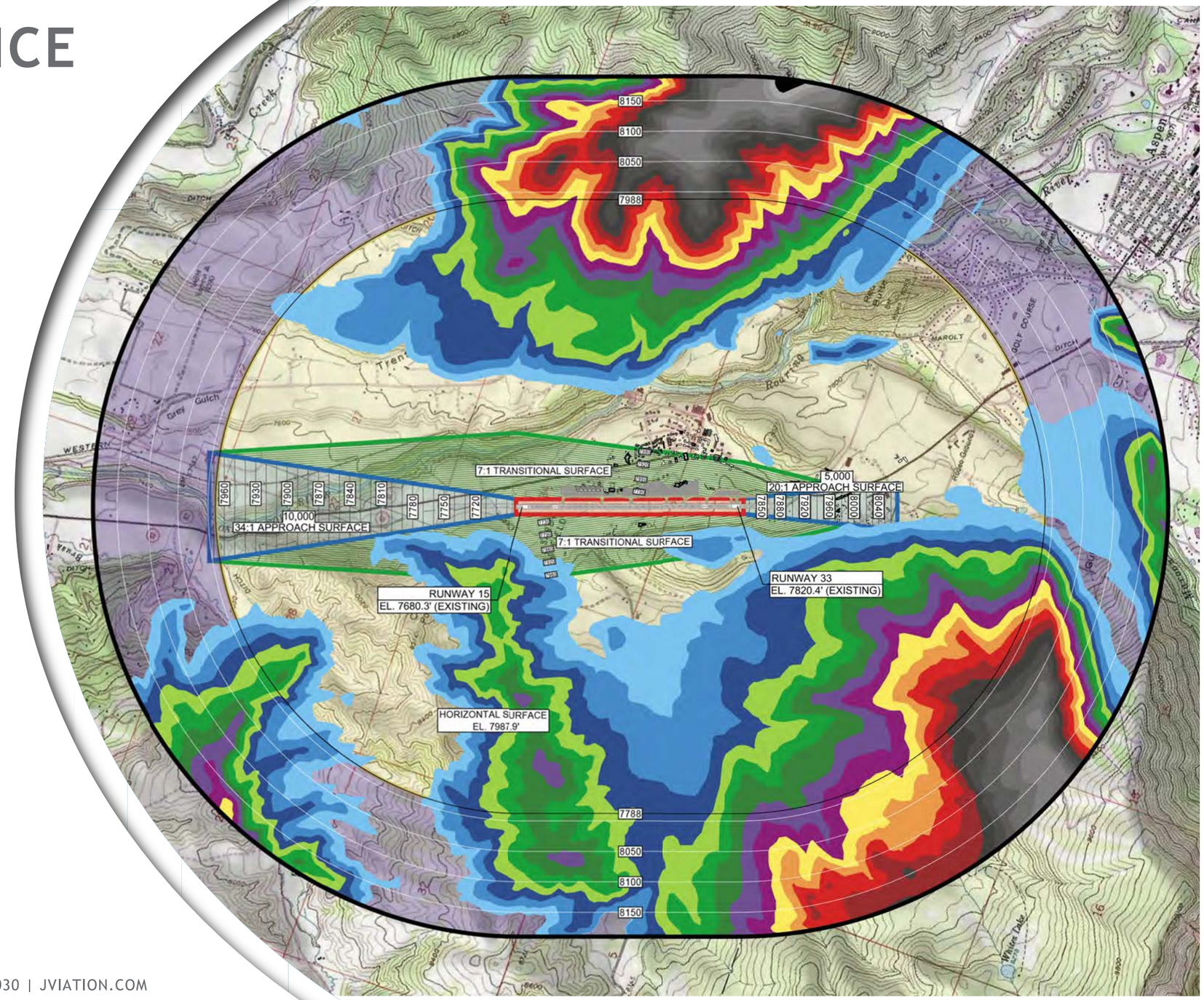
FUTURE AIR SERVICE PLANNING STUDY PHASE II



JUNE 24, 2014
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ASPEN/PITKIN COUNTY AIRPORT
OWNED AND OPERATED BY PITKIN COUNTY

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ASE Future Air Service Planning Study

Final Report

Index

Executive Summary

The primary intent of the Phase II Aspen/Pitkin County Airport (ASE) Future Air Service Planning Study was to identify two to four viable options for improving the infrastructure at the airport for the purposes of preserving commercial air service for the airport in the future while at the same time increasing safety and maintaining the efficiency and operational capacity of the airport. Over a six month time period, 18 alternatives were developed and evaluated in coordination with representatives from the FAA, Air Traffic, Pitkin County, air carriers, and multiple industry experts who specialize in flight procedure engineering, economic impact evaluation, and land use planning. Over three meetings, all viable alternatives were discussed and deliberated by this study group, resulting in two alternatives which met the primary objectives of the study, as follows:

- Meet or improve FAA standards of safety, efficiency and operational capacity
- Minimize the impact on the facilities previously approved in the 2012 Master Plan Update
- Accommodate larger future regional commercial aircraft

All 18 alternatives which were developed proposed a variety of airfield configurations and improvements in an effort to meet the study objectives above. Some alternatives considered improvements that did not meet FAA standards, while other options strived to meet all associated FAA standard to the extent possible. All alternatives were developed, refined, or removed through the study process. Figure 1 shows the range of the alternatives:

The Federal Aviation Administration (FAA) and the Airport strive to ensure that ASE operates in a manner to meet standards of safety, efficiency and operational capacity. In order to do so, the Airport must constantly monitor and evaluate such things as enhanced safety standards, changing trends in air travel, consolidations of air carriers, development of NextGen technology, opportunities for business development, and evolving aircraft fleet design—all of this, while maintaining the highest level of safety. To that end, the Airport along with the FAA, have made numerous safety enhancements to the Airport. Through the recently completed Master Planning process, key improvements have been identified to ensure the ongoing safety and viability of the Airport well into the future.

Of significance over the past several years is the development and design of new aircraft that provide financial viability to an ever-changing air carrier industry, as well as a more environmentally-sound aircraft to reduce noise and carbon footprints on our communities. This evolution has resulted in larger regional commercial aircraft that will require the Airport and the FAA to consider infrastructure changes to accommodate ASE's future commercial air service. Phase I of the Future Air Service Planning Study took an in depth look at the existing fleet versus the future commercial aircraft capable of serving ASE. The outcome of this phase of the study provided an understanding that the existing commercial aircraft which serve ASE will soon be retired from the fleet, and the current airfield configuration of ASE will be incapable of servicing the larger future regional commercial aircraft entering the market. The resulting aircraft capable of serving ASE in the future can be seen in Table 1.

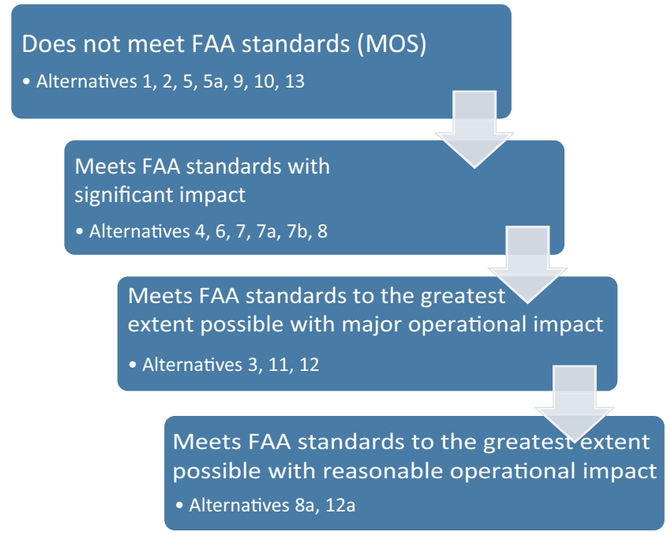
The Airport is physically constrained, due to topography and the proximity of Highway 82. In particular, there is little room on the east side of the Runway. The close proximity of Highway 82 limits the available space and makes it practically infeasible to accommodate both the taxiway and the necessary apron parking space while also satisfying the FAA lateral separation standards. The Airport has several Modifications to Standards (MOS) that have been previously approved by the FAA. These modifications have been required to document the

Table 1: Aircraft Technical Specifications

Aircraft Type	Wingspan		Max LW (Lbs.)	ASE Performance Capable	Meets/Does Not Meet Current Operational Restrictions
	Feet/Inches	Meters			
Current Regional Aircraft					
CRJ-700	76' 3"	23.2	67,000	Yes	Meets
Q-400	93' 3"	28.4	62,000	Yes	Meets
CRJ-900	81' 7"	24.9	73,500	No	Meets
CRJ-1000	85' 11"	26.2	81,500	No	Meets
E-170	85' 4"	26	72,312	No	Meets
E-175	85' 4"	26	74,957	No	Meets
E-190	94' 3"	28.7	94,799	No	Meets
E-195	94' 3"	28.7	99,208	No	Meets
Future Regional Aircraft					
E175-E2	101' 8"	31	86,201	Yes*	Does Not Meet
E190-E2	110' 7"	33.7	107,431	Yes*	Does Not Meet
E195-E2	110' 7"	33.7	116,911	TBD*	Does Not Meet
MRJ-70 Standard	95' 9"	29.2	79,807	TBD	Does Not Meet
MRJ-90 Standard	95' 9"	29.2	83,776	TBD	Does Not Meet
CS100 Base	115' 1"	35.1	110,000	Yes	Does Not Meet
CS300 Base	115' 1"	35.1	121,500	Yes	Does Not Meet

*Source: Manufacturers; *E-Jets E2 data are preliminary*

Figure 1



non-standard conditions that currently exist at the airport due to the existing mountainous terrain surrounding the airport and limitations on the available space on the airfield to meet all of the FAA geometric design standards, as well as the overall longitudinal gradient of the land on which the airfield resides. Each of these MOS for non-standard conditions at the Airport have been evaluated and approved by the FAA and have demonstrated that such conditions do provide an acceptable level of safety for air transportation. The FAA currently allows the runway to taxiway centerline distance MOS to operate in conjunction with Title X, Pitkin County Code, which limits the allowable wingspan of aircraft to 95 feet or less. This is the current acceptable level of safety at the airport.

This Future Air Service Planning Study provides an industry review of changing commercial aircraft fleet design technology and a comprehensive review of potential alternatives to ensure that ASE can continue to remain a relevant airport well into the future by maintaining commercial air service, while at the same time meeting the needs of the community and the flying public.

To address the objectives and intent of the study, the following project scope was developed and approved by the Board of County Commissioners (BOCC) and included the following:

- Review of regulatory environment
- Analysis of airfield and airspace configuration
- Feasibility analysis of different options to ensure future commercial air service to ASE (including likelihood of community support, cost, compliance with FAA regulations, etc.)
- Presentations to BOCC including draft alternatives and decision point regarding scope and decision regarding Phase III (next steps)

This phase of the study provides a conceptual level evaluation for proposed airfield reconfiguration alternatives. These conceptual designs analyzed alternatives in sufficient detail to identify preliminary airspace, and regulatory considerations, as well as provide preliminary cost estimates, of viable options. These various items in the Phase II study are described in more detail in the following paragraphs.

Step A

Step A of Phase II included analysis for each of the initial nine alternatives as follows:

- ✓ Evaluated initial airfield configurations alternative
- ✓ Evaluated viability of west side Fixed Base Operator (FBO)
- ✓ Considered potential MOS required for each alternative
- ✓ Evaluated Runway 15 approach surface impacts and airspace impacts
- ✓ Studied preliminary impacts to Owl Creek Road

The Step A conclusion meeting was held on February 18, 2014 to refine alternatives based upon the study objectives. Six alternatives were carried forward to Step B, while three alternatives were removed. Four new alternatives were created to also be analyzed during Step B.

Step B

Step B considered ten alternatives resulting from the Step A meeting. New alternatives were developed and analyzed using Step A criteria. Additional analysis was performed on each remaining alternative:

- ✓ Assessed impacts to Master Plan and future aircraft parking areas
- ✓ Refined impacts to Owl Creek Road and adjacent property
- ✓ Evaluated impacts to Highway 82 Right-of-Way
- ✓ Considered impact of meeting FAA standards for east side Taxiway Object Free Area and runway holdbar distances

The Step B conclusion meeting held on April 3, 2014 further refined alternatives. Three alternatives were carried forward to Step C, while seven alternatives were removed. Three new alternatives were developed for Step C evaluation.

Step C

As a result of the Step B meeting, six alternatives were further developed and evaluated utilizing analysis from Steps A and B. In addition, the following analysis performed on each of the remaining alternatives:

- ✓ Evaluated approach surface for Runway 33
- ✓ Refined impacts and improvements to Owl Creek Road
- ✓ Developed conceptual construction phasing
- ✓ Produced conceptual economic impacts from construction
- ✓ Evaluated approach and departure procedures for existing and proposed runway locations
- ✓ Identified potential items requiring local and federal approval

A meeting for the conclusion of Step C was held on May 30, 2014. One alternative was slightly modified and carried forward to Step D as a new alternative. A previously removed alternative from Step B was restored but slightly modified to be carried forward to Step D as a new alternative. The six alternatives presented at the Step C meeting were removed from the study.

Step D

Two remaining alternatives as a result from Step C underwent a more detailed evaluation and design in order to understand impact and cost.

- ✓ Developed conceptual design elements (grading, drainage, utilities, etc.)
- ✓ Produced conceptual cost estimates
- ✓ Explored feasibility of these alternatives
- ✓ Prepared Final Report for Phase II Future Air Service Study
- ✓ Prepared BOCC presentation

With the completion of Step D, it is recommended that Alternatives 8a and 12a be forwarded to the BOCC for further consideration.

Conclusion

At the conclusion of this four step study process, through much evaluation and collaboration by all parties within the study group, two alternatives remained which the FAA and Airport believe meet the objectives of the study to the highest extent possible. These alternatives are recommended to the BOCC for consideration to move forward to the Phase III of the overall Future Air Service Planning Study. All other alternatives which were considered and removed from the study have been deemed less capable of meeting the objectives as previously stated in this summary. A detailed discussion of the Phase II study process as well as identification and analysis of the two surviving alternatives follows this executive summary of the Future Air Service Planning Study – Phase II Final Report. Exhibits of all alternatives contemplated in this study can be found in Appendices B, C, and D.

Introduction

The Aspen/Pitkin County Airport (ASE) was founded in 1946 by Walter Paepcke and John Sprachner as a privately-owned, public-use, gravel landing strip. The original facility consisted of a log cabin terminal building and a gravel runway. Today, ASE is a premier airport serving both commercial and general aviation operations. It is a key component of the National Air Space System and, as an international destination, it provides an economic benefit of $841.1 million annually to the State of Colorado.[1] The airport currently serves over 440,000 commercial passengers with over 35,000 commercial and general aviation aircraft operations each year. ASE serves as the gateway to the world-class resort of Aspen and the Roaring Fork Valley.

The Federal Aviation Administration (FAA) and the Airport strive to ensure that the Airport operates in a manner to meet standards of safety, efficiency and operational capacity. In order to do so, the Airport must constantly monitor and evaluate such things as enhanced safety standards, changing trends in air travel, consolidations of air carriers, development of NextGen technology, opportunities for business development, and evolving aircraft fleet design—all of this, while maintaining the highest level of safety. To that end, the Airport along with the FAA, have made numerous safety enhancements to the Airport. Through the recently completed Master Planning process, key improvements have been identified to ensure the ongoing safety and viability of the Airport well into the future.

Aspen Airport, 1946

Of significance over the past several years is the development and design of new aircraft that provide financial viability to an ever-changing air carrier industry, as well as a more environmentally-sound aircraft to reduce noise and carbon footprints on our communities. This evolution has resulted in larger regional commercial aircraft that will require the Airport and the FAA to consider infrastructure changes to accommodate ASE's future commercial air service.

This Future Air Service Planning Study provides an industry review of changing fleet design technology and a comprehensive review of potential alternatives to ensure that the Airport can:

- Meet or improve FAA standards of safety, efficiency and operational capacity
- Minimize the impact on the facilities previously approved in the 2012 Master Plan Update
- Accommodate larger future regional commercial aircraft

Aspen Airways Terminal, 1975

In order to adequately understand the key elements that are essential components of this evaluation, the following material provides background to the Study. These elements (Airfield Configuration, Modifications of Standards, Second Fixed Based Operations Services, Wingspan Restriction and the recently adopted 2012 Airport Master Plan Update) provide a baseline foundation to best understand the dynamic and evolving challenges facing the Airport and the community into the future. The background material is followed by the in-depth alternatives analysis and summary. Accompanying technical information is provided in the Appendices.

Background

Airfield Configuration

ASE has one runway, Runway 15/33, which is 100 feet wide and runs north-south. Access to Runway 15/33 is provided by a partial parallel taxiway (Taxiway A) that is 50 feet wide. The Taxiway centerline is located 320 feet east of the Runway centerline. The Taxiway also provides access to the aircraft parking aprons on the east side of the Airport, immediately adjacent to Colorado Highway 82. The Airport is classified as Runway Design Code (RDC) D-III, based on the aircraft currently operating and projected to operate at the Airport. Approach category "D" includes aircraft with approach speeds between 121 knots and 141 knots. Aircraft Design Group III includes aircraft with tail heights between 30 and 45 feet (9 to 13.5 meters) and wingspans between 79 and 118 feet (24 and 36 meters).[2]

The Airport is physically constrained due to topography and the proximity of Highway 82. In particular, there is little room on the eastern side of the Runway. The close proximity of Highway 82 limits the available space and makes it practically infeasible to accommodate both the taxiway and the necessary apron parking space while also satisfying the following FAA lateral separation standards:

Runway Object Free Area (OFA) / runway centerline to adjacent taxiway centerline separation: FAA has calculated standard areas centered on the runway centerline to be kept free of objects in order to maintain an adequate margin of safety. These separation standards are based on landing and takeoff flight path profiles and physical characteristics of relevant aircraft.[3] FAA's standard for the full Runway OFA at D-III airports is 800 feet. In turn, the safe separation between a runway centerline and an adjacent taxiway centerline is half that distance, i.e., 400 feet.[4]

Runway centerline to aircraft holding position: Runway holding positions (holdlines) identify the location on a taxiway where a pilot must stop when s/he does not have tower clearance to proceed onto the runway. The holdline standards assume a perpendicular distance from a runway centerline to an intersecting taxiway centerline, but are increased if the taxiway intersects the runway at an acute angle.[5] The standard separation for D-III airports is 250 feet, however this distance is increased one foot for each 100 feet above sea level. The elevation of ASE is 7,837.9 feet. Therefore, the standard separation at ASE would be 328 feet (250 plus 78). ASE currently has an FAA approved modification to standards for a separation of 272.5 feet.

Aspen/Pitkin County Airport at Night

Taxiway Object Free Area (OFA) / taxiway centerline to fixed or movable object: FAA has also calculated standard object-free areas (OFAs) for taxiways. These separations are based on the need to ensure sufficient wingtip clearance. As FAA explains: "[t]he need for ample wingtip clearance is driven by the fact that the pilots of most modern jets cannot see their aircraft's wingtips."[6] For RDC D-III airports, the Taxiway OFA is 186 feet. In turn, the standard for a safe separation between the taxiway centerline and a fixed or movable object on one side of the taxiway is half of the Taxiway OFA, i.e., 93 feet.[7] These separations standards are calculated using the following formula:

(0.7 x (maximum wingspan in the design group)) + 10 = taxiway centerline to object separation

For RDC D-III airports, like ASE, the required separation for taxiway centerline to any fixed or movable object is 93 feet,[8] which is derived by applying the formula and using the maximum wingspan for D-III facilities, i.e., 118 feet.

(0.7 x 118) + 10 = 93 feet

However, the following non-standard conditions still exist at the Airport, subject to approved modifications of the federal standards.

Lateral Separation	FAA Standard	ASE Actual
Runway centerline to adjacent taxiway centerline	400'	320'
Runway centerline to aircraft holding position	328'	272.5'
Taxiway centerline to fixed or movable object	93' on each side of the taxiway centerline	76.5' (eastern side of Taxiway A)

Modification of Standards (MOS)

All Part 139 certified airports are required to adhere to the regulations and requirements of the FAA in order to ensure a high level of safety in air transportation. The FAA develops Advisory Circulars (AC) that provide guidance and information on a variety of topics for institutions, operations, and individuals within the aviation industry, as well as the general public. Advisory Circulars are intended to be informative in nature and not regulatory; however, many times they describe actions or advice that the FAA expects to be implemented or followed. As stated above, those airports operating under a Part 139 certificate as commercial air service airports are *required* to comply with such circulars through their grant assurances. The FAA Advisory Circular that specifically deals with airfield configuration and safety is AC 150/5300-13A - Airport Design, and includes the following statement:

> *"The FAA recommends the standard and recommendations in the AC for use in the design of civil airports. In general, use of this AC is not mandatory. The standards and recommendations contained in this AC may be used by certified airports to satisfy specific requirements of Title 14 Code of Federal Regulations (CFR) Part 139, Certification of Airports, subparts C (Airport Certification Manual) and D (Operations).* ***Use of this AC is mandatory for all projects funded with federal grant monies through the Airport Improvement Program (AIP) and/or with revenue from Passenger Facility Charges (PFC) Program*** *(emphasis added)."*[9]

Almost all of the major infrastructure improvement projects at ASE have been funded using money from the AIP or the PFC programs. The Aspen/Pitkin County Airport has received significant AIP grants over the years that have been used to construct various improvements on the airfield. Therefore, adherence to the Airport Design Advisory Circular was required as a condition of grant assurances for all of the recent airfield improvements at the Aspen/Pitkin County Airport.

Ideally, all airports would be able to meet the all of the design requirements that are specified within the Airport Design Advisory Circular. However, such adherence is often not practical due to various constraints and circumstances that an airport is bound by. The FAA also recognizes this fact as stated in the AC 150/5300-13A – Airport Design regarding existing airports,

> *"Every effort should be made to bring an airport up to current standards. It may not, however, be feasible to meet all current standards at existing airports, and in the case of federal assistance programs, funding of improvements may be subject to FAA criteria."*

This AC goes on to state,

> *"For non-standard conditions associated with such projects, the FAA may consider alternative means of ensuring an* ***acceptable level of safety*** *(emphasis added)."*[10]

These "alternative means" for an acceptable level of safety with non-standard conditions are referred to as MOS.

ASE has several MOS that have been previously approved by the FAA. These modifications have been required to document the non-standard conditions that currently exist at the airport due to the existing mountainous terrain surrounding the airport and limitations on the available space on the airfield to meet all of the FAA geometric design standards, as well as the overall longitudinal gradient of the land on which the airfield resides. Each of these MOS for non-standard conditions at the Airport have been evaluated and approved by the FAA and have demonstrated that such conditions do provide an acceptable level of safety for air transportation.

Second Fixed Base Operation Services (FBO)

The FAA has advised that airport sponsors can maintain compliance with these Grant Assurances in part by maintaining and implementing reasonable minimum standards for commercial aeronautical activities and by negotiating in good faith for the lease of suitable space with those who are willing and qualified to provide commercial aeronautical products and services. While there has been a single FBO operating at the Airport for the last several decades, the County has received informal inquiries from FBO operators preceding the last Master Plan Update about the potential for a second FBO at the Airport. Existing and future Airport users would benefit from certain additional GA facilities. The County accordingly determined that the Master Plan Update should include a detailed examination of the suitability of various areas of the Airport for a second FBO that meets or exceeds the Airport Minimum Standards. These alternatives were identified and examined in the Master Plan Update. The resulting analysis concluded that a second FBO on the Airport would be best situated on the west side of the Airport, north of the Airport Operations Center (AOC).

As part of receiving funds through the FAA Airport Improvement Program (AIP), airport sponsors are required to sign documents that ensure the airport will be used for the public good. These documents are known as grant assurances. Two of the grant assurances pertain to FBOs and minimum standards:

Grant Assurance 22 - Economic Non-Discrimination[11]

a. *(The airport sponsor) will make the airport available as an airport for public use on reasonable terms and without unjust discrimination to all types, kinds and classes of aeronautical activities, including commercial aeronautical activities offering services to the public at the airport.*

b. *In any agreement, contract, lease, or other arrangement under which a right or privilege at the airport is granted to any person, firm, or corporation to conduct or to engage in any aeronautical activity for furnishing services to the public at the airport, the sponsor will insert and enforce provisions requiring the contractor to*

   - *furnish said services on a reasonable, and not unjustly discriminatory, basis to all users thereof, and*
   - *charge reasonable, and not unjustly discriminatory, prices for each unit or service, provided that the contractor may be allowed to make reasonable and nondiscriminatory discounts, rebates, or other similar types of price reductions to volume purchasers.*

c. *Each fixed base operator at the airport shall be subject to the same rates, fees, rentals, and other charges as are uniformly applicable to all other fixed base operators making the same or similar uses of such airport and utilizing the same or similar facilities.*

d. *Each air carrier using such airport shall have the right to service itself or to use any fixed base operator that is authorized or permitted by the airport to serve any air carrier at such airport.*

e. *Each air carrier using such airport (whether as a tenant, non-tenant, or subtenant of another air carrier tenant) shall be subject to such*

nondiscriminatory and substantially comparable rules, regulations, conditions, rates, fees, rentals, and other charges with respect to facilities directly and substantially related to providing air transportation as are applicable to all such air carriers, which make similar use of such airport and utilize similar facilities, subject to reasonable classifications such as tenants or non-tenants and signatory carriers and non-signatory carriers.
Classification or status as tenant or signatory shall not be unreasonably withheld by any airport, provided an air carrier assumes obligations substantially similar to those already imposed on air carriers in such classification or status.

f. *(The airport sponsor) will not exercise or grant any right or privilege that operates to prevent any person, firm, or corporation operating aircraft on the airport from performing any services on its own aircraft with its own employees (including, but not limited to maintenance, repair, and fueling) that it may choose to perform.*

g. *In the event the sponsor itself exercises any of the rights and privileges referred to in this assurance, the services involved will be provided on the same conditions as would apply to the furnishing of such services by commercial aeronautical service providers authorized by the sponsor under these provisions.*

h. *The sponsor may establish such reasonable, and not unjustly discriminatory, conditions to be met by all users of the airport, as may be necessary for the safe and efficient operation of the airport.*

i. *The sponsor may prohibit or limit any given type, kind, or class of aeronautical use of the airport if such action is necessary for the safe operation of the airport, or necessary to serve the civil aviation needs of the public.*

Grant Assurance 23 - Exclusive Rights[12]

(The airport sponsor) will permit no exclusive right for the use of the airport by any person providing, or intending to provide, aeronautical services to the public. For purposes of this paragraph, the providing of the services at an airport by a single fixed based operator shall not be construed as an exclusive right if both of the following apply:

- It would be unreasonably costly, burdensome, or impractical for more than one fixed base operator to provide such services, and
- If allowing more than one fixed base operator to provide such services would require the reduction of space leased pursuant to an existing agreement between such single fixed base operator and such airport.

(The airport sponsor) further agrees that it will not, either directly or indirectly, grant or permit any person, firm, or corporation the exclusive right at the airport to conduct any aeronautical activities, including, but not limited to, charter flights, pilot training, aircraft rental and sightseeing, aerial photography, crop dusting, aerial advertising and surveying, air carrier operations, aircraft sales and services, sale of aviation petroleum products whether or not conducted in conjunction with other aeronautical activity, repair and maintenance of aircraft, sale of aircraft parts, and any other activities that because of their direct relationship to the operation of aircraft can be regarded as an aeronautical activity, and that it will terminate any exclusive right to conduct an aeronautical activity now existing at such an airport before the grant of any assistance under Title 49, United States Code.

Minimum facilities for an FBO in Pitkin County are defined by Title 10 of the Pitkin County Code (Section 10.40.020). The following minimum facilities are required to qualify as an FBO within Pitkin County and to provide such services:

- GA terminal building of exactly 5,000 SF
- Clear span hangar of exactly 14,400 SF
- Maintenance hangar of exactly 5,000 SF
- GA aircraft parking ramp of approximately 280,000 SF
- Paved aircraft tie-down parking area of 22,000 SF for a minimum of 30 spaces
- Motor vehicle parking for 60 vehicles
- Aviation fuel farm with three 20,000-gallon Jet A tanks and one 10,000-gallon Avgas tank

Wingspan Restriction

Section 10.12.030(C) of the Pitkin County Code provides, "No Person shall operate any Aircraft to, from, or on the Airport which has a tip-to-tip wingspan of greater than 95 feet." The Director is authorized to grant exceptions to this restriction for (1) emergencies, (2) immediate and temporary public purposes, and (3) special and temporary events in the public interest.[13] Violation of the prohibition is punishable by a civil penalty of $1,000 per occurrence.[14]

This prohibition has a complex history that is critical to its legal sufficiency and continued viability. In 1998, the County prepared an update to the Airport Layout Plan (ALP) that considered the "non-standard conditions" at the Airport, meaning the physical features of the Airport that did not conform to the FAA's design standards. These design standards are determined based upon the most demanding aircraft that frequently uses an airport or is projected to use an airport. ASE is classified as Runway Design Code (RDC) D-III which would typically allow aircraft with wingspans of 118 feet.[15]

The Airport is physically constrained and cannot satisfy all of FAA's design standards for D-III facilities. In particular, the Airport does not satisfy the FAA's design standards for the lateral separations between the runway and taxiway, between the taxiway and parked aircraft, and between the runway and the locations at which aircraft wait to enter the airfield until receiving permission from the Air Traffic Control Tower (known as the "holding position").

One alternative proposed in the 1998 ALP Update was relocating Taxiway A to achieve a higher level of safety by increasing the separation between the runway and taxiway while maintaining the largest practical apron area for parking and taxiing aircraft. The ALP Update report recommended that the separation between the runway and taxiway be increased from 221.5 feet to 320 feet. While this relocation did increase separation, it did not achieve full compliance with FAA design standards for D-III separation of 400 feet. As a result, the FAA approved a modification to standards for (1) the separation between the runway centerline and taxiway centerline, (2) the taxiway "object free area" on the east side of Taxiway "A", and (3) the separation between the runway centerline and the aircraft holding position.

In determining the maximum separations that could be achieved at the Airport while still providing for safe and efficient operations, the size of aircraft that could operate safely within the proposed airfield configuration had to be considered. The approved modifications to the separation standards only provide an acceptable level of safety when the wingspan of aircraft using the Airport 95 feet or less. Consequently, the MOS were approved by the FAA contingent on the County's adoption of an ordinance limiting operations at the Airport to aircraft with wingspans 95 feet or less.

The precise language of the ALP Update report has become quite important, and provides in relevant part:

"Although the proposal [for a taxiway centerline at a separation of 320 feet from the runway centerline] does not meet criteria for all of Design Group III, the County is prepared to enact an ordinance restricting aircraft with wingspans greater than 95 feet. . . . This 95-foot restriction will establish that this modification is contingent upon the ordinance being enacted and that the modified standard applies only to operations by aircraft with wingspans less than 95 feet. Should regular operations by a larger aircraft occur, the modification would be rescinded and the airport would be required to meet the standard separation. This will ensure the airport meets the [Runway Object Free Area] standard even at the busiest times."[16]

The Board of County Commissioners (BOCC) adopted the required ordinance on October 3, 2001.[17] In 2005, the BOCC adopted a resolution reaffirming the wingspan restriction and requiring that the restriction be codified as part of amendments to Title 10 of the County Code then under consideration.[18] The prohibition, its exceptions, and the penalty for violation now are codified in the Code provisions referenced above.

The County is authorized to regulate use of the Airport pursuant to the Pitkin County Home Rule Charter or as an express delegation under state law.[19] While the FAA prescribes airport design standards and regulates airspace, pilots, and aircraft, the FAA traditionally does not impose airport-specific rules on the operation of aircraft, such as the limitation on wingspan. This division of responsibility accounts for why the FAA approved the modifications to standards contingent upon the County's adoption and enforcement of a restriction on aircraft wingspan.

The County's authority to impose and enforce the restriction is constrained in two meaningful ways. First, the County is subject to an obligation under the Grant Assurances to "make the airport available as an airport for public use on reasonable terms and without unjust discrimination to all types, kinds and classes of aeronautical activities, including commercial aeronautical activities offering services to the public at the airport."[20] The FAA acknowledges the airport sponsor's right to limit use of an airport under the following circumstances:

- The sponsor may establish such reasonable, and not unjustly discriminatory, conditions to be met by all users of the airport as may be necessary for the safe and efficient operation of the airport.[21]
- The sponsor may prohibit or limit any given type, kind, or class of aeronautical use of the airport if such action is necessary for the safe operation of the airport or necessary to serve the civil aviation needs of the public.[22]

The fact that the wingspan restriction was adopted as a condition of FAA's approval of the modifications to standards and is based upon an engineering assessment as to the safety and efficiency of the Airport, strongly supports the conclusion that the restriction is consistent with

Grant Assurance 22. Nevertheless, as described more fully below, the owner or operator of a large aircraft could argue that the restriction is unreasonable or unjustly discriminatory and therefore in violation of Grant Assurance 22.

The second meaningful constraint on the County's authority is federal law, particularly the prohibition on any "law, regulation, or other provision having the force and effect of law related to a price, route, or service of an air carrier."[23] The wingspan restriction should be considered by the "proprietor's exception," which acknowledges that preemption does not limit a unit of government "carrying out its proprietary powers and rights."[24] However, the courts have found that the proprietor's exception only extends to those restrictions that are reasonable, non-arbitrary, and not unjustly discriminatory, a virtually identical standard to that imposed by the Grant Assurances.[25]

The wingspan restriction has been non-controversial for many years. We are not aware of any violations of the restriction. However, ASE has received requests for temporary exceptions, none of which have been granted. This is due in part to the fact that many larger aircraft are excluded from using the Airport by virtue of the wingspan restriction and the weight-based restriction (barring aircraft with a maximum allowable landing weight greater than 100,000 pounds). Unlike restrictions based on wingspan, which are quite rare, restrictions based on weight are common and commonly-accepted as a legitimate basis upon which to restrict airport access.[26] Aircraft manufacturers have made inquiries to the FAA over the last decade about the ability of certain aircraft types to operate at the Airport; however, the aircraft in question were so vastly over the wingspan and weight restrictions that the discussions did not advance.

Currently there are three aircraft in the research and design or production stage that have wingspans greater than 95 feet but allowable landing weight less than 100,000 pounds. These include the Gulfstream 650, the Bombardier Global 7000/8000, and the Mitsubishi MRJ90. The FAA certified the Gulfstream 650 in September 2012, and these aircraft are being manufactured and delivered.

Initially there was some uncertainty about whether the Gulfstream 650 complied with the County Code, since Gulfstream reports the wingspan in its technical specifications to be less than 95 feet. However, the FAA has since advised that the measured wingspan of an aircraft includes winglets, and, according to both the FAA and Gulfstream, the wingspan of the G650 including winglets is greater than 95 feet.[27] According to Gulfstream's technical specifications, the wingspan of the G650, including winglets, is 99 feet 7 inches.[28]

Master Plan

The Airport 20-year Master Plan Update was adopted in December 2012. The study examined future uses of the entire airport property, with a specific concentration on the terminal area. Other items under consideration include general aviation uses such as hangar development and fixed base operation services. In addition, the Airport has worked diligently with other agencies and departments with specific regard to transit/transportation issues.

Throughout the process, the Airport undertook an extensive outreach process to engage the public and seek guidance from the BOCC. One of the primary purposes of the Master Plan is to identify a program that will allow for the most efficient use of the airport's land resource, in consideration of financial realities and community sensitivities concerning the Airport. The FAA provided perspective on several key issues, many of which were related to the Master Plan, including uses on the airport and federal grant assurances.

Meetings were held with several key committees, including the Pitkin County Financial Advisory Board and the Pitkin County Planning and Zoning Commission, to review and comment on the document. Extensive public involvement was conducted. Several of the final recommendations were developed through the public charrette process that provided citizens, interested parties, and adjacent landowners an opportunity to express community values and develop layout concepts. Other public outreach efforts included the formation of a Study Committee, Open Houses, Agency presentations, civic and community group presentations, airport tours, and other means.

The adopted Master Plan provided for a new commercial terminal and transportation center, improved roadway system, and west-side general aviation services. In August 2013, the FAA approved the ALP reflecting the Master Plan improvements with the following exception, *"The FAA's approval of this ALP does not apply to the proposed runway/taxiway separation*

distance of 320 feet on the west side of Runway 15/33. FAA is evaluating this nonstandard separation distance and will continue to coordinate the issue with Pitkin County." [29]

Along with FAA's conditional approval of the ALP, and as the Master Plan concluded, air carrier industry trends were indicating a shift to replace the smaller commercial regional jet fleet with newer, advanced aircraft that provided reduced environmental impacts and a stronger financial benefit for air carriers. This advancement in commercial service aircraft was also occurring with the development and production of newer generation aircraft serving the general aviation market. With the trending of commercial service carriers toward a new generation of aircraft that exceeds the current 95-foot wingspan restriction, the Airport recognized the need to consider such changes and began the evaluation of impacts with the Future Air Service Planning Study discussed below.

Future Air Service Planning Study

In May 2013, the Airport presented an Air Service Report to the BOCC. It was designed to identify current air service trends and challenges for the ASE market. At the conclusion of the study, it was recommended that the BOCC consider evaluating the impact of changing fleet design and technology as it relates to ASE's air service. At that time, the BOCC directed staff to develop the parameters of such a study.

In June 2013, a study concept was presented to address the following questions:

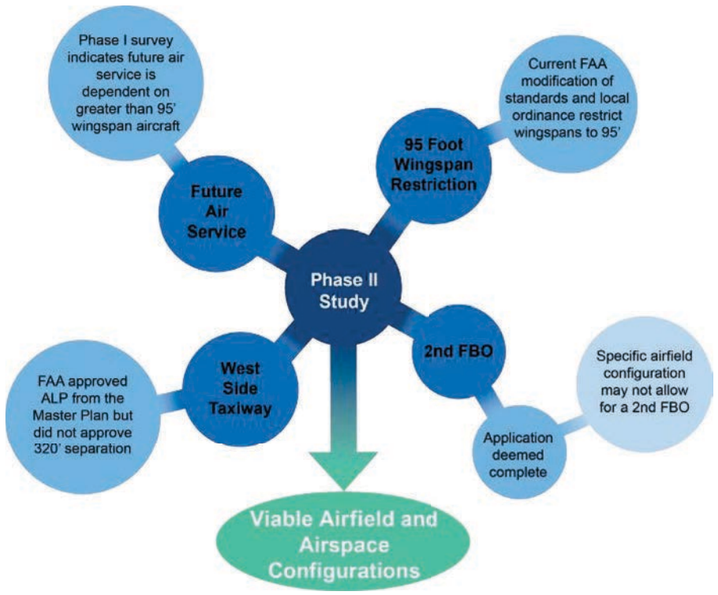
- What is the changing technology of future aircraft serving ASE?
- What can ASE do to best sustain future air service?
- How would ASE accommodate these operations?
- What are the impacts and benefits to the airport and community?
- What is best for the future health of the community?

To answer these questions, a phased approach was developed. The study was designed to progress in a sequentially phased approach that allowed the BOCC to begin the next phase, following the completion of the prior phase, or discontinue the study based on the findings. The phases were identified as follows:

Phase I

- Evaluation of current and future regional jets and their ability to operate at ASE
- Consideration of future fleet mix and impacts on air service development at ASE
- Presentation to the BOCC, decision point to scope and continue onto Phase II

Figure 1



Phase II

- Review of regulatory environment
- Analysis of airfield and airspace configuration
- Feasibility analysis of different options to ensure future commercial air service to ASE (including likelihood of community support, cost, compliance with FAA regulations, etc.)
- Presentation to BOCC, decision point to scope and continue to Phase III

Phase III

- Gathering of community input regarding options identified in Phase II
- Prioritization of options for BOCC consideration
- Final recommendations
- BOCC consideration and final direction

Study Implications

It has become readily apparent that both the timing and findings of the overall study have identified several factors that will impact the Airport's future viability. Understanding the future commercial service fleet mix and aircraft wingspan impacts to the future runway and taxiway separation is essential. The established separations will have direct impact on the future key airport facilities and infrastructure, including the second FBO on the west side. Knowing the FBO location and footprint provides necessary information for the County to issue a Request for Proposals for such operations in the future.

- **Current 95-foot Wingspan Restriction:** The current restriction is recognized under an FAA Modification to Standards and Pitkin County, Title 10.
- **Second FBO:** The ability to provide an economically viable FBO operation is dependent upon a west-side taxiway and its location.
- **West-side Taxiway:** FAA has approved the new ALP as promulgated through the Master Plan but did not approve the 320-foot west-side taxiway separation.
- **Future Air Service:** Phase I of the Study identified significant industry trends that potentially jeopardize future commercial air service to ASE, requiring aircraft larger than 95 feet.

Given these overlapping factors, it is essential to thoroughly evaluate and address the Phase II airfield and airspace configurations in order to define the critical path for key Airport components moving forward, including the runway, taxiways, commercial terminal, air carrier gates, ramp locations, and the second FBO.

Phase I

Phase I of the Study was completed and presented to the BOCC in November 2013 and is summarized as follows.

Introduction

The intent of this phase of the study was to review and identify aircraft types in relation to ASE's future air service viability. Industry trends indicate that current aircraft capable of serving ASE are in high demand and short supply but new aircraft such as the Bombardier CSeries, Embraer E175-E2 and Mitsubishi Regional Jet (MRJ) are on the horizon and coming into service in greater numbers. The CSeries is expected to enter service in 2014, the Embraer E175-E2 in 2018, and the Mitsubishi MRJ in 2017. This next generation of regional aircraft being developed will likely have the performance ability to operate at ASE and will be further reviewed for operational compatibility as they come into service in the U.S.

Phase I goals focused on three key areas:

- Aviation industry trends
- The changing technology of future regional jet aircraft that may be capable of serving ASE
- Actions that should be considered to sustain future air service

This phase of the study focused primarily on relevant industry trends and identifying potential regional jet aircraft that could provide commercial service to ASE in the future if deemed capable given ASE's unique operational characteristics, including the above mean sea level altitude, runway length, surrounding terrain, and pilot training requirements. In addition to the physical constraints of the airport, the regional jet aircraft identified in this study were evaluated for compliance with the County-imposed 95-foot wingspan restriction on the airport.

Industry Trends

Historically, ASE has had commercial service on regional aircraft with seating capacity exceeding the 70-seat CRJ-700 and more in line with the next generation of regional jets that will be put into service in the coming years. ASE has accommodated regional jet aircraft with as many as 100 seats (BAe-146). Though scheduled service records are not included past 1990, the BAe-146 did not operate in the U.S. past 2006 but served ASE for over a decade.

Each year the FAA publishes the *FAA Aerospace Forecasts*. The forecasts provide guidance on national trends that may impact local air service development efforts. The current edition of this annual forecast is *FAA Aerospace Forecasts-Fiscal Years 2013-2033*. The following are relevant excerpts from this document:

- Since the beginning of the century, the commercial air carrier industry has suffered several major shocks that have led to reduced demand for air travel. These shocks include the terrorist attacks of September 11, skyrocketing prices for fuel, debt restructuring in Europe and the U.S., and a global recession.
- To manage this period of extreme volatility, air carriers have fine-tuned their business models with the aim of minimizing financial losses by **lowering operating costs, eliminating unprofitable routes and grounding older, less fuel efficient aircraft**. To increase operating revenues, carriers have initiated new services that customers are willing to purchase. Carriers have also started charging separately for services that were historically bundled in the price of a ticket.
- The capacity discipline exhibited by carriers and their focus on additional revenue streams bolstered the industry to profitability in 2012 for the third consecutive year.
- Going into the next decade, there is cautious optimism that the industry has been transformed from that of a boom-to-bust cycle to one of sustainable profits.
- The 2013 FAA forecast calls for U.S. carrier passenger growth over the next 20 years to average 2.2 percent per year.
- System capacity in available seat miles (ASMs)—the overall yardstick for how busy aviation is both domestically and internationally—is projected to shrink by 0.1 percent this year after posting a 0.1 percent increase in 2012; it will then grow at an average annual rate of 2.9 percent through 2033.
- In the domestic market, capacity growth hovers around zero for the second year in a row. Domestic capacity is projected to grow at an average annual rate of 2.1 percent for the remainder of the forecast period.
- For the regional carriers, domestic capacity growth is also projected to be flat in 2013 after declining 4.3 percent in 2012.
- Domestic enplanements in 2013 will decrease 0.1 percent, and then grow at an average annual rate of 2.0 percent for the remainder of the forecast.

Beyond the limitations on growth, the industry has also gone through large scale changes in onboard service amenities and is in the process of phasing out smaller regional jets. Many carriers "unbundled" services that used to be free. Checked baggage fees, paying for food and drink onboard, fuel surcharges, and other fees are designed to keep the airline's fare competitive with the low-cost carriers yet, at the same time, bring in a new stream of ancillary revenue to help offset cost increases and lagging ticket revenues. Airlines are also continuing efforts to lower costs. With fuel costs rising significantly beginning in 2008, fuel management programs and other process efficiencies including keeping airport costs in check help lower costs.

The outlook is for more of the same as airlines wait for sustained economic improvement and stabilized energy prices. Look for the airlines to potentially cut capacity depending on fuel prices and the economy, and be aggressive in moving underperforming service into new routes or stronger performing routes. Cost cutting and fuel saving programs continue to be at the top of every airline's agenda.

Regional Jet Trends

Many of the oldest 50-seat or smaller regional jets have reached their 15-to-17-year lifecycle and are being phased out. Bombardier CRJs have life-limiting parts which preclude them from flying past a certain age based on the number of cycles or hours. There is currently no replacement for the 50-seat or smaller regional jet on the horizon. Orders have shifted to the larger regional jets as the manufacturers are currently targeting new narrow-body aircraft and larger regional jets. Internal forecasts show little demand for aircraft below 70 seats. Though the first generation of Bombardier regional jets introduced in the early 1990s were incapable of efficiently serving the ASE market, it is worth noting that these aircraft have begun to be phased out and are being replaced by the CRJ-700. Scheduled flights for this fleet type peaked in 2004, a decade after initially coming into service, with 25 percent fewer flights today. Indications from the manufacturer are that the CRJ-700s useful flying cycle should be similar to the 50-seat CRJ-100 and CRJ-200.

As 70-seat aircraft are phased in to replace aging 50-seat aircraft, in general, market frequencies will likely decline to keep capacity neutral. Adverse 50-seat regional jet economics may cause cancellation of service in some markets that could subsequently be reinstated as additional 70-seat regional jets become available. This market shift away from the first generation of smaller regional jets is an important industry trend for ASE as it indicates the CRJ-700 is in high demand and will be approaching its limited flying cycle sometime in the next decade. Over 50 percent of U.S. CRJ-700 deliveries occurred by 2004. With an anticipated 20-year useful life cycle, it is expected that the majority of CRJ-700 operations will begin to significantly decline in the coming decade, by 2024.

With the CRJ-700 and Q-400 (turboprop) as the only viable aircraft with the ability to serve ASE mostly unrestricted today, ASE's future air service recruitment and retention efforts may be limited over the next decade. Though the CRJ-700 is technically still in production and expected to be in service for the foreseeable future, recent aircraft order trends indicate that other aircraft such as the E-175-E2 and MRJ are coming into the

pipeline in greater numbers. This next generation of regional jet aircraft should be considered as viable replacements to the CRJ-700 and Q-400 in operation today.

Bombardier, Embraer and other regional jet manufacturers are in the process of introducing a new generation of regional jet aircraft in the larger regional jet market. One of these next generation regional jets comes in the form of new Bombardier aircraft types, the CS100 and CS300, which currently are entering the production phase with the first deliveries to follow shortly. As of June 2013 there are up to 388 orders/commitments from 15 customers around the world for these new Bombardier aircraft types, including the U.S.-based launch customer Republic Airways.

Phase I Conclusions and Recommendations

Longer term air service development considerations suggest that it is appropriate to review all options, if any, to secure future air service viability by revising locally imposed operating restrictions. Such a review must take into consideration the needs of the community balanced with the realities of today's commercial air service opportunities. If improvements in these areas are operationally and economically feasible, a favorable impact on long-term air service may result. Looking forward, the next generation of aircraft to replace the CRJ-700 and other aging regional jets includes the CSeries by Bombardier, the E175-E2 by Embraer, and the Mitsubishi MRJ-70/90. Each of these new regional jet types have improved operating characteristics achieved in part by expanding the size of the wing.

To remain a viable air service market in the future, limit risks and to accommodate changing regional jet specifications, it was recommended to proceed with Phase II of the *ASE Future Air Service Planning Study*. Phase II includes a review of the regulatory environment and assessment of the options available to accommodate the next generation of regional aircraft.

Table 1: Aircraft Technical Specifications

Aircraft Type	Wingspan		Max LW (Lbs.)	ASE Performance Capable	Meets/Does Not Meet Current Operational Restrictions
	Feet/Inches	Meters			
Current Regional Aircraft					
CRJ-700	76' 3"	23.2	67,000	Yes	Meets
Q-400	93' 3"	28.4	62,000	Yes	Meets
CRJ-900	81' 7"	24.9	73,500	No	Meets
CRJ-1000	85' 11"	26.2	81,500	No	Meets
E-170	85' 4"	26	72,312	No	Meets
E-175	85' 4"	26	74,957	No	Meets
E-190	94' 3"	28.7	94,799	No	Meets
E-195	94' 3"	28.7	99,208	No	Meets
Future Regional Aircraft					
E175-E2	101' 8"	31	86,201	Yes*	Does Not Meet
E190-E2	110' 7"	33.7	107,431	Yes*	Does Not Meet
E195-E2	110' 7"	33.7	116,911	TBD*	Does Not Meet
MRJ-70 Standard	95' 9"	29.2	79,807	TBD	Does Not Meet
MRJ-90 Standard	95' 9"	29.2	83,776	TBD	Does Not Meet
CS100 Base	115' 1"	35.1	110,000	Yes	Does Not Meet
CS300 Base	115' 1"	35.1	121,500	Yes	Does Not Meet

*Source: Manufacturers; *E-Jets E2 data are preliminary*

Phase II

In December 2013, the BOCC authorized Phase II of the study to proceed. This document constitutes the final Phase II report and details all findings for the goals discussed below. This phase focused on three primary goals:

- Meet or improve FAA standards of safety, efficiency, and operational capacity.
- Minimize the impact on the facilities previously approved in the 2012 Master Plan Update.
- Accommodate larger future commercial regional aircraft.

To address these goals and the intent of the study, the following project scope was developed and approved by the BOCC and included the following:

- Review of regulatory environment.
- Analysis of airfield and airspace configuration.
- Feasibility analysis of different options to ensure future commercial air service to ASE (including likelihood of community support, cost, compliance with FAA regulations, etc.).
- Presentations to BOCC including draft alternatives and decision point regarding scope and decision regarding Phase III.

This phase of the study provides a conceptual level evaluation for proposed airfield reconfiguration alternatives. These conceptual designs analyzed alternatives in sufficient detail to identify preliminary airspace, and regulatory considerations, as well as provide preliminary cost estimates, of viable options. These various items in the Phase II study are described in more detail in the following paragraphs.

Step A

Step A of Phase II included analysis for each of the initial nine alternatives as follows:

- ✓ Evaluated initial airfield configurations alternative
- ✓ Evaluated viability of west side Fixed Base Operator (FBO)
- ✓ Considered potential MOS required for each alternative
- ✓ Evaluated Runway 15 approach surface impacts and airspace impacts
- ✓ Studied preliminary impacts to Owl Creek Road

The Step A conclusion meeting was held on February 18, 2014 to refine alternatives based upon the study objectives. Six alternatives were carried forward to Step B, while three alternatives were removed. Four new alternatives were created to also be analyzed during Step B.

Step B

Step B considered ten alternatives resulting from the Step A meeting. New alternatives were developed and analyzed using Step A criteria. Additional analysis was performed on each remaining alternative:

- ✓ Assessed impacts to Master Plan and future aircraft parking areas
- ✓ Refined impacts to Owl Creek Road and adjacent property
- ✓ Evaluated impacts to Highway 82 Right-of-Way
- ✓ Considered impact of meeting FAA standards for east side Taxiway Object Free Area and runway holdbar distances

The Step B conclusion meeting held on April 3, 2014 further refined alternatives. Three alternatives were carried forward to Step C, while seven alternatives were removed. Three new alternatives were developed for Step C evaluation.

Step C

As a result of the Step B meeting, six alternatives were further developed and evaluated utilizing analysis from Steps A and B. In addition, the following analysis performed on each of the remaining alternatives:

- ✓ Evaluated approach surface for Runway 33
- ✓ Refined impacts and improvements to Owl Creek Road
- ✓ Developed conceptual construction phasing
- ✓ Produced conceptual economic impacts from construction
- ✓ Evaluated approach and departure procedures for existing and proposed runway locations
- ✓ Identified potential items requiring local and federal approval

A meeting for the conclusion of Step C was held on May 30, 2014. One alternative was slightly modified and carried forward to Step D as a new alternative. A previously removed alternative from Step B was restored but slightly modified to be carried forward to Step D as a new alternative. The six alternatives presented at the Step C meeting were removed from the study.

Step D

Two remaining alternatives as a result from Step C underwent a more detailed evaluation and design in order to understand impact and cost.

- ✓ Developed conceptual design elements (grading, drainage, utilities, etc.)
- ✓ Produced conceptual cost estimates
- ✓ Explored feasibility of these alternatives
- ✓ Prepared Final Report for Phase II Future Air Service Study
- ✓ Prepared BOCC presentation

The following Phase II study analysis is a result of a systematic review and filtering of potential alternatives under the background constraints and criteria components stated above.

Sources

[1] *2013 Economic Impact Study for Colorado Airports,* Colorado Department of Transportation, Division of Aeronautics.

[2] FAA Advisory Circular 150/5300-13A at Tables 1-1 and 1-2.

[3] FAA Advisory Circular 150/5300-13A at ¶ 320 (a)(2).

[4] FAA Advisory Circular 150/5300-13A at Appendix 7, Table A7-9.

[5] FAA Advisory Circular 150/5300-13A at ¶ 315(a).

[6] FAA Advisory Circular 150/5300-13A at ¶ 404(a).

[7] FAA Advisory Circular 150/5300-13A at Table 4-1.

[8] FAA Advisory Circular 150/5300-13A at Table 4-1.

[9] FAA Advisory Circular 150/5300-13A, Page i

[10] FAA Advisory Circular 150/5300-13A, Pages 1, 2

[11] Statutory Reference: 49 U.S.C. 47107/Regulatory Reference 14 CFR Parts 150-169

[12] Statutory Reference: 49 U.S.C. 47107/Regulatory Reference 14 CFR Parts 150-169

[13] Pitkin County Code Section 10.12.030(H).

[14] Pitkin County Code Section 10.32.010.

[15] D-III aircraft include aircraft with an approach speed between 121 knots and 141 knots, tail height between 30 feet and 45 feet, and wingspan between 79 feet and 118 feet. FAA Advisory Circular 150/5300-13A - *Airport Design* at Table 1-2.

[16] ALP Update at IV-20.

[17] Pitkin County Ordinance 041-2001.

[18] Pitkin County Resolution 108-2005.

[19] *See* C.R.S. § 41-4-106 ("In connection with the erection, maintenance, and operation of any such airport or navigation facilities, any county has the power and jurisdiction, when acting singly, or by agreement, when acting jointly with any other county, city and county, city, or town, to . . . provide rules and regulations governing the use of such airport and facilities and the use of other property and means of transportation within or over said airport, landing field, and navigation facilities . . .").

[20] Grant Assurance 22(a).

[21] Grant Assurance 22(h).

[22] Grant Assurance 22(i).

[23] 49 U.S.C. § 41713(b)(1). Although this provision applies only to "air carriers" and therefore would not be a bar to the regulation of general aviation users, there are additional theories of preemption that have been accepted by courts, including that federal law preempts the field of aviation safety. *See Township of Tinicum v. City of Philadelphia*, 737 F. Supp. 2d 367, 375-379 (E.D. Pa. 2010) (appeal pending) and cases cited therein.

[24] 49 U.S.C. § 41713(b)(3).

[25] *See Arapahoe County Public Airport Authority v. FAA*, 242 F.3d 1213, 1222 (10th Cir. 2001) ("The preemption provision does not, however, prevent a state or political subdivision of a state from carrying out its 'proprietary powers,' 49 U.S.C. § 41713(b)(3), so long as the exercise of proprietary powers is reasonable, nondiscriminatory, nonburdensome to interstate commerce, and designed not to conflict with the Airline Deregulation Act and its policies.").

[26] *See* FAA, Notice of Proposed Policy, *Weight-Based Restrictions at Airports,* 68 Fed. Reg. 39,176 (2003).

[27] *See* FAA Advisory Circular 150/5300-13A - *Airport Design* at 102 (dddd). (Wingspan is "The maximum horizontal distance from one wingtip to the other wingtip, including the horizontal component of any extensions, such as winglets or raked wingtips.")

[28] As reflected in Attachment "A", the wingspan of the Bombardier Global 7000/8000 is 104 feet 3 inches, and the wingspan of the Mitsubishi MRJ90 is 95 feet 11 inches.

[29] Bauer, John, letter to Jim Elwood, August 6, 2013, Aspen, Colorado.

Alternatives Analysis

Throughout the four step process of this study as described previously in the Study Overview section, all the alternatives were narrowed using the three main objectives of the study. Table 1 shows the specific narrowing process of each alternative for each step. Please see the subsequent sections (Step A through Step D) for specific summaries of each step in its entirety.

Table 1: Alternative Refinement

Alternative	Study Step/Meeting			
	STEP A FEBRUARY 18, 2014 MEETING	STEP B APRIL 3, 2014 MEETING	STEP C MAY 30, 2014 MEETING	STEP D JUNE 24, 2014 FINAL REPORT
ALTERNATIVE 1	☑	☑	☒	
ALTERNATIVE 2	☑	☒		
ALTERNATIVE 3	☑	☒		
ALTERNATIVE 4	☑	☑	☒	
ALTERNATIVE 5	☑	☑	☒	
ALTERNATIVE 5a		☑	☑	☒
ALTERNATIVE 6	☑	☑	☑	☒
ALTERNATIVE 7	☑	☑	☒	
ALTERNATIVE 7a		☑	☒	
ALTERNATIVE 7b		☑	☒	
ALTERNATIVE 8	☑	☑	☒	
ALTERNATIVE 8a				☑
ALTERNATIVE 9	☑	☒		
ALTERNATIVE 10		☑	☑	☒
ALTERNATIVE 11			☑	☒
ALTERNATIVE 12			☑	☒
ALTERNATIVE 12a				☑
ALTERNATIVE 13			☑	☒

☑ Viable Alternative
☑ Viable Alternative Carried Forward from Previous Step
☒ Alternative Eliminated during Previous Step

Preliminary Alternatives

Potential airfield reconfiguration alternatives, to accommodate future commercial aircraft, were developed by the Aspen/Pitkin County Airport, Jviation, and William E. Payne & Associates in collaboration with the FAA Division of Airports and Air Traffic. The proposed airfield layouts for ultimate service to the Aspen/Pitkin County Airport were developed with the purpose of maintaining the safety, efficiency, and operational capacity of the airport into the future. In addition, consideration was given to the current airfield configuration with the approved FAA modification to standard for Runway/Taxiway (RW/TW) separation of 320' and the FAA required separation of 400' for airports serving aircraft with wingspans between 79' and 118'. Finally, FAA safety zones required for the safe maneuvering of aircraft on the ground such as runway safety areas (RSA's), runway object free areas (ROFA's), taxiway safety areas (TSA's) and taxiway object free areas (TOFA's) were identified with any proposed airport improvement. Initially, the following nine (9) alternatives were evaluated for the Future Air Service Planning Study (Phase II) at the Aspen/Pitkin County Airport.

- **Alternative 1 –** Construct a new parallel taxiway 320' west of the existing runway and leave the existing runway and east side parallel taxiway in place
  - » Configuration is as shown on 2013 Master Plan and ALP
  - » Meets current Pitkin County Code and FAA RW/TW separation modification to standard of 320' for the east and west side taxiways
- **Alternative 2 –** Construct a new parallel taxiway 350' west of the existing runway and leave the existing runway and east side parallel taxiway in place
  - » Would require new FAA modification to standard (350' RW/TW separation) for the west side taxiway
  - » Meets current approved FAA RW/TW separation modification to standard of 320' for the east side taxiway
- **Alternative 3 –** Construct a new parallel taxiway 400' west of the existing runway
  - » Would meet FAA standard for RW/TW separation for the west side taxiway
  - » Meets current approved FAA RW/TW separation modification to standard of 320' for the east side taxiway
- **Alternative 4 –** Shift east side parallel taxiway (Taxiway "A") 80' east, and construct a new parallel taxiway 400' west of the existing runway
  - » Meets FAA RW/TW separation standards for the east and west side taxiways
- **Alternative 5 –** Shift Runway 15/33 30' west and construct a new parallel taxiway 350' west of the relocated runway
  - » Would require new FAA modification to standard (350' RW/TW separation) for the east and west side taxiways
- **Alternative 6 –** Shift Runway 15/33 80' west and the west side "teacup" taxiways on the south end of the runway 160' west with no west side parallel taxiway or FBO
  - » Meets FAA RW/TW separation standards for the east
- **Alternative 7 –** Shift Runway 15/33 80' west and construct a partial parallel taxiway at 400' west of the relocated runway with a midfield runway crossing for access to the west side
  - » Meets FAA RW/TW separation standards for the east and west side taxiways
  - » Conflicts with FAA recommendation to limit runway crossings
- **Alternative 8 –** Shift Runway 15/33 80' west and construct a new parallel taxiway at 400' west of the relocated runway
  - » Meets FAA RW/TW separation standards for the east and west side taxiways
- **Alternative 9 –** Hold Runway 15 threshold and shift Runway 33 threshold 20' west and construct a new parallel taxiway at 350' west of the angled runway; existing east side parallel Taxiway "A" separation from the runway varies from 330' to 377'
  - » Would require multiple new FAA modifications to standard (330'-377' RW/TW separation) for the east and west side taxiways
  - » Runway 15/33 would not be parallel with any of the existing airport infrastructure

Once all the preliminary alternatives were identified, they were to incorporate, to the extent possible, new guidance from the FAA on airfield design and Modifications to Standards. Graphical layouts of each alternative compared to the existing airport layout and cross sections were produced at critical points on the airfield. In addition, the approach surface for Runway 15 was evaluated for any obstruction penetrations. The results of Step A findings are explained below. Each alternative can be viewed in its entirety in Appendix A.

Major Impact Evaluation

High level evaluations of major impacts were identified for each alternative. Major impacts to airport approach Navigational Aids (NAVAIDs), existing east and west side infrastructure, the Airport Operations Center (AOC), and existing Owl Creek were included.

Approach NAVAIDs

NAVAIDs are located at both ends of Runway 15/33 that help aircraft maintain the correct horizontal alignment while on approach. On the north end of the runway is the approach lighting system, while on the south is the Localizer Antenna and Distance Measuring Equipment (DME). These systems are located on the runway centerline; therefore a relocation of each system will be associated with any runway shift or realignment (Alternatives 5 through 9). Figure A-1 shows an 80' runway shift and relocated approach NAVAIDs systems associated with Alternative 8.

Figure A-1: Approach NAVAIDs Relocation (Appendix B, Alternative 8, Sheet 1 of 4)

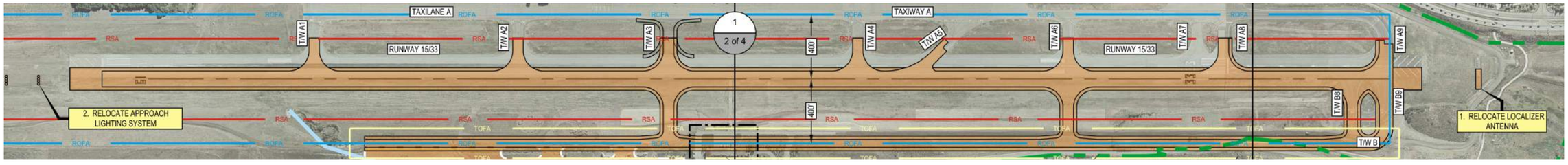
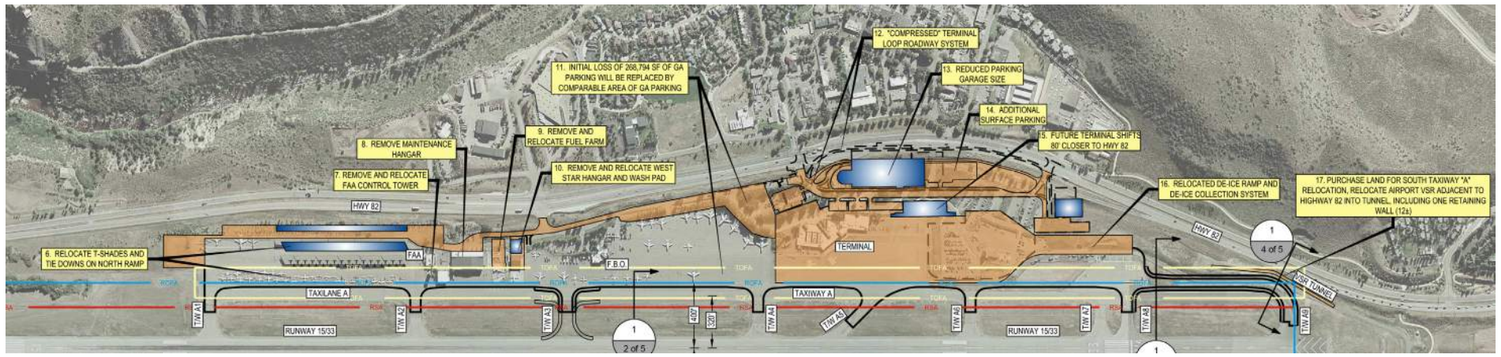


Figure A-2: East Side Impacts (Appendix B, Alternative 4, Sheet 1 of 5)



East Side Infrastructure

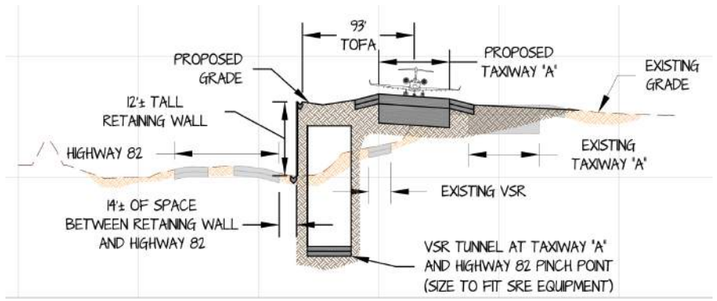
All existing infrastructure which provides service to the flying public is constrained between Taxiway "A" and State Highway 82. Due to the community presence, limited space, and potential cost, this study does not recommend any reconfiguration east of the existing airport property line.

Alternative 4 (see Figure A-2) is the only proposed option which poses any significant impact to the east side infrastructure. Due to Taxiway "A" shifting 80' east into the existing ramp, extensive reconfiguration is required to provide an area that is operational for aircraft and the airport. The largest impact to the existing infrastructure would be the removal and relocation of the FAA air traffic control tower. In addition, the T-shade hangars and tie downs on the North GA Ramp, the maintenance hangar, fuel farm, and WestStar hangar and wash pad will be required to be removed and relocated due the encroachment of the shifted Taxiway "A" OFA.

With Taxiway "A" moving further east, ramp space is lost on the North GA, South GA, and Commercial Ramps. To accommodate for the lost ramp space on the North and South GA Ramps, additional ramp is shown north and east of the existing GA ramps for potential usable aircraft parking. The commercial ramp loses a substantial amount of spaced compared to the ultimate Terminal Area Plan (TAP) as approved in the current Master Plan. To provide for sufficient parking space on the commercial apron for aircraft, the proposed TAP was compressed by 80'. This shifted the proposed terminal 80' east, and compressed the terminal loop and roadway system. In addition, the proposed transit center was decreased in footprint size, and the surface parking was reconfigured. Ultimately, this Alternative would decrease commercial ramp space by 13' along Taxiway "A" as compared to the current Master Plan. Lastly, additional ramp space is shown on the deice pad to provide a comparable area for deice operations.

Under Alternative 4, Taxiway "A9," which is the entrance taxiway to Runway 33 and where the majority of departing operations take place, encroaches on the Highway 82 right-of-way. In order to accommodate the airport VSR in this area, a tunnel beneath Taxiway "A" and a 14' retaining wall along Highway 82 were proposed to account for the change in grade. Figure A-3 depicts the VSR tunnel and retaining wall for Alternative 4.

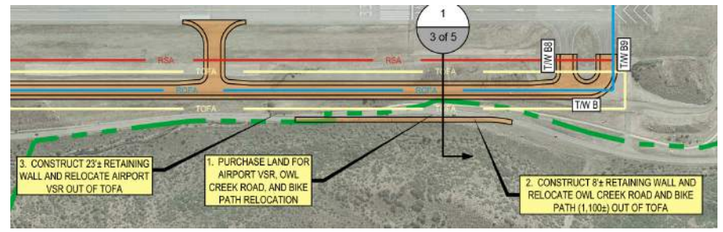
Figure A-3: Alternative 4 East VSR Tunnel and Retaining Wall (Appendix B, Alternative 4, Sheet 4 of 5)



West Side Infrastructure

The southwest side of the airport poses critical impacts for all alternatives. The airport vehicle service road (VSR), existing Owl Creek bike path, and Owl Creek Road are all located in a narrow envelope between rugged terrain and the airfield. This area evaluated is the location where Owl Creek Road is the closest to the airfield, at approximately Taxiway "A8" just south of the Runway 33 threshold, as this area has the largest impact on non-airport infrastructure. Redefined OFA's for the runway and taxiway, associated with a runway shift or west side parallel taxiway, will require relocation of the airport VSR, the Owl Creek bike path, and Owl Creek Road. Land acquisition may be required to accommodate the new locations of Owl Creek Road and Owl Creek bike path. In order to maintain FAA design criteria for the new runway and taxiway locations, extensive grading operations will be required. For all the alternatives, the airport VSR will be lowered and relocated outside of the west TOFA. Owl Creek Road along with the bike path will be relocated in Alternatives 2 through 5, 8, and 9. The length of relocation of Owl Creek Road ranges from 700' to 2,700', which is dependent upon encroachment of the new west side TOFA on existing infrastructure. Figure A-4 provides a medium impact scenario under Alternative 4, with approximately 1,100' of road to relocate. Alternative 1, which is the layout reflected in the current Master Plan, will not require a relocation of the bike path and Owl Creek Road. Although Alternatives 6 and 7 do not require relocation of Owl Creek Road, the bike path will require relocation around the proposed Taxiway "B" TOFA.

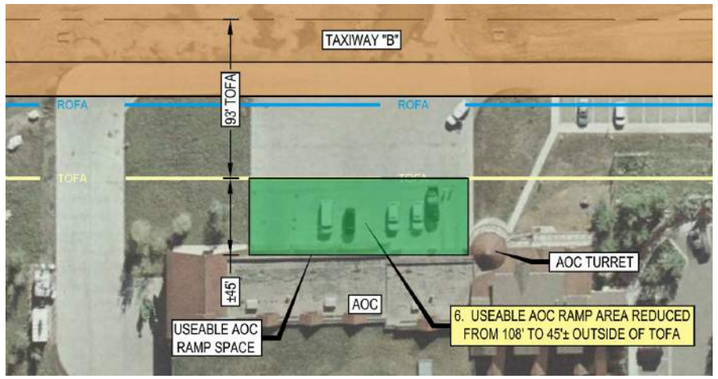
Figure A-4: Existing West Side Infrastructure Impacts (Appendix B, Alternative 4, Sheet 1 of 5)



Airport Operations Center (AOC)

The AOC holds many important uses for the operations at the airport. In addition to housing snow removal equipment (SRE) and maintenance equipment, Airport Rescue and Firefighting (ARFF) is stationed out of the AOC. The concrete ramp in front of the AOC is used for many purposes, including, but not limited to, ARFF truck daily inspections, equipment maintenance, equipment training, and vehicle parking. As the usable space on this ramp becomes more limited, so do the operations of the AOC. The new west side taxiway TOFA will encroach on the AOC ramp, in turn reducing the usable space in front of the ARFF and SRE bay doors. Lost ramp space ranges from 3' in Alternative 1 to 83' in Alternatives 3 and 4. Figure A-5 shows Alternative 5, where there is 63' of AOC ramp space lost due to construction of a west side taxiway, leaving 45' of usable ramp space remaining. The new ROFA from the runway shifting west in Alternatives 6 and 7 reduces the usable ramp space by 70'. These measurements are taken from the east side of the AOC ramp. Under Alternative 8, proposed west side Taxiway "B" would be located

Figure A-5: Usable AOC Ramp Space (Appendix B, Alternative 5, Sheet 1 of 4)

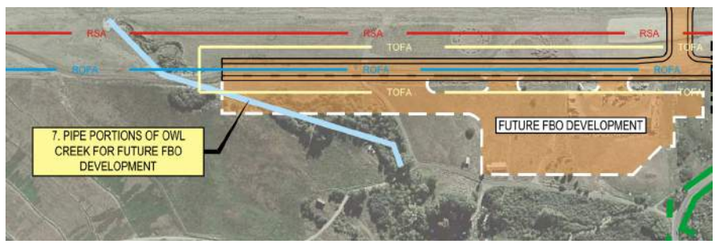


in the current location of the AOC, requiring a complete relocation of the building. A potential future site for the relocated AOC has not been determined at this time.

Owl Creek

As the airfield infrastructure shifts further west, the proposed west side development shifts with it. The ramp space shown in the ALP was maintained throughout each alternative to show the amount of space required, per Pitkin County Code Title X, for the west side FBO to operate. The further west this development shifts, the more it encroaches on the existing Owl Creek. A portion of Owl Creek will be required to be piped underneath any future ramp areas. Figure A-6 shows the worst case scenario for the piping of Owl Creek under Alternative 8. Alternative 1 and 6 do not require piping of Owl Creek, as Alternative 1 was originally laid out in the current Master Plan to not impact the creek, and Alternative 6 does not have a west side FBO.

Figure A-6: Owl Creek Piping (Appendix B, Alternative 8, Sheet 1 of 4)



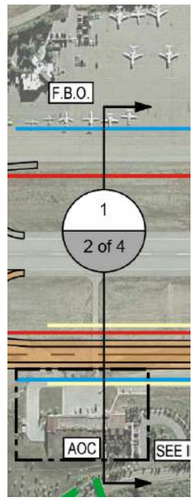


Figure A-7: Location of AOC Part 77 Evaluation Cross Section (Typical)

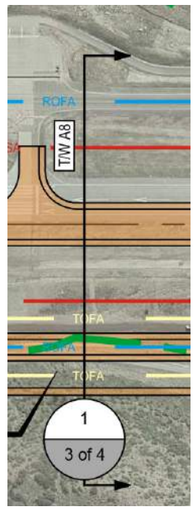


Figure A-9: Location of West Side Pinch Point Cross Section (Typical)

Figure A-8: AOC Part 77 Evaluation (Appendix B, Alternative 5, Sheet 2 of 4)

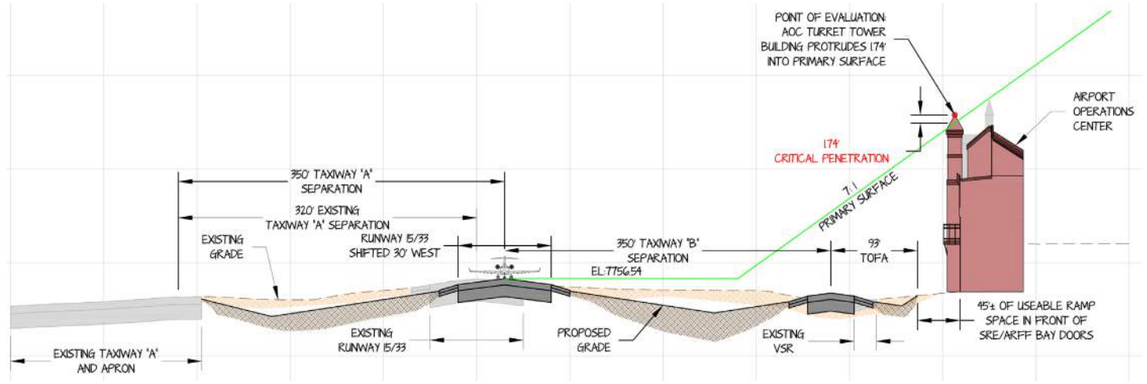
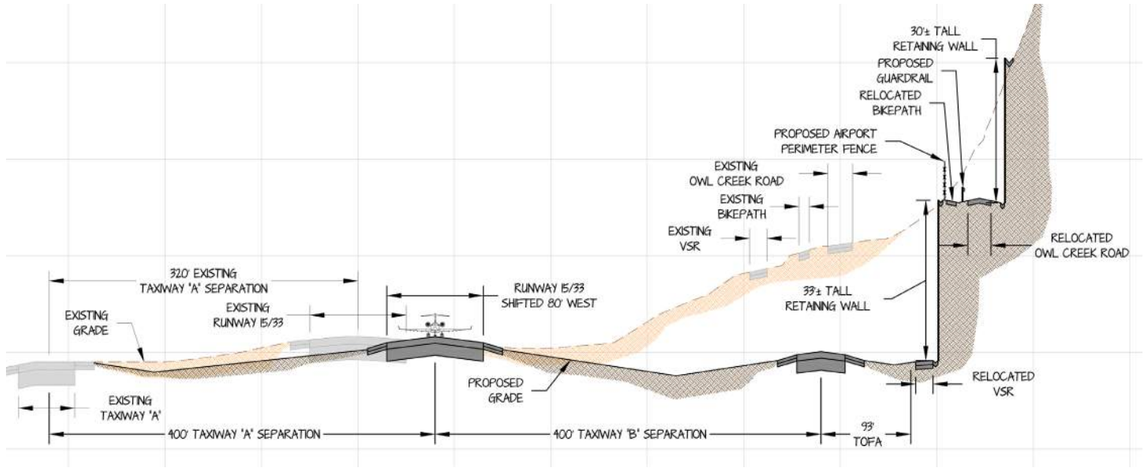


Figure A-10: West Side Pinch Point Evaluation (Appendix B, Alternative 8, Sheet 3 of 4)



Cross Section Development

Cross sections were produced at critical locations on the airfield to assist the evaluation of impacts for each alternative. To produce the cross sections, a computer generated topographical terrain model was developed using aerial survey data to help identify critical locations of the airfield that will incur the greatest impact from the proposed alternative. There were two impacts that were evaluated. The first was existing infrastructure that would have the greatest obstruction into FAA Part 77 airspace. The Part 77 surface that was being evaluated for potential obstructions is an imaginary surface that is aligned with the runway which extends out and up from the runway to protect airspace around the airport. This airspace is critical for the safe operations of aircraft both while in the air and on the runway surface. The second evaluated locations were where the proposed alternative geometry would have the greatest impact on existing infrastructure outside of the airport perimeter.

It was determined that the critical location for existing infrastructure into the Part 77 surface was the turret tower on the existing AOC. The critical location for impact of the proposed alternative geometry on the existing infrastructure was determined to be the area on the west side of

the airport where Owl Creek Road is nearest to the airfield, referred to hereafter as the "pinch point."

Airport Operations Center

Multiple sections were produced to analyze Part 77 obstructions at the existing AOC due to the runway shifting closer to the building. These sections were produced at key locations on the building which would potentially penetrate the Part 77 surface. After investigation, it was determined that the AOC turret tower is the most likely location on the AOC which penetrates or will potentially penetrate the primary surface. Alternatives 5, 6, 7, 8, and 9 all show a penetration of the Part 77 surface with the AOC, ranging from 2' to 9'. As previously mentioned, Alternative 8 requires the AOC to be removed and relocated. Figure A-7 shows the location of the AOC Part 77 evaluation cross section which is typical for all alternatives, while Figure A-8 shows Alternative 5 and how the shift of the runway impacts the Part 77 primary surface.

West Side Pinch Point

The rugged terrain on the west side of the airport provides difficulty in maintaining the existing conditions when grading proposed infrastructure for each alternative to FAA standards. The pinch point along Owl Creek Road located at approximately Taxiway "A8" just south of the Runway 33 threshold (see Figure A-9) provides a worst case scenario as the terrain in this area impedes the most on the proposed airfield alternatives. The sections show the ultimate grading to FAA standards for the new west side taxiway for where the section was analyzed. To accommodate for the drastic changes in grade, proposed retaining walls will be required. Potential surface drainage structures and the proposed airport perimeter fence are shown for space allocation, in addition to a proposed guard rail for Owl Creek Road. Figure A-10 shows the cross section for Alternative 8.

A retaining wall is required for each alternative on the west side of the relocated airport VSR. The VSR is located outside of the west side TOFA. The retaining wall required to catch grade for the relocated airport VSR ranges in height from 20' to 33' depending upon the extent of the airfield reconfiguration to the west.

When necessary, the relocated bike path and Owl Creek Road are shown in their new locations. Due to the proposed airfield reconfiguration encroaching further west in Alternatives 3, 4, 5, and 9, a second retaining wall on the west side of Owl Creek Road may be required to tie back to existing grade without further impacting the existing terrain. This second retaining wall would range in height from 5' to 8', with exception to Alternative 8.

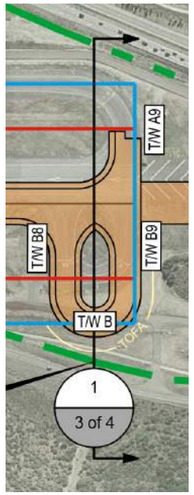
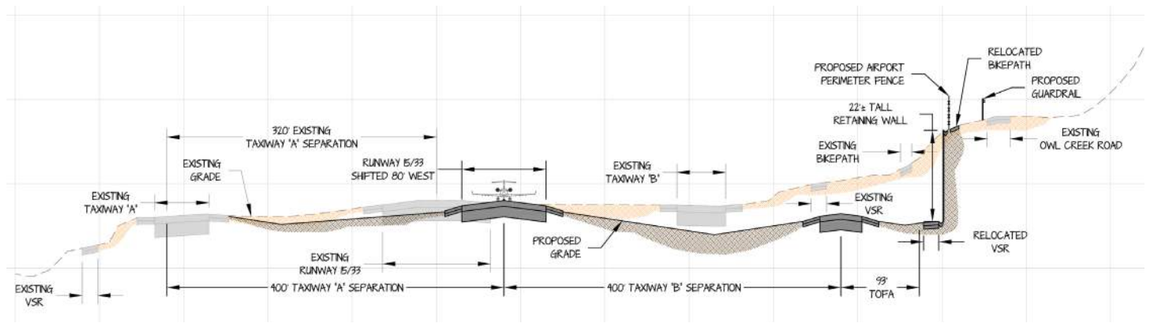


Figure A-11: Location of Taxiway "B" "Teacup" Cross Section (Typical)

Figure A-12: Taxiway "B" "Teacup" Cross Section (Appendix B, Alternatives 6 and 7, Sheet 3 of 4)



Alternative 8 produces the greatest impact to the infrastructure on the west side of the airport, resulting in a 33' retaining wall adjacent to the Airport VSR, and a 30' retaining wall on the west side of Owl Creek Road.

West Side Taxiway "B" "Teacup"

With Owl Creek Road not requiring relocation under Alternatives 6 and 7, the Taxiway "B" "teacup" area was evaluated for potential retaining walls. Cross sections show that a 22' retaining wall is required to catch grade for the proposed Taxiway "B", and the bike path will require relocation. Figures A-11 and A-12 show the location of the "teacup" cross section and the cross section itself, respectively.

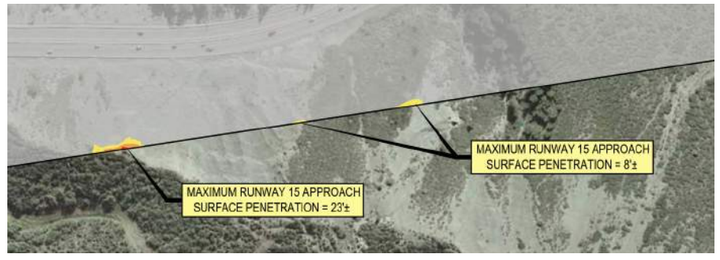
Approach Surface Evaluation

The non-precision instrument approach surface for aircraft landing on the Runway 15 end of the runway was evaluated for penetrations by existing terrain. The existing Runway 15 approach surface was compared to the proposed Runway 15 approach surface in alternatives where the runway alignment was shifted to the west. Results are stated below.

Existing Runway In-Place

There are currently terrain penetrations into the existing Runway 15 approach surface. These penetrations are located on the west side of the approach surface in the Shale Bluffs area, approximately 4,000' to 5,000' north of the Runway 15 threshold. Penetrations here range up to 23' in height. Figure A-13 depicts these penetrations.

Figure A-13: Approach Surface Penetrations – Existing Condition (Appendix B, Alternatives 1-4, Last Sheet)



Shift Runway 30′ to the West

As the runway shifts further west, the Runway 15 approach surface shifts with it. The terrain penetrations to the approach surface worsen in the 30' runway shift, ranging up to ±31' in height. A small penetration of approximately 2 feet occurs in the far southwest corner of the approach surface. Local grading can be performed to remove this penetration. See Figure A-14 for penetrations located 4,000' to 5,000' north of the runway threshold, and Figure A-15 for the small penetration near the runway threshold.

Shift Runway 80′ to the West

Just like the 30' runway shift to the west, the 80' runway shift to the west creates greater penetrations to the Runway 15 approach surface. In

Figure A-14: Approach Surface Penetrations – 30′ Runway Shift – 4,000′ to 5,000′ North (Appendix B, Alternative 5, Sheet 4 of 4)

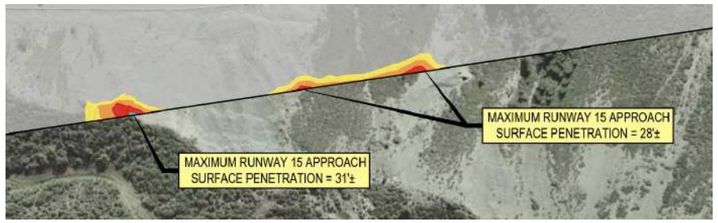


Figure A-15: Approach Surface Penetrations – 30′ Runway Shift – Near Runway Threshold (Appendix B, Alternative 5, Sheet 4 of 4)

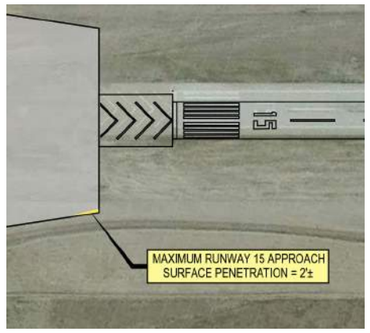


Figure A-16: Approach Surface Penetrations – 80′ Runway Shift – 3,000′ to 5,000′ North (Appendix B, Alternatives 6 through 8, Sheet 4 of 4)

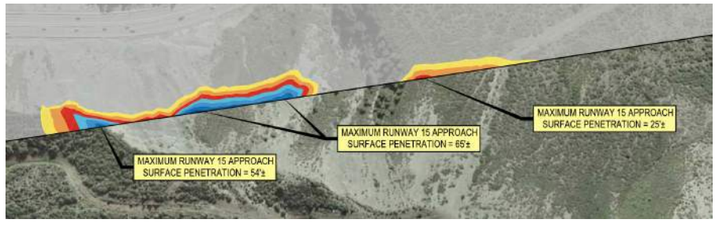
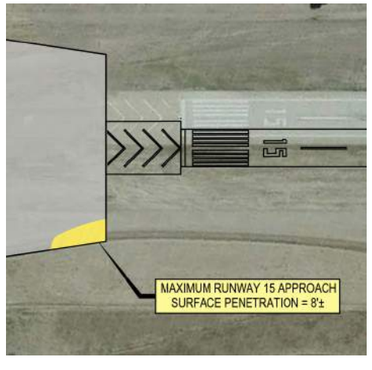


Figure A-17: Approach Surface Penetrations – 80′ Runway Shift – Near Runway Threshold (Appendix B, Alternatives 6 through 8, Sheet 4 of 4)



addition, the area of terrain penetration lengthens along the west side of the approach surface, from approximately 3,000' to 5,000' north of the Runway 15 threshold. These penetrations range up to 65'. The small terrain penetration in the southwest corner of the approach surface, as mentioned in the 30' runway shift, worsens to approximately eight feet. However, local grading can mitigate this penetration. See Figure A-16 for penetrations located 3,000' to 5,000' north of the runway threshold, and Figure A-17 for the small penetration near the runway threshold.

Step A – Meeting to Reduce Alternatives Based on Findings

A meeting was held on February 18, 2014, at the Aspen/Pitkin County Airport to discuss and evaluate the nine alternatives, and begin narrowing and eliminating alternatives that are not viable. This meeting was also an opportunity to add any alternatives that had not been contemplated at the time. Attendees for the meeting included.

- **Aspen/Pitkin County Airport –** Jim Elwood, Brian Grefe and Dustin Havel
- **Pitkin County –** Jon Peacock, Kara Silbernagle
- **FAA –** John Bauer, Chris Schaffer, Mark Miller, John Dermody
- **Air Traffic –** Greg Dyer
- **William E. Payne and Associates –** William Payne
- **Jviation, Inc. –** J.D. Ingram, Travis Vallin, Hilary Fletcher, Alan Wiechmann, Craig Sparks, Paul Fiore, Andy Remstad, Brian Lincoln

Outcomes

As was established in the Introductory chapter of this Final Report for the Future Air Service Planning Study – Phase II, the following three objectives were used to either eliminate or retain alternatives:

- Meet or improve FAA standard of safety, efficiency, and operational capacity
- Minimize the impact to the facilities previously approved in the 2012 Master Plan Update
- Accommodate larger future commercial regional aircraft

During the course of the evaluation, consultants and ASE staff were advised that the FAA has shifted federal policy to a more stringent approach to the application of safety standards to airport capital improvement projects. This policy shift essentially makes the grant of a Modification to Standards (MOS) unlikely if a project can adhere to FAA safety standards.

However, at this time the impact of shifting the runway on aircraft approach and departure procedures was unknown, although the majority of the study group was concerned that an 80’ runway shift to the west, which would provide the FAA standard RW/TW separation of 400’, would negatively impact these procedures. Therefore, runway shifts less than 80’, which did not provide a full 400’ FAA standard RW/TW separation, were still considered viable options. In addition, the impacts to the 2012 Master Plan Update were limited to looking at the west side FBO, except for Alternative 4, which had a major impact on the east side of the airfield. Below are the results of the alternative analysis.

✓ Meets objectives
✓ Meets objectives with conditions
✓ Does not meet objectives

- **Alternative 1 –** RW in-place, TW “A” (east) at 320', TW “B” (west) at 320'
  - ✓ Does not meet FAA standard for RW/TW separation of 400’ for existing TW “A” or proposed TW “B”
  - ✓ Meets the currently approved FAA Modifications to standard of 320’ RW/TW separation
  - ✓ Does not impact efficiency and operational capacity of the airport as the current level of service is maintained with a 95-foot wingspan limitation
  - ✓ Does not impact 2013 Master Plan Update as the proposed improvements are the same as presented in the Master Plan
  - ✓ Does not accommodate the larger commercial regional aircraft

Decision – Continued to Step B

- **Alternative 2 –** RW in-place, TW “A” (east) at 320', TW “B” (west) at 350'
  - ✓ Does not meet FAA standard for RW/TW separation of 400’ for existing TW “A” or proposed TW “B”
  - ✓ Would require a new FAA modification to standard for the 350’ RW/TW separation for proposed Taxiway “B”
  - ✓ Would impact efficiency of airport as operational restrictions, such as full sterilization of TW “A”, would likely be required during landing and takeoff operations of larger aircraft

because of a smaller RW/TW separation than TW "B"
- ✓ Would impact operational capacity as delays caused by operational restrictions could force arriving aircraft to be diverted to other airports
- ✓ Minimal impacts to 2012 Master Plan Update
- ✓ Proposed 350' TW "B" separation may not be sufficient to allow for larger commercial regional aircraft

Decision – Removed as a viable option due to falling short of meeting study objectives

- **Alternative 3 –** RW in-place, TW "A" (east) at 320', TW "B" (west) at 400'
  - ✓ Meets FAA standard for RW/TW separation of 400' for proposed TW "B" but not for existing TW "A"
  - ✓ Would impact efficiency of airport as operational restrictions, such as full sterilization of TW "A", would likely be required during landing and takeoff operations of larger aircraft because of a smaller RW/TW separation than TW "B"
  - ✓ Would impact operational capacity as delays caused by operational restrictions could force arriving aircraft to be diverted to other airports
  - ✓ Minimal impacts to 2012 Master Plan Update
  - ✓ Would accommodate larger commercial regional aircraft with substantial operational restrictions to the east side taxiway

Decision – Removed as a viable option due to falling short of meeting study objectives

- **Alternative 4 –** RW in-place, TW "A" (east) at 400', TW "B" (west) at 400'
  - ✓ Meets FAA standard for RW/TW separation of 400' for existing TW "A" and proposed TW "B"
  - ✓ Efficiency would not be impacted because no operational restrictions would exist with uniform RW/TW separation on both side of the runway
  - ✓ Would impact operational capacity as the reduced aircraft parking area on the east side of the airfield would limit the amount aircraft able to arrive at ASE, forcing aircraft diversions to other airports if ramps were full
  - ✓ Known Major impacts to the 2012 Master Plan Update (Reconfiguration of entire terminal area)
  - ✓ Would accommodate larger commercial regional aircraft

Decision – Continued to Step B

- **Alternative 5 –** RW 30' west, TW "A" (east) at 350', TW "B" (west) at 350'
  - ✓ Does not meet FAA standard for RW/TW separation of 400' for existing TW "A" and proposed TW "B"
  - ✓ Would require a new FAA modification to standard for the 350' RW/TW separation for existing Taxiway "A" and proposed Taxiway "B"
  - ✓ Efficiency would not be impacted because no operational restrictions would exist with uniform RW/TW separation on both sides of the runway
  - ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
  - ✓ Known impacts to 2012 Master Plan Update limited to shifting 2nd FBO further west
  - ✓ Proposed 350' TW "A" and "B" separations may not be sufficient to allow for larger commercial regional aircraft

Decision – Continued to Step B

- **Alternative 6 –** RW 80' west, TW "A" (east) at 400', No west side FBO
  - ✓ Meets FAA standard for RW/TW separation of 400' for existing TW "A"
  - ✓ Efficiency would not be impacted because no operational restrictions would exist with 400' RW/TW separation
  - ✓ Capacity would be impacted as larger aircraft would be restricted to the existing ramp parking area without the benefit of additional parking provided by the west side FBO
  - ✓ Known major impacts to the 2012 Master Plan Update (No west side FBO)
  - ✓ Would accommodate larger commercial regional aircraft

Decision – Continued to Step B

- **Alternative 7 –** RW 80' west, TW "A" (east) at 400', Partial TW "B" (west) at 400'
  - ✓ Meets FAA standard for RW/TW separation of 400' for existing TW "A" and proposed TW "B"
  - ✓ Conflicts with FAA recommendation to avoid runway crossings
  - ✓ Efficiency may be impacted due to aircraft holding for runway crossing to access west side FBO
  - ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
  - ✓ Known impacts to 2012 Master Plan Update limited to shifting 2nd FBO further west
  - ✓ Would accommodate larger commercial regional aircraft

Decision – Continued to Step B

- **Alternative 8 –** RW 80' west, TW "A" (east) at 400', TW "B" (west) at 400'
  - ✓ Meets FAA standard for RW/TW separation of 400' for TW "A" at the expense of removing the Airport Operations Center
  - ✓ Efficiency would not be impacted for aircraft because no operational restrictions would exist
  - ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
  - ✓ Known impacts to 2012 Master Plan Update limited to shifting 2nd FBO further west
  - ✓ Would accommodate larger commercial regional aircraft

Decision – Continued to Step B

- **Alternative 9 –** RW angled about 15 end, TW "A" (east) at 330'-370', TW "B" (west) at 350'
  - ✓ Does not meet FAA standard for RW/TW separation of 400' for TW "A" and proposed TW "B"
  - ✓ Would require a new FAA modification to standard for the 330' – 370' RW/TW separation for existing Taxiway "A" and 350' for proposed Taxiway "B"
  - ✓ Runway would be angled to entire east side of airport, causing a safety concern for pilot visibility entering runway environment from the east side of airfield
  - ✓ Would impact efficiency of airport as operational restrictions, such as partial sterilization of TW "A" and full sterilization of TW "B", would likely be required during landing and takeoff operations of larger aircraft because of a varying RW/TW separations
  - ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
  - ✓ Known impacts to 2012 Master Plan Update limited to shifting 2nd FBO further west

✓ Proposed increase of RW/TW separation may not be sufficient to allow larger regional commercial aircraft

Decision – Removed as a viable option due to falling short of meeting study objectives

After all alternatives were presented, discussed, and deliberated, there were outcomes for further evaluation which were inclusive of all remaining alternatives and any new alternatives moving forward. These included:

- Preference for symmetrical airfield configuration (i.e. RW/TW separation the same on the east and west side)
- Effect of the proposed alternative on runway to holdbar separation distance (holdbar is where an aircraft has to hold on a taxiway before the control tower gives clearance to access the runway).
- Impact of making east side Taxiway "A" TOFA to FAA standard on existing aircraft ramp areas
- Impact of proposed alternatives on 2012 Master Plan Update
- Impact of larger aircraft on future commercial aircraft parking area form the 2012 Master Plan Update
- Evaluation of whether moving the west side airport VSR inside west side taxiway OFA would reduce the impacts on existing infrastructure and terrain outside of the airport (Owl Creek Road and bike path)
- Estimation of acreage of property impacted on west side for relocation of Owl Creek Road and Owl Creek bike path

During the meeting, the FAA continued to emphasize the point that for any proposed alternative, meeting current design criteria should be the priority as these criteria are in place for the safe operation of aircraft. The FAA and the airport also wanted to explore alternatives for realigning the airport VSR and Taxiways "A" and "A9" on the east side of the airfield where they impacted the right-of-way of State Highway 82 as shown in Alternative 4. The intent would be to find an option that reduces or eliminates the encroachment of the proposed alternative into the highway right-of-way.

The final point that the FAA wanted to clarify is that the runway would be strengthened based on the new design aircraft allowed into the airport. The FAA would require the County ordinance for maximum landed weight of 100,000 pounds to be rescinded to properly accommodate for the larger wingspan aircraft which exceeded this weight restriction. A new ordinance may be established based on the new design aircraft. Evaluation of the strengthened runway will take place under Step D.

There were four new alternatives developed in the Step A meeting for further evaluation in Step B. These were Alternatives 5a, 7a, 7b, and 10 which are detailed below in the section Additional Alternatives.

Summary of Alternative Analysis

- **Alternative 1 –** Continued to Step B
- **Alternative 2 –** Removed from study
- **Alternative 3 –** Removed from study
- **Alternative 4 –** Continued to Step B
- **Alternative 5 –** Continued to Step B
- **Alternative 6 –** Continued to Step B
- **Alternative 7 –** Continued to Step B
- **Alternative 8 –** Continued to Step B
- **Alternative 9 –** Removed from study

Additional Alternatives

- **Alternative 5a –** Evolves from Alternative 5
  - » Shift runway 25', widen to 150', construct a new west side parallel taxiway at 345' from the relocated runway
  - » Widens runway to standard, utilizes existing pavement and east side lighting system for new runway
- **Alternative 7a –** Addition to Alternative 7
  - » Extend Taxiway "B" to Taxiway "A6" for runway crossing
  - » Allows landing aircraft better access to west side
- **Alternative 7b–** Addition to Alternative 7
  - » Extend Taxiway "B" to Runway 15 threshold for runway crossing
  - » FAA preferred runway crossing
- **Alternative 10 –** New alternative
  - » Shift runway 25', widen to 150' shift Taxiway "A" 25' east, construct a new west side parallel taxiway at 360' from the relocated runway
  - » Widens runway to standard, utilizes existing pavement and east side lighting system for new runway

Step A Summary

Removed Alternatives

- Alternative 2
- Alternative 3
- Alternative 9

Additional Alternatives

- Alternative 5a
- Alternative 7a
- Alternative 7b
- Alternative 10

Remaining Alternatives to Step B

- Alternative 1
- Alternative 4
- Alternative 5
- Alternative 5a
- Alternative 6
- Alternatives 7, 7a, and 7b
- Alternative 8
- Alternative 10

Remaining Alternatives and Additions

Step B of the Future Air Service Planning Study (Phase II) for the Aspen/Pitkin County Airport consisted of further evaluation of alternatives that were carried forward from Step A, and development of new alternatives that were introduced at the concluding meeting of Step A. The following Alternatives were carried forward from Step A:

- Alternative 1
- Alternative 4
- Alternative 5
- Alternative 6
- Alternative 7
- Alternative 8

New alternatives were added based on comments, feedback, and brainstorming at the concluding meeting of Step A. New alternatives included the following:

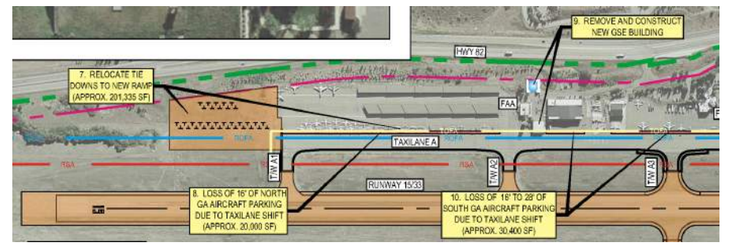
- **Alternative 5a –** Shift Runway 15/33 25' west, utilizing the existing runway pavement to increase the width of the runway from 100' to 150' and construct a new parallel taxiway at 345' west of the relocated runway.
  - » Would require new FAA modification to standard (345' RW/TW separation) for the east and west side taxiway
  - » Meets FAA standard for runway width for airports serving aircraft with wingspans between 79' and 118' and weights of 150,000 pounds or more
- **Alternative 7a (shown on Alternative 7) –** Shift Runway 15/33 80' west and construct a partial parallel taxiway at 400' west of the relocated runway with a midfield runway crossing south of the AOC for access to the west side.
  - » Meets FAA RW/TW separation standards for the east and west side taxiways
  - » Conflicts with FAA recommendation to limit runway crossings
- **Alternative 7b (shown on Alternative 7) –** Shift Runway 15/33 80' west, construct east side parallel taxiway (Taxiway "A") north to the Runway 15 threshold and construct a partial parallel taxiway at 400' west of the relocated runway with a threshold crossing at Runway 15.
  - » Meets FAA RW/TW separation standards for the east and west side taxiways
  - » Conflicts with FAA recommendation to limit runway crossings
- **Alternative 10 –** Shift Runway 15/33 25' west, utilizing the existing runway pavement to increase the width of the runway from 100' to 150', shift east side parallel taxiway (Taxiway "A") 15' to the east and construct parallel taxiway at 360' west of the relocated runway.
  - » Would require new FAA modification to standard (360' RW/TW separation) for the east and west side taxiways
  - » Meets FAA standard for runway width for airports serving aircraft with wingspans between 79' and 118' and weights of 150,000 pounds or more

As was done in Step A, new alternatives were to incorporate, to the extent possible, new guidance from the FAA on airfield design and Modifications to Standards. Graphical layouts of each alternative compared to the existing airport layout and cross sections were produced at critical points on the airfield. In addition, the approach surface for Runway 15 was evaluated for any penetrations. The results of Step B findings for new alternatives are explained below. Each alternative can be viewed in its entirety in Appendix B.

Major Impact Evaluation for New Alternatives

High level evaluations of major impacts were identified for each new alternative. As identified above, the new alternatives were 5a, 7a, 7b, and 10. Major impacts to airport approach Navigational Aids (NAVAIDs), existing east and west side infrastructure, the Airport Operations Center (AOC), and existing Owl Creek were included.

Figure B-2: East Side Impacts (Appendix B, Alternative 10, Sheet 1 of 8)



Approach NAVAIDs

Located off each end of Runway 15/33 are NAVAIDs that assist aircraft to maintain the correct horizontal alignment while on approach onto Runway 15. On the north end of the runway is the approach lighting system, while on the south is the Localizer Antenna and Distance Measuring Equipment (DME). These systems are located on the runway centerline; therefore a relocation of each system will be associated with any runway shift (Alternatives 5a, 7a, 7b, and 10). Figure B-1 shows a 25' runway shift and relocated Approach NAVAIDs systems associated with Alternative 10.

East Side Infrastructure

All existing infrastructure which provides service to the flying public is constrained between Taxiway "A" on the west side and State Highway 82 on the east side. Due to the community presence, limited space, and potential cost, this study does not recommend any reconfiguration east of the existing airport property line.

Alternative 10 (see Figure B-2) is the only new alternative which poses any impact to the east side infrastructure. Due to Taxiway "A" shifting 15' east into the existing ramp, the existing GSE building would be required

Figure B-1: Approach NAVAIDs Relocation (Appendix C, Alternative 10, Sheet 1 of 8)

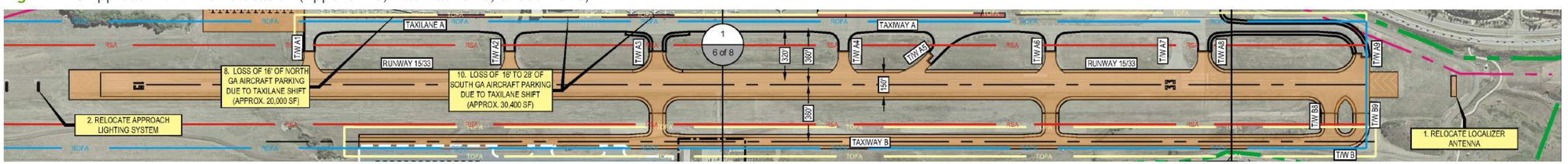


Figure B-3: Existing West Side Infrastructure Impacts (Appendix C, Alternatives 7 and 7a, Sheet 1 of 10)

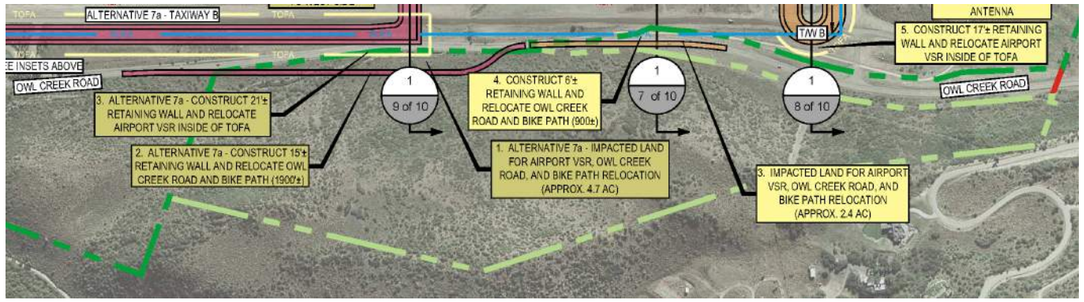


Figure B-4: Usable AOC Ramp Space (Appendix C, Alternative 10, Sheet 1 of 8)

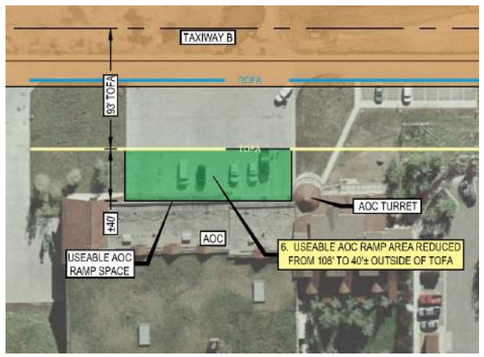
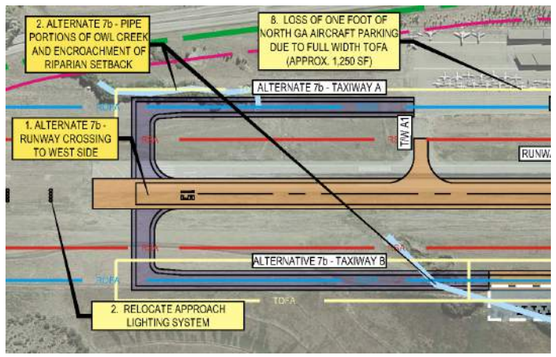


Figure B-5: Owl Creek Piping (Appendix C, Alternative 7b, Sheet 1 of 10)



to be removed and relocated to the location shown on the current Master Plan. In addition, the Taxiway "A" shift would cause loss of aircraft tie-downs on the North GA Ramp. To replace this loss, it is proposed to construct additional ramp with aircraft tie-downs on the north end of the North GA Ramp.

West Side Infrastructure

The southwest side of the airport poses critical impacts for all new alternatives. The airport vehicle service road (VSR), existing Owl Creek bike path, and Owl Creek Road are all located in a narrow envelope between rugged terrain and the airfield. This area evaluated is the location where Owl Creek Road is the closest to the airfield, at approximately Taxiway "A8" just south of the Runway 33 threshold, as this area has the largest impact on non-airport infrastructure. Redefined OFA's for the runway and taxiway, associated with a runway shift or west side parallel taxiway, will require relocation of the airport VSR, the Owl Creek bike path, and Owl Creek Road. Since the airfield is shifting to the west, the existing infrastructure will also need to move west, land acquisition may be required to accommodate the new locations of Owl Creek Road and Owl Creek bike path. In order to maintain FAA design criteria, extensive grading operations will be required in the southwest portion of the airport. For all the alternatives, the airport VSR will be lowered and relocated to the west. Owl creek road along with the bike path will be relocated in alternatives in Alternatives 7a, 7b, and 10. The length of relocation of Owl Creek Road ranges from 700' in Alternative 10 to 1,900' in Alternative 7a. Figure B-3 shows the impact on Owl Creek Road from Alternatives 7 and 7a. Alternative 5a, will only require relocation of the Owl Creek bike path due to the smaller proposed runway shift of 25' and smaller RW/TW separation of 345'.

Airport Operations Center (AOC)

The AOC holds many important uses for the operations at the airport. In addition to housing snow removal equipment (SRE) and maintenance equipment, Airport Rescue and Firefighting (ARFF) is stationed out of the AOC. The concrete ramp in front of the AOC is used for many purposes, including, but not limited to, ARFF daily inspections, equipment maintenance, equipment training, and vehicle parking. As the usable space on this ramp becomes more limited, so do the operations of the AOC. The new west side taxiway TOFA encroaches on the AOC ramp, in turn reducing the usable space in front of the ARFF truck and SRE bay doors. Lost ramp space ranges from 53' in Alternative 5a to 68' in Alternative 10. Figure B-4 shows Alternative 10, where there is 68' of AOC ramp space lost due to construction of a west side taxiway, leaving 45' of usable ramp space remaining. These measurements are taken from the east side of the AOC ramp. Under Alternative 7a, proposed west side Taxiway "B" is located in the location of the AOC, requiring a complete relocation of the building. A potential future site has not been determined at this time.

Owl Creek

As the airfield infrastructure shifts further west, the proposed west side development shifts with it. The ramp space shown in the ALP was maintained throughout each alternative to show the amount of space required, per Pitkin County Code Title X, for the west side FBO to operate. The further west this development shifts, the more it encroaches on the existing Owl Creek. A portion of Owl Creek will be required to be piped underneath any future ramp areas. In addition, alternative 7b would require the piping of Owl Creek on the east side of the runway where east side parallel Taxiway "A" would be extended to the north. Figure B-5 depicts the Owl Creek piping that would be required for Alternative 7b.

Cross Section Development

Cross sections were produced at critical locations on the airfield to assist the evaluation of impacts for each new alternative. To produce the cross sections, a computer generated topographical terrain model was developed using aerial survey data to help identify critical locations of the airfield that will incur the greatest impact from each proposed alternative. There were two impacts that were evaluated. The first was existing infrastructure that would have the greatest obstruction into FAA Part 77 airspace. The Part 77 surface that was being evaluated for potential obstructions is an imaginary surface that is aligned with the runway which extends out and up from the runway in order to protect airspace around the airport. This airspace is critical for the safe operations of aircraft both while in the air and on the runway surface. The second were locations where the proposed alternative geometry would have the greatest impact on existing infrastructure outside of the airport perimeter.

It was determined that the critical location for existing infrastructure into the Part 77 surface was the turret tower on the existing AOC. The critical location for impact of the proposed alternative on the existing infrastructure was determined to be the area on the west side of the airport where Owl Creek Road is nearest to the airfield, referred to hereafter as the "pinch point." Additionally, because the west side taxiway in Alternative 7a does not extend south to the "pinch point," a location north of this area was identified as a critical point for impacts to Owl Creek Road.

Airport Operations Center

Multiple sections were produced to analyze Part 77 surface conditions at the existing AOC due to the runway shifting closer to the building. These sections were produced at key locations on the building which would potentially penetrate the Part 77 surface. After investigation, it was determined that the AOC turret tower is the most likely location

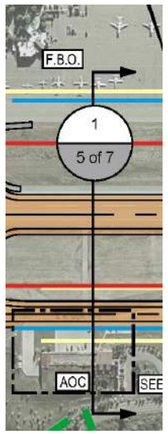
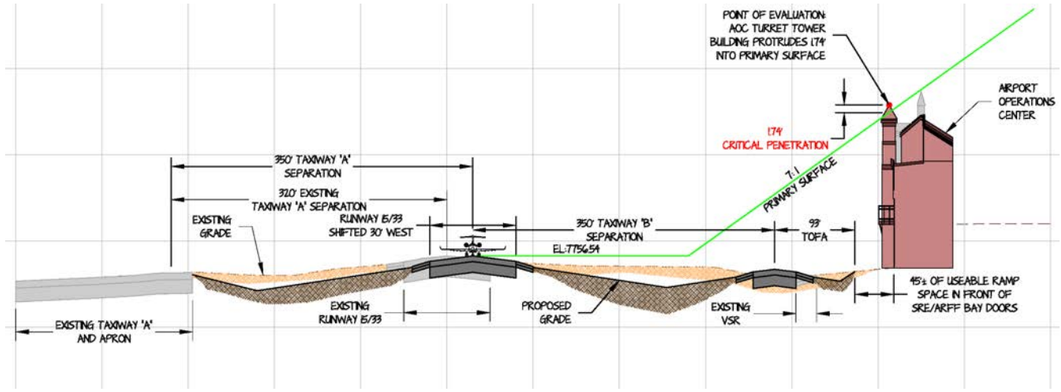


Figure B-6: Location of AOC Part 77 Evaluation Cross Section (Typical)

Figure B-7: AOC Part 77 Evaluation (Appendix C, Alternative 5, Sheet 5 of 7)



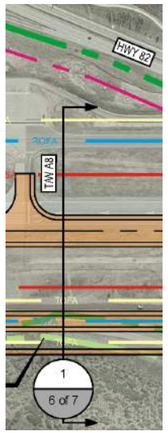
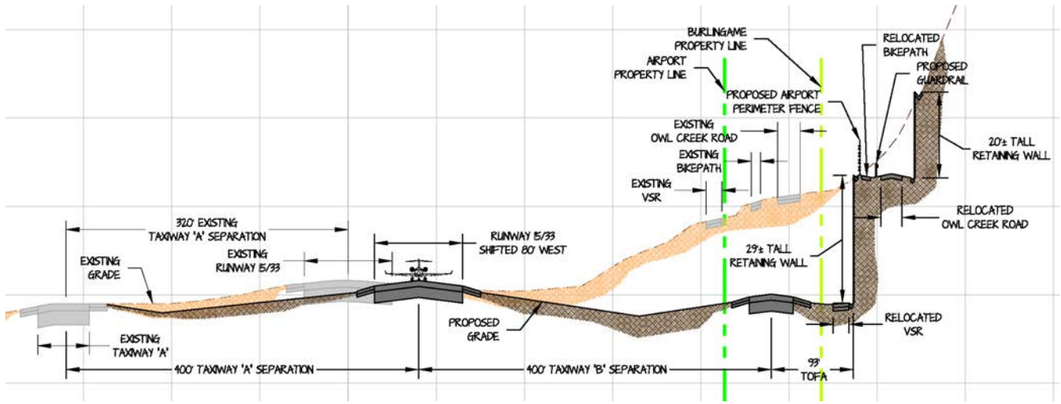


Figure B-8: Location of West Side Pinch Point Cross Section (Typical)

Figure B-9: West Side Pinch Point Evaluation (Appendix C, Alternative 8, Sheet 6 of 7)



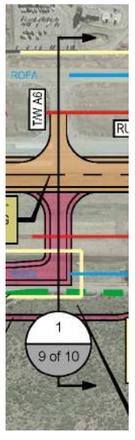
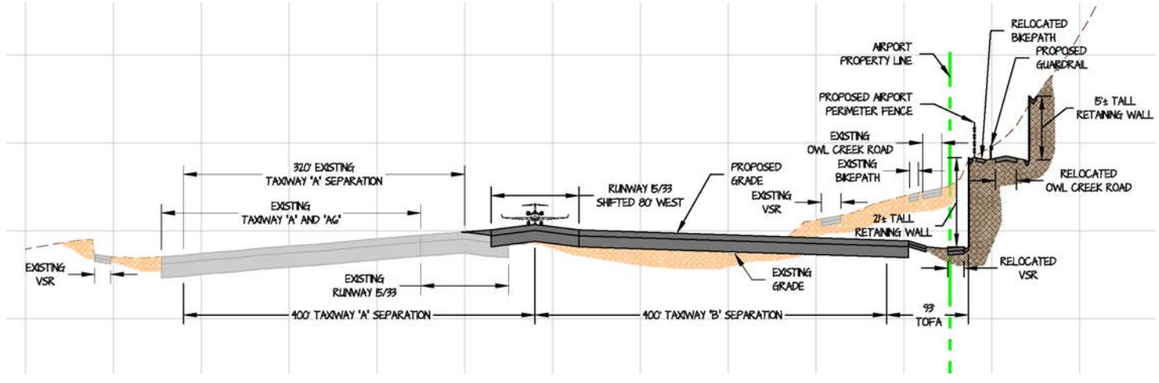


Figure B-10: Location of Owl Creek Road West of Taxiway "A6" Cross Section (Typical)

Figure B-11: Owl Creek Road West of Taxiway "A6" Evaluation (Appendix C, Alternative 7a, Sheet 9 of 10)



on the AOC which penetrates or will potentially penetrate the primary surface. Alternatives 5a, 7a, and 10 all show a penetration of the Part 77 surface with the AOC, ranging from 0.4' to 9'. As previously mentioned, Alternative 7a requires the AOC to be removed and relocated. Figure B-6 shows the location of the AOC Part 77 evaluation cross section which is typical for all alternatives, while Figure B-7 shows Alternative 5 and how the shift of the runway impacts the Part 77 primary surface.

West Side Pinch Point

The rugged terrain on the west side of the airport provides difficulty in maintaining the existing conditions when grading proposed infrastructure for each alternative to FAA standard. The pinch point along Owl Creek Road located at approximately Taxiway "A8" just south of the Runway 33 threshold (see Figure B-8) provides a worst case scenario as the terrain in this area impedes the most on the proposed airfield alternatives. The sections show the proposed ultimate grading to FAA standards of the new west side taxiway for where the section was analyzed. To accommodate for the drastic changes in grade, retaining walls will be required. Potential surface drainage structures and the proposed airport perimeter fence are shown for space allocation, in addition to a proposed guard rail for Owl Creek Road. Figure B-9 shows the cross section for Alternative 8, which has the greatest impact to this area.

A retaining wall is required for each new alternative on the west side of the relocated airport VSR. The retaining wall required to catch grade for the relocated airport VSR ranges in height from 6' to 29' depending upon the extent of the airfield reconfiguration to the west.

Slightly further north of the west side pinch point, the location of the proposed west side taxiway at approximately existing Taxiway "A6" on Alternative 7a would force the relocation of Owl Creek road to the west and would require construction of two retaining walls (see Figure B-10). One wall would extend 29' below Owl Creek Road to the airfield and the other wall would be 20' in height above Owl Creek Road to catch existing grades. Figure B-11 shows the cross section for Alternative 7a along Owl Creek Road.

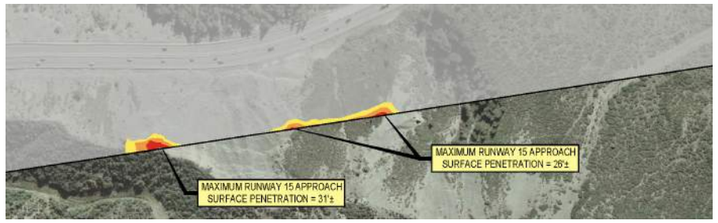
Approach Surface Evaluation

The non-precision instrument approach surface for aircraft landing on the Runway 15 end of the runway was evaluated for penetrations by existing terrain. There was one new Runway 15 approach surface produced in Step B, and this was for Alternatives 5a and 10 for a 25' runway shift to the west. The Runway 15 approach surface evaluations from Step A were still applicable for all of the remaining alternatives. Results are stated below.

Shift Runway 25′ to the West

As the runway shifts further west, the Runway 15 approach surface shifts with it. The terrain penetrations to the approach surface worsen in the 25' runway shift, ranging up to 31' in height. A small penetration of approximately 1 foot occurs in the far southwest corner of the approach surface. Local grading can be performed to remove this penetration. See Figure B-12 for penetrations located 4,000' to 5,000' north of the runway threshold, and Figure B-13 for the small penetration near the runway threshold.

Figure B-12: Approach Surface Penetrations - 25′ Runway Shift - 4,000′ to 5,000′ North (Appendix C, Alternatives 5a and 10, Sheets 7 of 7 and 8 of 8)



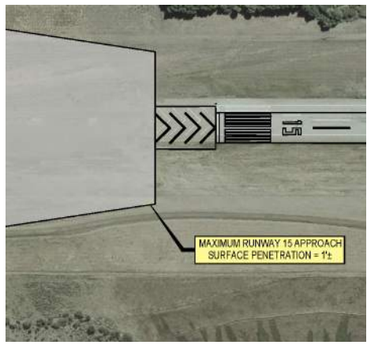


Figure B-13: Approach Surface Penetrations - 25′ Runway Shift - Near Runway 15 Threshold (Appendix C, Alternatives 5a and 10, Sheets 7 of 7 and 8 of 8)

Additional Evaluation for All Alternatives from Step A

As the refinement of airfield alternatives continued to progress, the FAA expressed that one of the objectives of the alternatives would be to reduce the existing modifications to standards and meet FAA standards unless there was a reason why doing so could not be achieved. Currently, in addition to the reduced RW/TW separation of 320', the airport has approved FAA modifications of standards (MOS) for the runway to holdbar separation of 272.5' and Taxiway "A" OFA of 169.5' (93' on west side of the taxiway and 76.5' on the east side). Step B included determining the impacts for each alternative on meeting FAA standards on runway to holdbar separation of 328' and the east side Taxiway "A" OFA of 186', specifically on existing aircraft parking area.

There were several specific items where additional evaluation was provided from Step A for the analysis of alternatives in Step B. These items included determining impacts of the proposed alternative to the future improvements shown in the current Master Plan, looking at proposed larger aircraft's impact on future commercial ramp parking, moving the proposed airport VSR inside the TOFA of the proposed west side taxiway to reduce impacts on existing infrastructure outside of the airport, estimating property that would be impacted from shifting Owl Creek Road and Owl Creek bike path to the west for future west side improvements, and reducing encroachment into the Highway 82 right-of-way.

Meeting FAA Standards on Runway/Holdbar Separation and Taxiway/Taxilane "A" OFA

Each alternative was evaluated to determine the feasibility of meeting FAA standards for Runway/Holdbar separation and Taxiway/Taxilane "A" OFA criteria. A taxilane is a taxiway that is not controlled by the Air Traffic Control Tower and where slower aircraft taxiing speeds occur. At the time of the refining of Alternatives in Step B, the FAA Advisory Circular for Airport Design indicated that for airports serving aircraft with wingspans between 79' and 118', the required Runway/Holdbar separation was 328' and taxiway/taxilane OFA widths were 186' and 162' respectively. East side Taxiway "A" turns into a taxilane just north of Taxiway "A4" and remains a taxilane until it terminates at Taxiway "A1." This change can be seen in Figure B-15.

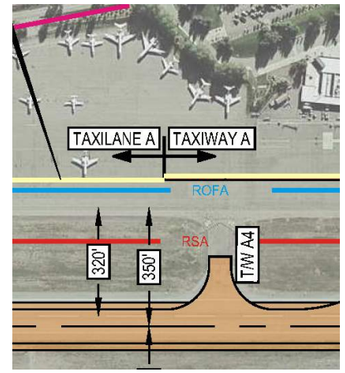
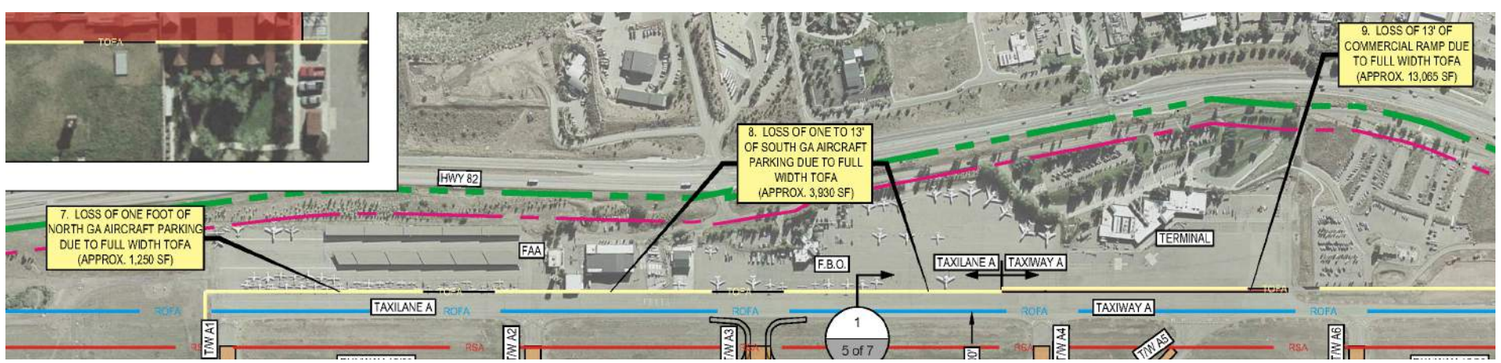


Figure B-14: Location where Taxiway "A" Turns into Taxilane "A" (Typical)

Meeting the FAA's 328' Runway/Holdbar separation standard was possible for all Alternatives in Step B except for Alternative 1. Each of the proposed Alternatives had a runway shift that provided more distance between the new runway centerline and the east or west side taxiways, thus allowing the FAA standard to be met. However, because Alternative 1 has no runway shift and the non-standard 320' RW/TW separation is maintained, there is not enough distance to meet the FAA standard for Runway/Holdbar separation.

The standard OFA widths for Taxiway/Taxilane "A" were applied to each proposed alternative to determine the impacts to the existing aircraft parking areas on the east side of the airport. Because of the limited amount of aircraft parking available at the airport, any loss of parking area is critical. Alternative 1 had no impact as this alternative reflects maintaining the existing conditions including all current MOS, as reflected in the current Master Plan. For the majority of alternatives, the impact was not a result of shifting existing east side Taxiway "A" to the east for further separation from the runway, but rather application of the full FAA standard TOFA width. Alternatives 5, 5a, 6, 7, 7a, 7b and

Figure B-15: Impacts to Aircraft Parking Ramp Area (Appendix C, Alternative 8, Sheet 1 of 7)



8 showed the TOFA reduced the North GA Ramp by 1' along the east edge, or 1,250 square feet. The South GA Ramp was reduced by 1' with a small segment of the south end of the South GA Ramp being reduced by 13', or a total of 3,930 square feet. The Commercial Ramp was reduced by 13' along the east side because of the Taxiway "A" TOFA, or a total of 13,065 square feet. Figure B-15 shows the lost aircraft parking ramp for Alternative 8.

Alternative 4 and Alternative 10 each propose shifting Taxiway "A" to the east, further impacting the existing aircraft parking ramps. In Alternative 10, Taxiway "A" is shifted 15 feet to the east. As a result, the reduction on the existing North GA Ramp from the TOFA is 16' along the east edge, or 20,000 square feet. The reduction to the South GA Ramp from the TOFA is 16' with a small segment of the south end of the South GA Ramp being reduced by 28', or a total of 30,400 square feet. The Commercial Ramp was reduced by 28' along the east edge because of the Taxiway "A" TOFA, or a total of 28,140 square feet. In Alternative 4, Taxiway "A" is shifted 80' to the east. As a result, the reduction on the existing North GA Ramp from the TOFA is 81' along the east edge, or 101,160 square feet. The reduction to the South GA Ramp from the TOFA is 81' with a small segment of the south end of the South GA Ramp being reduced by 93', or a total of 145,000 square feet. The Commercial Ramp was reduced by 93' along the east edge because of the Taxiway "A" TOFA, or a total of 93,465 square feet. Each of these alternatives show the construction of additional GA ramp parking area on the north side of the North GA Ramp. Figure B-16 illustrates the impact to ramp parking in Alternative 4.

Impacts on Current Master Plan

Figure B-16: Impacts to Ramp Parking Area (Appendix C, Alternative 4, Sheet 1 of 7)

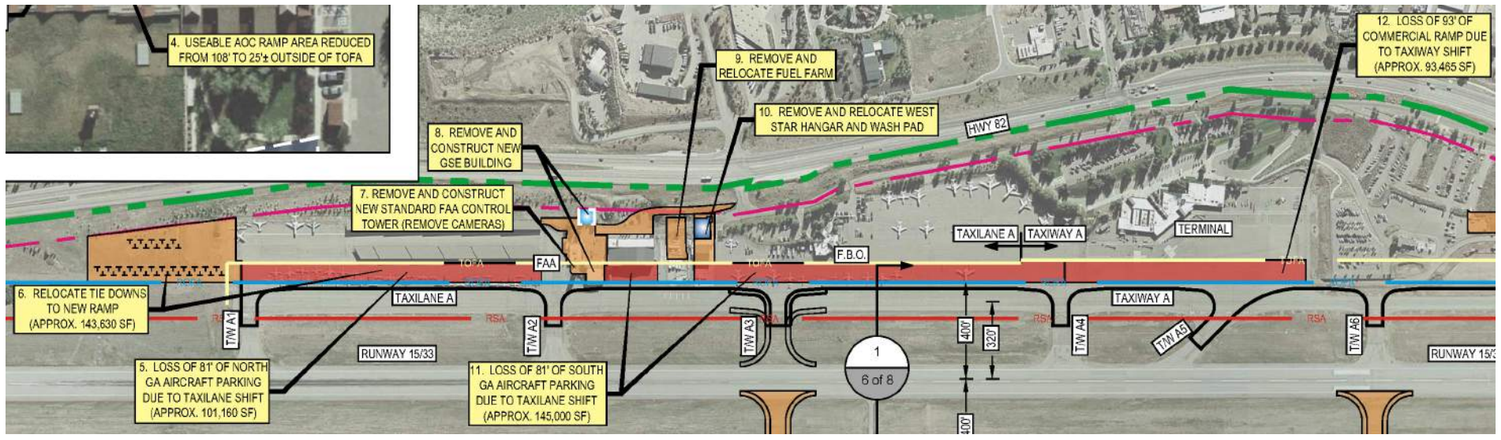


Figure B-17: Impacts to Master Plan Commercial and South GA Ramps (Appendix C, Alternative 6, Sheet 3 of 7)

An existing Master Plan was completed for the Aspen/Pitkin County Airport in 2012. The Master Plan contemplated future needs and development of the airport based upon maintaining the 95-foot aircraft wingspan restriction into the future. Since then, as discussed in the Future Air Service Study – Phase I section of the final report, a reconsideration of proposed improvements to the airport was necessary due to emerging aircraft technology resulting in larger aircraft. In Step B, each alternative was compared to the existing Master Plan proposed improvements to see how they could be impacted. Alternative 1 will have no impact to the current Master Plan because it follows the development recommended in the Master Plan. Exhibits were produced for the remaining alternatives that highlighted the impacts on the Master Plan Terminal Area, North and South GA Ramps, and west side FBO.

For Alternatives 5, 5a, 6, 7, 7a, 7b and 8, the impacts to the Master Plan Terminal Area and North and South GA Ramps was solely in lost apron space from applying the FAA standard TOFA width to Taxiway/Taxilane "A." When compared with the current Master Plan, the North GA Ramp, South GA Ramp, and Master Plan Terminal Area resulted in a reduction in aircraft ramp areas of 1,250 square feet, 9,460 square feet, and 14,775 square feet respectively. Figure B-17 depicts the impacts to the Master Plan Terminal Area South GA Ramps from Alternative 6. Alternative 10 impacted the Master Plan Terminal Area and South GA Ramp with aircraft ramp area reductions of 32,030 square feet and 42,340 square feet respectively. However, because of additional ramp proposed to be constructed on north end of the North GA Ramp, the net area for this ramp increases by 72,000 square feet when compared to the Master Plan.

There were some reconfigurations of Alternative 4 from Step A, such as not moving the T-shades on the North GA Ramp to the east, not building additional ramp on the east side of the existing North and South GA Ramps, and reconfiguring the North GA Ramp for additional aircraft parking. Despite these revisions, Alternative 4 has the greatest impact on the Master Plan Terminal Area and North and South GA Ramps. The Terminal Area from the Master Plan is compressed by 80' because of Taxiway "A" shifting 80' to the east. This results in the future terminal building being 80' closer to Highway 82, the future underground transit center being reduced in size, and all of the access roads, parking lots and buildings around the future terminal being reconfigured. In addition, a net of loss of 14,590 square feet of Commercial Ramp space results when compared with the Master Plan. Alternative 4 also reduced the South GA Ramp area by 184,670 square feet when compared to the Master Plan. On the North GA Ramp, all of the existing tie-downs will need to be relocated to a new ramp constructed on the north end of the existing North GA Ramp. Because of this new ramp, the North GA Ramp has net of 14,320 square feet of additional pavement than the Master Plan.

Figures B-18 and B-19 depict the impacts to the Master Plan Terminal Area and North and South GA ramps from Alternative 4.

For the future west side FBO, the FBO ramp and buildings are shifted further west because of the runway shift in various alternatives. This shift varies between 50' in Alternative 5a to 160' in Alternatives 7, 7a, 7b, and 8. Of these alternatives, 4, 7, 7a, 7b, and 8 may require reconfiguration of the west side FBO ramp due to proximity to Airport Ranch structures which may need to be preserved. Figure B-20 shows the effect of the Alternatives 7, 7a, 7b, and 8 runway shift to the west side FBO from the current Master Plan. Alternative 6 does not allow for West Side FBO development.

Impact of Proposed Larger Aircraft on Future Commercial Ramp Parking

All of the future airport improvements that were proposed in the 2012 Master Plan Update were developed assuming a 95-foot wingspan aircraft would be the largest aircraft operating at the airport. With the ongoing development of future commercial aircraft capable of flying into ASE increasing in size, an examination was made as to how the operational capacity of the future commercial apron would be impacted if larger aircraft began serving ASE. The aircraft that was used in this evaluation was the Bombardier CS-100 aircraft, which has a wingspan of 115'-1" and is roughly 8'-6" longer than the CRJ-700, which is the main commercial aircraft currently serving ASE.

Alternative 1, (Figure B-21) which proposes no change from the current Master Plan geometry, shows that 10 commercial aircraft with a 95-foot or less wingspan (CRJ-700) could be accommodated on the future commercial ramp. The remaining alternatives, 4 thru 10, can only accommodate 8 commercial aircraft the size of the Bombardier CS-100 on the future commercial ramp shown in the Master Plan. Figure B-22 illustrates the typical layout for the Master Plan commercial ramp with the Bombardier CS-100 aircraft.

Additionally, Alternative 1 provided enough room behind the aircraft parked on the future commercial ramp for a taxilane to exist between Taxiway "A" and the parked aircraft. This would allow aircraft that were on the commercial ramp to maneuver around other parked aircraft safely, without impeding on Taxiway "A." The required separation for Taxiway/Taxilane centerlines is 152' and the distance from a taxilane centerline to a fixed or movable object is 81'. Alternatives 4 thru 10 were once again studied to determine if a taxilane could still exist and meet FAA criteria with the larger aircraft parked on the future commercial ramp. It was concluded that a taxilane could still safely exist between the parked aircraft on the commercial ramp and Taxiway "A" for each proposed

Figure B-18: Impacts to Master Plan Terminal Area and South GA Ramp (Appendix C, Alternative 4, Sheet 3 of 8)

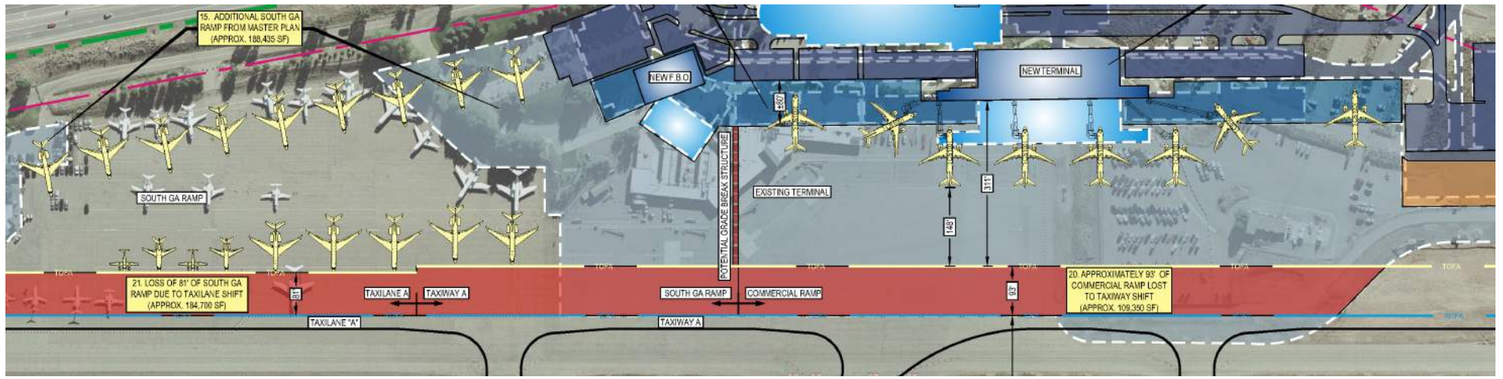


Figure B-19: Impacts to Master Plan North GA Ramp (Appendix C, Alternative 4, Sheet 4 of 8)

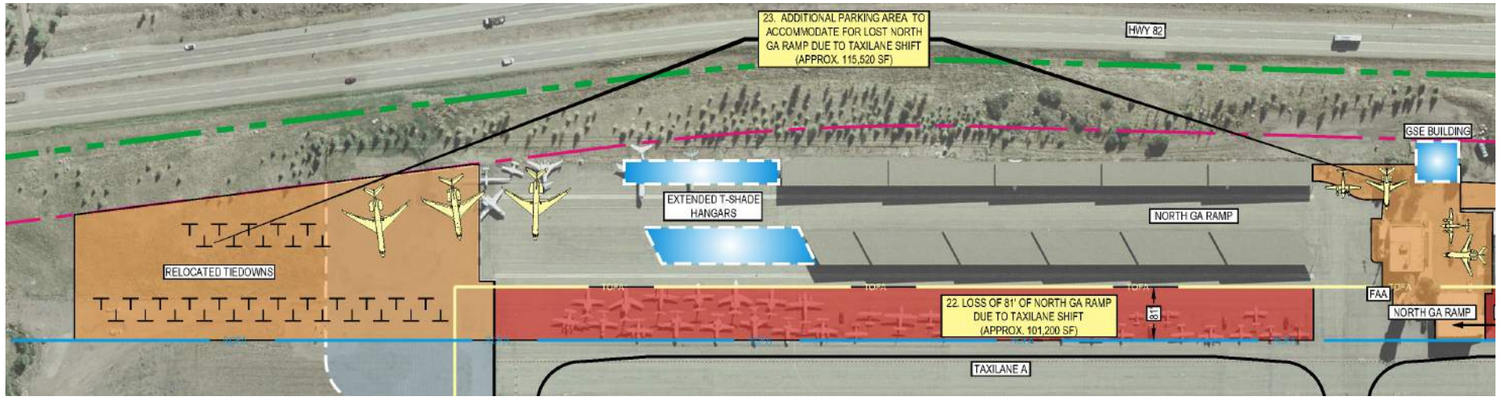


Figure B-20: Impacts to Master Plan West Side FBO (Appendix C, Alternatives 7, 7a, and 8, Sheets 4 of 10 and 4 of 7)

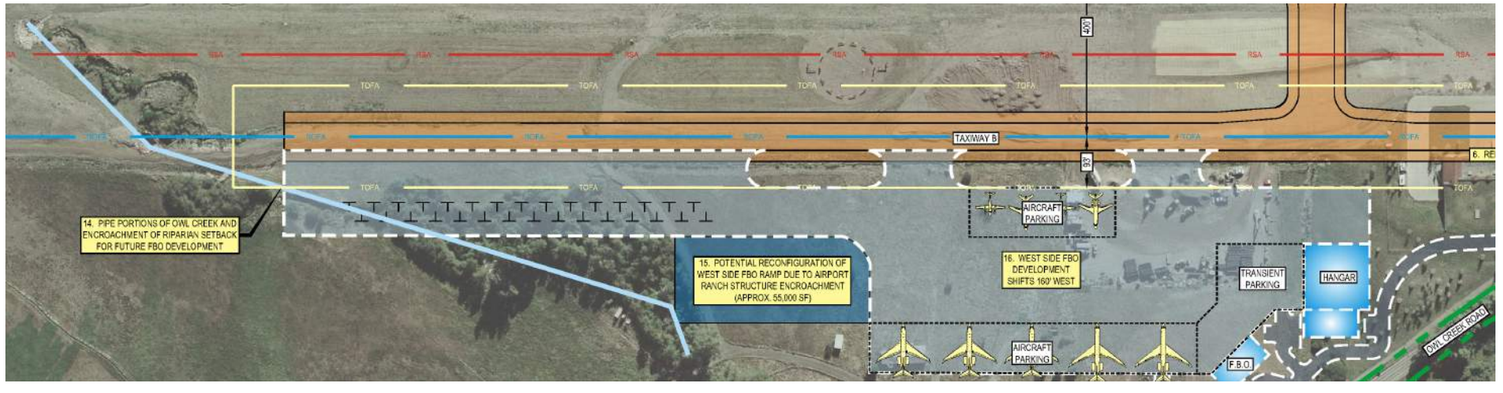


Figure B-21: 95-Foot Wingspan Aircraft on Master Plan Commercial Ramp (Appendix C, Alternative 1, Sheet 2 of 5)

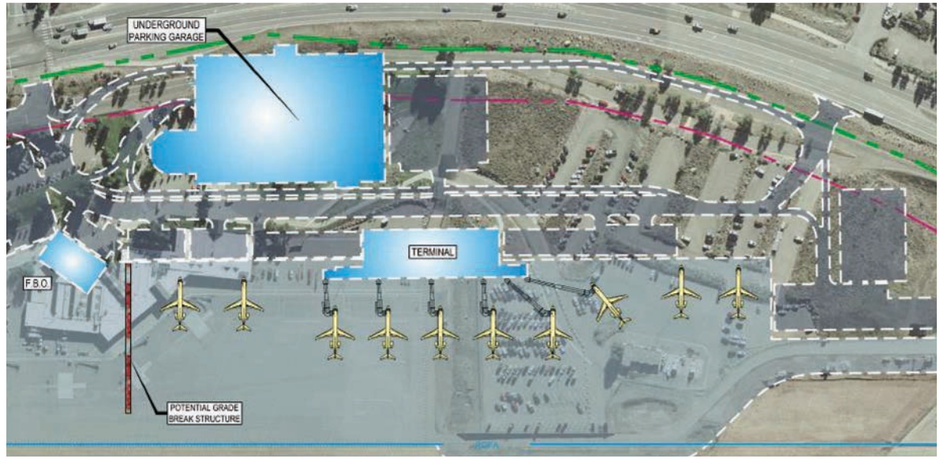


Figure B-22: Larger Regional Aircraft on Proposed Master Plan Commercial Ramp (Typical)

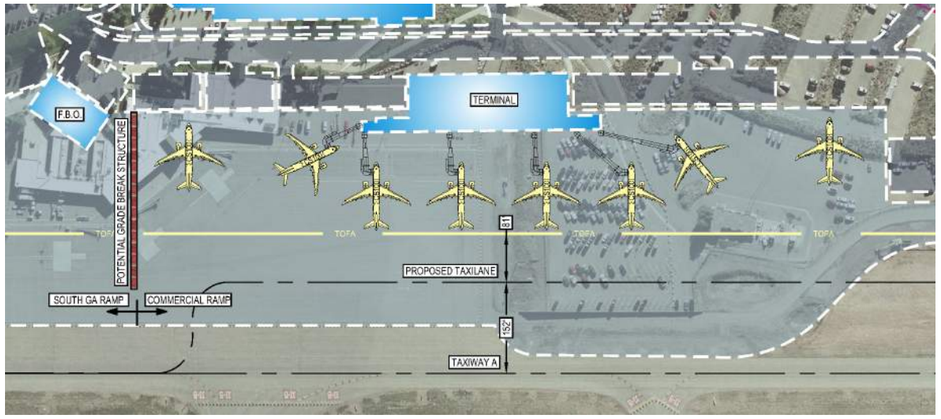
alternative except for Alternative 10, due to Taxiway "A" being shifted 15' to the east while the proposed commercial ramp and Terminal Building remained in-place. Figure B-23 shows the area for a proposed taxilane behind future aircraft on the Master Plan commercial apron.

Moving Proposed West Side Airport VSR Inside the TOFA of the Proposed West Side Taxiway

Another area from Step A which was identified for further evaluation was the impact of the proposed alternative layouts on the west side of the airport, particularly at the pinch point of Owl Creek Road and bike path. The FAA and airport wanted to explore ways that impacts such as retaining wall heights or extent of relocations for Owl Creek Road and Owl Creek bike path could be reduced. The FAA proposed allowing the west side airport VSR inside of the TOFA of the proposed west side taxiway. At a minimum, this change would reduce the extent of the proposed west side development in all alternatives by 22' (width of VSR and surface drain pan). Alternatives that were carried forward from Step A were evaluated for any reduction of impact to the west side infrastructure.

Alternative 1, which adheres to the current Master Plan proposed improvements, shows the proposed retaining wall below Owl Creek Road from the airfield was reduced from 20' to 18' in height. Owl Creek Road and Owl Creek bike path are not relocated in this alternative. Alternative 4 eliminated the proposed 8' retaining wall above Owl Creek Road, while the 23' retaining wall below Owl Creek Road to the airfield remained. Alternative 5 eliminated the proposed 5' retaining wall above Owl Creek Road, while the 24' retaining wall below Owl Creek Road remained. Alternatives 6 and 7 each do not propose a west side parallel taxiway at the pinch point of Owl Creek Road and bike path, therefore the retaining wall required in that area is 6' due to standard ROFA grading. However, the west side teacup taxiway will still exist and shift 160' west, resulting in a retaining wall of 17' below Owl Creek Road at this location. Alternative 8, which had the greatest impact on Owl Creek Road and bike path, will still require two retaining walls, one above Owl Creek Road and one below. However, the walls were reduced from 33' to 29' for the wall below Owl Creek Road, and 30' to 20' for the wall above Owl Creek Road. Figures B-24 and B-25 depict the reduction of the retaining wall heights on the west side of the airport in Alternative 8.

Figure B-23: Taxilane Behind Future Regional Aircraft on Master Plan Commercial Ramp (Typical)



New Alternatives 5a and 10 proposed retaining wall heights at the Owl Creek Road pinch point of 22' and 23', respectively. Alternative 5a also shows that Owl Creek Road will not require relocation, however, Owl Creek bike path will need to be relocated and the proposal is to move it to the west side of Owl Creek Road in this alternative. New Alternative 7a shows that Owl Creek Road and bike path will need to be relocated to the west in order to construct the portion of west side taxiway south of the AOC. In addition, a dual retaining wall system will be require with a 21' retaining wall below Owl Creek Road and a 15' retaining wall above Owl Creek Road. Figure B-10 shows the location of where the section for Alternative 7a was analyzed and Figure B-11 depicts the impact on west side infrastructure for Alternative 7a.

Property Impacted by Owl Creek Road and Owl Creek Bike Path Shift to the West

All of the alternatives in Step B propose either a runway shift to the west and/or a west side taxiway in the future. Due to these proposals, Owl Creek Road and Owl Creek bike path will require realignment further to the west. With this shift, the existing land impacted was evaluated.

The interested parties that will be impacted by the Owl Creek Road and bike path shift are Burlingame Open Space, Colorado Department of Transportation, and the Aspen/Pitkin County Airport. The property lines for each of these parcels were depicted on all of the proposed alternatives in Step B. For the impact to the existing land, it was not determined exactly how much of each party's interest would be impacted. This will come at a later time with the further evaluation of viable options. Rather, the overall land impacted was estimated in total amount of acreage required for infrastructure relocation.

Alternative 1 had no impact to the existing land where property would

Figure B-24: Retaining Wall Heights at Owl Creek Road Pinch Point with VSR Outside of TOFA (Appendix B, Alternative 8, Sheet 3 of 4)

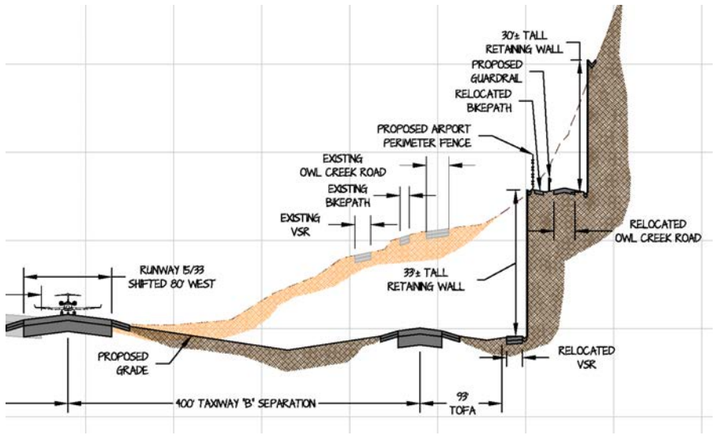
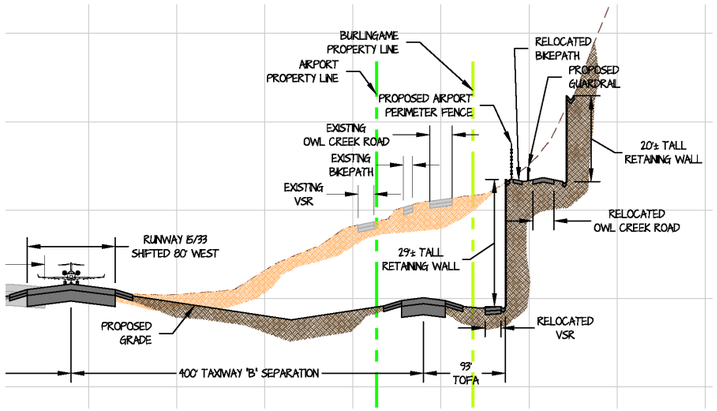


Figure B-25: Retaining Wall Height at Owl Creek Road Pinch Point with VSR Inside of TOFA (Appendix C, Alternative 8, Sheet 6 of 7)



be required to be purchased or a change in use would be required. The remainder of the proposed options, Alternatives 4-10 each have impacts to the existing land on the west side of the airport. The amount of acreage impacted by the shift of Owl Creek Road and bike path to the west varies from 1.1 acres in Alternative 5a to 9.5 acres in Alternative 10. Each of these alternatives may require a purchase of additional property and a public vote for change in use of the Burlingame parcel in order to move Owl Creek Road and bike path to the west. Figure B-27 shows an example of the total land impacted by shifting Owl Creek Road and bike path to the west in Alternative 6.

Figure B-26: Estimate of Total Land Impacted by Owl Creek Road Shift (Appendix C, Alternative 6, Sheet 1 of 7)

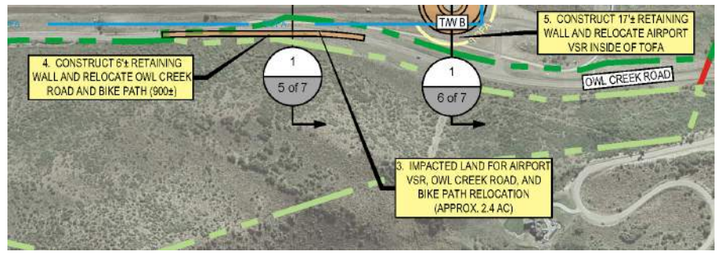
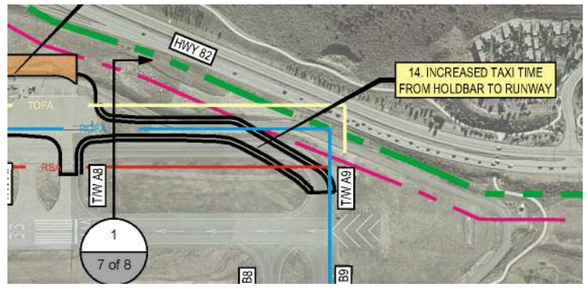


Figure B-27: Realigned Taxiway "A" and "A9" (Appendix C, Alternative 4, Sheet 1 of 8)



Reducing Encroachment into the Highway 82 Right-of-Way

Only one alternative showed an encroachment into the Highway 82 right-of-way. Alternative 4, as discussed in Step A, indicated a 14' retaining wall and a VSR tunnel would be located within the Highway 82 right-of-way to tie the proposed grade back to the existing grade. The FAA and the airport wanted to explore whether the encroachment into the Highway 82 right-of-way could be reduced or eliminated.

To provide additional room for the VSR on the east side, Taxiway "A" and "A9" were "dog-legged" to shift them further to the west, away from the highway right-of-way. Figure B-28 depicts the revised alignment for Taxiways "A" and "A9" from Alternative 4 on the Runway 33 end. By making this change the VSR is able to be adjusted so that it does not enter the Highway 82 right-of-way, thus eliminating the encroachment in this area. However, the revised taxiway alignment does present a safety concern since that taxiway would not be perpendicular to the runway at the holdbar. Addtionally, the VSR would likely encroach into the 100' Highway 82 right-of-way setback.

Step B – Meeting to Reduce Alternatives Based on Findings

A meeting was held on April 3, 2014, at the Jviation, Inc. office in Denver, CO to further narrow down the 9 alternatives and eliminating alternatives that are not viable. This meeting also provided an opportunity to add any alternatives that had not been contemplated. Attendees for the meeting included:

- **Aspen/Pitkin County Airport –** Jim Elwood, Brian Grefe and Dustin Havel
- **Pitkin County –** Jon Peacock
- **FAA –** John Bauer, Chris Schaffer, Mark Miller, Bill Watson (phone), Bob Bonnani (phone), John Dermody (phone)
- **Air Traffic –** Greg Dyer
- **Air Carrier –** Dave Faddis
- **William E. Payne and Associates –** William Payne
- **Kaplan, Kirsch, and Rockwell –** Peter Kirsch, Dan Reimer
- **Jviation, Inc. –** J.D. Ingram, Travis Vallin, Hilary Fletcher, Craig Sparks, Paul Fiore, Andy Remstad, Brian Lincoln

Outcomes

As was established in the Introductory chapter of this Final Report for the Future Air Service Planning Study – Phase II, the following three objectives were used to either eliminate or retain alternatives:

- Meet or improve FAA standard of safety, efficiency, and operational capacity
- Minimize the impact to the facilities previously approved in the 2012 Master Plan Update
- Accommodate larger future commercial regional aircraft

The FAA was consistent with the message from Step A as consultants and ASE staff were advised that the FAA has shifted federal policy to a more stringent approach to the application of safety standards to airport capital improvement projects. This policy shift essentially makes the grant of a Modification to Standards (MOS) unlikely if a project can adhere to FAA safety standards.

Once again, the impact of shifting the runway on aircraft approach and departure procedures was still unknown, although the majority of the study group was concerned that an 80' runway shift to the west, which

would provide the FAA standard RW/TW separation of 400', would negatively impact these procedures. Therefore, runway shifts less than 80', which did not provide a full 400' FAA standard RW/TW separation were still considered viable options. On the following pages are the results of the alternative analysis.

- ✓ **Meets objectives**
- ✓ **Meets objectives with conditions**
- ✓ **Does not meet objectives**

- **Alternative 1 –** RW in-place, TW "A" (east) at 320', TW "B" (west) at 320'
  - ✓ Does not meet FAA standard for RW/TW separation of 400' for existing TW "A" or proposed TW "B"
  - ✓ Meets the currently approved FAA Modifications to standard of 320' RW/TW separation
  - ✓ Does not impact efficiency and operational capacity of the airport as the current level of service is maintained with a 95-foot wingspan limitation
  - ✓ Does not impact 2013 Master Plan Update as the proposed improvements are the same as presented in the Master Plan
  - ✓ Does not accommodate the larger commercial regional aircraft

  Decision – Removed as a viable option due to not accommodating larger commercial aircraft

- **Alternative 4 –** RW in-place, TW "A" (east) at 400', TW "B" (west) at 400'
  - ✓ Meets FAA standard for RW/TW separation of 400' for existing TW "A" and proposed TW "B"
  - ✓ Efficiency would not be impacted because no operational restrictions would exist with uniform RW/TW separation on both side of the runway
  - ✓ Would impact operational capacity as the reduced aircraft parking area on the east side of the airfield would limit the amount aircraft able to arrive at ASE, forcing aircraft diversions to other airports if ramps were full
  - ✓ Major impacts to the 2012 Master Plan Update (Reconfiguration of entire terminal area)
  - ✓ Would accommodate larger commercial regional aircraft

  Decision – Removed as viable option due to major impacts to 2012 Master Plan Update

- **Alternative 5 –** RW 30' west, TW "A" (east) at 350', TW "B" (west) at 350'
  - ✓ Does not meet FAA standard for RW/TW separation of 400' for existing TW "A" and proposed TW "B"
  - ✓ Would require a new modification to standard for the 350' RW/TW separation for existing Taxiway "A" and proposed Taxiway "B"
  - ✓ Efficiency would not be impacted because no operational restrictions would exist with uniform RW/TW separation on both sides of the runway
  - ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
  - ✓ Limited impacts the 2012 Master Plan Update on aircraft ramp areas, west side FBO, and Owl Creek
  - ✓ Proposed 350' TW "B" separation may not be sufficient to allow for larger commercial regional aircraft

  Decision – Removed as viable option in favor of Alternative 5a

- **Alternative 5a –** RW 25' west and 150' wide, TW "A" (east) at 345', TW "B" (west) at 345'
  - ✓ Does not meet FAA standard for RW/TW separation of 400' for existing TW "A" and proposed TW "B"
  - ✓ Would require a new modification to standard for the 345' RW/TW separation for existing Taxiway "A" and proposed Taxiway "B"
  - ✓ Meets FAA standard of 150' runway for full Category D-III airports
  - ✓ Efficiency would not be impacted because no operational restrictions would exist with uniform RW/TW separation on both sides of the runway
  - ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
  - ✓ Limitedimpacts the 2012 Master Plan Update on aircraft ramp areas, west side FBO, and Owl Creek
  - ✓ Proposed 345' TW "A" and "B" separations may not be sufficient to allow for larger commercial regional aircraft

  Decision – Continued to Step C

- **Alternative 6 –** RW 80' west, TW "A" (east) at 400', No West side FBO
  - ✓ Meets FAA standard for RW/TW separation of 400' for existing TW "A"
  - ✓ Efficiency would not be impacted because no operational restrictions would exist with 400' RW/TW separation
  - ✓ Capacity would be impacted as larger aircraft would be restricted to the existing ramp parking area without the benefit of additional parking provided by the west side FBO
  - ✓ Major impacts to the 2012 Master Plan Update (No west side FBO)
  - ✓ Would accommodate larger commercial regional aircraft

  Decision – Continued to Step C

- **Alternatives 7, 7a, and 7b –** RW 80' west, TW "A" (east) at 400', Partial TW "B" (west) at 400'
  - ✓ Meets FAA standard for RW/TW separation of 400' for existing TW "A" and proposed TW "B" (7a would require removal of Airport Operations Center)
  - ✓ Conflicts with FAA recommendation to avoid runway crossings
  - ✓ Efficiency may be impacted due to aircraft holding for runway crossing to access west side FBO
  - ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
  - ✓ Known impacts to 2012 Master Plan Update limited to shifting 2nd FBO further west
  - ✓ Would accommodate larger commercial regional aircraft

  Decision – Removed as viable option due to safety and operational inefficiencies of runway crossings and impacts to Airport Operations Center by meeting RW/TW separation standards

- **Alternative 8 –** RW 80' west, TW "A" (east) at 400', TW "B" (west) at 400'
  - ✓ Meets FAA standard for RW/TW separation of 400' for TW "A" at the expense of removing the Airport Operations Center
  - ✓ Efficiency would not be impacted for aircraft because no operational restrictions would exist

- ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
- ✓ Known impacts to 2012 Master Plan Update limited to shifting 2nd FBO further west
- ✓ Would accommodate larger commercial regional aircraft

Decision – Removed as viable option due to impacts of meeting RW/TW separation standards on Airport Operations Center

- **Alternative 10 –** RW 25' west and 150' wide, TW "A" (east) shifted 15' east at 360', TW "B" (west) at 360'
  - ✓ Does not meet FAA standard for RW/TW separation of 400' for existing TW "A" and proposed TW "B"
  - ✓ Would require a new modification to standard for the 360' RW/TW separation for relocated Taxiway "A" and proposed Taxiway "B"
  - ✓ Meets FAA standard of 150' runway for full Category D-III airports
  - ✓ Efficiency would not be impacted because no operational restrictions would exist with uniform RW/TW separation on both sides of the runway
  - ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
  - ✓ Limited impacts the 2012 Master Plan Update on aircraft ramp areas, west side FBO, and Owl Creek
  - ✓ Proposed 360' TW "A" and "B" separations may not be sufficient to allow for larger commercial regional aircraft

Decision – Continued to Step C

After all alternatives were presented, discussed, and deliberated, there were outcomes which were inclusive of all remaining alternatives and any new alternatives moving forward. These included:

- FAA would pay to increase pavement strength for future larger aircraft at ASE
- FAA is very hesitant about removing and relocating both the FAA control tower and the Airport Operational Center
- 150' Runway width would be preferred by FAA and airlines for any future development

During the meeting, the FAA continued to emphasize the point that for any proposed alternative, meeting current design criteria should be the priority as these criteria are in place for the safe operation of aircraft.

There were three new alternatives developed in the Step B meeting for further evaluation in Step C. These were Alternatives 11, 12, and 13 and are detailed below in the section Additional Alternatives.

Summary of Alternative Analysis

- **Alternative 1 –** Removed from Study
- **Alternative 4 –** Removed from Study
- **Alternative 5 –** Removed from Study
- **Alternative 5a –** Continued to Step C
- **Alternative 6 –** Continued to Step C
- **Alternative 7, 7a, and 7b –** Removed from Study
- **Alternative 8 –** Removed from Study
- **Alternative 10 –** Continued to Step C

Additional Alternatives

- **Alternative 11 –** New Alternative
  - » Shift runway 80', widen to 150', construct a new west side parallel taxiway at 320' from the relocated runway
  - » East side RW/TW separation meets FAA standard, west side taxiway restricted to small GA aircraft
  - » Move proposed west side FBO to east side and move all GA parking to west side where FBO was proposed in Master Plan
- **Alternative 12 –** New Alternative
  - » Shift runway 80', widen to 150', construct a new west side parallel taxiway at 320' from the relocated runway south of the AOC
  - » Construct a new west side parallel taxiway at 400' from the relocated runway north of the AOC
  - » East side RW/TW separation meets FAA standard, west side taxiway operational restrictions south of the AOC
- **Alternative 13 –** Hybrid of 5a and 10
  - » Explore shifting runway more than 25' to the west and pushing Taxiway "A" into the ramp further than 15' shown on Alternative 10
  - » Try to split the difference between runway shift and Taxiway shift to get a greater RW/TW separation

Step B Summary

Removed Alternatives

- Alternative 1
- Alternative 4
- Alternative 5
- Alternative 7
- Alternative 7a
- Alternative 7b
- Alternative 8

Additional Alternatives

- Alternative 11
- Alternative 12
- Alternative 13

Remaining Alternatives to Step C

- Alternative 5a
- Alternative 6
- Alternative 10
- Alternative 11
- Alternative 12
- Alternative 13

Step C

Remaining Alternatives and Additions

Step C of the Future Air Service Planning Study (Phase II) for the Aspen/Pitkin County Airport consisted of further evaluation of alternatives that were carried forward from Step B and development of new alternatives that were introduced at the concluding meeting of Step B. The following were the Alternatives that were carried forward from Step B:

- Alternative 5a
- Alternative 6
- Alternative 10

All of the alternatives carried forward from Step B proposed an increase of the runway width from 100' to 150' in Step C. This was based upon input from the FAA and airlines that an additional 50' of runway width will substantially improve the visibility and safety of the runway and will satisfy the full Airplane Design Group III requirements.

New alternatives included the following:

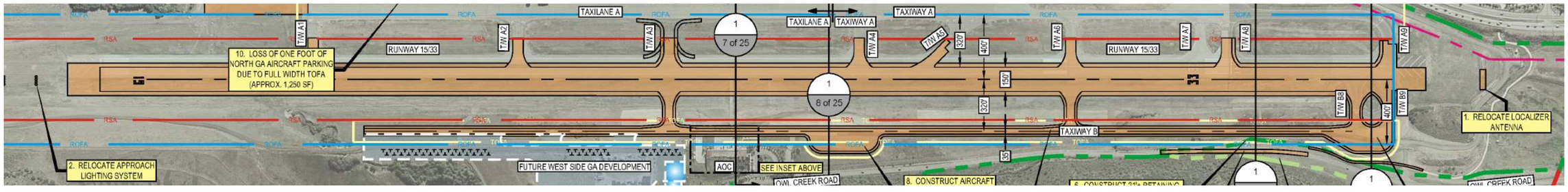
- **Alternative 11 –** Shift Runway 15/33 80' west, increase runway to 150' wide, construct parallel taxiway at 320' west of the relocated runway, restrict west side taxiway to smaller GA aircraft, move proposed west side FBO to east side of airport on North GA Ramp
  - » Would require new FAA modification to standard (320' RW/TW separation) for the west side taxiway
  - » Would require operational restrictions to the west side taxiway
  - » Would create two FBO operators on the east side of the airport, which creates safety and operational operational capacity concerns
  - » Meets FAA standard for RW/TW separation standards for the east side taxiway
  - » Meets FAA standard for runway width for airports serving aircraft with wingspans between 79' and 118' and weights of 150,000 pounds or more
- **Alternative 12 –** Shift Runway 15/33 80' west, increase runway width to 150', construct a parallel taxiway at 400' west of the relocated runway to the north of the AOC and 320' west of the relocated runway to the south of the AOC
  - » Would require new FAA modification to standard (320' RW/TW separation) for the west side taxiway, south of the AOC
  - » Would require operational restrictions to the west side taxiway, south of the AOC
  - » Meets FAA RW/TW separation standards for the east side taxiway and the portion of the west side taxiway north of the AOC
  - » Meets FAA standard for runway width for airports serving aircraft with wingspans between 79' and 118' and weights of 150,000 pounds or more
- **Alternative 13 (From Step B) –** The intent of this alternative was to try to develop a hybrid version of Alternatives 5a and 10 that maximized the RW/TW separation by shifting the runway west and east side Taxiway "A" east into the aircraft parking ramps. However, as this was explored, it became evident that there would be too much impact on the east side infrastructure and aircraft parking areas if Taxiway "A" was shifted any further to the east than the 15' proposed on Alternative 10. Therefore, this option of Alternative 13 was abandoned and another version of Alternative 13 was developed.
- **Alternative 13 (New Version) –** Shift Runway 15/33 43' west at the Runway 15 end and rotate the runway about the Runway 15 end 0.17° to the west, resulting in a 66' shift to the west on the Runway 33 end, increase runway width to 150', realign existing east side Taxiway "A" to 380' from the realigned runway centerline north of Taxiway "A6" and have a variable Taxiway "A" separation south of Taxiway "A6" from 380' to 387', construct a parallel taxiway at 380' west of the realigned runway to the north of the AOC and 320' west of the realigned runway to the south of the AOC
  - » Would require new FAA modification to standard (380' RW/TW separation) for the east side taxiway and the west side taxiway, north of the AOC
  - » Would require new FAA modification to standard (320' RW/TW separation) for the west side taxiway, south of the AOC
  - » Runway 15/33 would not be parallel with existing buildings on east side of runway and the AOC on the west side
  - » Meets FAA standard for runway width for airports serving aircraft with wingspans between 79' and 118' and weights of 150,000 pounds or more

As was done in Steps A and B, new alternatives were to incorporate, to the extent possible, new guidance from the FAA on airfield design and Modifications of Standards (MOS). Graphical layouts of each alternative compared to the existing airport layout and cross sections were produced at critical points on the airfield. In addition, the approach surface for Runway 15 and Runway 33 were evaluated for any penetrations. The results of Step C findings for new alternatives are explained below. Each alternative can be viewed in its entirety in Appendix "D".

Major Impact Evaluation for New Alternatives

High level evaluations of major impacts were identified for each new alternative. As identified above, the new alternatives were 11, 12, and 13. Major impacts to airport approach Navigational Aids (NAVAIDs), existing east and west side infrastructure, the Airport Operations Center (AOC), and existing Owl Creek were included.

Figure C-1: Approach NAVAIDs Relocation (Appendix D, Alternative 11, Sheet 1 of 25)



Approach NAVAIDs

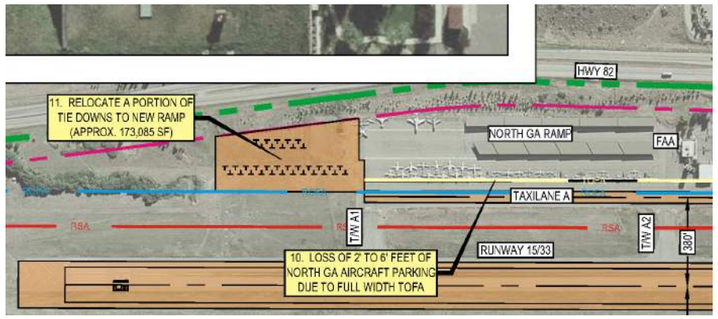
Located off each end of Runway 15/33 are NAVAIDs that assist aircraft to maintain the correct horizontal alignment while on approach onto Runway 15. On the north end of the runway is the approach lighting system, while on the south is the Localizer Antenna and Distance Measuring Equipment (DME). These systems are located on the runway centerline; therefore a relocation of each system will be associated with any runway shift (Alternatives 11, 12 and 13). Figure C-1 shows an 80' runway shift and relocated Approach NAVAIDs systems associated with Alternative 11.

East Side Infrastructure

All existing infrastructure which provides service to the flying public is constrained between Taxiway "A" on the west side and State Highway 82 on the east side. Due to the community presence, limited space, and potential cost, this study does not recommend any reconfiguration east of the existing airport property line.

Alternative 13 (see Figure C-2) is the only new alternative which poses any impact to the east side infrastructure. Due to Taxiway "A" being realigned with the runway in this Alternative, a portion of the aircraft tie-downs will require relocation. It is proposed to construct additional aircraft parking ramp on the north side of the North GA Ramp to accommodate these relocated tie-downs.

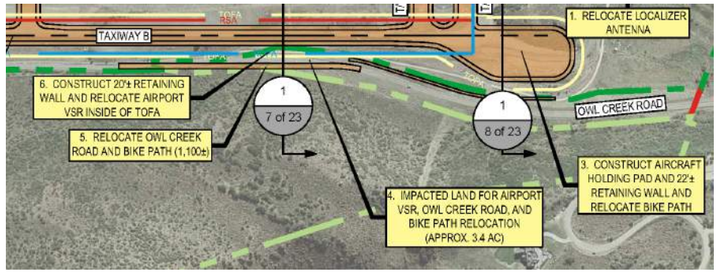
Figure C-2: East Side Impacts (Appendix D, Alternative 13, Sheet 1 of 27)



West Side Infrastructure

The southwest side of the airport poses critical impacts for all new alternatives. The airport vehicle service road (VSR), existing Owl Creek bike path, and Owl Creek Road are all located in a narrow envelope between rugged terrain and the airfield. This area evaluated is the location where Owl Creek Road is the closest to the airfield, at approximately

Figure C-3: Existing West Side Infrastructure Impacts (Appendix D, Alternative 12, Sheet 1 of 23)



Taxiway "A8" just south of the Runway 33 threshold, as this area has the largest impact on non-airport infrastructure. Redefined OFA's for the runway and taxiway, associated with a runway shift or west side parallel taxiway, will require relocation of the airport VSR, the Owl Creek bike path, and Owl Creek Road. Since the airfield is shifting to the west, the existing infrastructure will also need to move west, and may require land acquisition to accommodate the new locations of Owl Creek Road and Owl Creek bike path. In order to maintain FAA design criteria, extensive grading operations will be required in the southwest portion of the airport. For all the alternatives, the airport VSR will be lowered and relocated to the west. Owl Creek Road along with the bike path will be relocated in Alternatives 11, 12, and 13. The length of relocation of Owl Creek Road ranges from 900' in Alternatives 11 and 13 to 1,100' in Alternative 12. Figure C-3 shows the impact on Owl Creek Road from Alternative 12.

Airport Operations Center (AOC)

The AOC holds many important uses for the operations at the airport. In addition to housing snow removal equipment (SRE) and maintenance equipment, Airport Rescue and Firefighting (ARFF) is stationed out of the AOC. The concrete ramp in front of the AOC is used for many purposes, including, but not limited to, ARFF truck daily inspections, equipment maintenance, equipment training, and vehicle parking. As the usable space on this ramp becomes more limited, so do the operations of the AOC. The new west side taxiway TOFA encroaches on the AOC ramp, in turn reducing the usable space in front of the ARFF truck and SRE bay doors. Lost ramp space ranges from 83' in Alternative 12 to 61' in Alternative 13. Figure C-4 shows Alternative 13, where there is 61' of AOC ramp space lost due to construction of a west side taxiway, leaving 47' of usable ramp space remaining. These measurements are taken from the east side of the AOC ramp.

Figure C-4: Usable AOC Ramp Space (Appendix D, Alternative 13, Sheet 1 of 27)

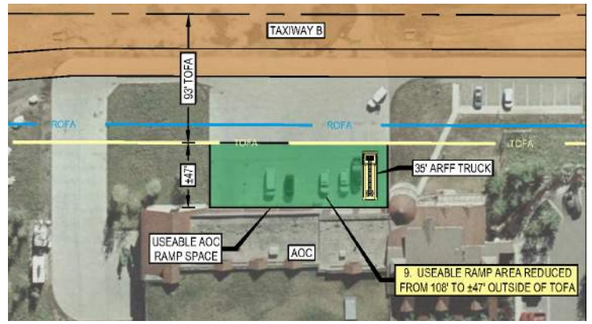
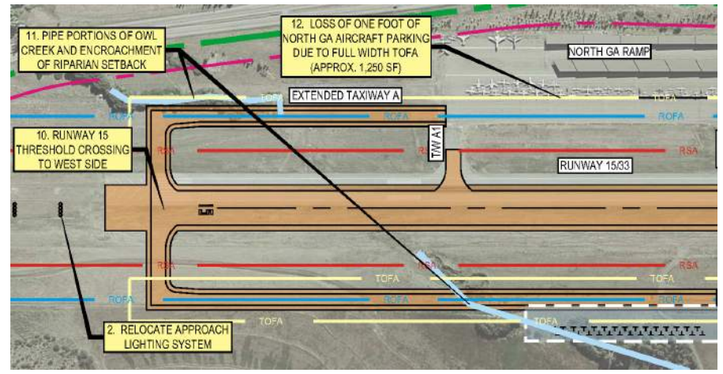


Figure C-5: Owl Creek Piping (Appendix D, Alternative 12, Sheet 1 of 23)



Owl Creek

As the airfield infrastructure shifts further west, the proposed west side development shifts with it. The ramp space shown in the ALP was maintained throughout each alternative to show the amount of space required, per Pitkin County Code Title X, for the west side FBO to operate. The further west this development shifts, the more it encroaches on the existing Owl Creek and 100' riparian setback. A portion of Owl Creek will be required to be piped underneath any future ramp areas. In addition, Alternative 12 would require the piping of Owl Creek on the east side of the runway where east side parallel Taxiway "A" would be extended to the north. Figure C-5 depicts the Owl Creek piping that would be required for Alternative 12.

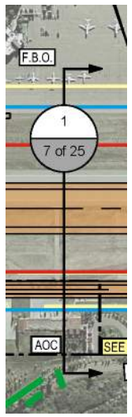
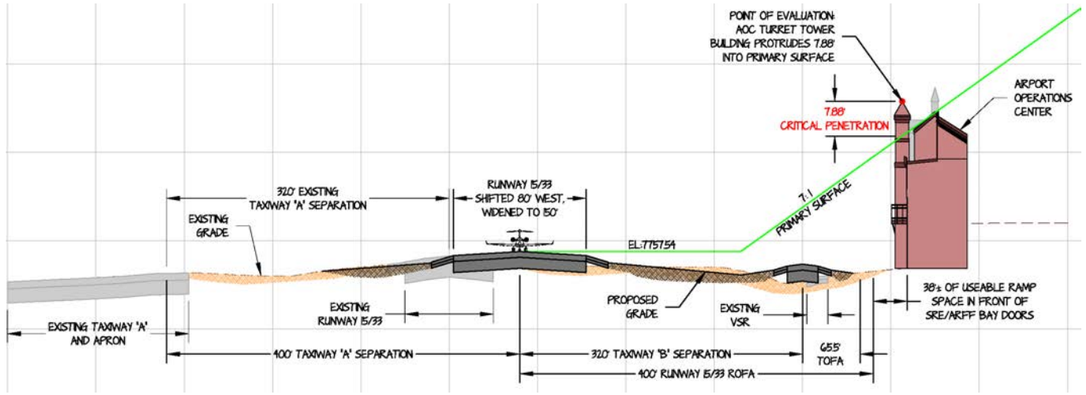


Figure C-6: Location of AOC Part 77 Evaluation Cross Section (Typical)

Figure C-7: AOC Part 77 Evaluation (Appendix D, Alternative 11, Sheet 7 of 25)



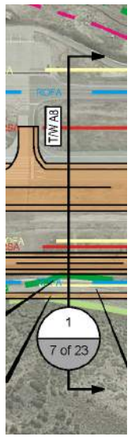
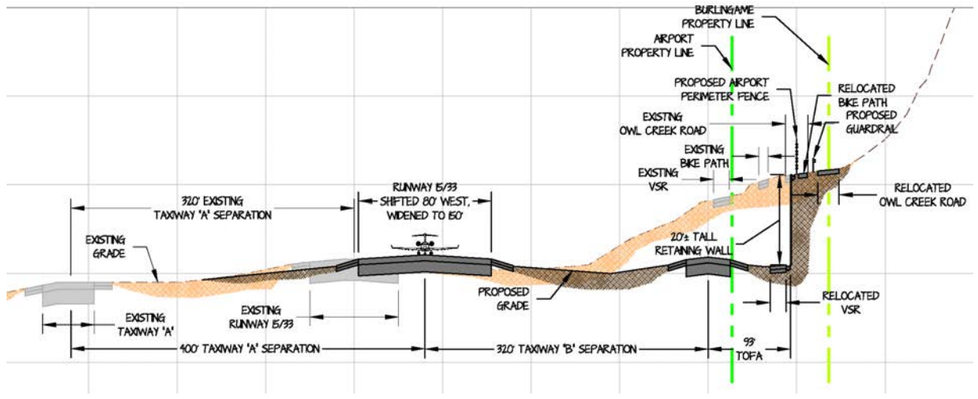


Figure C-8: Location of West Side Pinch Point Cross Section (Typical)

Figure C-9: West Side Pinch Point Evaluation (Appendix D, Alternative 12, Sheet 7 of 23)



Cross Section Development

Cross sections were produced at critical locations on the airfield to assist the evaluation of impacts for each new alternative. To produce the cross sections, a computer generated topographical terrain model was developed using aerial survey data to help identify critical locations of the airfield that will incur the greatest impact from each proposed alternative. There were two impacts that were evaluated. The first was existing infrastructure that would have the greatest obstruction into FAA Part 77 airspace. The Part 77 surface that was being evaluated for potential obstructions is an imaginary surface that is aligned with the runway which extends out and up from the runway in order to protect airspace around the airport. This airspace is critical for the safe operations of aircraft both while in the air and on the runway surface. The second were locations where the proposed alternative geometry would have the greatest impact on existing infrastructure outside of the airport perimeter.

It was determined that the critical location for existing infrastructure into the Part 77 surface was the turret tower on the existing AOC. The critical location for impact of the new proposed alternatives on the existing infrastructure was determined to be the area on the west side of the airport where Owl Creek Road is nearest to the airfield, referred to hereafter as the "pinch point". In addition, aircraft holding pads have been identified along the proposed west side taxiway of alternatives 11, 12, and 13. Each of these proposed holding pads would be in close proximity to Owl Creek Road, so cross sections were taken at these locations to determine the impact.

Airport Operations Center

Multiple sections were produced to analyze Part 77 surface conditions at the existing AOC due to the runway shifting closer to the building. These sections were produced at key locations on the building which would potentially penetrate the Part 77 surface. After investigation, it was determined that the AOC turret tower is the most consistent location on the AOC which conflicts or comes close to conflicting with the primary surface. Alternatives 11, 12, and 13 all show a penetration of the Part 77 surface with the AOC, ranging from 3.4' to 7.9'. Figure C-6 shows the location of the AOC Part 77 evaluation cross section which is typical for all alternatives, while Figure C-7 shows Alternative 11 and how the shift of the runway impacts the Part 77 primary surface.

West Side Pinch Point

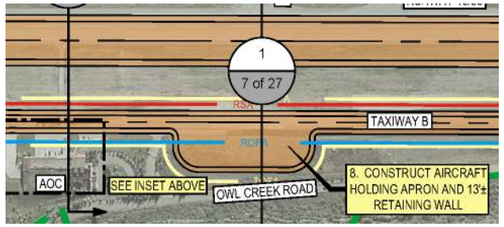
The rugged terrain on the west side of the airport provides difficulty in maintaining the existing conditions when grading proposed infrastructure for each alternative to FAA standard. The pinch point along Owl Creek Road located at approximately Taxiway "A8" just south of the Runway 33 threshold (see Figure C-8), provides a worst case scenario as the terrain in this area impedes the most on the proposed airfield alternatives. The sections show the proposed ultimate grading to FAA standards of the new west side taxiway for where the section was analyzed. To accommodate for the drastic changes in grade, retaining walls will be required. Potential surface drainage structures and the proposed airport perimeter fence are shown for space allocation, in addition to a proposed guard rail for Owl Creek Road. Figure C-9 shows the cross section for Alternative 12.

A retaining wall is required for each new alternative on the west side of the relocated airport VSR. The retaining wall required to catch grade for the relocated airport VSR ranges in height from 20' to 22' depending upon the extent of the airfield reconfiguration to the west.

Holding Pad South of AOC at Taxiway "A4"

This aircraft holding pad is shown in Alternatives 11, 12, and 13 along the proposed west side taxiway at a location consistent to what is shown in the current Master Plan. The benefit of this holding pad is to allow aircraft which land from the north to exit the runway sooner and hold on this pad, rather than that holding pad at the end of Runway 33, if required, due to operational restrictions. The sections cut at this holding pad location for the new alternatives indicate that a retaining wall of 12' to 15' will be required to tie the proposed grade back to the existing grade. The impact of this retaining wall and the holding apron on Owl Creek Road and bike path will be minimal other than the construction challenge of building a wall within close proximity of Owl Creek Road

Figure C-10: Location of Holding Pad South of AOC Cross Section (Typical)



shown in Alternative 13. The holding pad on Alternative 11 is slightly smaller than those on Alternatives 12 and 13 because the west side aircraft would be restricted to smaller GA aircraft. Figure C-10 shows the location of where the holding pad south of the AOC at T/W "A4" is proposed and Figure C-11 depicts the section from Alternative 13.

Holding Pad at Runway 33 End

This aircraft holding pad was added to the new alternatives to provide aircraft a location to hold, while waiting to takeoff from the 33 end, in an area that was outside of any runway or taxiway safety areas. This pad would likely be utilized on the west side in the new alternatives because of the operational restrictions on the proposed west side taxiway. The sections cut at this holding pad location for the new alternatives indicate that a retaining wall of 14' to 24' will be required to tie the proposed grade back to the existing grade. None of the alternatives require the relocation of Owl Creek Road, however, Owl Creek bike path will need to be relocated to the west in Alternatives 12 and 13. The holding pad on Alternative 11 is slightly smaller than those on Alternatives 12 and 13 because the west side aircraft would be restricted to smaller GA aircraft. Figure C-12 shows the proposed location of this holding pad and Figure C-13 illustrates the section from Alternative 12.

Figure C-11: Evaluation of Holding Pad South of AOC (Appendix D, Alternative 13, Sheet 7 of 27)

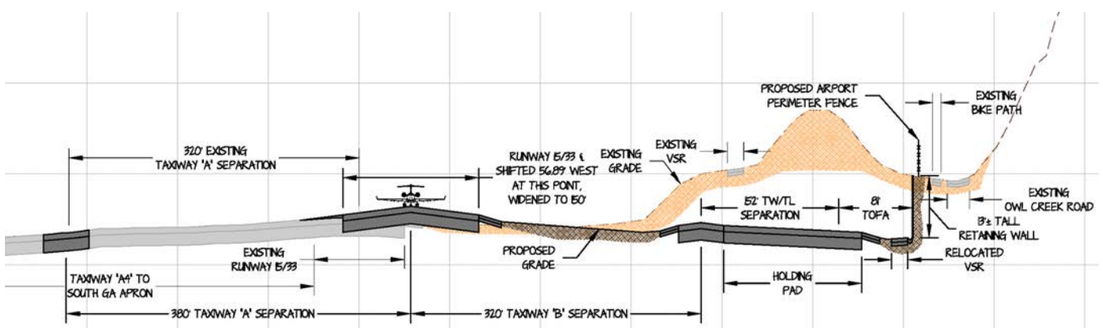


Figure C-12: Location of Holding Pad at Runway 33 End (Typical)

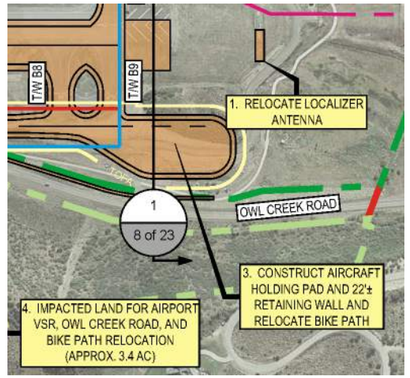
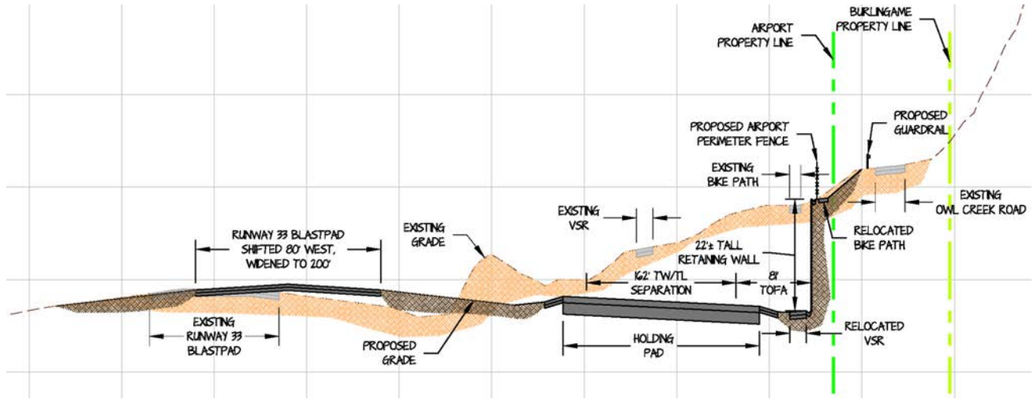


Figure C-13: Evaluation of Holding Pad at Runway 33 End (Appendix D, Alternative 12, Sheet 8 of 23)



Approach Surface Evaluation

The non-precision instrument approach surface for aircraft landing on the Runway 15 end of the runway was evaluated for penetrations by existing terrain. There was only one new Runway 15 approach surface produced in Step C, and this was for Alternative 13. The Runway 15 approach surface evaluations from Step A were still applicable for all of the remaining alternatives. Results are stated below. In addition to the Runway 15 non-precision instrument approach surface, the visual approach surface into Runway 33 was evaluated for the existing alternatives carried forward from Step B and the new alternatives developed.

Runway 15 Approach - Shift Runway 43′ to the West and Rotate 0.17°

As the runway shifts further west, the Runway 15 approach surface shifts with it. The terrain penetrations to the approach surface worsen in the 43' runway shift, however, because of the slight rotation of the runway to the west, the penetrations were less than if the runway would have remained on the same alignment. The penetrations for Alternative 13 into the runway approach surface reach up to 31' in height and are comparable to a 25' runway shift. A small penetration of approximately 6' occurs in the far southwest corner of the approach surface. Local grading can be performed to remove this

Figure C-14: Runway 15 Approach Surface Penetrations - 43′ Runway Shift and 0.17° Rotation - 4,000′ to 5,000′ North (Appendix D, Alternative 13, Sheet 13 of 27)

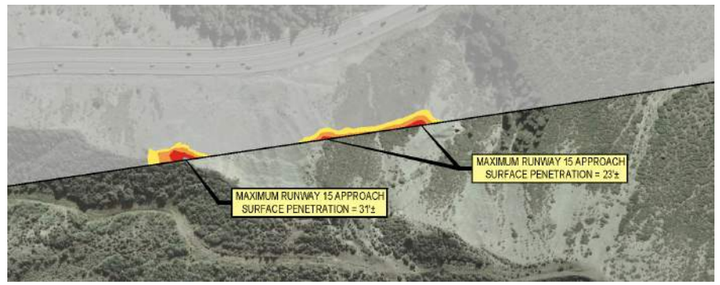


Figure C-15: Approach Surface Penetrations - 43′ Runway Shift and 0.17° Rotation - New Runway Threshold (Appendix D, Alternative 13, Sheet 13 of 27)

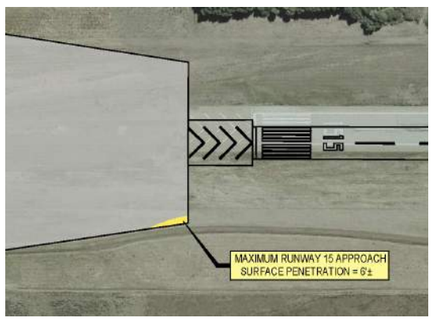


Figure C-16: Runway 33 Approach Surface Penetrations - Existing Conditions - 3,500′ to 5,000′ South

Figure C-17: Runway 33 Approach Surface Penetrations - Existing Conditions - Existing Threshold

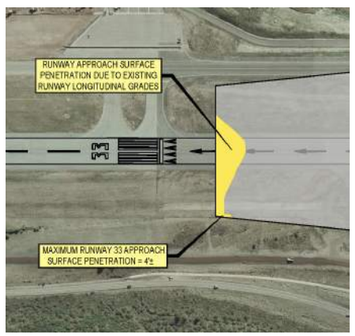


Figure C-18: Runway 33 Approach Surface Penetrations - 25′ Runway Shift - 3,500′ to 5,000′ South (Appendix D, Alternatives 5a and 10, Sheets 11 of 16 and 12 of 17)

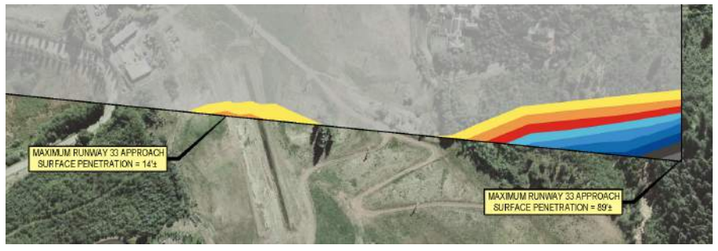


Figure C-19: Runway 33 Approach Surface Penetrations - 25′ Runway Shift - New Runway Threshold (Appendix D, Alternatives 5a and 10, Sheets 11 of 16 and 12 of 17)

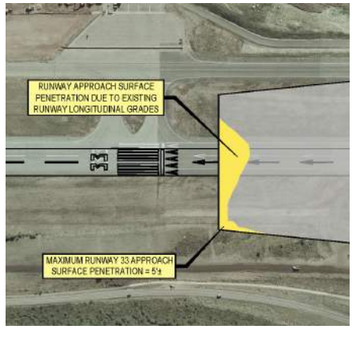


Figure C-20: Runway 33 Approach Surface Penetrations - 80′ Runway Shift - 3,500′ to 5,000′ south (Appendix D, Alternatives 6, 11, and 12, Sheets 11 of 21, 15 of 25, and 13 of 23)

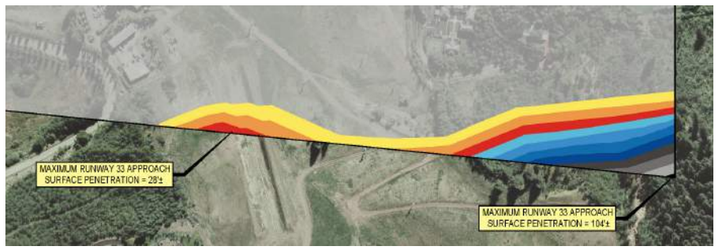


Figure C-21: Runway 33 Approach Surface Penetrations - 80′ Runway Shift - New Runway Threshold (Appendix D, Alternatives 6, 11, and 12, Sheets 11 of 21, 15 of 25, and 13 of 23)

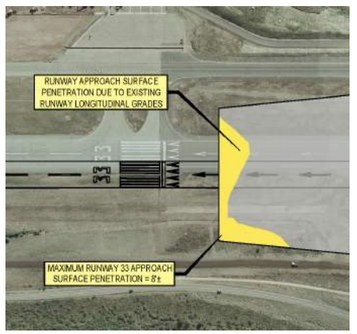


Figure C-22: Runway 33 Approach Surface Penetrations - 43′ Runway Shift and 0.17° Rotation - 3,500′ to 5,000′ south (Appendix D, Alternative 13, Sheet 14 of 27)

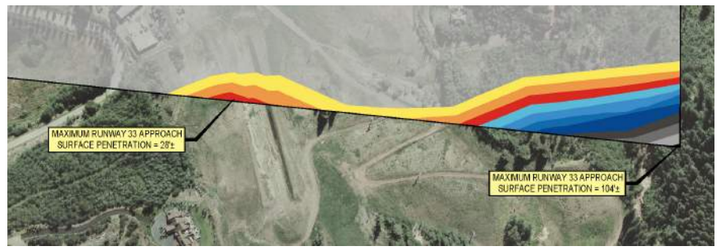
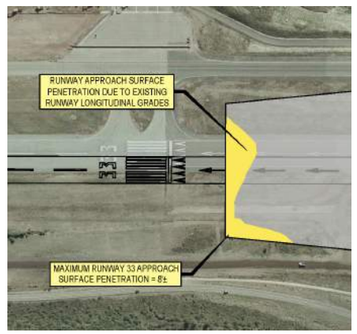


Figure C-23: Runway 33 Approach Surface Penetrations - 43′ Runway Shift and 0.17° Rotation - New Runway Threshold (Appendix D, Alternative 13, Sheet 14 of 27)



penetration. See Figure C-14 for penetrations located 4,000' to 5,000' north of the runway threshold, and Figure C-15 for the small penetration near the runway threshold.

Runway 33 Approach – Existing Runway In-Place

There are penetrations to the existing Runway 33 approach surface for the existing runway alignment. These penetrations are located on the west side of the approach surface in the Buttermilk Ski Area, approximately 3,500' to 5,000' south of the Runway 33 threshold. Penetrations here are up to 83' in height. A small area of penetration up to 4' exists at the Runway 33 threshold due to the grade of the runway continuing to rise to the south. Figures C-16 and C-17 shows the penetrations for the existing Runway 33 approach surface.

Runway 33 Approach - Shift Runway 25′ to the West

Similar to the Runway 15 approach, the further the runway shifts to the west, the greater the penetrations will be from existing terrain. Alternatives 5a and 10 each proposed a runway shift of 25' to the west, resulting in penetrations of the 33 approach surface up to 89' on the southwest area of the approach. Additionally, because the runway grade continues to rise to the south from the north end of the approach, there are some penetrations into the approach surface which cannot be corrected unless the runway was rebuilt at a flatter grade. Figures C-18 and C-19 shows the penetrations for the 25' shift Runway 33 approach surface.

Runway 33 Approach - Shift Runway 80′ to the West

Alternatives 6, 11, and 12 all propose to shift the runway 80' to the west. The analysis shows that this shift causes Runway 33 approach surface penetrations up to 104' in the southwest corner of the approach surface. Once again, the existing runway grade causes a penetration into the approach surface as it nears the Runway 33 threshold of up to 8'. This penetration cannot be corrected unless the runway was reconstructed at less of a longitudinal grade. Figures C-20 and C-21 shows the penetrations for the 80' shift Runway 33 approach surface.

Runway 33 Approach - Shift Runway 43′ to the West and Rotate 0.17°

Alternative 13 is the only alternative that proposes to realign the runway centerline. The result is on the Runway 33 end, the runway is shifted 66' to the west. When the Runway 33 approach surface is placed on this new

alignment and evaluated, penetrations up to 104' in the southwest corner of the approach surface can be expected. The impact to the Runway 33 approach surface in Alternative 13 mirrors that of a straight 80' shift to the west as presented in Alternatives 6, 11, and 12. The rotation of the runway did not improve the penetration of the approach surface near the Runway 33 threshold as approximately 8' of ground penetration occurred. Figures C-22 and C-23 shows the penetrations for the 80' shift Runway 33 approach surface.

Additional Evaluation for Alternatives 11, 12, and 13 from Step A

The creation of new alternatives from Step B to Step C necessitated the evaluation of specific items that were studied for all alternatives in Step B. Currently, in addition to the reduced RW/TW separation, the airport has approved FAA modifications of standards (MOS) for the runway to holdbar separation of 272.5' and east side Taxiway "A" OFA of 169.5' (93' on west side of the taxiway and 76.5' on the east side). Step B included determining the impacts for each alternative of meeting FAA standards on runway to holdbar separation of 328' and the Taxiway "A" OFA of 186', specifically on existing aircraft parking area.

In addition, there were several specific items that were established in Step A for evaluation for all alternatives in Step B. These items would also require evaluation for any new alternatives in Step C. Included in the items was determining the impacts of the proposed alternative to the future improvements shown in the current Master Plan, looking at proposed larger aircraft's impact on future Commercial Ramp parking, moving the proposed airport VSR inside the TOFA of the proposed west side taxiway to reduce impacts on existing infrastructure outside of the airport, and estimating property that would be impacted in order shift Owl Creek Road and Owl Creek bike path to the west for future west side improvements.

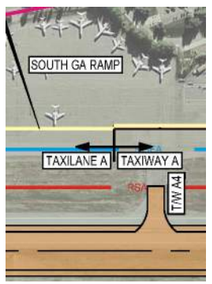


Figure C-24: Location where Taxiway "A" Turns into Taxilane "A" (Typical)

Meeting FAA Standards on Runway/Holdbar Separation and Taxiway/Taxilane "A" OFA

Each new alternative was evaluated to determine the feasibility of meeting FAA standards for Runway/Holdbar separation and Taxiway/Taxilane "A" OFA criteria. A taxilane is a taxiway that is not controlled by the Air Traffic Control Tower and where slower aircraft taxiing speeds occur. At the time of the refining of Alternatives in Step C, the FAA Advisory Circular for Airport Design had updated the Runway/Holdbar separation requirement for airports serving aircraft with wingspans between 79' and 118' from what was used in Step B. During step B, the required Runway/Holdbar separation was 328'. However, the new updated FAA criteria now required Runway/Holdbar separation of 328'. The required taxiway/taxilane OFA widths remained the same at 93' and 81' respectively. East side Taxiway "A" turns into a taxilane just north of Taxiway "A4" and remains a taxilane until it terminates at Taxiway "A1". This change can be seen in Figure C-24.

Meeting the FAA's updated standard of 328' Runway/Holdbar separation required not only the possibility for the new alternatives to meet this standard, but a re-examination of the existing alternatives. After this was completed, the determination was that only Alternatives 6 could meet this updated FAA standard because it is the only option with a single RW/TW separation of 400'. The remaining alternatives would not be able to meet the updated FAA standard for Runway/Holdbar separation of 328' because some portions of RW/TW separation are proposed to be less that 400', and would therefore require a MOS from the FAA.

The standard OFA widths for Taxiway/Taxilane "A" were applied to each new alternative to determine the impacts to the existing aircraft parking areas on the east side of the airport. Because of the limited amount of aircraft parking available at the airport, any loss of parking area is critical. For Alternatives 11 and 12, the impact was not a result of shifting existing east side Taxiway "A" to the east for further separation from the runway, but rather application of the FAA standard TOFA width. Each of these alternatives showed the TOFA reduced the North GA Ramp by 1' along the east edge, or 1,250 square feet. The South GA Ramp was

Figure C-25: Impacts to Aircraft Parking Ramp Areas (Appendix D, Alternative 11, Sheet 1 of 25)

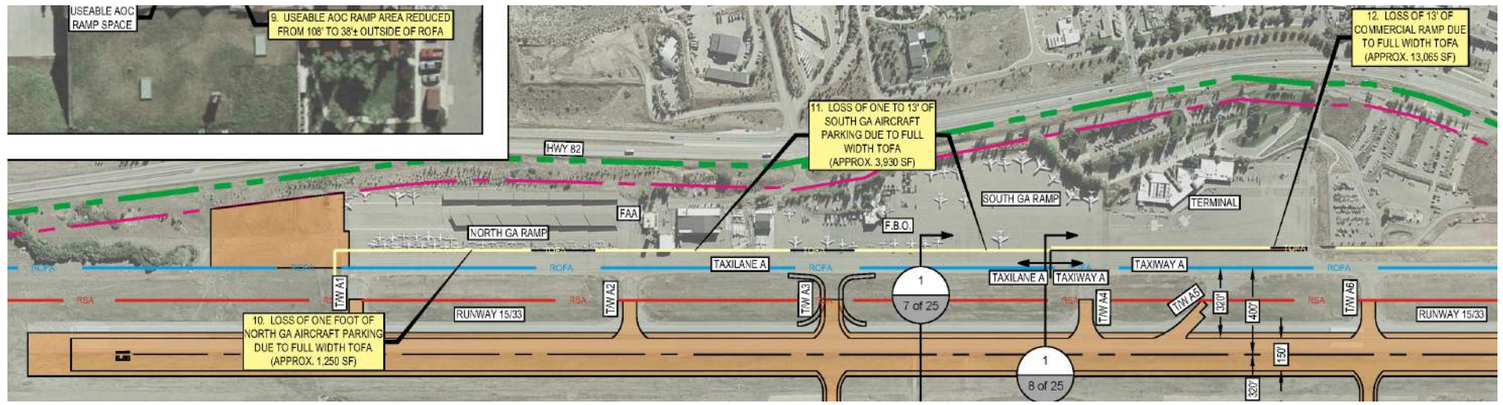
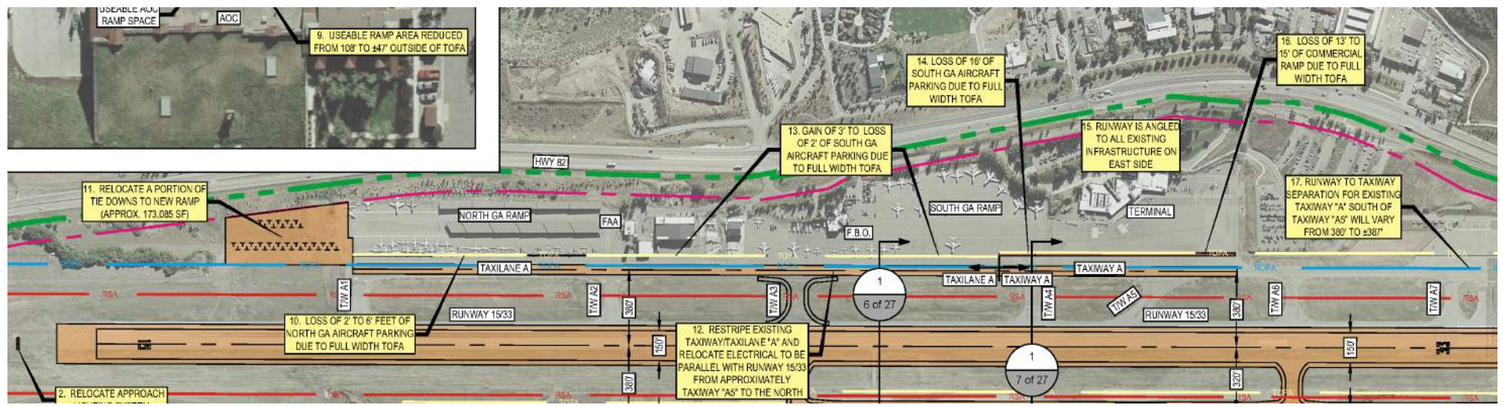


Figure C-26: Impacts to Aircraft Parking Areas (Appendix D, Alternative 13, Sheet 1 of 27)



reduced from applying a standard TOFA by 1' with a small segment of the south end of the South GA Ramp being reduced by 13', or a total of 3,930 square feet. The Commercial Ramp was reduced by 13' along the east side because of the Taxiway "A" TOFA, or a total of 13,065 square feet. Figure C-25 shows the lost aircraft parking ramp for Alternative 11.

Alternative 13 does realign the centerline of existing east side Taxiway "A", shifting the taxiway further into the aircraft ramp areas on the North and South GA Ramps. As a result, the reduction on the existing North GA Ramp from the TOFA is 2' to 6' along the east edge, or 5,410 square feet. The change to the South GA Ramp from the TOFA is a loss up to 2' on the north end and a gain of 3' on the south end resulting in a total reduction of 370 square feet. The Commercial Ramp was reduced by 13' to 15' along the east edge because of the Taxiway "A" TOFA, or a total of 15,290 square feet. Figure C-26 illustrates the impact to ramp parking in Alternative 13.

Figure C-27: Impacts to Master Plan Terminal Area and South GA Ramp (Appendix D, Alternative 11, Sheet 3 of 25)

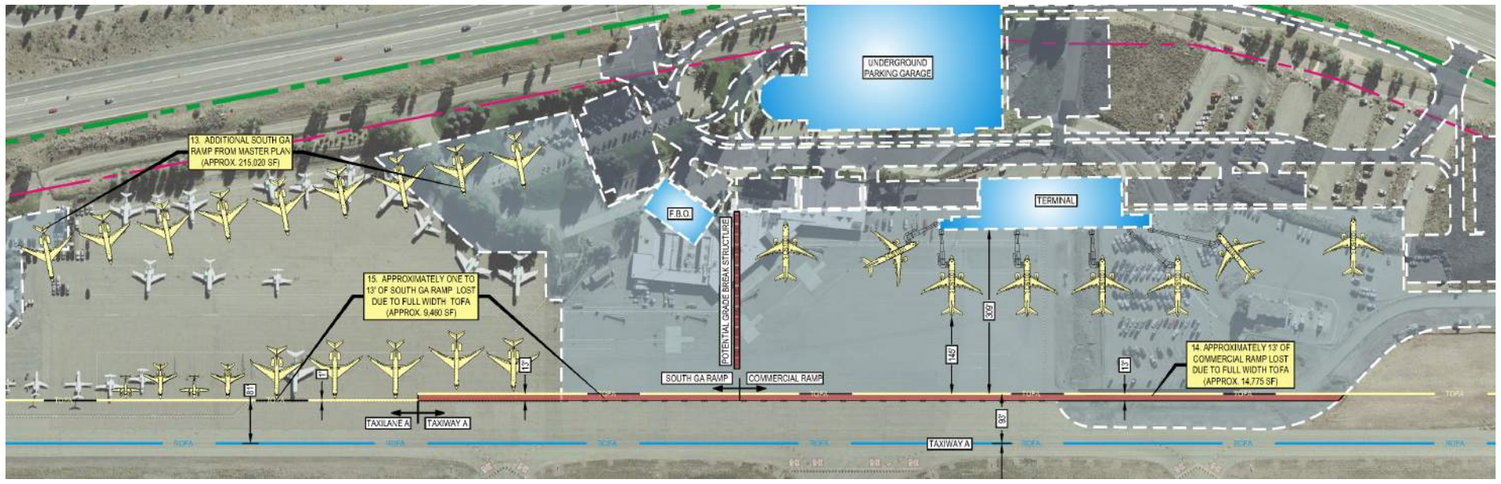
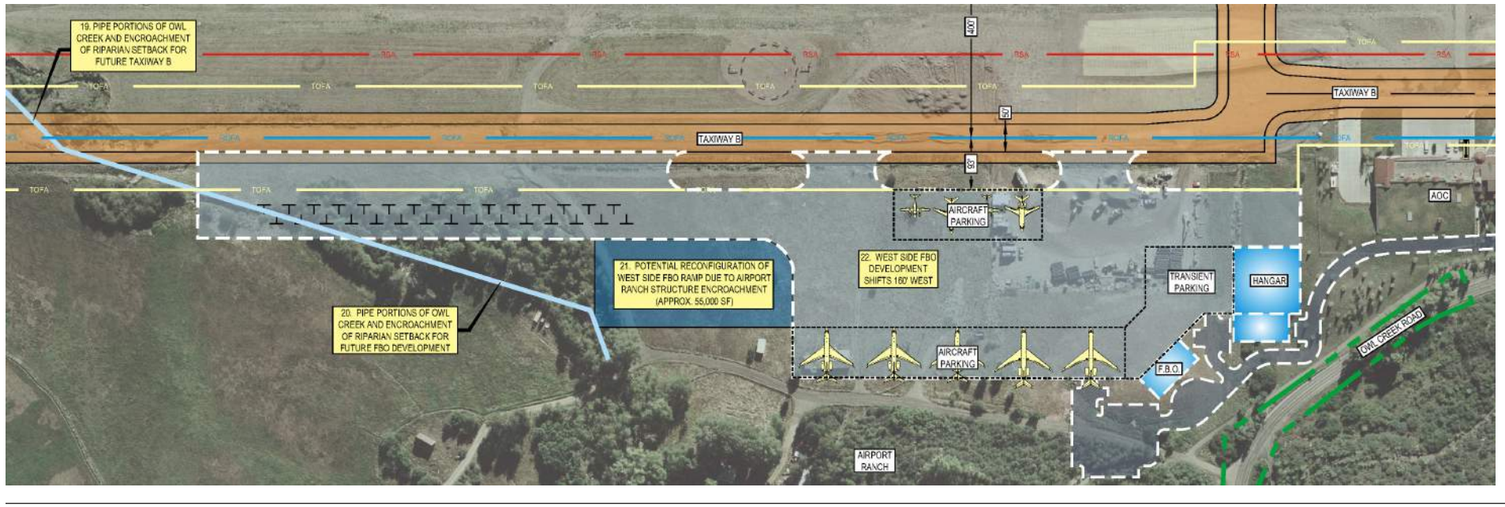


Figure C-28: Impacts to Master Plan West Side FBO (Appendix D, Alternative 12, Sheet 4 of 23)



Impacts on Current Master Plan

An existing Master Plan was completed for the Aspen/Pitkin County Airport in 2012. The Master Plan contemplated future needs and development of the airport based upon maintaining the 95-foot aircraft wingspan restriction into the future. Since then, as discussed in the Future Air Service Study – Phase I section of the final report, a reconsideration of proposed improvements to the airport was necessary due to emerging aircraft technology resulting in larger aircraft. In Step C, each new alternative was compared to the existing Master Plan proposed improvements to see how they could be impacted. Exhibits were produced for the new alternatives that highlighted the impacts on the Master Plan Terminal Area, North and South GA Ramps, and west side FBO.

For Alternatives 11, 12, and 13, the impacts to the Master Plan Terminal Area and North and South GA Ramps was solely in lost apron space because of applying the FAA standard TOFA width to Taxiway/Taxilane "A". When Alternatives 11 and 12 were compared with the current Master Plan, the North GA Ramp, South GA Ramp, and Master Plan Terminal Area showed a reduction in aircraft ramp areas of 1,250 square feet, 9,460 square feet, and 14,775 square feet respectively. Figure C-27 depicts the impacts to the Master Plan Terminal Area and South GA Ramp from Alternative 11. Alternative 13 impacted the Master Plan Terminal Area and South GA ramp with aircraft ramp area reductions of 15,290 square feet and 7,870 square feet respectively. However, because of additional ramp proposed to be constructed on north end of the North GA Ramp, the net ramp area increases by 94,450 square feet when compared to the Master Plan.

For the future west side FBO, the FBO ramp and buildings are shifted further west because of the runway shift in Alternatives 12 and 13. This shift varies between 105' in Alternative 13 to 160' in Alternative 12. Each of these alternatives may require reconfiguration of the west side FBO ramp due to proximity to Airport Ranch structures which may need to be preserved. Alternative 11 has the largest impact on the proposed west side FBO from the Master Plan as it considers moving the west side FBO to the east side of the airport on the North GA ramp and moving all small GA operations to the west side of the airport where the proposed FBO had been contemplated. Figure C-28 illustrates the impact to the west side FBO in Alternative 12 and Figures C-29 and C-30 show how the west side FBO would be moved to the east side of the airfield and small GA would operate on the west side of the airfield in Alternative 11.

Figure C-29: Move Master Plan West Side FBO to East Side of Airport (Appendix D, Alternative 11, Sheet 6 of 25)

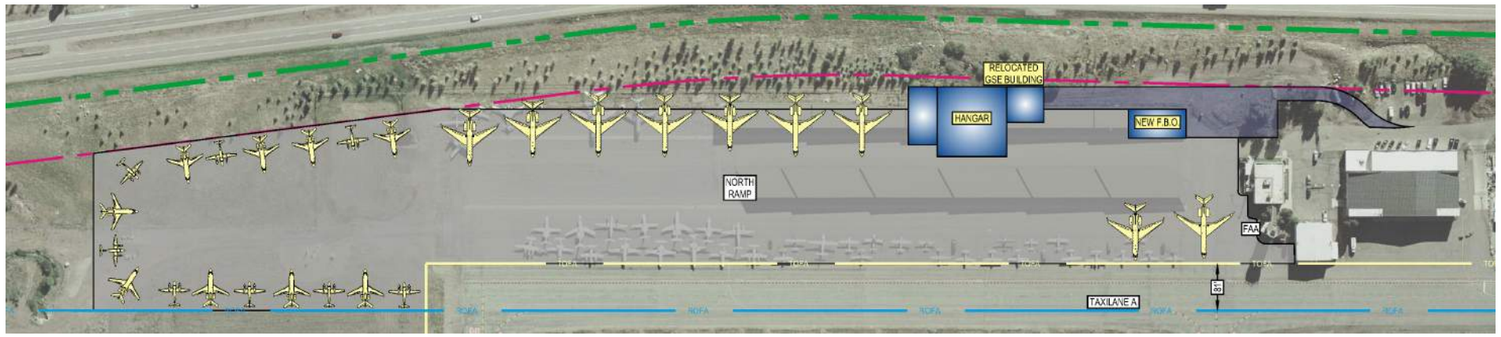


Figure C-30: West Side Ramp for Small GA Aircraft (Appendix D, Alternative 11, Sheet 6 of 25)

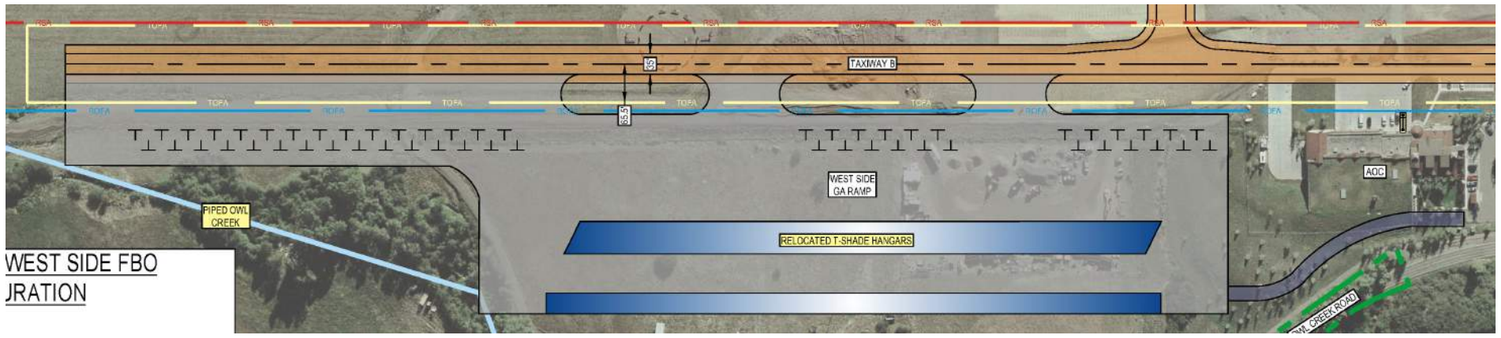
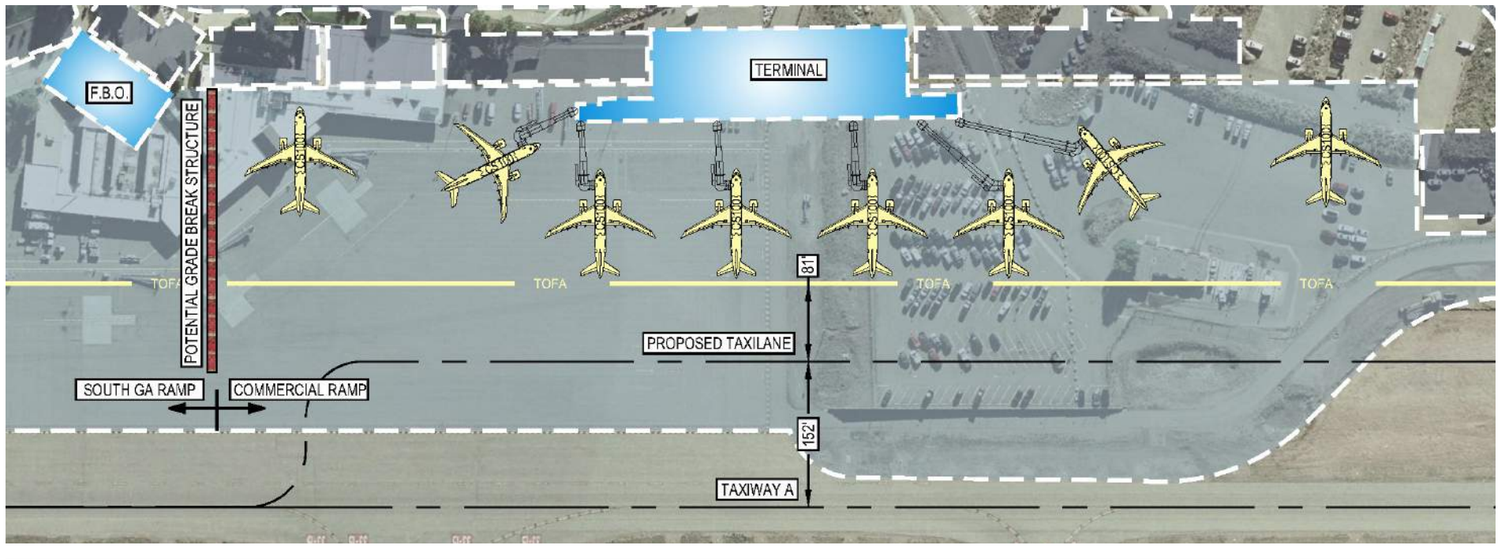


Figure C-31: Taxilane Behind Future Regional Aircraft on Master Plan Commercial Ramp (Typical)



Impact of Proposed Larger Aircraft on Future Commercial Ramp Parking

All of the future airport improvements that were proposed in the 2012 Master Plan Update were developed assuming a 95-foot wingspan aircraft would be the largest aircraft operating at the airport. With the ongoing development of future commercial aircraft capable of flying into ASE increasing in size, an examination was made as to how the operational operational capacity of the future commercial apron would be impacted if larger aircraft began serving ASE. The aircraft that was used in this evaluation was the Bombardier CS-100 aircraft, which has a wingspan of 115'-1" and is roughly 8'-6" longer than the CRJ-700, which is the main commercial aircraft currently serving ASE.

Each of the new alternatives, 11 thru 13, can only accommodate eight commercial aircraft the size of the Bombardier CS-100 on the future Commercial Ramp shown in the Master Plan. Additionally, an examination was performed to determine if there was enough room behind the aircraft parked on the future commercial ramp for a taxilane to exist between Taxiway "A" and the parked aircraft. This would allow aircraft that were on the commercial ramp to maneuver around other parked aircraft safely, without impeding on Taxiway "A". The required separation for Taxiway/Taxilane centerlines is 152' and the distance from a taxilane centerline to a fixed or movable object is 81'. It was concluded that a taxilane could still safely exist behind the parked aircraft on the commercial ramp and Taxiway "A" on each of the new alternatives. Figure C-31 shows the area for a proposed taxilane behind future aircraft on the Master Plan commercial apron.

Moving Proposed West Side Airport VSR Inside the TOFA of the Proposed West Side Taxiway

New Alternatives 11, 12, and 13 each showed the proposed west side VSR inside of the TOFA of the proposed west side taxiway as the preferred location. This assisted in reducing the impacts to Owl Creek Road and bike path as well as reducing the heights of retaining walls along the west side of the airfield. Figure C-32 shows how the west side VSR lies within the TOFA of the west side taxiway in Alternative 13.

Property Impacted by Owl Creek Road and Owl Creek Bike Path Shift to the West

All of the new alternatives propose a runway shift to the west and a west side taxiway in the future. Due to these proposals, Owl Creek Road and Owl Creek bike path will require realignment further to the west. With this shift, the existing land impacted was evaluated.

The interested parties that will be impacted by the Owl Creek Road and bike path shift are Burlingame Open Space, Colorado Department of

Figure C-32: West Side VSR Inside TOFA of West Side Taxiway (Appendix D, Alternative 13, Sheet 8 of 27)

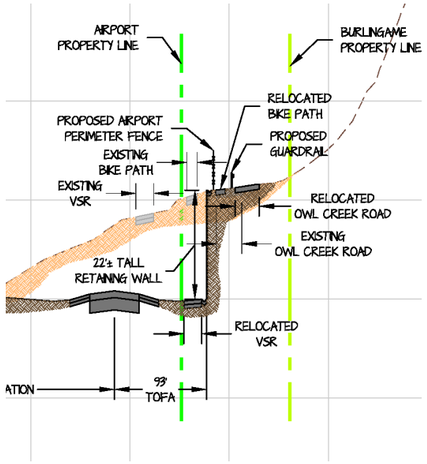
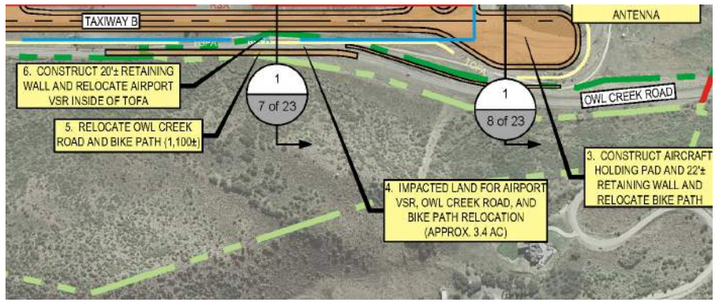


Figure C-33: Estimate of Total Land Impacted by Owl Creek Road Shift (Appendix D, Alternative 12, Sheet 1 of 23)



Transportation, and the Aspen/Pitkin County Airport. The property lines for each of these parcels were depicted on all of the new alternatives in Step C. For the impact to the existing land, it was not determined exactly how much of each party's interest would be impacted. This will come at a later time with the further evaluation of viable options. Rather, the overall land impacted was estimated in total amount of acreage required for infrastructure relocation.

Alternatives 11 thru 13 each had impacts to the existing land on the west side of the airport. The amount of acreage impacted by the shift of Owl Creek Road and bike path to the west varies from 2.0 acres in Alternative 13 to 3.4 acres in Alternative 12. Alternatives 11 and 12 may require a purchase of additional property and a public vote for change in use of the Burlingame parcel in order to move Owl Creek Road and bike path to the west. Alternative 13 will likely not shift Owl Creek Road far enough to the west that additional land will be required from the Burlingame parcel. Figure C-33 shows an example of the total land impacted by shifting Owl Creek Road and bike path to the west in Alternative 12.

Additional Evaluation for All Alternatives from Step B

Per the Scope of Work for the Future Air Service Planning Study, Phase II, there were specific tasks that needed to be completed in Step C. These included assessing the effect that each runway shift would have on approach and departure procedures, looking at what local and federal considerations could apply to each alternative, developing potential construction phasing for the alternative, estimating the economic impacts of a runway shut-down to perform the construction, and researching regulatory considerations from an FAA perspective.

Approach and Departure Procedures Impact from Proposed Runway Shifts

When contemplating the extent that the runway could shift to the west, approach and departure procedures for aircraft were a key component to determining the limits. There were several options studied for shifting the runway to the west to allow greater separation from the existing east side Taxiway "A". The alternatives ranged from shifting the runway 80' to the west to leaving the runway in place. However, in order to achieve greater RW/TW separation and have minimal impact on existing aircraft parking areas, a runway shift would be required.

In order to determine the impacts on the approach and departure procedures as a result of a new runway position, Lean Photometrics, a sub-consultant who specializes in evaluating and establishing approach and departure procedures, was hired to analyze existing procedures specific to ASE. In addition, with improving technology in aircraft, potential future approach procedures were developed and analyzed to determine the challenges of a shift in the runway to the west.

A summary of the results indicated that although there are some impacts to existing and potential future approach and departure procedures, none of the runway shift alternatives created a scenario that would make it impossible for aircraft to operate at ASE. With this in mind, it would be feasible for the runway to shift 80' to the west to meet FAA standards for RW/TW separation of 400' (currently a 320' separation exists between Runway 15/33 and east side Taxiway "A"). In addition, with an 80' shift of the runway to the west, the impacts to existing aircraft parking on the east side of the airport would be minimized. The detailed results of the approach and departure procedure analysis can be found in Appendix "E".

Figure C-34: Matrix of Local and Federal Considerations for Each Alternative

REVIEW AND APPROVALS / ALTERNATIVE	Pitkin County				City of Aspen	ALVT*	USACE^	Federal Aviation Administration				
	LOCATION AND EXTENTS REVIEW	ASPEN/PITKIN COUNTY AIRPORT DESIGN GUIDELINES APPROVAL	BUILDING PERMIT (TITLE II)	ENVIRONMENTAL HEALTH (TITLE 6)	BURLINGAME OPEN SPACE PARCEL CHANGE IN USE (PUBLIC VOTE)	CONSENT PERSUANT TO DEED OF CONSERVATION EASEMENT	404 PERMIT	ALP REVISIONS	ENVIRONMENTAL ASSESSMENT	OBSTRUCTION EVALUATION/APPROACH AND DEPARTURE PROCEDURE ANALYSIS	NAVAID RELOCATION	MODIFICATIONS OF STANDARDS
ALTERNATIVE 5a	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ALTERNATIVE 6	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ALTERNATIVE 10	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ALTERNATIVE 11	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ALTERNATIVE 12	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
ALTERNATIVE 13	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓

* Aspen Valley Land Trust
^ United States Army Corps of Engineers

Local and Federal Considerations

For each alternative remaining in Step C, a high level assessment was performed to determine what local and federal reviews/requirements may be necessary. The purpose of this assessment was not to identify every local and federal process that may be triggered by each alternative, as there will likely be additional requirements that are discovered with further design. Rather, the intent of this task was to identify the local and federal processes that could take a year or longer to complete. This evaluation was performed by TG Malloy Consulting, a local land use planner who has extensive experience with local and federal regulations for planned improvement projects within Pitkin County. Below is a description of the local and federal items identified that could be prompted by the proposed alternatives. Figure C-34 specifies which local and federal actions apply to each alternative.

1. **Environmental Health/Building Permitting:** As public facility, improvements at the Airport are exempt from all provisions of Title 8 (Land Use Code) of the Pitkin County Code except for Location and Extents (L&E) review, which is authorized under Section 30-28-110 of the Colorado Revised Statutes. This means improvements at the Airport are exempt from regulations governing setback and height limitations, density and open space requirements, environmental restrictions (geologic hazards, wildlife habitat, riparian and wetland setbacks, etc.), growth management regulations and most exactions including affordable housing, road impacts, and park dedication requirements. However, improvements at the Airport are subject to other provisions of the County Code including those related to health and safety (Title 6), which addresses air pollution, solid waste management, noxious weed control, and noise abatement. In the past, these issues were addressed through the earthmoving permit process. However, the County is no longer requiring earthmoving permits for public projects so these issues will need to be addressed in construction documents and specifications and construction contracts. In addition, all structures are subject to the provisions of the Building and Construction Code (Title 11) and a building permit must be obtained prior to construction of a building. For purposes of a building permit, the term "building" does not include roads, pavement, fences, retaining walls or other site improvements that do not enclose space for the protection of persons, animals or property.
2. **Location and Extents Review/WOMP Compliance:** Since the improvements contemplated in all of the alternatives would not qualify as "Minor Projects" in the recently-approved Aspen/Pitkin County Airport Design Guidelines" they would require L&E review pursuant to the Section 2-30-30(h)(10) of the Pitkin County Land Use Code (LUC). The principle criterion for approval of an L&E review is conformance with the applicable county master plan. In the case of the Airport, the applicable county master plan is the West of Maroon Creek Plan (WOMP) which was adopted in October of 2013. For many land use reviews in Pitkin County, the applicable county master plan is considered an advisory document and strict compliance is not required. However, the L&E review is somewhat unique since the authority for this review is derived directly from Colorado State Statutes and compliance with the applicable master is specifically referenced in the Land Use Code. As a result, the County takes the position that for L&E reviews, and a few other types of land use reviews, the county master plan has the force of law. The following excerpt from the WOMP confirms the County's position on this point: *"The County Land Use Code specifically requires consideration of Comprehensive Plans as a criterion of approval for certain types of land use reviews (including special review, location and extent review, code amendments, rezoning, activities of local and state interest, and growth management exemptions). Reference to Comprehensive Plans in the Land Use Code as a basis for reviewing and taking action on a land use application has the force of law, and where such reference is made, Comprehensive Plans (including the WOMP) may be used accordingly."*

As a result, the policies and standards contained in the WOMP have substantial weight in the L&E review and approval process and must be carefully considered. However, the weight of the policies and standards in the WOMP is somewhat offset by the nature of L&E review and appeal process, which is also derived from the State Statutes (CRS 30-28-110). The authority for L&E review and approval resides with the Pitkin County Planning Commission, but a decision by the Planning Commission can be appealed to the Pitkin County Board of County Commissioners (BOCC). In order to overturn a decision of the Planning Commission the BOCC must find that there has been an error in the findings of the Planning Commission or an abuse of authority. Given the nature of the appeal process the potential for overturning a denial by the Planning Commission will depend on the magnitude of community opposition and the political will of the BOCC in the face of that opposition.

The WOMP includes a number of policies directly applicable to the Airport and future improvements thereon. Most of these policies are benign in terms of how they relate to the improvements contemplated in the airfield layout alternatives. However, there are a few standards in the Scenic Guidelines Chapter (Chapter 3) that are worth mentioning. It should be noted that the guidelines called out below are ones that could present a problem for some of the alternatives. There are also a number of guidelines that would support aspects of the improvements contemplated with the alternatives and these have not been listed for the sake of brevity.

Guidelines Applying to Entire WOMP Area

There are several places where minimizing the disturbance of natural vegetation is recommended;

Landscaping - Item #5: "All riparian corridors (including ditches) and native vegetation and natural plant groupings contained within those corridors, should remain undisturbed."

Airport-Specific Guidelines

Design – Item #6: "To the extent possible, undeveloped areas immediately beyond the ends of the Pitkin County Airport runway should remain undeveloped as a visual break between Buttermilk to the south and shale bluffs to the north;"

Design – Item #7: Maintain existing setback of 100 feet from property line along Highway 82;

Landscaping - Item #4: Maintain the Owl Creek riparian corridor with native, natural vegetation where consistent with the Aspen-Pitkin Airport Wildlife Hazard Management Plan.

Views and Viewplanes Guidelines (Airport Specific)

The WOMP includes a series of annotated photographs which provide further direction regarding the location and character of future development within the WOMP area. Several of these photos include statements which could have an impact the whether a particular improvement is considered in compliance with the WOMP.

Upvalley Photo #1: "Vegetation along Owl Creek should be preserved to the greatest extent possible, where consistent with the Aspen-Pitkin County Airport Wildlife Hazard Management Plan;"

Upvalley Photo #2: "Maintain open, natural borders along the western edge of the Pitkin County Airport property;"

Owl Creek Photo #2: "Preserve existing visual character along the east side of Owl Creek Road to the greatest extent possible in consideration of the improvements depicted on the Recommended Improvements Plan contained in The 2012 Aspen/Pitkin County Airport Master Plan Update. Any above-ground improvements on the west side of the Pitkin County Airport should incorporate screening to minimize scenic impacts as viewed from Owl Creek Road and the Owl Creek Pedestrian Trail;" "Maintain native sage vegetation along the Owl Creek right-of-way;"

Owl Creek Photo #3: "Any above-ground improvements on the west side of the Pitkin County Airport should incorporate screening to minimize scenic impacts as viewed from Owl Creek Road and the Owl Creek Pedestrian Trail."

Aspen/Pitkin County Airport Design Guidelines Approval

All of the alternatives would require review under the "major" process described in the Aspen/Pitkin County Airport Design Guidelines (Design Guidelines). This process is designed to be initiated early in the project design process and is integrated with the L&E review process. As a result, the design guidelines review would probably not significantly lengthen the overall entitlements timeline unless the Planning Commission were to require significant changes to the project through the L&E review that would result in the project needing to go back through the design guidelines review.

City of Aspen

Burlingame Open Space Parcel Change in Use (public vote)

The Burlingame Open Space Parcel, which is located on the west side of Owl Creek Road from the Airport, was acquired by the City of Aspen

with open space funds. As a result, any change in use or conveyance of any portion of this property requires approval through a vote of the citizens of the City of Aspen. Such a vote would be subject to the regulations and procedures contained inTitle 9 of the City of Aspen Municipal Code and would add considerable time and complication to the entitlements process.

Aspen Valley Land Trust (AVLT)

Consent Pursuant to Deed of Conservation Easement

The Burlingame Open Space Parcel is encumbered by a conservation easement, which is held by the Aspen Valley Land Trust. The stated purpose of the deed of conservation easement (DOCE) is to "ensure that the property will remain forever predominantly in its open space, natural habitat and recreational condition." The DOCE goes on to say that the property will be confined to uses such as recreation, conservation education, and general conservation purposes and it specifically prohibits the construction, placement, reconstruction or replacement of any buildings or structures or the construction of any roadways without the consent of the Aspen Valley Land Trust. The conveyance of easements and rights-of-way is also prohibited without the consent of the AVLT.

While the process of seeking consent for a variance from the provisions of a deed of conservation easement from AVLT is not typically complicated or lengthy, the AVLT Board has a reputation for being relatively inflexible regarding the grating of such consent.

Unites States Army Corps of Engineers (USACE)

404 Permit

According to the 2012 Airport Master Plan Update, there are several delineated wetlands located on the Airport property. Figure 7-4 on the Airport Master Plan depicts the location of the largest wetland area, which is located at the south end of the Airport property. None of the airfield layout alternatives encroach into this wetland area. However, the text of the 2012 Airport Master Plan Update references three other small wetlands which are not depicted on Figure 7-4, though one of these wetlands is described as being along the banks of Owl Creek on the west side of the runway. Since Alternative 12 shows the tie-down area for the west-side FBO as encroaching into a portion of the Owl Creek riparian corridor it's possible that this wetland could be impacted by this alternative. If so, construction permitting would need to address Section 404 of the Clean Water Act.

Potential Project Phasing

Each of the alternatives in Step C was examined to determine conceptual phasing plans that show how the improvements could be completed. During this process, it became evident that a substantial amount of work would be required on the west side of the airfield for any runway shift to the west in order to meet, at a minimum, ROFA grading requirements. The airport currently has areas on the west side of the airfield that do not meet FAA ROFA grading criteria, so any improvement to the runway would likely include performing grading operations to meet ROFA requirements. In addition, all alternatives required relocation of Owl Creek Road and bike path in areas, along with construction of retaining walls and utility relocations. Due to the work needed on the west side of the airfield in each alternative, the conceptual phasing plans were developed to complete all of the required work on the west side of the airfield prior to doing any adjustment to the runway. By completing all of the required west side improvements prior to touching the runway, any improvements to the runway could be concentrated, reducing potential shut down times for these phases of the project. Figure C-35 shows an example of the conceptual phasing for Alternative 12.

The next step in developing conceptual phasing was to determine how the runway improvements themselves could occur. For each alternative, the priority was to get as much work done in the least amount of time as possible on the runway in order to minimize shutdown times for the airport. It was estimated that a 60-day shutdown to complete the runway work in Alternatives 5a and 10 could be possible because of these options only shifting the runway 25' west. For the remaining options, 6, 11, 12, and 13, two potential shutdown scenarios were evaluated. The first was to perform the runway work in 2 60-day shutdowns in the spring over one year, with the existing runway being able to operate in a temporary condition between the shut downs. This option would need to be coordinated with the FAA for acceptance on temporary runway conditions. Figures C-36 and C-37 show this proposal for Alternative 6. The other option was to shut the runway down for 90 days to complete the work on the runway. This 90-day shutdown would present a significant challenge to complete all of the work for the runway within that time frame and it would have a

Figure C-35: Conceptual Phasing Plan (Appendix D, Alternative 12, Sheet 14 of 23)

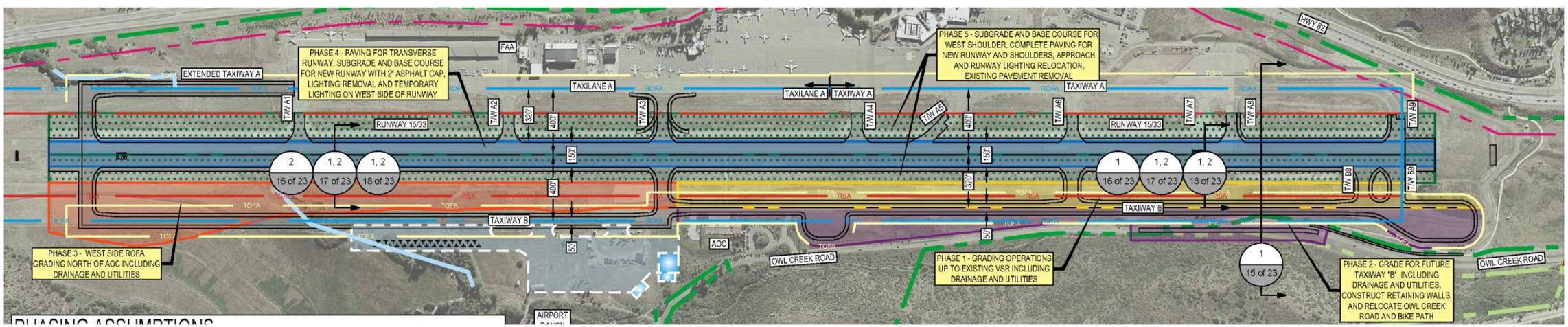


Figure C-36: First 60-Day Runway Shutdown for Construction (Appendix D, Alternative 6, Sheet 15 of 21)

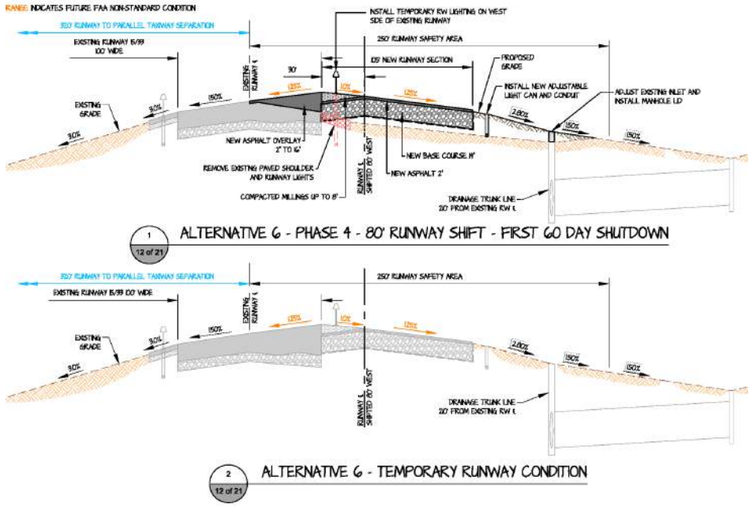
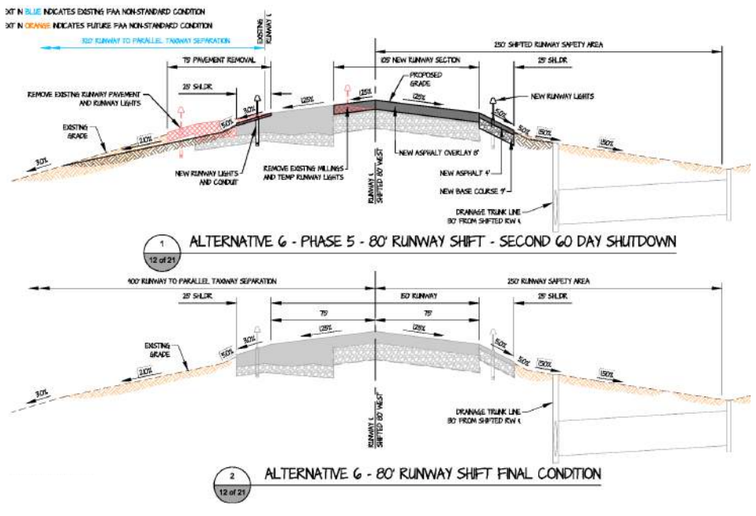


Figure C-37: Second 60-Day Runway Shutdown for Construction (Appendix D, Alternative 6, Sheet 16 of 21)



larger overall economic impact to the community as will be discussed in the next section. Finally, the 90 day scenario would likely not match up with FAA funding to complete all of the runway work within one fiscal year. For these reasons, the two 60-day shutdowns of the runway would be the preferred option for completing the runway work.

Economic Impacts of a Runway Closure

In order to make the improvements to the runway which will allow the operation of larger aircraft, it is necessary to shutdown the runway. Based upon the conceptual phasing options presented above, there were three options for the runway closure. This analysis estimates the potential "economic loss" that could be associated with the four three conceptual closure options. Data to support this analysis were obtained from Colorado's Statewide Airport Economic Impact Study, completed by the Colorado Division of Aeronautics in June 2013. In this section, this document is referred to as the "state study."

From the state study, areas of economic impact considered for the Airport included:

- Impacts from spending by visitors arriving on commercial airlines
- Impacts from spending by visitors arriving on general aviation aircraft
- Impacts from the administration, operation, and maintenance of the Airport
- Impacts from tenants/businesses at the airport that provide aviation services or customer support

Information provided by the Airport indicates that "lost" economic impacts would not be incurred as they relate to general aviation visitor expenditures, Airport administration, or Airport tenants. According to the Airport, economic impacts from all of these activities would not be adversely impacted by any of runway closure options under consideration. This leaves economic impacts from spending related to visitors who arrive in the Aspen area via a commercial airline that serves the Airport.

Colorado's state study estimated, an annual basis, 164,248 visitors arrive in the Aspen area via the Aspen/Pitkin County Airport on a commercial airline. It is important to remember that these visitors are a subset of the airport's total annual commercial passenger enplanements. The Airport's total passenger enplanements for 2013 were reported at 211,749. Visitors make up almost 78% of the Airport's annual enplanements, with the remaining 22% being residents/locals that use the Airport for commercial airline travel.

In order to estimate the potential economic loss from various runway closure options, the Airport's monthly enplanements for 2013 were reviewed. Data is not available to show specifically on a month-by-month basis how many enplanements are associated with visitors and how many are associated with residents. Therefore, lacking specific monthly visitor data, the annual ratios of 78% and 22% from the state were assumed to be constant. Table 1 presents total monthly enplanements for the Airport in 2013.

Table 1: Monthly Enplanements

Month	Total 2013 Enplanements	% of Year
January	29,810	14.10%
February	27,853	13.10%
March	34,180	16.10%
April	12,061	5.70%
May	6,062	2.90%
June	14,240	6.70%
July	21,928	10.40%
August	21,791	10.30%
September	11,996	5.70%
October	8,051	3.80%
November	5,971	2.80%
December	17,806	8.40%

Source: Airport Records

As indicated in Table 1, January, February, March, July, August, and December are the six peak enplanement months for the Airport.

There are three conceptual options for construction periods that could be required to realign the runway. During each of these periods, the runway would be closed for all operations. The three options are as follows:

- **Option 1 –** Two 60 day closures (spring), for a total of four months over 1 year – 80' runway shift to the west (Alternatives 6, 11, 12, and 13)
- **Option 2 –** One 90 day closure (spring/early summer) – 80' runway shift to the west (Alternatives 6, 11, 12, and 13)
- **Option 3 –** One 60 day closure (2 months spring) – 25' runway shift to the west (Alternatives 5a and 10)

Option 2 would include a portion of July, which according to Table 1, is a peak enplanement month, while Options 1 and 3 would not include any of the peak months for commercial enplanements.

The next step in the analysis was to estimate how many of the Airport's annual commercial visitors (estimated at 164,248 in the state study) could

be impacted by a runway closure. For this analysis, it was assumed that economic impacts from all commercial visitor spending, during the runway closure periods, would be "lost". Commercial visitors wanting to travel to the immediate Aspen area would not use another commercial airport to reach Aspen during the periods of runway closure.

Table 2 shows estimated visitor enplanements by month for each of the closure options. For this analysis, it was assumed that economic impacts that stem from visitors who arrive in the Aspen area on a commercial airline would cease during all runway closure periods.

As shown in Table 3, option 1 enplanements are calculated for 1 closure during the 2 month period. However, this number would be doubled for this option for purposes of examining the two 60 day closures during the cited months associated with this option. The result is that option 1 has slightly more enplanements than option 2, resulting in a higher reduction in visitors to the area who arrive on a commercial airline. Option 3 results in about half the potential loss in commercial visitor enplanements. Total "lost" commercial visitors for each of the runway closure options follow:

- **Option 1 (Two 60 day closures) –** 38,424 commercial visitors

Table 2: Estimated Visitor Enplanements For Closure Options

Option One (two closures)	Monthly Visiting Enplanements Estimates
Month	
1/2 April (following Easter)	6,030*
May	6,062
1/2 June	7,120
Total	**19,212**
Option Two	
Month	
1/2 April (following Easter)	6,030*
May	6,062
June	14,240
July	8,540
Total	**34,872**
Option Three	
Month	
1/2 April (following Easter)	6,030*
May	6,062
1/2 June	7,120
Total	**19,212**

**For this estimate, one-half of April's total enplanements were used, however, it should be noted that the majority of April enplanements occur by the Easter holiday, which varies in date from year to year.*

Source: Airport Records and State Study

Table 3: Lost Spending, Jobs and Payroll from Reduction in Commercial Visitors Spending

	Reduction in Annual Spending	Reduction in Annual Visitor Supported Jobs	Reduction in Visitor Supported Payroll
Option 1	$44,187,600	2,070	$9,904,950
Option 2	$59,753,340	2,547	$18,282,366
Option 3	$22,093,800	1,035	$4,952,475

- **Option 2 (One 90 day closure) –** 34,872 commercial visitors
- **Option 3 (One 60 day closure) –** 19,212 commercial visitors

When visitors arrive in the Aspen area via commercial airline service, they have expenditures for lodging, food, local transportation, retail, recreation, and entertainment. The state study conducted surveys with visitors to Colorado who arrive on a commercial airline. For each of the state's commercial airports, an average "spend" per visitor trip was developed using survey information from the state study. For the Airport, it was estimated that each commercial visitor spends an average of $2,300 per visit to the Aspen area.

In reality, commercial visitors to the Aspen area have varied spending patterns and different lengths of trip durations. During peak travel months, visitors tend to stay longer and spend more on a per trip basis. This factor was taken into consideration when developing estimates of commercial visitor spending for each of the four options. As noted, Options 1 and 3 do not include any of the Airport's peak travel months when higher rates of commercial visitor spending per trip take place, while Option 2 includes a portion of July, which is a peak travel month.

Estimates of annual commercial visitor spending for each of the three options that could be "lost" from a runway closure were estimated. Spending by visitors who arrive in the Aspen area on a commercial airline helps to support jobs in hotels, restaurants, retail establishments, and recreational venues in the area. These jobs also have an associated payroll or wage.

For each of the three options, Table 3 provides information that shows commercial visitor spending or output that could be lost as a result of runway closure. Data from the state study was used to estimate the number of jobs supported by this spending and the payroll (for the closure periods) that is associated with these jobs. Lost employment and payroll estimates are specific to the potential months of runway closure for each of the four options.

From a conceptual economic impact "loss" standpoint, Option 3 provides the least potential adverse economic impact on the local economy due to the closure time being reduced to one 60 day closure for a 25' runway shift to the west as shown in Alternatives 5a and 10. For the remaining alternatives which propose shifting the runway 80' to the west, Option 1 has the least conceptual economic impact.

Economic Impacts from Project Implementation

When airports have investment for capital improvements, over the duration of the project(s), there are various economic impacts. These impacts are classified as output or spending, the investment needed to plan and construct the project; jobs, the employment supported over the duration of project implementation; and payroll, compensation paid to workers over the life of the project. It is important to note that for economic impacts related to capital investment, these impacts exist only over the life of the investment and are not on-going in nature. That is, of course, unless similar levels of investment continue, which is typically not the case.

For the Airport, there are two options under consideration as they relate to a major capital investment project that would realign the Airport's runway. These two options are referred to as Alternative 8a and Alternative 12a. While both alternatives would be implemented in over two separate 60 day construction periods, the total cost to implement each of the two alternatives varies.

Table 4 compares the costs for the two alternatives. Costs for each alternative are broken down into four categories: total construction costs, engineering design, construction management, and total costs.

Information from Colorado's Statewide Airport Economic Impact Study was used to estimate the level of employment that could be supported by

Table 4: Alternative Development Cost Comparison

	Alternative 8a	Alternative 12a
Construction Costs	$112,222,578	$102,590,026
Engineering Design	$9,619,078	$8,793,431
Construction Management	$10,687,865	$9,770,479
Total Costs	**$132,529,521**	**$121,153,936**

investment associated with the two alternatives. Two separate estimates of potential employment related to each of the alternatives were developed; both estimates relied on information from the State Study.

For Aspen-Pitkin County Airport, the Colorado study found that for every $115,100 in total capital investment made, one (1) job is supported over the duration of that investment. Based on the ratio developed as part of the State Study, over the duration of either project, the following number of jobs could be supported:

- **Alternative 8a –** 1,150 jobs
- **Alternative 12a –** 1,050 jobs

As it relates to these employment estimates, there a several noteworthy points of information. These employment estimates represent a wide range of jobs that could potentially be supported by the estimated capital investment ranging from jobs that would be required to design and engineer the project to jobs that would be required apply for and approve necessary permitting. Also included are jobs that would be supported by production of materials that would be required to construct the project. Jobs to transport materials to the construction site and jobs for those who would address earth work, drainage, retaining walls, utilities, signage, NAVAIDs, lighting/electrical, pavement and other noted projects are also included in the employment estimates in Table 4.

A second approach was also considered to estimate potential employment associated with implementing each of the two alternatives. This approach also considered information from the State Study that showed that the average annual salary for jobs that are supported by capital investment is $55,000. This is an average salary, and it represents a combination of jobs from higher compensation professional services jobs to materials transportation jobs.

The cost estimate for each of the alternatives shows separate labor costs associated with engineering design and construction management. In addition, it is estimated that approximately 35 percent of total estimated construction costs would be for labor. With this assumption and information shown in Table 4, estimated employment related spending and jobs that could be supported by this spending for each of the two alternatives is as follows:

- **Alternative 8a Labor Costs –** $59,584,845 = 1,083 jobs
- **Alternative 12a Labor Costs –** $54,470,419 = 990 jobs

These employment estimates are slightly more conservative than those developed using Aspen's ratio of capital investment to employment derived from the State Study. The two employment estimates, however, are similar. With employment supported by Alternative 12a being slightly less than the employment supported by Alternative 8a as a result of Alternative 12a's lower overall all implementation cost.

Table 5 shows employment and payroll estimates for each of the two alternatives estimated using information from the State Study. It is worth noting that most of the jobs reflected in the various employment estimates would be for others outside the immediate Aspen area. Many of these jobs, however, would most likely be for Colorado residents. Further, while it is likely that some of the payroll estimated below could be spent in the Aspen area, the majority of payroll expenditures would most likely take place elsewhere in Colorado.

Table 5: Estimated Employment and Payroll by Alternative

	Alternative 8a	Alternative 12a
Jobs	1,150	1,050
Payroll	$20,792,000	$18,984,000
Jobs	1,083	990
Payroll	$19,580,640	$17,899,200

Regulatory Considerations

For the regulatory considerations, the focus was on how and when the FAA may consider a MOS for airport improvement projects. FAA design standards were evaluated along with what the general process for submittal and approval of an FAA modification to standard involves. Additionally, relevant FAA modification to standards that currently exist at ASE along with a comparison of other airports that have similar constraints to ASE and any approved FAA MOS was considered. Finally, a brief discussion on the Airport Cooperative Research Program (ACRP) Report 51 – Risk Assessment Method to Support Modification of Airfield Separation Standards concludes the regulatory research. A detailed report of all of the items listed above can be found in Appendix "A".

Step C – Meeting to Reduce Alternatives Based on Findings

A meeting was held on May 30, 2014, at the Jviation, Inc. office in Denver, CO to further narrow down the 6 alternatives and eliminating alternatives that are not viable. This meeting was also provided an opportunity to add any alternatives that had not been contemplated. Attendees for the meeting included.

- **Aspen/Pitkin County Airport –** Jim Elwood, Brian Grefe and Dustin Havel
- **FAA –** John Bauer, Chris Schaffer, Mark Miller
- **Air Traffic –** Greg Dyer
- **William E. Payne and Associates –** William Payne
- **Lean Photometrics –** Doron Lean, Paul Hannah
- **Jviation, Inc. –** J.D. Ingram, Hilary Fletcher, Paul Fiore, Brian Lincoln

Outcomes

As was established in the Introductory chapter of this Final Report for the Future Air Service Planning Study – Phase II, the following three objectives were used to either eliminate or retain alternatives:

- Meet or improve FAA standard of safety, efficiency, and operational operational capacity
- Minimize the impact to the facilities previously approved in the 2012 Master Plan Update
- Accommodate larger future commercial regional aircraft

FAA representatives continued to stress the point that was made in Steps A and B, that the FAA has shifted federal policy to a more stringent approach to the application of safety standards to airport capital improvement projects. This policy shift essentially makes the grant of a Modification to Standards (MOS) unlikely if a project can adhere to FAA safety standards.

Prior to this meeting, the evaluation of the approach and departure analysis on various runway shifts up to 80' west was completed by Lean Photometrics. The results of this analysis were presented at the meeting with the conclusion that an 80' shift of the runway to the west had a minimal impact on existing aircraft approach and departure procedures. With this new information, it became clear that an 80' shift to the west could not be eliminated because of airspace issues, and if it was possible to physically shift the runway this distance to allow a 400' separation between the runway and existing east side Taxiway "A", the FAA would support this. Below are the results of the alternative analysis.

- ✓ Meets objectives
- ✓ Meets objectives with conditions
- ✓ Does not meet objectives

- **Alternative 5a –** RW 25' west and 150' wide, TW "A" (east) at 345', TW "B" (west) at 345'
  - ✓ Does not meet FAA standard for RW/TW separation of 400' for existing TW "A" and proposed TW "B"
  - ✓ Would require a new modification to standard for the 345' RW/TW separation for existing Taxiway "A" and proposed Taxiway "B"
  - ✓ Meets FAA standard of 150' runway for full Category D-III airports
  - ✓ Efficiency would not be impacted because no operational restrictions would exist with uniform RW/TW separation on both sides of the runway
  - ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
  - ✓ Limited impacts the 2012 Master Plan Update on aircraft ramp areas, west side FBO, and Owl Creek
  - ✓ Proposed 345' TW "A" and "B" separations may not be sufficient to allow for larger commercial regional aircraft

  Decision – Removed as a viable option for not meeting RW/TW separation standards and potentially not allowing for larger commercial regional aircraft

- **Alternative 6 –** RW 80' west and 150' wide, TW "A" (east) at 400', No West side FBO
  - ✓ Meets FAA standard for RW/TW separation of 400' for existing TW "A"
  - ✓ Meets FAA standard of 150' runway for full Category D-III airports
  - ✓ Efficiency would not be impacted because no operational restrictions would exist with 400' RW/TW separation
  - ✓ Capacity would be impacted as larger aircraft would be restricted to the existing ramp parking area without the benefit of additional parking provided by the west side FBO
  - ✓ Major impacts to the 2012 Master Plan Update (No west side FBO)
  - ✓ Would accommodate larger commercial regional aircraft

  Decision – Removed as a viable option for operational operational capacity issues related to larger aircraft with no additional ramp parking area and the major impacts to the Master Plan Update

- **Alternative 10 –** RW 25' west and 150' wide, TW "A" (east) shifted 15' east at 360', TW "B" (west) at 360'
  - ✓ Does not meet FAA standard for RW/TW separation of 400' for existing TW "A" and proposed TW "B"
  - ✓ Would require a new modification to standard for the 345' RW/TW separation for existing Taxiway "A" and proposed Taxiway "B"
  - ✓ Meets FAA standard of 150' runway for full Category D-III airports
  - ✓ Efficiency would not be impacted because no operational restrictions would exist with uniform RW/TW separation on both sides of the runway
  - ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
  - ✓ Limited impacts the 2012 Master Plan Update on aircraft ramp areas, west side FBO, and Owl Creek
  - ✓ Proposed 360' TW "A" and "B" separations may not be sufficient to allow for larger commercial regional aircraft

  Decision – Removed as a viable option for not meeting RW/TW separation standards and potentially not allowing for larger commercial regional aircraft

- **Alternative 11 –** RW 80' west and 150' wide, TW "A" (east) 400', TW "B" (west) at 320' and limited to ADG II aircraft, move 2nd FBO to east side of airport and move small GA operations to west side of airport
  - ✓ Meets FAA standard for RW/TW separation of 400' for existing TW "A" and 300' for proposed TW "B"(limited to ADG II aircraft)
  - ✓ Meets FAA standard of 150' runway for full Category D-III airports
  - ✓ Efficiency would be impacted due to head to head aircraft traffic taxiing on east side Taxiway "A" between 2 FBO's and the Commercial Terminal
  - ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
  - ✓ Major impacts to 2012 Master Plan Update (shift 2nd FBO to east side of airport and move all small GA operations to west side of airport
  - ✓ Would accommodate larger commercial regional aircraft

  Decision – Removed as a viable option for operational inefficiencies on the east side of the airport with 2 FBO's and the Commercial Terminal and for major impacts to the Master Plan Update

- **Alternative 12 –** RW 80' west and 150' wide, TW "A" (east) 400' and extended north to RW 15 threshold, TW "B" (west) at 400' north of AOC and 320' south of AOC
  - ✓ Meets FAA standard for RW/TW separation of 400' for existing TW "A" and for proposed TW "B" north of the AOC, but not for TW "B" south of the AOC
  - ✓ Would require a new modification to standard for the 320' RW/TW separation for proposed Taxiway "B" south of the AOC
  - ✓ Meets FAA standard of 150' runway for full Category D-III airports
  - ✓ Conflicts with FAA recommendation to avoid runway crossings
  - ✓ Efficiency would be impacted due to operational restrictions, but these would be limited to TW '"B" south of the AOC (sterilize this portion of taxiways when larger aircraft were operating on the runway)
  - ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
  - ✓ Limited impacts the 2012 Master Plan Update on aircraft ramp areas, west side FBO, and Owl Creek
  - ✓ Would accommodate larger commercial regional aircraft

  Decision – Continued as a viable option with the removal of the runway crossing at the RW 15 threshold – renamed as Alternative 12a

- **Alternative 13 –** RW 43' west, rotated about RW 15 threshold 0.17°, and 150' wide, TW "A" (east) realigned to 380' north of TW "A5" and 380' to 387' south of TW 'A5", TW "B" (west) at 380' north of AOC and 320' south of AOC
  - ✓ Does not meet FAA standard for RW/TW separation of 400' for existing TW "A" and proposed TW "B"
  - ✓ Would require a new modification to standard for the 380' RW/TW separation for existing Taxiway "A" and proposed Taxiway "B"
  - ✓ Meets FAA standard of 150' runway for full Category D-III airports

- ✓ Runway realignment so slight it would have minimal impact to aircraft operators
- ✓ Efficiency would be impacted due to operational restrictions on TW "'B" south of the AOC (sterilize this portion of taxiways when larger aircraft were operating on the runway)
- ✓ Capacity would not be impacted as existing ramp parking would not be reduced and additional ramp parking at west side FBO would be provided
- ✓ Limited impacts the 2012 Master Plan Update on aircraft ramp areas, west side FBO, and Owl Creek
- ✓ Proposed 380' TW "A" and "B" separations may not be sufficient to allow for larger commercial regional aircraft

Decision – Removed as a viable option for not meeting RW/TW separation standards and potentially not allowing for larger commercial regional aircraft

An idea surfaced in the meeting of providing a bump out of proposed west side Taxiway "B" around the AOC, reducing the RW/TW separation in this area to 320', to allow the building to remain in place while meeting standard FAA RW/TW separation north and south of the AOC. Previously eliminated during the Step B meeting on April 3rd, 2014, Alternative 8 provided a complete standard geometry layout with an 80' runway shift to the west and 400' west side parallel taxiway. The 400' parallel taxiway would require the AOC to be completely relocated and reconstructed, thus eliminating Alternative 8 as a viable option. With the potential acceptance of a non-standard 320' Taxiway "B", Alternative 8 was resurrected as Alternative 8a. Alternative 8a would still have operational restrictions on the proposed west side taxiway north and south of the AOC, but this greatly limited the area on proposed west side Taxiway "B" where operational restrictions would be required.

The final remaining Alternatives of 8a and 12a have been determined to best meet the three objectives of Phase II of the Future Air Service Planning Study and provide viable options to ensure future commercial air service at the airport. These alternatives will be continued to Step D of this study, in which construction cost estimates will be developed to determine ultimate feasibility. In addition, further conceptual layouts will be developed to determine impacts of grading, retaining walls, drainage, airfield lighting, and utilities.

Summary of Alternative Analysis

- **Alternative 5a –** Removed from Study
- **Alternative 6 –** Removed from Study
- **Alternative 10a –** Removed from Study
- **Alternative 11 –** Removed from Study
- **Alternative 12 –** Revised as 12a and continued on to Step D
- **Alternative 13 –** Removed from Study

Additional Alternatives

- **Alternative 12a –**Modified Version of Alternative 12
  - » Shift runway 80', widen to 150', construct a new west side parallel taxiway at 400' north of the AOC and 320' south of the AOC from the relocated runway
  - » East side RW/TW separation meets FAA standards
  - » West side RW/TW separation north of the AOC meets FAA standard, west side taxiway south of AOC will have operational restrictions
- **Alternative 8a –**Modified Version of Alternative 8 (Previously Removed at Step B Meeting)
  - » Shift runway 80', widen to 150', construct a new west side parallel taxiway at 400' from the relocated runway and provide bump out around AOC at 320' from the relocate runway
  - » East side RW/TW separation meets FAA standard
  - » West side RW/TW separation north and south of the AOC meets FAA standard, bump out around AOC will have operational restrictions

Step C Summary

Removed Alternatives

- Alternative 5a
- Alternative 6
- Alternative 10a
- Alternative11
- Alternative 12 (Revised to 12a)
- Alternative 13

Additional Alternatives

- Alternative 12a
- Alternative 8a

Remaining Alternatives to Step D

- Alternative 12a
- Alternative 8a

Step D

Remaining Alternatives

The primary intent of the Phase II study was to identify two to four viable options for improving the infrastructure at Aspen/Pitkin County Airport for the purposes of preserving commercial air service for the airport in the future while at the same time increasing safety and maintaining the efficiency and operational capacity of the airport. Over a six month time period, 18 alternatives were developed and evaluated in coordination with representatives from the FAA, Air Traffic, Pitkin County, air carriers, and multiple industry experts who specialize in flight procedure engineering, economic impact evaluation, and land use planning. Over three meetings, the results of which have been discussed in the three previous sections of this report, this study group narrowed the viable alternatives to two options, which will be analyzed in more detail during Step D.

Each of the remaining alternatives was derived from previous alternatives with nuanced variations making them distinct:

- **Alternative 8a (from Step B with Modifications) –** This alternative is a derivative of Alternative 8 which widened the Runway to 150', shifted the Runway 80' to the west, and provided a full 400' RW/TW separation on both the east and west sides of the relocated runway. Alternative 8 was dismissed in Step B with the realization that the combination of a 400' separation on the west and an 80' runway shift to the west would require the relocation of the Airport Operations Center (AOC). This option was re-evaluated during the meeting at the conclusion of Step C at the suggestion from the FAA that the partial parallel Taxiway "B" could include a bump out around the AOC to 320' to allow the AOC to remain in place, and operational restrictions for aircraft would be limited to the taxiway around the AOC. The operational restrictions would require sterilization during landing and takeoff operations of the portion of the proposed west side taxiway around the AOC that did not meet the FAA RW/TW separation standard. Aircraft would be required to hold on either the north or south side of the AOC until they were provided clearance from the Air Traffic Control Tower to proceed.
  - » East side RW/TW separation meets FAA standard
  - » West side RW/TW separation north and south of the AOC meets FAA standard, bump out around AOC will have operational restrictions
  - » Reqires new MOS for 320' RW/TW separation around AOC
  - » Meets FAA standard of 150' runway for full Category D-III airports
  - » Rescinds two modifications to standards
    - Runway/Holdbar separation
    - East Side Taxiway "A" TOFA
- **Alternative 12a (from Step C with Modifications) –** Shift Runway 15/33 80' west, increase runway width to 150', construct a new west side parallel taxiway at 400' west of the relocated runway to the north of the AOC and 320' west of the relocated runway to the south of the AOC. Operational restrictions would be required for the section of the proposed west side taxiway south of the AOC that did not meet FAA standards for RW/TW separation. The operational restrictions would require sterilization of the portion of the proposed west side taxiway south of the AOC. Aircraft would be required to remain off of this section of taxiway until they were provided clearance from the Air Traffic Control Tower to proceed.
  - » East side RW/TW separation meets FAA standards
  - » West side RW/TW separation north of the AOC meets FAA standard, west side taxiway south of AOC will have operational restrictions
  - » Meets FAA standard of 150' runway for full Category D-III airports
  - » Would require new FAA modification to standard (320' RW/TW separation) for the west side taxiway, south of the AOC
  - » Rescinds one modification to standards
    - East side Taxiway "A" TOFA

Both of these identified alternatives accomplish the three objectives identified throughout the process:

- Meet or improve FAA standards of safety, efficiency, and operational capacity
- Minimize the impact to the facilities previously approved in the 2012 Master Plan Update
- Accommodate larger future commercial regional aircraft

Building on the analysis performed in the previous Steps A through C, Step D provides a more detailed evaluation and design of the remaining two alternatives in order to more fully understand the overall impacts to the airfield, the area immediately surrounding the airfield, particularly on the west side, and the overall cost of the proposed improvements. Consideration was also given to the practicality and feasibility of construction. This step included creating conceptual design exhibits for each alternative to explore the impacts for various design elements such as airfield geometry, site grading, storm drainage, electrical and NAVAID layout, and utility installation and relocations. An analysis of approach and departure procedures for each option was also considered. These preliminary design exercises were used to anticipate noteworthy design challenges inherent to these alternatives. The Step D process served to generate approximate quantities for conceptual level cost estimates that were informed by historically tabulated construction bid prices throughout the industry in general, and in the Pitkin County area in particular.

Major Impact Evaluation for New Alternatives

High level evaluations of major impacts were identified for each new alternative. As identified above, both of the remaining Alternatives 8a, 12a, were variations to previously evaluated alternatives. The alternatives that they were generated from (Alternatives 8 and 12) were previously evaluated according to the criteria set forth in Steps A through C. Both of these alternatives involve an 80′ runway shift to the West, and have the same impact to the airport approach Navigational Aids (NAVAIDs), existing east side infrastructure, the Airport Operations Center (AOC), and existing Owl Creek. To avoid redundancy, a brief summary of the significant impacts of the two alternatives is listed below.

Approach NAVAIDs

The approach lighting system on the north and of the runway and the Localizer Antenna and Distance Measuring Equipment (DME) will require relocation with the shift of the runway alignment in both alternatives 8a and 12a. In addition, NAVAIDs that will require relocation with a runway shift that were not previously identified, are the Precision Approach Path Indictors (PAPI) and the Runway End Identifier Lights (REILS). The PAPI system provides information to aircraft to ensure that the correct descent angle is achieved while on approach into Runway 15. The PAPI system is located approximately 600' south of the Runway 15 threshold on the east side of the runway. The REILS provide rapid and positive identification of the end of the runway. These are located on each side of the end of Runway 33.

East Side Infrastructure

Alternatives 8a and 12a have a very minimal impact to the east side infrastructure. The full width Taxiway Object Free Area (TOFA) reduces the available parking in the North GA Ramp area by 1', the South GA Ramp area is reduced by 13', and the Commercial Ramp loses 13' of ramp depth as well (See Figure D-1).

Figure D-1: East Side Infrastructure Impact, Lost Ramp Space (Alternative 8a, Sheet 3 of 29)

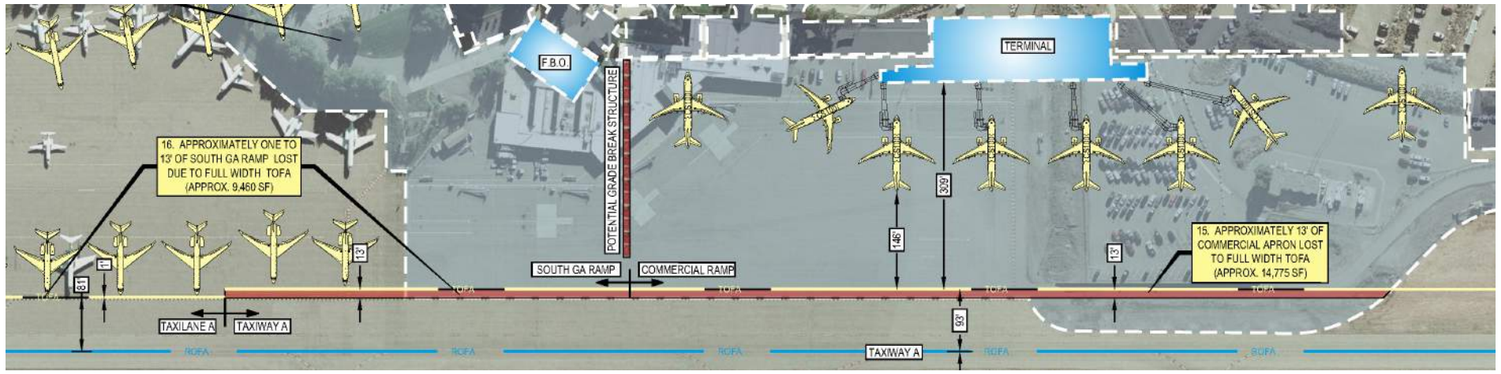


Figure D-2: Owl Creek Road Relocation (Alternative 12a, Sheet 1 of 30)

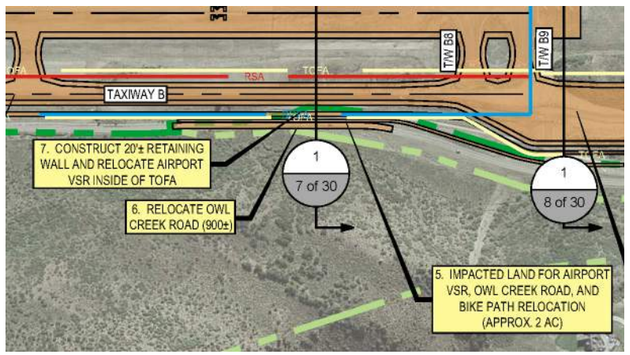


Figure D-3: Owl Creek Road Relocation (Alternative 8a, Sheet 1 of 29)

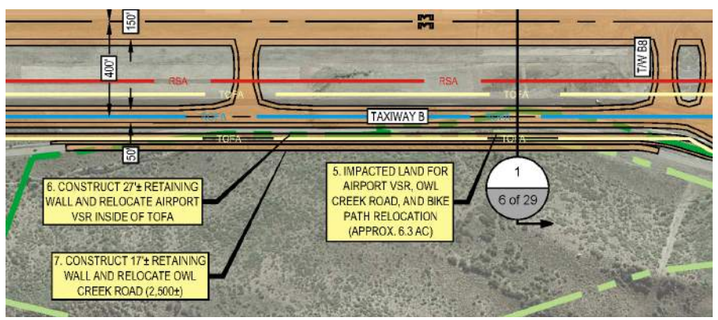


Figure D-4: Usable AOC Ramp Space (Alternative 8a, Sheet 1 of 29)

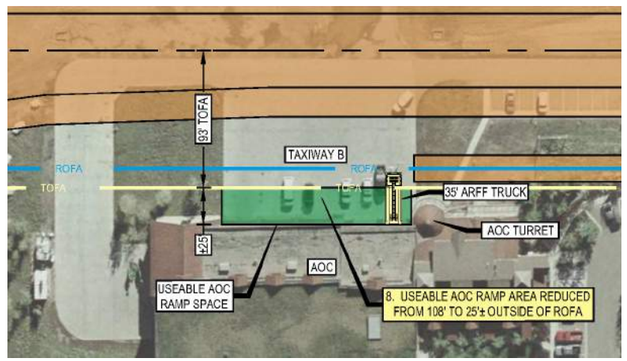
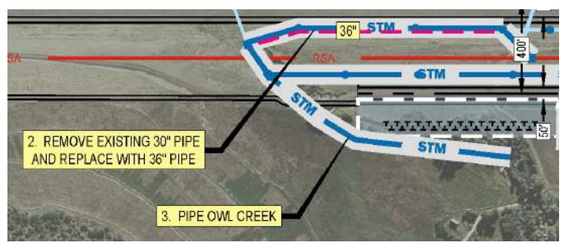


Figure D-5: Owl Creek Piping (Alternative 8a, Sheet 23 of 29)



West Side Infrastructure

The southwest side of the airport is the major critical impact for all alternatives. The existing infrastructure will be impacted by the redefined OFAs for the runway and taxiway associated with a runway shift or west side parallel taxiway, requiring relocation of the airport VSR, the Owl Creek bike path, and Owl Creek Road. The airport VSR will be lowered and relocated to the west. Owl Creek Road along with the bike path will be relocated in Alternatives 8a and 12a. Alternative 8a will require land acquisition to accommodate the new locations of Owl Creek Road and Owl Creek bike path. The length of relocation of Owl Creek Road is 1,100' in Alternative 12a (see Figure D-2) and 2,700' in Alternative 8a (see Figure D-3).

Airport Operations Center

Figure D-4 shows the ramp space configuration in front of the AOC for both alternatives. The ramp space in front of the AOC will be reduced by 83' for the staging of airport support vehicles and equipment due to the restricted uses allowed in the OFA of the west side taxiway. Both alternatives are left with 25' of usable and unrestricted ramp space, and the AOC itself can remain in place.

Owl Creek

A portion of Owl Creek will be required to be piped underneath any future ramp areas as indicated in Figure D-5. Alternative 12a was modified from Alternative 12 to eliminate the extension of the parallel taxiways to the north that would require substantial portions of Owl Creek east of the Runway to be piped. Alternative 8a and 12a have the same impact to Owl Creek at the location of the second FBO on the west side.

Cross Section Development

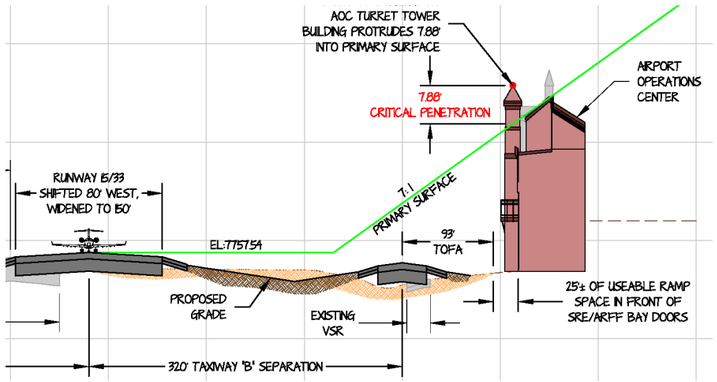
Cross sections were produced at critical locations on the airfield to assist the evaluation of impacts for each new alternative as described in the previous sections at two locations, the Part 77 surface impact at the turret tower on the existing AOC, and the Owl Creek Road "pinch point". In addition, aircraft holding pads (with potential for future deice pads) have been identified along the proposed west side taxiway of Alternatives 8a and 12a. Each of these proposed holding pads would be in close proximity to Owl Creek Road, so cross sections were taken at these locations to analyze the impact.

Airport Operations Center

As analyzed in the previous sections Alternatives 8a, 12a, both show a penetration of the Part 77 surface with the AOC; a more detailed

analysis of the penetration at the turret location derived a penetration of approximately 7.9', see Figure D-6.

Figure D-6: AOC Part 77 Evaluation (Alternative 8a, Sheet 5 of 29)



Holding Pad South of AOC at Taxiway "A4"

This aircraft holding pad is shown along the proposed west side taxiway at a location consistent to what is shown in the current Master Plan in Alternative 12a. The benefit of this hold pad is to allow aircraft who land from the north to exit the runway sooner and hold on this pad, as required, due to operational restrictions in this alternative. The sections cut at this holding pad location indicate that a retaining wall of 12' will be required to tie the proposed grade back to the existing grade, see Figure D-7. Alternative 8a meets the FAA's standard separation in this area and does not require a holding pad.

Holding Pad at Runway 33 End

The aircraft holding pad was added to the alternatives to provide aircraft a location to hold and potentially deice, while waiting to takeoff from the 33 end, in an area that was outside of any runway or taxiway safety areas. This area would likely be utilized on the west side in Alternative 12a for operational restrictions on the proposed west side taxiway, and primarily used in Alternative 8a for deicing and as a run-up area. The sections cut at this holding pad location for the new alternatives indicate that a retaining wall of 22' will be required to tie the proposed grade back to the existing grade, see Figure D-8. The Owl Creek bike path will need to be relocated in order to accomplish this holding pad.

Figure D-7: Alternative 12a, Holding Pad South of AOC at Taxiway "A4" (Alternative 12a, Sheet 6 of 30)

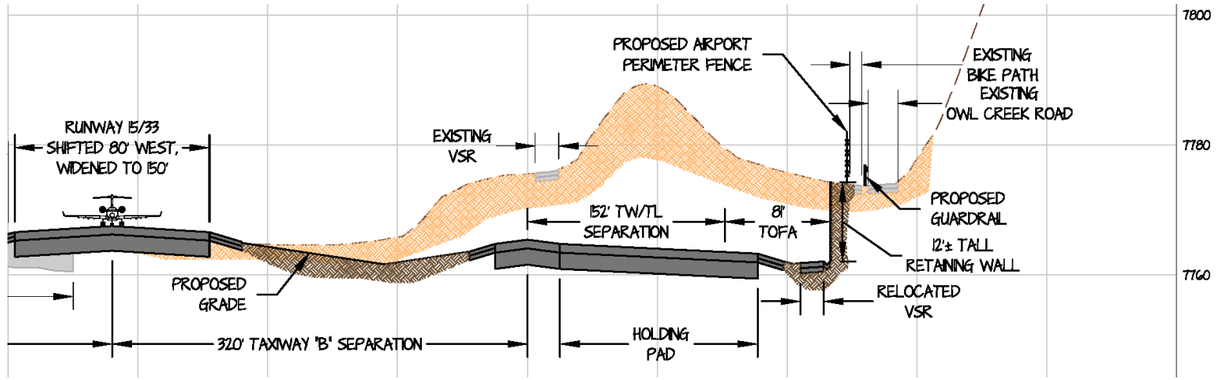
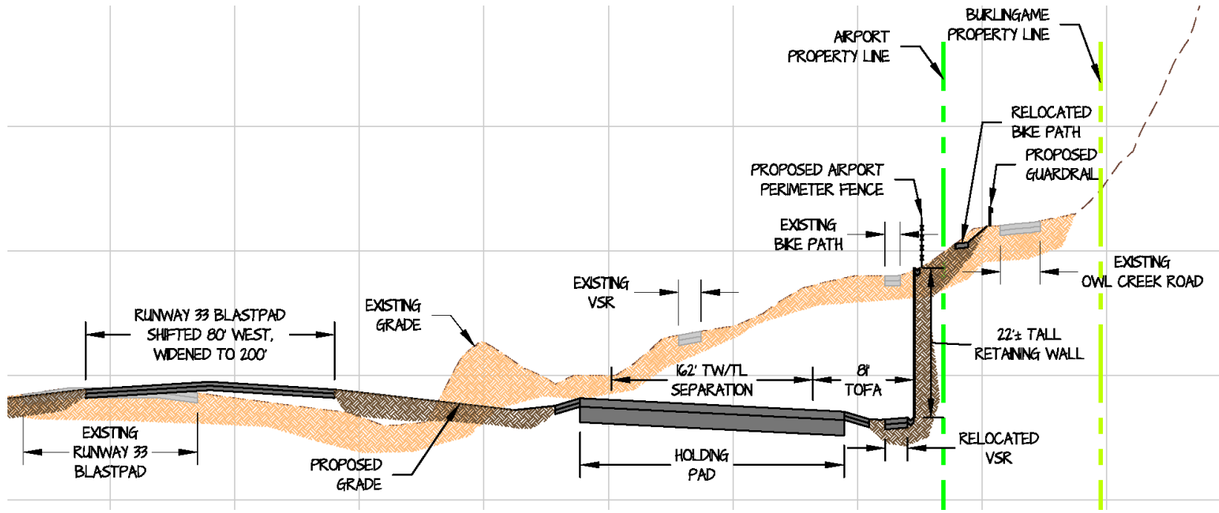


Figure D-8: Holding Pad at Runway 33 End (Alternative 8a, Sheet 7 of 29)



Impacts on Current Master Plan

The impacts to the approved Master Plan were discussed in the previous sections. The impacts can be summarized as follows: a reduction in the depth of the commercial ramp and the South GA Ramp area by 13', a negligible reduction in the North GA Ramp area, a shifting of the west side FBO to the west, potential west side FBO Ramp reconfiguration due to encroachment on the existing Airport Ranch structures, piping of additional length of Owl Creek, and encroachment into the Owl Creek riparian corridor.

Approach Surface Evaluation

The various approaches for aircraft landing and departing from Runway 15/33 with an 80' shift to the west were evaluated in detail in Step C. Since the runway configuration is the critical element in analyzing the airspace, both of the remaining alternatives fit within the analysis for the 80' west runway shift.

Overall Impact Analysis

The overall airfield geometry and pavement layout was discussed in the Major Impact Evaluation and Cross Sections paragraphs above. The two remaining alternatives were studied in greater depth to anticipate additional elements that would be impacted so that conceptual cost estimates, constructability assessments, and feasibility analysis could be performed. The following sections describe in further detail the projected impacts.

Site Grading

A preliminary grading study was performed for both options to identify the approximate extent of earthwork plus the location and height of required retaining walls. Figure D-9 shows the full build out for grading limits for Alternative 8a. With the geometry for the two remaining alternatives being primarily the same, with exception to Taxiway B south of the AOC, the result of the grading plan is very similar, minus the southwest side of the project area. Figure D-10 shows the minor differences of grading limits for Alternative 12a.

The area within the Runway and Taxiway Safety and Object Free Areas are required per FAA standards to be graded and maintained to enhance safety in the event of an aircraft may veer from the pavement in addition to providing greater accessibility for fire-fighting and rescue equipment during such incidents. The FAA criteria for these designated areas are as follows:

1. Cleared and graded and have no potentially hazardous ruts, humps, depressions or other surface variations.
2. Drained by grading or storm sewers to prevent water accumulation.
3. Capable under dry conditions of supporting snow removal equipment, Aircraft Rescue and Fire Fighting (ARFF) equipment, and the occasional passage of aircraft without causing damage to the aircraft.
4. Free of objects, except for those required to be in the RSA by their function. Objects higher than 3 inches must be constructed on frangible mounted structures. Other objects such as manholes should be constructed at grade.

Figure D-9: Proposed Grading Limits (Alternative 8a, Sheet 22 of 29)

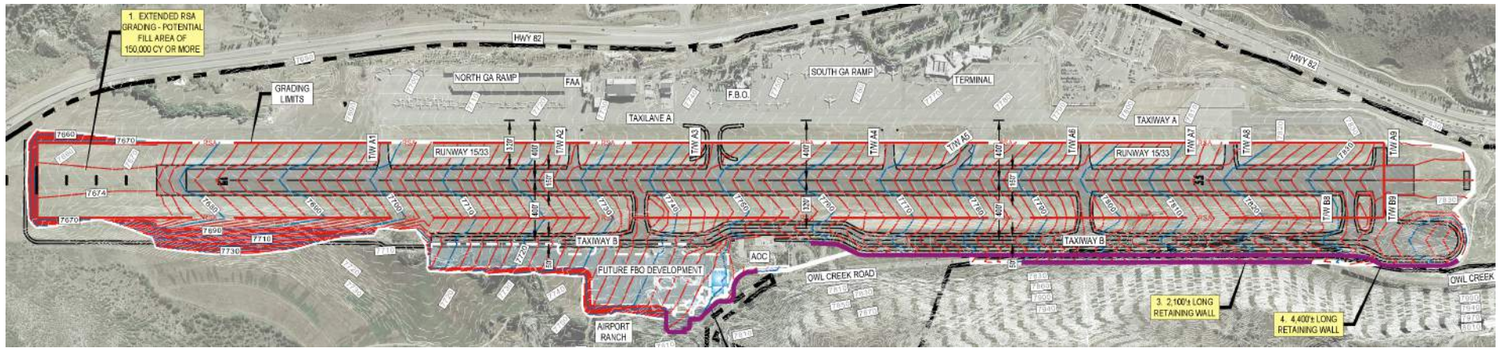
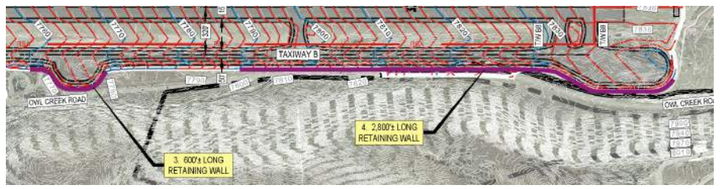


Figure D-10: Difference in Grading Limits, Southwest Side of Airport (Sheet 23 of 30)



A mountainous terrain, such as Aspen, the requirement to construct a relatively flat surface typically results in an extensive amount of earthwork. This is the case for both of the alternatives resulting in large amounts of excavation. Minimum transverse grading standards were utilized to help reduce earthwork volumes.

In order to decrease the amount of earthwork required, decrease the footprint of the construction area, and to minimize impact to the surrounding environment, the use of retaining walls were implemented in necessary areas. Retaining walls are required for each new alternative on the west side of the relocated airport VSR at the "pinch point" between the airfield and Owl Creek Road, and the future FBO development. There are existing retaining walls to accomodate steep terrain along Highway 82 in the vicinity of the Airport. The proposed retaining walls would be similar in nature (see Figures D-11 and D-12). The retaining walls required to catch grade for the each option is as follows:

- **Alternative 8a**
  - » "Stacked" retaining wall system
    - Lower retaining wall adjacent to relocated VSR south of AOC
      - Approximately 4,400 long with a maximum height of 22'
    - Upper retaining wall on west side of Owl Creek Road
      - Approximately 2,100' long with a maximum height of 30'
  - » West side FBO development along roadways and parking lot system
    - Approximately 1,200' long with a maximum height of 44'
- **Alternative 12a**
  - » Adjacent to relocated VSR south of AOC
    - Approximately 2,800' long with a maximum height of 23'
  - » West side of proposed north holding pad
    - Approximately 600' long with a maximum height of 12'
  - » West side FBO development along roadways and parking lot system
    - Approximately 1,200' long with a maximum height of 44'

Figure D-11: Highway 82 "Stacked" Retaining Wall System

Figure D-12: Highway 82 Retaining Wall Just North of the Airport Property

Alternative 8a will require the construction of two "stacked" retaining walls due to the Taxiway "B" being located 80' further to the west. This stacked system of retaining walls is required since the terrain of the adjacent hill located within the Burlingame Property is very steep through this section of Owl Creek Road. The upper retaining wall will also reduce the amount of land that would need to be acquired and impacted

for the project. The cumulative height of both walls in Alternative 8a is static, although, as the Owl Creek Road profile is developed in the design process, the actual heights of the upper and lower walls can be adjusted to both help construction and community interests. In addition to a "stacked" retaining wall system, other alternatives were considered in the costing process of this study. These concepts were:

- Build a cantilever bike path similar to those built in Pitkin County (See Figures D-13 and D-14)
- Bridge Owl Creek Road to mitigate height of walls
- Place either Owl Creek Road or the bike path in a tunnel

Figure D-13: Existing Cantilever Bike Path

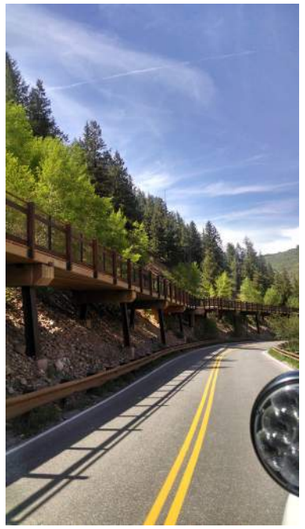


Figure D-14: Existing Bike Path

The existing topography and layout of the airport and adjacent property provides difficulty for expansion in any direction. If the new located runway was raised in elevation, the entire east side infrastructure would need to be reconfigured due to existing grades on the connector taxiways being maximized. To mitigate costs on the east of the airport, the new runway was graded to maintain the existing characteristics of the topography. This results in extensive excavation on the airport, with minimal space to place material. The extended Runway Safety Area on the north side of the airport provides a potential area to place excess excavated materials. The proposed grading shows raising the north end of the airport to the allowable maximum FAA standards. This provides an area in which material may be placed, up to 20' in height. This area may also be expanded based on community preference to provide for a more aesthetically pleasing view, which in turn would allow more excavated material to be placed, and unit costs for earthwork to decrease.

Unit prices for earthwork were derived assuming that the majority of excavated materials will be required to be exported from the airport, and placed elsewhere. There are potential areas within the Roaring Fork valley, within 30 minutes of the airport where the excess material may be placed. These may include gravel pits, or land in which an owner needs the material. The earthwork unit price was based on an hour trip each way for hauling operations. Due to the large amount of material being excavated on this project, and the available areas, the hauling cost for earthwork is the driving factor for overall cost on this project. If the exported material is required to be hauled further than one hour one-way, the unit price will increase proportionally. Figure D-15 represents a map showing a hauling radius and associated unit costs for increased distance.

Figure D-15: Estimated Hauling Routes for Excess Earthwork

Estimated Cost of Hauling Earthwork

Haul Time (one-way)	Cost/Cubic Yard (CY) (round trip)
Up to 30 minutes	Up to $15/CY
Up to 1 hour	Up to $20/CY
Over 1 hour	$20/CY and higher

Pavement Sections

Runway/Taxiway/Apron

In order to develop cost estimates for the project, it was critical to identify both the depth and material types for the pavement sections in consideration. At the direction of the FAA, the pavement sections for the runway, taxiway, and apron sections were designed using the FAA's FARFIELD program to handle ADG-III aircraft. The bearing operational capacity of the soil was based on previous geotechnical investigations at the airport. Three distinct pavement sections were reviewed: new full depth pavement, overlay of the existing pavement section, and overlay of the recent runway extension.

The resulting full depth pavement section includes 12 inches of P-401 Asphalt Paving on top of 11 inches of P-208 Flexible Base Course. This pavement section will be installed on top of conditioned native subgrade material in areas where no airfield pavement currently exists, such as the west portion of the shifted runway location and the proposed west side taxiway system.

The existing runway has varying depths of asphalt and base material. The existing runway was analyzed in two sections to account for the variable depth: From Runway 15 end to Taxiway A8 and from Taxiway A8 to Runway 33 end, which is the 1,000-foot extension.

The overlay section will require 2.5 inches for the Runway 15 to Taxiway A8 portion and 5 inches for the Taxiway A8 to Runway 33 portion. A transition will be required to tie the overlay sections prior to Taxiway A7.

Based upon the history of native soils that drain moisture very well and exhibit minimal signs of frost heave, underdrains were only considered for portions of the connector taxiways and parallel taxiways where water would become trapped beneath the pavement section. Underdrains were not evaluated for the runway itself.

Runway/Taxiway Shoulders

The runway and taxiway shoulder sections were estimated using a similar methodology. The resulting pavement section includes 4 inches of P-401 Asphalt Paving on top of 12 inches of P-208 Flexible Base Course. This pavement section will be installed on top of conditioned native subgrade material.

Vehicle Service Road

The relocated Vehicle Service Road (VSR) was estimated using an assumed section that is similar to the pavement section of the exiting VSR. The section will be comprised of 4 inches of P-403 Colorado Modified Asphalt Paving on top of 4 inches of CDOT-304 Aggregate Base Course or recycled asphalt millings. This pavement section will be installed on top of conditioned native subgrade material.

Owl Creek Road

The relocated Owl Creek Road was designed using an assumed section. The section will be comprised of 6 inches of P-403 Colorado Modified

Asphalt Paving on top of 8 inches of CDOT-304 Aggregate Base Course and installed on top of conditioned native subgrade material.

Bike Path

The relocated Owl Creek Bike Path was estimated using an assumed section of 6 inches of CDOT-412 Concrete Paving on top of 6 inches of CDOT-304 Aggregate Base Course and installed on top of conditioned native subgrade material.

Airfield Lighting and NAVAIDs

The airfield lighting, signage, and navigation aid systems (NAVAIDs) associated with the runway and taxiways will need to be removed and replaced as a result of the 80' runway shift, as indicated in Figure D-16. This project will include a substantial amount of electrical work. The lighting systems associated with the runway that will need to be relocated are the runway end lights, the runway edge lights, runway exit signs, mandatory holdline signs and Runway Distance Remaining Signs. New runway centerline and touchdown zone lights may also be installed at this time. The impacted NAVAIDs will include the Localizer system, Runway End Indicator Lights, Medium-intensity Approach Lighting System with Flashers (MALSF), and Precision Approach Path Indicators (PAPIs). The lighting systems associated with the taxiway that will need to be modified are the taxiway edge lights, and guidance signs. The main wind cone with segmented circle will need to be relocated as well. New taxiway edge lights and guidance signs will be required for the new west side parallel taxiway. Power for the airfield lighting system will come from the existing airfield lighting vault. New constant current regulators will be installed to service the additional loads on the airfield lighting system. Modifications to the existing Airfield Lighting Control and Monitoring System (ALCMS) will be required due to the altered airport geometry and airfield lighting system functionality.

Utilities - Storm Drainage

The storm sewer related infrastructure will be impacted by construction of the new Runway and Taxiway "B" in both alternatives and will require an extensive detailed drainage analysis for the entire airfield. The additional pavement will increase the impervious values associated with the existing storm sewer systems which will trigger the upsizing of certain pipes in both the existing east side and west side storm sewers. New storm sewer lines will need to be added to the west side storm sewer system and the existing Stapleton Brothers Ditch storm system will also require modification. With the construction of the west side FBO development a portion of Owl Creek will be piped. Figure D-17 shows the overall stormline configuration for Alternative 12a. The following is additional information regarding these storm sewer modifications:

East Side Storm Sewer System

Both alternatives add approximately 30 feet of pavement length to each of the connector taxiways that drain into the basins of the east side storm sewer system. The majority of this existing system can handle the additional capacity based on the 5-year runoff flows, but approximately 1,200 linear feet of storm sewer will need to be upsized from an 18" pipe to a 24" pipe. With the improvements associated with these alternatives, the existing east side storm sewer will be close to its maximum operational capacity. If additional development occurs on the east side of the Airport beyond what is shown in this study, the east side storm sewer system may require additional pipe upsizing.

West Side Storm Sewer System

The existing west side storm sewer system was designed and constructed with consideration of future improvements to the west airfield. Both alternatives increase the amount of pavement above the previous assumptions for the future build-out of the west airfield. The majority of this existing system can handle the additional capacity based on the

Figure D-16: Airfield Lighting and NAVAIDs Layout (Alternative 12a, Sheet 28 of 30)

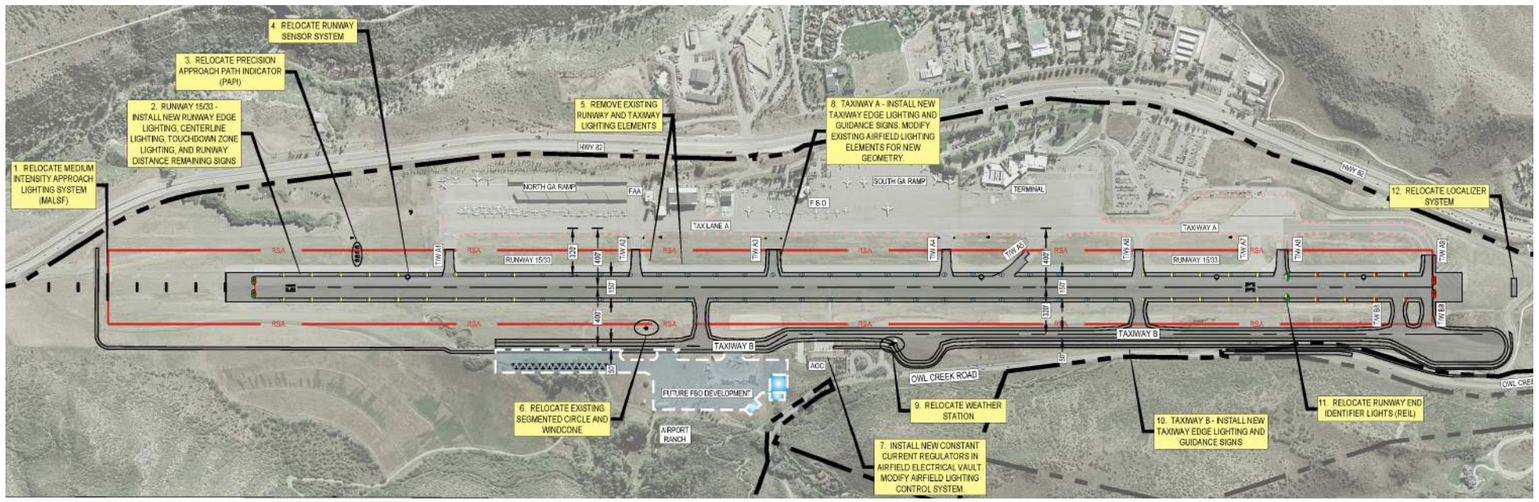
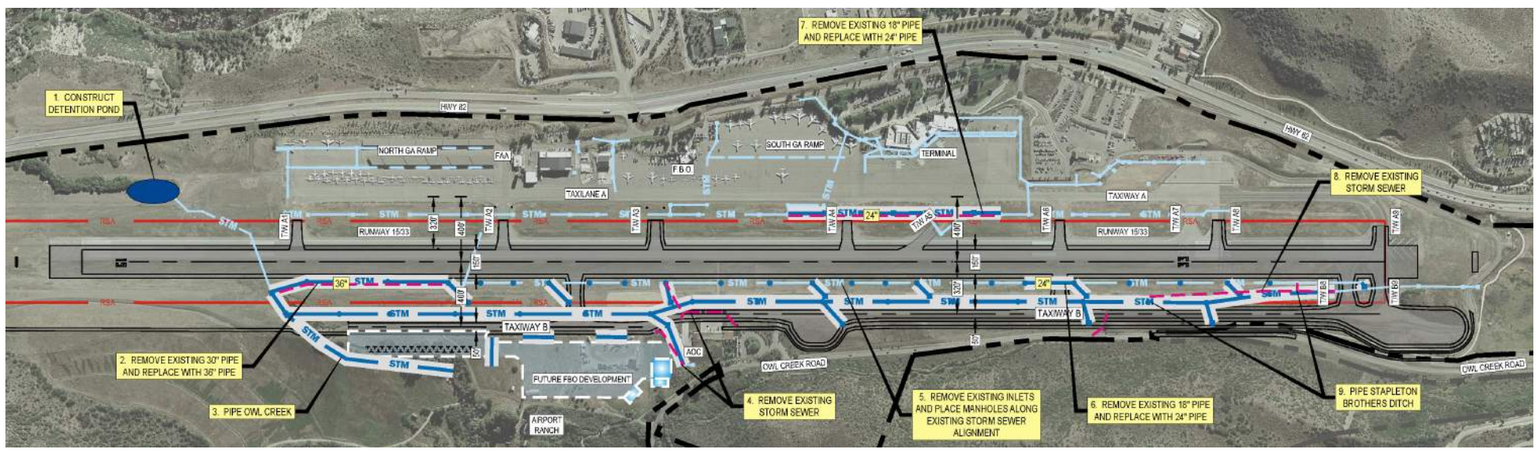


Figure D-17: Storm Drainage Layout (Alternative 12a, Sheet 24 of 30)



5-year runoff flows, but approximately 300 linear feet of 18" storm sewer pipe will need to be upsized to 24" pipe and 1,100 linear feet of 30" storm sewer pipe will be upsized to 36" pipe. The existing storm sewer inlets will be removed and replaced with aircraft rated manholes in relocated low spots within the new infields. Aircraft rated inlets will be installed 120 feet west of the existing system to capture the flow between the runway and Taxiway "B". Proposed storm sewers with be installed to convey the runoff from the new inlets into the existing system.

Stapleton Brothers Ditch Relocation

Currently Stapleton Brothers Ditch (SBD) is captured south of the airfield and conveyed through a 30" pipe along the hillside west of the runway to a point west of Owl Creek Road where it joins Willow and Herrick Ditch (WHD). WHD flows north and releases into Owl Creek. Owl Creek crosses to the east side of the airfield through a 72" pipe near the North end of the runway. With the expansion of the west airfield, SBD pipe will require relocation. The improvements to the west airfield have an elevation lower than WHD. SBD pipe would need to be routed behind the west airfield wall if it is to remain connected to WHD. In this scenario, SBD pipe would be up to 30 feet deep behind the wall and would prevent this pipe from being replaced if a future problem occurs without removing the wall. Rerouting this pipe behind the wall entailed too much risk, produced a difficult maintenance situation, as well as being cost prohibitive and was not considered a viable option. Therefore, SBD would need to be routed through storm piping along the west airfield all the way to Owl Creek.

The SBD pipe will be upsized to a 36" pipe and run to the north off the edge of Taxiway "B". This 36" pipe will parallel the west side storm sewer system all the way to Owl Creek. Any flows west of Taxiway "B" will be captured and tied into this SBD pipe as well. Ultimately the drainage pattern in the area will be maintained as Stapleton Brothers Ditch will release into Owl Creek as it always has. It has been assumed that any water rights associated with Stapleton Creek lay downstream of the airport property. A 36" pipe parallel with the existing west side storm sewer system will be more cost effective than upsizing the entire west side storm sewer system to 48" pipe or larger to convey the flows collectively down to Owl Creek.

Owl Creek

Owl Creek is captured in a 72" pipe and conveyed under the runway to the east side of the airfield where it leaves airport property under Highway 82. The 72" pipe will be extended approximately 1,500 linear feet around the north end of the westside FBO development. This extension will accommodate the proposed construction of west side Taxiway "B" and is in line with recommendations from the 2013 Wildlife Hazard Assessment for mitigation of wildlife hazards to aircraft. The FAA remains concerned about the proximity of wildlife attractants to airports and potential incidents that may result. It is assumed that a Letter of Map Revision will be completed which will map the adjusted floodplain in this area. It is also anticipated that these improvements will require approximately three quarters of an acre of wetland mitigation work.

Detention Pond

With the increased flows generated from these alternatives, it was assumed a detention pond may be required to stage runoff flows to ensure no downstream properties are affected. This detention pond would be installed east of the airfield upstream of the outfall under Highway 82, as shown on Figure D-18. This pond is assumed to be for detention only and water quality capture volume would not be required. This detention pond would be equipped with an outlet structure and overflow spillway to handle any additional flow.

Utilities - Sanitary Sewer

The sanitary sewer main that extends from the North GA Ramp to the AOC will be impacted by the construction of the new runway and taxiway "B" in both alternatives. The main line is a 15" PVC line with an 8" PVC service line for the AOC facility. The main line and service line are deep enough to remain in place; the primary impacts are to the manhole structures. One manhole is located within the new runway limits and needs to be eliminated. This will require reconstruction of 440' of the sanitary sewer line. The rest of the manholes will require adjustment for the new grades. Refer to Figure D-19 for the sanitary sewer adjustments for both alternatives.

Utilities - Natural Gas

The gas will be impacted in two locations for both alternatives. See Figure D-20 for the gas realignment for both alternatives. The 6" high pressure gas main on the north end of the airfield will be impacted by the regrading and embankment of the relocated runway safety area and object free area. The gas main will be relocated around the extension outside of these areas.

The gas main that provides service to the AOC facility is a 2" low pressure line that runs through the airfield. As a result of the runway shift, and the subsequent safety area grading that will be required, the gas line will need to be lowered in place from the east edge of the runway safety area to the AOC. The portion of the gas main that crosses the airfield pavement will be installed inside a utility sleeve to facilitate future maintenance.

Figure D-18: Proposed Detention Pond (Alternative 8a, Sheet 23 of 29)

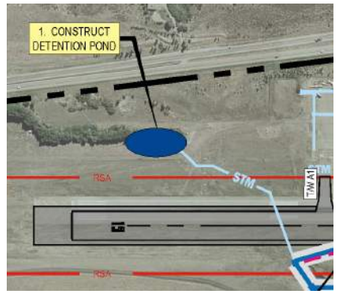


Figure D-19: Sanitary Sewer Layout (Alternative 8a, Sheet 24 of 29)

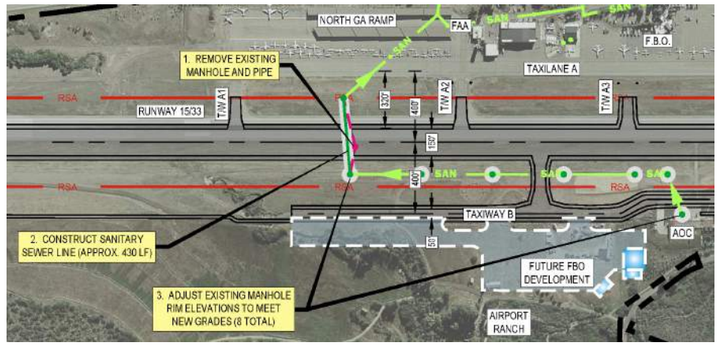
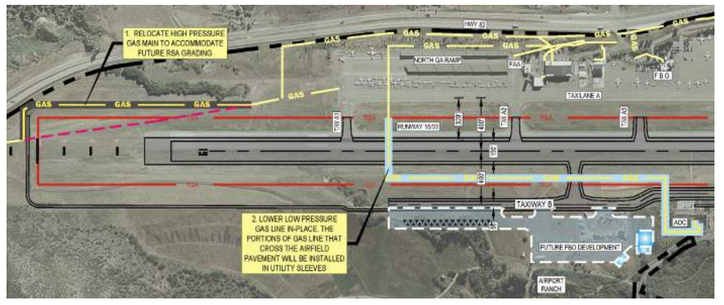


Figure D-20: Natural Gas Layout (Alternative 12a, Sheet 26 of 30)



Utilities – Electrical

The electrical power lines and associated spare conduit duct banks throughout the site will be impacted. Both alternatives will require the lowering of the electrical lines that run across the airfield from the east side to the AOC. As a result of the runway shift, and the subsequent safety area grading that will be required, the electrical lines will need to be lowered from the east edge of the runway safety area to the AOC. The electrical power line at the southwest corner of the airport will also

need to be relocated as a result of Taxiway "B" and Owl Creek Road construction. These lines may be located adjacent to the new bike path alignment. Miscellaneous electrical boxes present in the location of the future FBO apron and the holding aprons will need to be relocated as well. This work will need to be coordinated with Holy Cross Energy, the service provider in the area, and all new construction and adjustments will need to be constructed to their standards. Refer to Figure D-21 for the conceptual electrical layout for Alternative 8a.

Utilities – Telephone

The proposed construction will impact the telephone wire system in three locations in both alternatives. The reconstruction of the extended safety area on the north end of the airport will require the relocation of a section of telephone. The telephone will be routed in a conduit duct bank along with the cable TV line outside of the object free area. New pedestals will be required at the tie in points.

The telephone feed to the AOC facility will be lowered in place to accommodate the proposed grades. The telephone line is in a conduit duct bank along with fiber optic. The existing aircraft rated structures will be replaced and new structures will be required at the northern tie in point. Because this line runs across the entire airfield, spare conduits will be installed to accommodate future construction.

At the south end of the airfield the telephone line will be relocated to accommodate the construction of Taxiway "B" and the relocation of the Owl Creek Road. The new line will be placed in a conduit duct bank that is located in between the bike path and Owl Creek Road. The southern portion of the telephone line will share a duct bank with two fiber optic lines. Refer to Figure D-22 for the communication adjustment required for Alternative 12a.

Utilities – Fiber Optic

At the south end of the airfield two fiber optic lines will be impacted by both alternatives. The proposed grades will be lowered, requiring a relocation of these lines, and routed around the object free areas. The new fiber optic line may be run in between the bike path and Owl Creek Road in a duct bank along with the relocated telephone infrastructure. Concrete vaults will be required at the tie in points.

The fiber optic feed on the north end of the airfield will be relocated to accommodate the extended safety area grading. The line will be run within a duct bank along with the telephone. New pedestals will be required at the tie in points.

The main feed for the AOC facility will need to be lowered. The fiber optic line is run in a conduit duct bank along with the telephone line.

Figure D-21: Electrical Layout (Alternative 8a, Sheet 26 of 29)

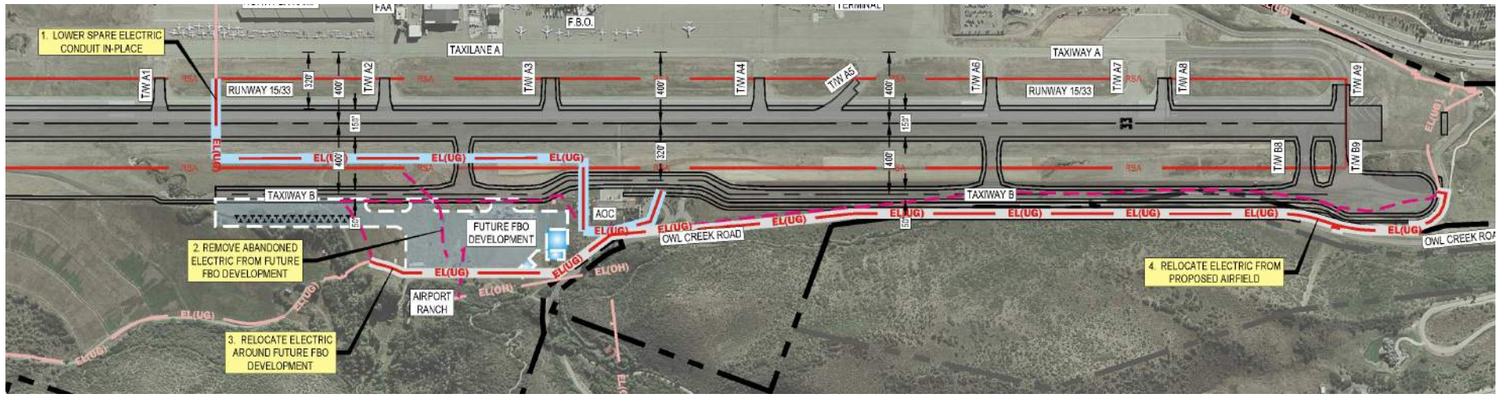
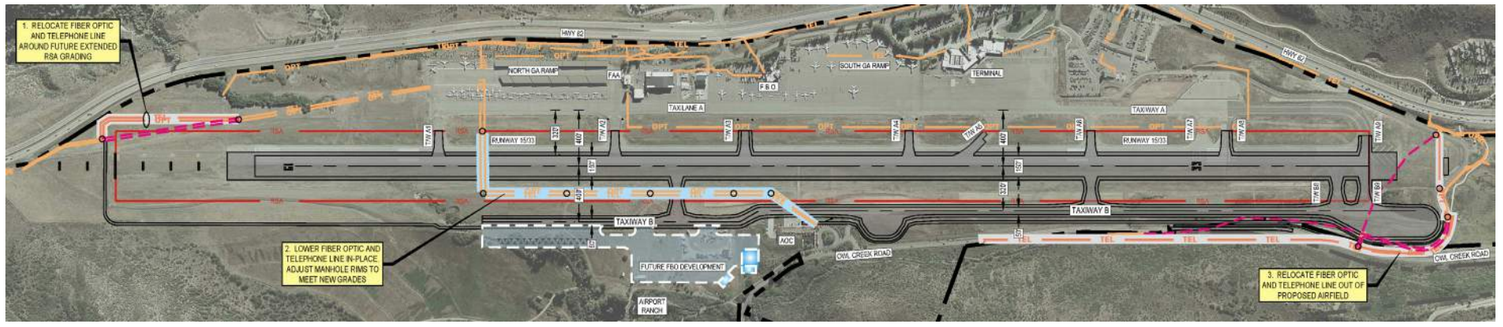


Figure D-22: Telephone and Fiber Optic Layout (Alternative 12a, Sheet 29 of 30)



Because this line crosses the entire airfield, spare conduits should be installed to accommodate future construction. The new duct bank will require replacement of the existing vault structures as well as a new structure at the north tie in point.

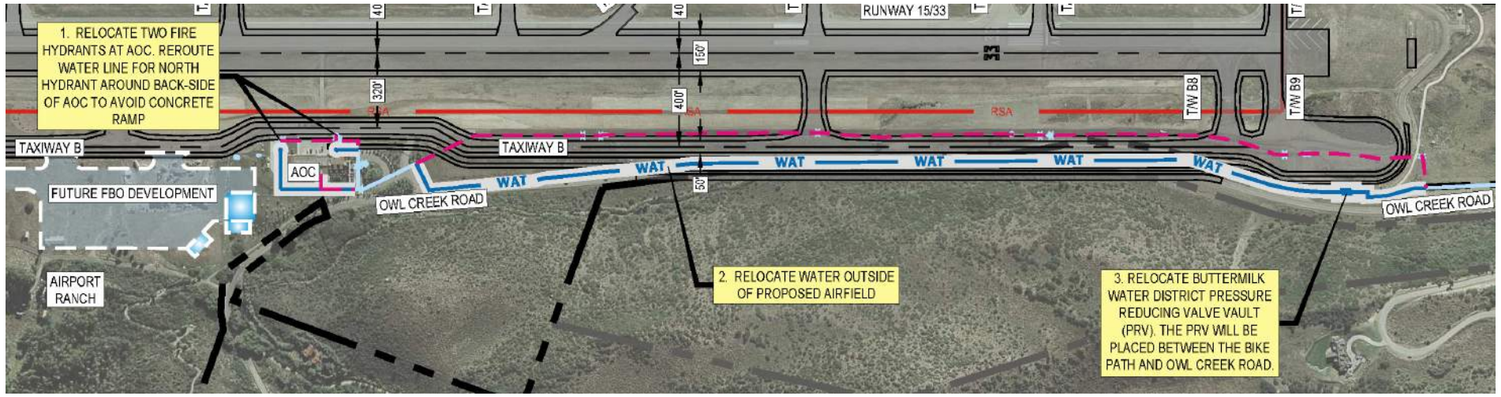
Utilities - Water

Portions of the water system will require relocation to accommodate the proposed runway and taxiway improvements for both alternatives. The existing 10"/12" Ductile Iron Pipe (DIP) water line runs parallel to runway on the west side which will be relocated to run 5' off of the bike path. The new line will be located in between the new retaining wall and the bike path. This alignment may not allow for a full 30' exclusive easement, which will need to be discussed with the Buttermilk Water District. Another key area that will be impacted is the pinch point at the mid-airfield hold apron. The water line needs to be shifted under the bike path. If a MSE wall section is selected, or if a 30' exclusive easement is required, the water and proposed electric may need to be shifted further west under Owl Creek Road.

A manhole and a pressure reducing valve (PRV) vault are located on this line. These structures will need to be relocated along with the 10"/12" water line along with two air release valves. There are no fire hydrants located on the existing main; therefore it is assumed that no fire hydrants will be required on the relocated water main. On the existing water main there are two tees that are facing east for future cross airfield connections. These tees will not be installed on the new line as the proposed wall will cut off access to the airfield.

The second impact to the water line is to the east of the AOC facility. Two fire hydrants and their lines will need to be relocated to move out of the taxiway object free area. The 6" line for the north fire hydrant will be routed to the west of the building to avoid cutting through the apron pavement. Refer to Figure D-23 for the conceptual waterline realignment for Alternative 8a.

Figure D-23: Water Layout (Alternative 8a, Sheet 29 of 29)

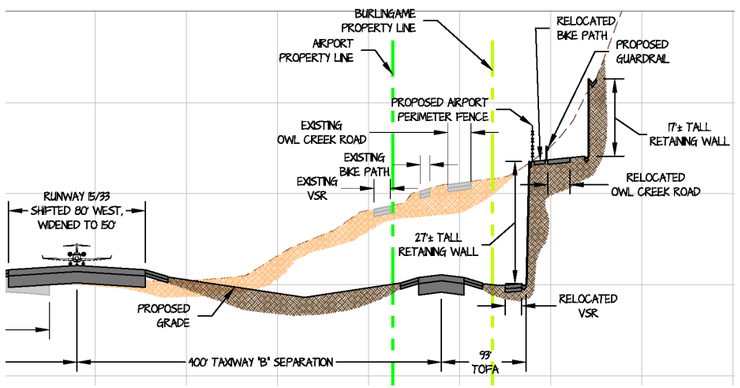


Property Acquisitions and Rights of Way

Both of the alternatives will utilize the existing airport property to a large extent at the "pinch point" along Owl Creek Road. However, the full 400' offset between the Runway and Taxiway "B" in that area in Alternative 8a will have a greater impact to the land use in that area.

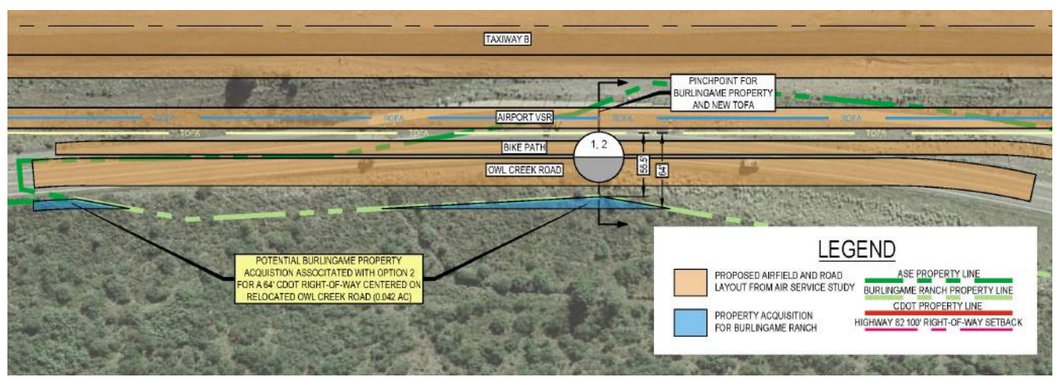
The TOFA for Taxiway "B" in Alternative 8a extends over the Burlingame Property line and will require a modification to the airport property line in the area. This alternative will also impact the Owl Creek Road in such a way that the limits of construction, the road realignment, the bike paths and the retaining walls, will extend beyond the existing airport property boundaries. This will require a modification to the airport property boundary in this vicinity. Refer to Figure D-24 for the cross section at the pinch point for Alternative 8a.

Figure D-24: Land Impact at Owl Creek Road Pinch Point (Alternative 8a, Sheet 6 of 29)



Alternative 12a may not require any additional property acquisition or land transfer since the limits of the project impact can remain outside of Burlingame Property. Refer to Figure D-25 for the plan view of the property boundaries and Rights-of-way lines in the area. There are some options for the locations of the CDOT right-of-way in that area which may impact the need to adjust the airport property line. One option may not require any modifications to the property in the area. Option 1, shown in Figure D-26, shows a 53.5' Right-of-way, which is offset from the centerline of the proposed Owl Creek Road alignment, and which does not impact the adjacent Burlingame Property. Option 2, shown in Figure D-27, shows the full 64' wide CDOT Right-of-way centered on the proposed Owl Creek Road alignment; in this case the Right-of-way encroaches into the Burlingame Property in two areas and may require the acquisition of 0.04 acres. Coordination between Pitkin County and CDOT will be required to determine an acceptable option.

Figure D-25: Alternative 12a - Owl Creek Road Relocation



Construction Practicality and Feasibility

An investigation was made into the practicality of the project implementation and phasing during Step C. Given the importance of the airport to the economic activity in the region, it will be critical to minimize the airport closure time as much as possible. Safety on airports during construction is an extremely high priority for the FAA, and as such, they prohibit construction work from taking place within active safety areas and taxiway object free areas. Areas for construction must be clearly delineated and marked, and all the requirements prescribed in the Advisory Circular 150/5370-2F Operational Safety on Airports During Construction must be followed. All options for construction will look to phase the project to construct as much as possible outside of the RSA to allow the airport to remain operational before closing the runway. A planned phasing and runway closure period

Figure D-26: CDOT Right-Of-Way Not Centered on Owl Creek Road

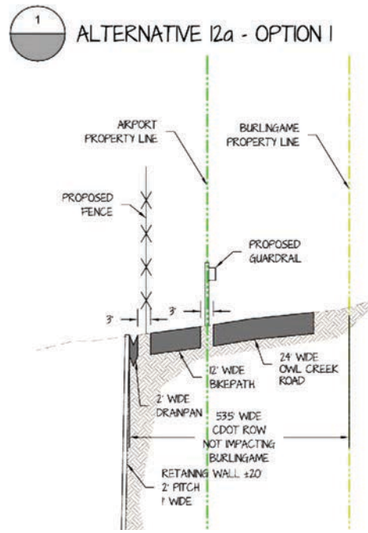
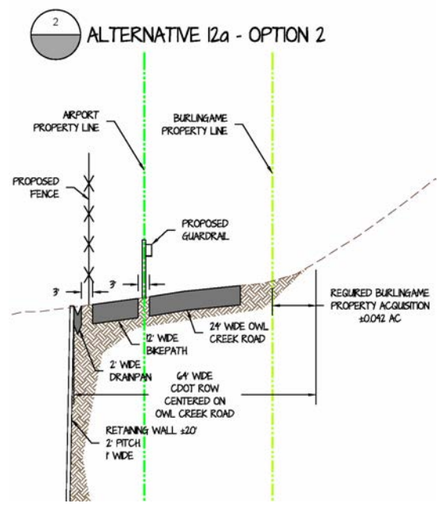


Figure D-27: CDOT Right-Of-Way Centered on Owl Creek Road



inherent within these alternatives requires an aggressive construction schedule for that portion of work in order to limit the impacts to the airport and the local economy during construction. While construction is in progress, the contractor will be encouraged to work around the clock in order to compress the airport closure timeframe as much as possible. Various scenarios were considered to time the construction to take place outside of the airport's peak seasons. Breaking the various elements of the project out into smaller schedules or phases of work has the benefit of maximizing the FAA's ability to participate in the funding of the project, and also of being able to decrease the critical closure times. For instance, a project to relocate utilities around the periphery of the airport could be accomplished without any airport closure time at all, and could be completed ahead of a large paving project. Other smaller projects that could be accomplished at night, when the airport is typically closed, could be performed ahead of a large closure as well. By taking incremental steps towards completing the overall project, a reduction in the magnitude of the impact of the larger project can be achieved.

Consideration should also be given to the age and condition of the existing airfield pavement. The FAA typical cycle of the airfield pavement is described as application of a rejuvenating agent every 3-5 years, a mill and fill type rehabilitation or overlay every 10-15 years, and a complete reconstruction every 20-25 years. The existing Runway 15/33 pavement underwent a mill and fill type rehabilitation in 2007 during an airport closure for 60 days, and is likely to require the next rehabilitation type maintenance within the next 5 years in order remain in good condition. This next project will experience a similar Runway shutdown period. Even though the proposed runway shift will have a substantial impact by requiring a considerable airport closure time, it should be considered that the airport would face a future runway closure for a similar duration regardless of any course of action.

Capital Project Costs

In order to develop conceptual cost estimates, the conceptual elements as discussed above in this section, were priced using current bid tabulations for other airport projects, and other civil projects in close proximity to the airport. The key components comprising the cost estimates were:

- Conceptual design of the overall site grading in order to evaluate the required earthwork for the final alternatives.
- In association with the conceptual grading for each final alternative, site specific drainage was also analyzed, with special consideration to Owl Creek.
- Conceptual profiles, cross sections, and safety area grading in order to determine earthwork volumes for the final alternatives.
- Conceptual utility plans were developed for the final alternatives in order to determine the general layout of new and/or relocated utilities, and to identify the impacts to the existing infrastructure. The conceptual utility plans account for the general layout and estimated quantities.
- Conceptual level airfield electrical design was developed in order to determine the general layout and quantities for the runway and taxiway lighting and guidance systems, and all navigational aids (NAVAIDs) impacted by the project.

The cost estimates for the two alternatives contain the conceptual construction cost, estimated engineering design and construction management fees, and a 5% contingency to account for unforeseen items at this conceptual level of detail (see Table D-1 and D-2).

Funding Alternatives and Sources

The work required to achieve the final Airfield Configurations indicated in the two alternatives is largely supported by the FAA. As such, this work is eligible to receive Airport Improvement Program (AIP) grant funding. Typically the FAA will provide 90% towards the total project cost with a 10% local match, a portion of which is often contributed by CDOT Aeronautics. While the project may be eligible, FAA and CDOT funds are not guaranteed. The work described is likely to be broken out into multiple bid packages over 3 to 5 years to fit within the FAA's budgetary timeframe and thereby maximize the FAA's participation over a longer period of time. It is a benefit for the FAA to be able to spread out the required funding over numerous years of construction, as multiple airports in the region are competing for the same FAA funding.

Additionally, the work outlined in the alternatives would compete well for CDOT Aeronautics grant funding.

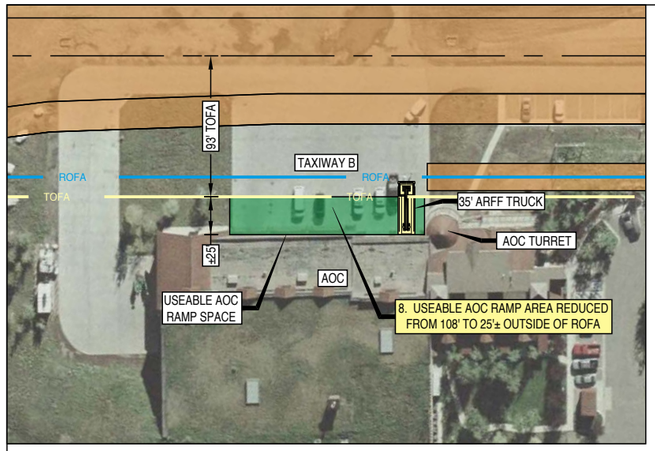
Local funding sources are expected to provide between 5% and 10% in matching capital of the construction grants listed above. Providing alternatives which allow for the construction of the 2nd FBO on the west side has the importance of additionally promoting competition and free enterprise, and meeting the requirements of the grant assurances set forth by the FAA. This FBO will also likely become a valuable source of revenue generation for the airport.

Table D-1: Alternative 8a Conceptual Level Cost Estimate:

Item Description	Cost
Mobilization	$6,992,061
Airfield Pavement (New and Removal)	$44,148,775
Earthwork and Retaining Walls (Seeding, Erosion Control, Top Soil, Etc.)	$34,762,000
Drainage Improvements (Subsurface, Collection, Glycol Collection System, Etc.)	$6,507,100
Airfield Electrical (Lighting, Signage, NAVAIDs)	$6,269,450
Owl Creek and Bike Path Relocation (Property Acquisition, Retaining Wall, and Earthwork)	$5,789,700
Utility Improvements (Electrical, Fiber Optic, Gas, Sanitary Sewer, Telephone, Water, Etc.)	$2,409,560
Subtotal	$106,878,646
Contingency (5%)	$5,343,932
Construction Costs	$112,222,578
Engineering Design	$9,619,078
Construction Management	$10,687,865
Estimated Project Cost	**$132,529,521**

Table D-2: Alternative 12a Conceptual Level Cost Estimate:

Item Description	Cost
Mobilization	$6,391,902
Airfield Pavement (New and Removal)	$44,702,325
Earthwork and Retaining Walls (Seeding, Erosion Control, Top Soil, Etc.)	$30,820,500
Drainage Improvements (Subsurface, Collection, Glycol Collection System, Etc.)	$6,507,100
Airfield Electrical (Lighting, Signage, NAVAIDs)	$6,269,450
Owl Creek and Bike Path Relocation (Retaining Wall, and Earthwork)	$702,700
Utility Improvements (Electrical, Fiber Optic, Gas, Sanitary Sewer, Telephone, Water, Etc.)	$2,310,810
Subtotal	$97,704,787
Contingency (5%)	$4,885,239
Construction Costs	$102,590,026
Engineering Design	$8,793,431
Construction Management	$9,770,479
Estimated Project Cost	**$121,153,936**



HWY 82

12. LOSS OF ONE TO 13' OF SOUTH GA AIRCRAFT PARKING DUE TO FULL WIDTH TOFA (APPROX. 3,930 SF)

13. LOSS OF 13' OF COMMERCIAL RAMP DUE TO FULL WIDTH TOFA (APPROX. 13,065 SF)

11. LOSS OF ONE FOOT OF NORTH GA AIRCRAFT PARKING DUE TO FULL WIDTH TOFA (APPROX. 1,250 SF)

NORTH GA RAMP

FAA

F.B.O.

SOUTH GA RAMP

TERMINAL

3. RELOCATE PRECISION APPROACH PATH INDICATOR

TAXILANE A

TAXIWAY A

T/W A1

T/W A2

T/W A3

T/W A4

T/W A5

T/W A6

T/W A7

T/W A8

T/W A9

T/W B8

T/W B9

RUNWAY 15/33

9. OPERATIONAL RESTRICTIONS ON TAXIWAY "B" BUMP OUT AT AOC

2. RELOCATE APPROACH LIGHTING SYSTEM

10. RELOCATE AIRPORT VSR

1. RELOCATE LOCALIZER ANTENNA

TAXIWAY B

AOC

SEE INSET ABOVE

OWL CREEK ROAD

FUTURE FBO DEVELOPMENT

AIRPORT RANCH

6. CONSTRUCT 27'± RETAINING WALL AND RELOCATE AIRPORT VSR INSIDE OF TOFA

7. CONSTRUCT 17'± RETAINING WALL AND RELOCATE OWL CREEK ROAD (2,500±)

5. IMPACTED LAND FOR AIRPORT VSR, OWL CREEK ROAD, AND BIKE PATH RELOCATION (APPROX. 6.3 AC)

4. CONSTRUCT AIRCRAFT HOLDING PAD AND 22'± RETAINING WALL AND RELOCATE BIKE PATH (3,200'±)

1 / 5 of 29

1 / 6 of 29

1 / 7 of 29

CONDITIONS

- SHIFT RUNWAY 80' WEST, WIDEN TO 150'
- 400' EAST SIDE PARALLEL TAXIWAY "A"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 400' WEST SIDE PARALLEL TAXIWAY "B"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 320' TAXIWAY "B" BUMP OUT AT AOC
  WOULD REQUIRE NEW FAA MODIFICATION TO STANDARD
  (320' RUNWAY/TAXIWAY SEPARATION)
- RESCINDS TWO MODIFICATIONS TO STANDARDS
  RUNWAY/HOLDBAR SEPARATION
  EAST SIDE TAXIWAY "A" TOFA

- ALL RSA'S, ROFA'S, AND TOFA'S SHOWN ARE FOR PROPOSED AIRCRAFT PAVEMENT

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- IMPACT ON EXISTING AIRCRAFT PARKING
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- MASTER PLAN LAYOUT BUILDINGS
- CDOT PROPERTY LINE
- HIGHWAY 82 100' RIGHT-OF-WAY SETBACK

GRAPHIC SCALE
300 0 300 600
(IN FEET)

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ALTERNATIVE 8a

DATE: JUNE 24, 2014

SHEET 1 OF 29

SEE SHEET 3 OF 29

TRANSIT CENTER

TERMINAL AREA PLAN IMPACTS (SEE SHEET 3 OF 29)

HWY 82

GSE BUILDING

HANGAR

SOUTH GA RAMP IMPACTS (SEE SHEET 3 AND 4 OF 29)

F.B.O.

TERMINAL

HWY 82

EXTENDED T-SHADE HANGARS

FAA

TAXILANE A

TAXILANE A

TAXIWAY A

TAXIWAY A

T/W A1

T/W A2

T/W A3

T/W A4

T/W A5

T/W A6

T/W A7

T/W A8

T/W A9

T/W B8

T/W B9

NORTH GA RAMP IMPACTS (SEE SHEET 4 OF 29)

RUNWAY 15/33

RUNWAY 15/33

ROFA

RSA

TOFA

320'

400'

150'

50'

TAXIWAY B

TAXIWAY B

AOC

HANGAR

F.B.O.

OWL CREEK ROAD

OWL CREEK ROAD

WEST SIDE DEVELOPMENT IMPACTS (SEE SHEET 4 OF 29)

AIRPORT RANCH

SEE SHEET 4 OF 29

MASTER PLAN COMPARISON TO PROPOSED LAYOUT FROM STUDY

- IMPACTS - CURRENT PROPOSED MASTER PLAN LAYOUT
  - TERMINAL AREA/COMMERCIAL RAMP
  - SOUTH AND NORTH GA RAMP
  - WEST SIDE DEVELOPMENT

- ALL RSA'S, ROFA'S, AND TOFA'S SHOWN ARE FOR PROPOSED AIRCRAFT PAVEMENT

PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY

ASE PROPERTY LINE

BURLINGAME RANCH PROPERTY LINE

CDOT PROPERTY LINE

HIGHWAY 82 100' RIGHT-OF-WAY SETBACK

LEGEND

MASTER PLAN LAYOUT AIRCRAFT PAVEMENT

MASTER PLAN LAYOUT BUILDINGS

MASTER PLAN LAYOUT ROADWAYS AND PARKING LOTS

GRAPHIC SCALE

300 0 300 600

(IN FEET)

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SHEET 2 OF 29

HWY 82

TRANSIT CENTER

TERMINAL

F.B.O.

14. ADDITIONAL SOUTH GA RAMP FROM MASTER PLAN (APPROX. 215,020 SF)

16. APPROXIMATELY ONE TO 13' OF SOUTH GA RAMP LOST DUE TO FULL WIDTH TOFA (APPROX. 9,460 SF)

15. APPROXIMATELY 13' OF COMMERCIAL APRON LOST TO FULL WIDTH TOFA (APPROX. 14,775 SF)

POTENTIAL GRADE BREAK STRUCTURE

SOUTH GA RAMP

COMMERCIAL RAMP

TAXILANE A

TAXIWAY A

TAXIWAY A

T/W A4

T/W A5

T/W A6

T/W A7

T/W A8

RUNWAY 15/33

61'

13'

309'

146'

93'

400'

150'

TOFA

ROFA

RSA

TERMINAL AREA AND COMMERCIAL AND SOUTH GA RAMP IMPACTS

- **MASTER PLAN IMPACTS**
  - NET LOSS OF COMMERCIAL RAMP
  - NET LOSS OF SOUTH GA RAMP
- **COMMERCIAL RAMP AIRCRAFT**
  - CS100 AIRCRAFT (115' 1" WINGSPAN)

NET AIRCRAFT RAMP IMPACT (SF)

COMMERCIAL - 14,775 LESS THAN MASTER PLAN
SOUTH GA - 9,460 SF LESS THAN MASTER PLAN

- ALL RSA'S, ROFA'S, AND TOFA'S SHOWN ARE FOR PROPOSED AIRCRAFT PAVEMENT

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- IMPACT ON PROPOSED MASTER PLAN AIRCRAFT PARKING
- ASE PROPERTY LINE
- HIGHWAY 82 100' RIGHT-OF-WAY SETBACK
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT ROADWAYS AND PARKING LOTS

GRAPHIC SCALE
100 0 100 200
(IN FEET)

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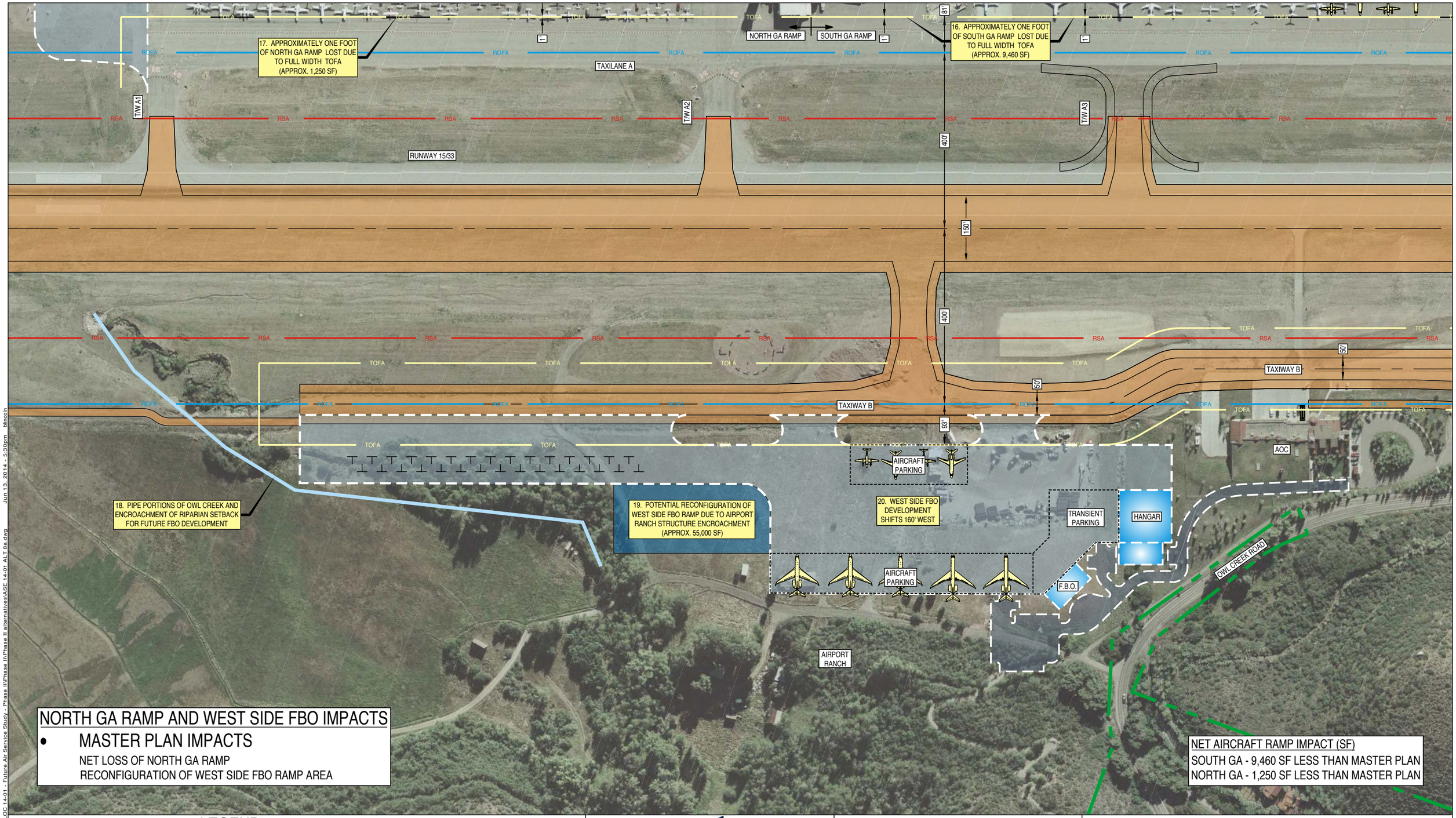

NORTH GA RAMP AND WEST SIDE FBO IMPACTS

- MASTER PLAN IMPACTS

  NET LOSS OF NORTH GA RAMP

  RECONFIGURATION OF WEST SIDE FBO RAMP AREA

NET AIRCRAFT RAMP IMPACT (SF)

SOUTH GA - 9,460 SF LESS THAN MASTER PLAN

NORTH GA - 1,250 SF LESS THAN MASTER PLAN

- ALL RSA'S, ROFA'S, AND TOFA'S SHOWN ARE FOR PROPOSED AIRCRAFT PAVEMENT

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- IMPACT ON PROPOSED MASTER PLAN AIRCRAFT PARKING
- ASE PROPERTY LINE
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT ROADWAYS AND PARKING LOTS
- RECONFIGURED AIRCRAFT PAVEMENT FROM AIR SERVICE STUDY

GRAPHIC SCALE

100 0 100 200

(IN FEET)

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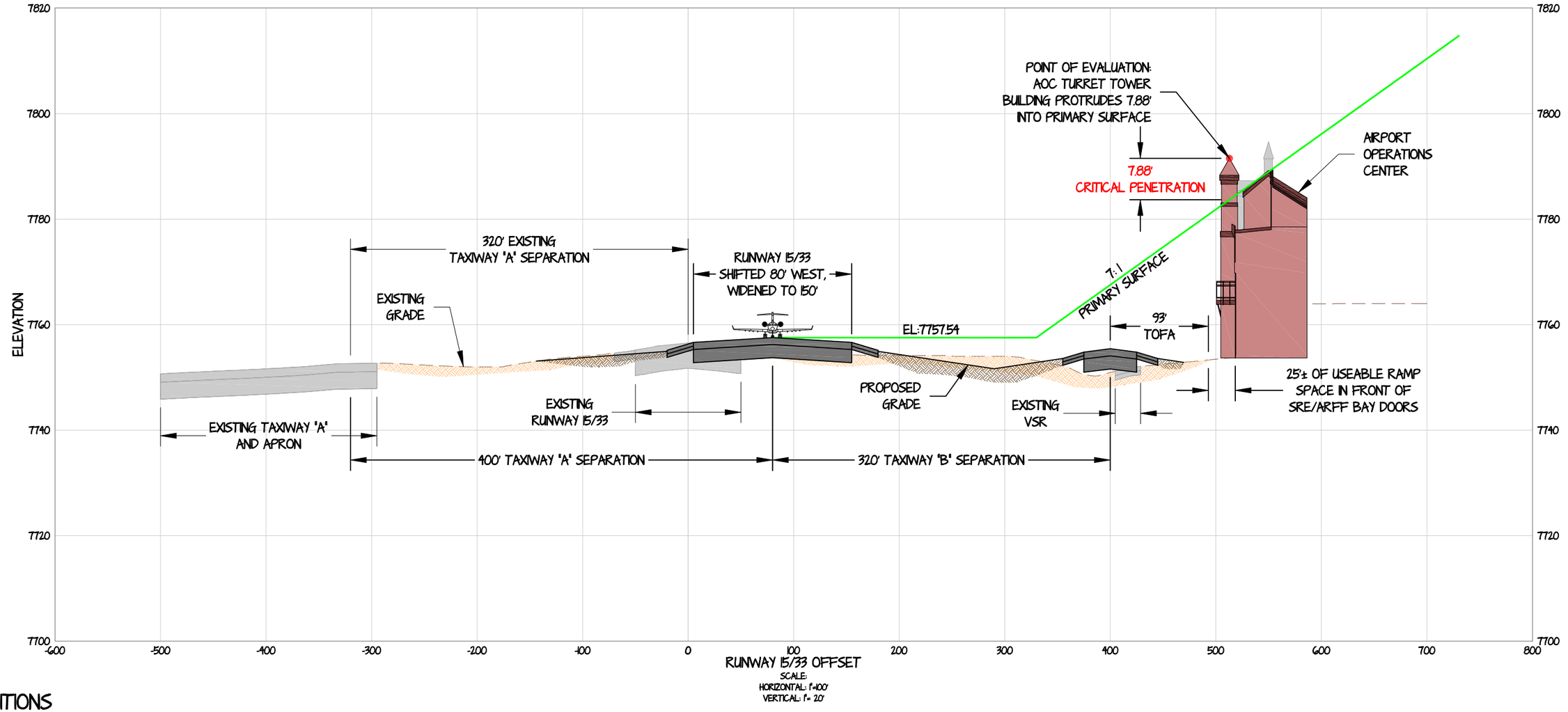
ALTERNATIVE 8a - AIRPORT OPERATIONS CENTER - PART 77 AND RAMP SPACE EVALUATION



SCALE:
HORIZONTAL: 1"=100'
VERTICAL: 1"= 20'

CONDITIONS

- SHIFT RUNWAY 80' WEST, WIDEN TO 150'
- 400' EAST SIDE PARALLEL TAXIWAY "A"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 400' WEST SIDE PARALLEL TAXIWAY "B"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 320' TAXIWAY "B" BUMP OUT AT AOC
  WOULD REQUIRE NEW FAA MODIFICATION TO STANDARD
  (320' RUNWAY/TAXIWAY SEPARATION)

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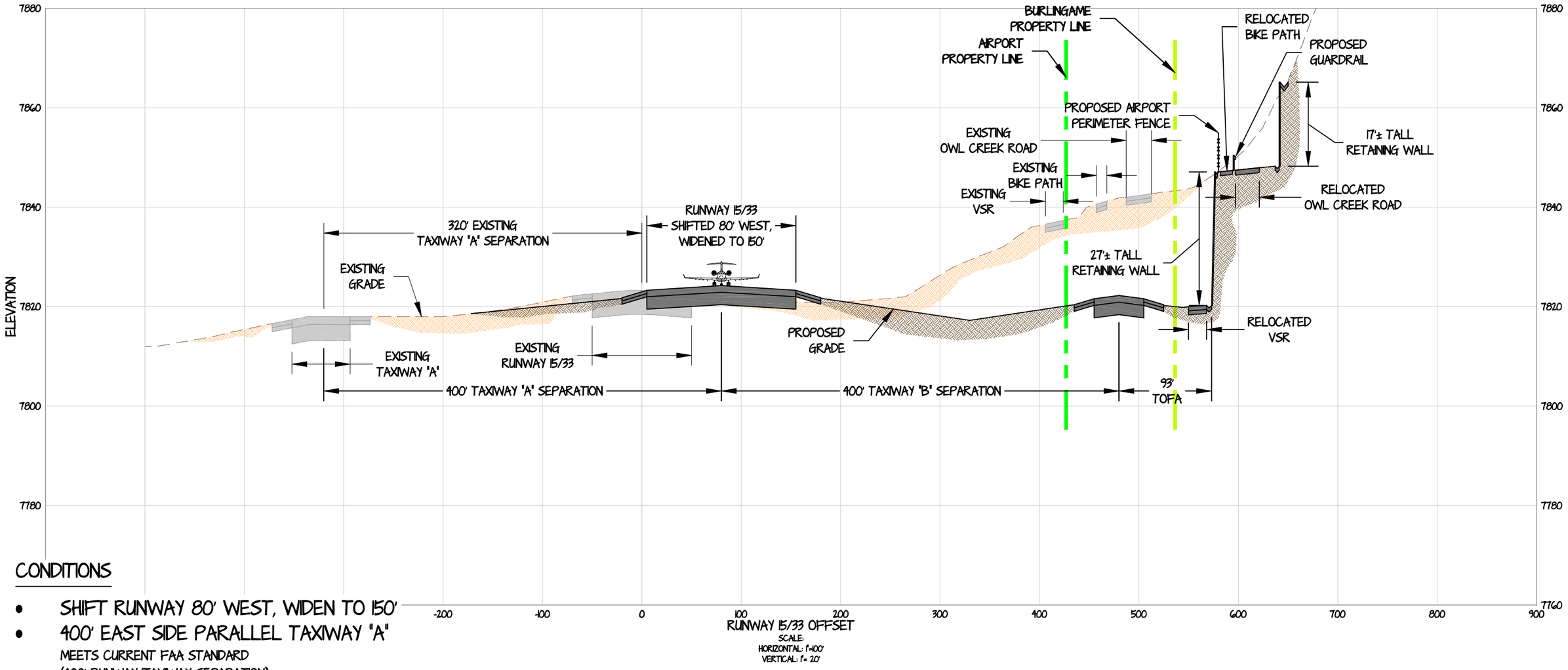
ALTERNATIVE 8a

DATE: JUNE 24, 2014

ALTERNATIVE 8a - SOUTH END OF AIRFIELD APPROXIMATELY TAXIWAY "A8" - OWL CREEK ROAD PINCH POINT EVALUATION



CONDITIONS

- SHIFT RUNWAY 80' WEST, WIDEN TO 150'
- 400' EAST SIDE PARALLEL TAXIWAY "A"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 400' WEST SIDE PARALLEL TAXIWAY "B"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 320' TAXIWAY "B" BUMP OUT AT AOC
  WOULD REQUIRE NEW FAA MODIFICATION TO STANDARD
  (320' RUNWAY/TAXIWAY SEPARATION)

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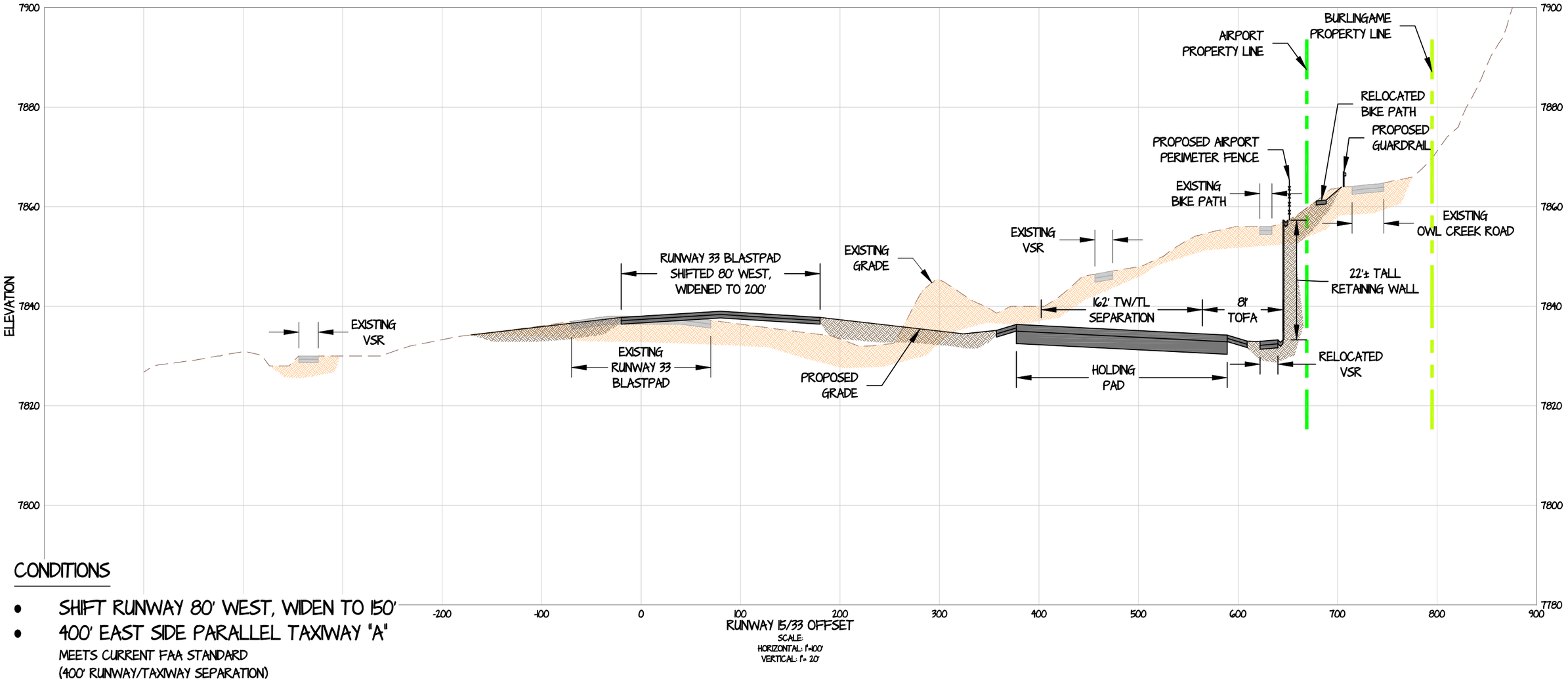
ALTERNATIVE 8a - RUNWAY 33 BLAST PAD - SOUTH HOLDING PAD EVALUATION



SCALE:
HORIZONTAL: 1"=100'
VERTICAL: 1"= 20'

CONDITIONS

- SHIFT RUNWAY 80' WEST, WIDEN TO 150'
- 400' EAST SIDE PARALLEL TAXIWAY "A"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 400' WEST SIDE PARALLEL TAXIWAY "B"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 320' TAXIWAY "B" BUMP OUT AT AOC
  WOULD REQUIRE NEW FAA MODIFICATION TO STANDARD
  (320' RUNWAY/TAXIWAY SEPARATION)

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ALTERNATIVE 8a

DATE: JUNE 24, 2014

APPROACH PROCEDURES ANALYSIS

EXISTING STATE VS EXISTING STATE WITH UPDATED CRITERIA

PREPARED BY: LEAN PHOTOMETRICS

					Existing Runway Configuration					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					
Ranking by Usage	Runway	Proce dure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
1	15	LOC-DME - E	Circl ing Only	Public	9840 (2160) 3 mi	10020 (2520) 3 mi	10220 (2540) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Business Jets, Turboprop and smaller	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	Minor Impact
2	15	LOC-DME RWY 15	Straight In	Public-Special	9200 (1520) 2 3/4 mi	9200 (1520) 2 3/4 mi	9200 (1520) 2 3/4 mi	Several waivers exist for this procedure, visibility increased due to straight-in minimums	Regional Jets, Business Jets, Turboprops and smaller	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	Several waivers exist for this procedure, visibility increased due to straight-in minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	Minor Impact
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8760 (1080) 2 3/4 mi	8760 (1080) 2 3/4 mi	8760 (1080) 2 3/4 mi	MAP Climb of 330ft/nm to 11100ft Several waivers exist for this procedure, visibility increased due to straight-in minimums	Regional Jets, Business Jets, Turboprops and smaller	8880 (1199) 3 mi	8880 (1199) 3 mi	8880 (1199) 3 mi	MAP Climb of 330ft/nm to 11100ft Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	Moderate Impact due to increased vis and ceilings. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	9680 (2000) 3 mi	10320 (2640) 3 mi	10840 (3160) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums	Regional Jets, Business Jets, Turboprops and smaller	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	Moderate Impact due to increased vis and ceilings.
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13680 (6000) 10 mi	13680 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	13680 (6000) 10 mi	13680 (6000) 10 mi	13680 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	No Impact
6	15	Visual	Circling/FMS Visual	Private-Special	10200 (2520) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, several waivers exist for this procedure	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	No Impact
7	15	VOR/DME - C	Circling Only	Public	10220 (2540) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, A+B minimums are merged for unknown reasons, several waivers exist for this procedure	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minor Impact
8	15	RNAV/GPS - F	Circling Only	Public	10200 (2520) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, several waivers exist for this procedure	Turboprop and smaller	10140 (2459) 1 3/4 mi	10460 (2799) 1 3/4 mi	11740 (4099) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minor Impact
9	33	Visual	Circling	Public	10200 (2520) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, several waivers exist for this procedure. Approach to runway 33 is N/A at night due to 34:1 and 20:1 penetrations.	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No Impact
10	33	Visual	Circling/FMS Visual	Private-Special	10200 (2520) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, several waivers exist for this procedure. Approach to runway 33 is N/A at night due to 34:1 and 20:1 penetrations.	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No Impact
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8079 (399) MALSF On 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only	No Impact

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

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FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 8a

DATE: JUNE 24, 2014

APPROACH PROCEDURES ANALYSIS

EXISTING STATE WITH UPDATED CRITERIA VS 80' RUNWAY SHIFT

PREPARED BY: LEAN PHOTOMETRICS

					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					80ft Offset to the West Configuration (State 5)					
Ranking by U sage	Runway	Procedure Nam e	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	9740 (2059) 3 mi	10420 (2759) 3 mi	11660 (4019) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, IASE LOC and DME shifted to the west, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	Minimal impact when compared to state 1
2	15	LOC-DME RWY 15	Straight In	Public-Special	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	Several waivers exist for this procedure, visibility increased due to straight-in minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Minimal impact when compared to state 1
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8880 (1199) 3 mi	8880 (1199) 3 mi	8880 (1199) 3 mi	MAP Climb of 330ft/nm to 11100ft Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	8940 (1259) 3 mi	8940 (1259) 3 mi	8940 (1259) 3 mi	MAP Climb of 330ft/nm to 10000ft New circling criteria, runway 15/33 shifted 80ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Moderate impact when compared to state 1. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9740 (2059) 3 mi	10420 (2759) 3 mi	11660 (4019) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Minimal impact when compared to state 1
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13680 (6000) 10 mi	13680 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	13681 (6000) 10 mi	13681 (6000) 10 mi	13681 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	No impact when compared to state 1.
6	15	Visual	Circling/FMS Visual	Private-Special	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	No impact when compared to state 1.
7	15	VOR/DME - C	Circling Only	Public	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	9780 (2099) 1 3/4 mi	10420 (2759) 1 3/4 mi	11660 (4019) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minimal impact when compared to state 1
8	15	RNAV/GPS - F	Circling Only	Public	10140 (2459) 1 3/4 mi	10460 (2799) 1 3/4 mi	11740 (4099) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	10140 (2459) 1 3/4 mi	10400 (2719) 1 3/4 mi	11780 (4139) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minimal impact when compared to state 1
9	33	Visual	Circling	Public	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No impact when compared to state 1.
10	33	Visual	Circling/FMS Visual	Private-Special	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No impact when compared to state 1.
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8300 (619) 1 1/2 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Initial estimates based on procedure design results. Shifting the runway any amount will have significant impacts on this particular approach which will cause a complete redesign	High Performance BusinessJets Only	High impact when compared to state 1

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

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ASPEN/PITKIN COUNTY AIRPORT
ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 8a

DATE: JUNE 24, 2014

DEPARTURE PROCEDURES ANALYSIS

EXISTING STATE VS EXISTING STATE WITH UPDATED CRITERIA

PREPARED BY: LEAN PHOTOMETRICS

				Existing Runway Configuration					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					
Runway	Procedu re Name	Type	Publ ic/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Commen t	Typical Aircraft Using Procedure	Operational Impact
33	LINDZ 8	Convent ional	Public	(40 0) 1 mi			465ft/nm to 10000	Regional Jets, Business Jets, Turboprops and smaller	(200) 1 mi			465ft/nm to 10000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	No Impact
33	SARDD 3	Conventional	Public	(400) 1 mi			460ft/nm to 14000	Regional Jets, Business Jets, Turboprops and smaller	(200) 1 mi			460ft/nm to 14000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	No Impact
33	PITKIN 4	RNAV	Public	(400) 1 mi			500ft/nm to 16000	High Performance Aircraft only, FMS issues with short 2nd leg	(200) 1 mi			500ft/nm to 16000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only, FMS issues with short 2nd leg	No Impact
33	GLENO 2	RNP-AR	Private - Special	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	No impact assumed based on existing deviation from visibility requirements due to obstacles in the ICA and extended ICA.
33	ASPEN 6	Conventional	Public	(400) 1 mi			650ft/nm to 13000	High Performance Aircraft only	(200) 1 mi			650ft/nm to 13000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only	No Impact
33	RWY 33 EOSID RNAV	RNAV	Private - Special	(400) 1 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(200) 1 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	No Imapct
33	RWY 33 EOSID	Conventional	Private - Special	(400) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(200) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	No Imapct

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

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ALTERNATIVE 8a

DATE: JUNE 24, 2014

DEPARTURE PROCEDURES ANALYSIS

EXISTING STATE WITH UPDATED CRITERIA VS 80' RUNWAY SHIFT

PREPARED BY: LEAN PHOTOMETRICS

				Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					80ft Offset to the West Configuration (State 5)					
Runw ay	Proce dure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comme nt	Typical Aircraft Using Procedure	Oper ational Impact
33	LINDZ 8	Conventional	Public	(200) 1 mi			465ft/nm to 10000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	(300) 1 mi			465ft/nm to 10000	Regional Jets, Business Jets, Turboprops and smaller	No impact when compared to state 1.
33	SARDD 3	Conventional	Public	(200) 1 mi			460ft/nm to 14000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	(300) 1 mi			460ft/nm to 14000	Regional Jets, Business Jets, Turboprops and smaller	No impact when compared to state 1.
33	PITKIN 4	RNAV	Public	(200) 1 mi			500ft/nm to 16000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only, FMS issues with short 2nd leg	(300) 1 mi			500ft/nm to 16000	High Performance Aircraft only, FMS issues with short 2nd leg	No impact when compared to state 1.
33	GLENO 2	RNP-AR	Private - Special	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	No impact when compared to state 1. Based on assumption that current deviation from visibility requirements will be upheld.
33	ASPEN 6	Conventional	Public	(200) 1 mi			650ft/nm to 13000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only	(300) 1 mi			605ft/nm to 13000	High Performance Aircraft only	No impact when compared to state 1.
33	RWY 33 EOSID RNAV	RNAV	Private - Special	(200) 1 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(300) 1 mi			SID Based Operators: 460ft/nm to 14000, 14ft HAR, 58ft from DER Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, 14ft HAR, 58ft from DER	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	Minimal impact to all operators when compared to state 1.
33	RWY 33 EOSID	Conventional	Private - Special	(200) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(300) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, 14ft HAR, 58ft from DER Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, 14ft HAR, 58ft from DER Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	Minimal impact to all operators when compared to state 1.

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

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FUTURE PROCEDURES ANALYSIS

EXISTING STATE VS EXISTING STATE WITH UPDATED CRITERIA

PREPARED BY: LEAN PHOTOMETRICS

					Existing Runway Configuration					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					
Runway	Procedure	Navigation Mode	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8079 (399) MALSF On 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only	No Impact
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	Does Not Currently Exist	Does Not Currently Exist	Does Not Currently Exist	No public or public-special RNP procedures have been created. RNP/LPV approaches are slated for development by FAA in 2016.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 377ft/nm to 13340ft. RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	Significant increase in airport access, completion factor and overall flight safety
15	Approach	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	Does Not Currently Exist	Does Not Currently Exist	Does Not Currently Exist	No public or public-special RNP procedures have been created. RNP/LPV approaches are slated for development by FAA in 2016.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 376ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	Significant increase in airport access, completion factor and overall flight safety
15	Approach	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	Does Not Currently Exist	Does Not Currently Exist	Does Not Currently Exist	No public or public-special RNP procedures have been created. RNP/LPV approaches are slated for development by FAA in 2016.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 372 ft/nm to 12700ft, then 364ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	Significant increase in airport access, completion factor and overall flight safety

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

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FUTURE PROCEDURES ANALYSIS

EXISTING STATE WITH UPDATED CRITERIA VS 80' RUNWAY SHIFT

PREPARED BY: LEAN PHOTOMETRICS

					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					80ft Offset to the West Configuration (State 5)					
Runway	Procedure	Navigation Mode	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8300 (619) 1 1/2 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only	High impact when compared to state 1
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 377ft/nm to 13340ft. RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	8610 (929) MALSF On 2 1/2 mi MALSF Out 3 mi	8610 (929) MALSF On 2 1/2 mi MALSF Out 3 mi	8610 (929) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 374ft/nm to 13340ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	No Impact when compared to state 1.
15	Approach	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 376ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 370ft/nm to 13340ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	No Impact when compared to state 1.
15	Approach	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 372 ft/nm to 12700ft, then 364ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	MAP Climb of 368ft/nm to 12700ft, then 361 ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	Minor Impact when compared to state 1.

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

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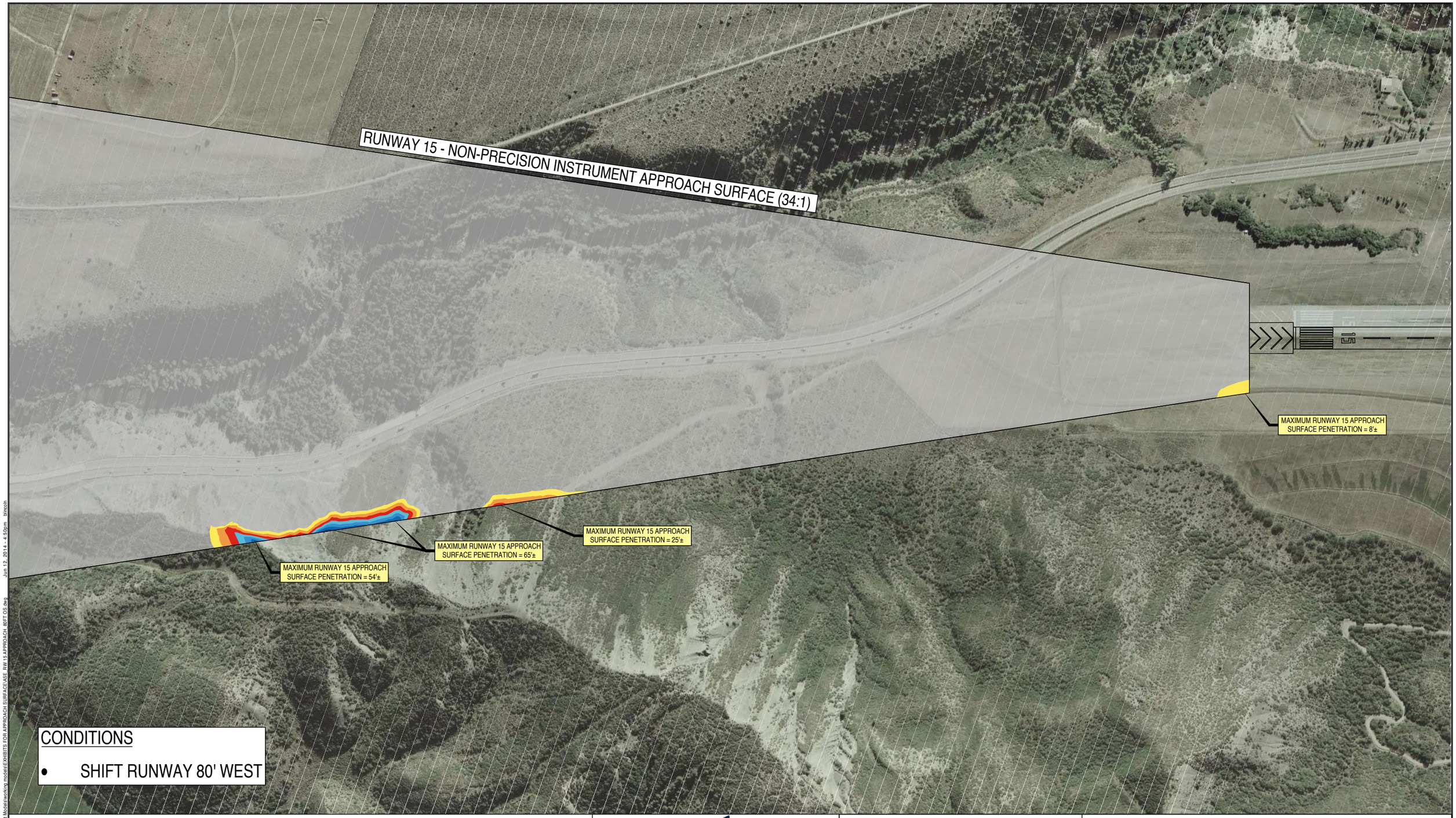
ASPEN/PITKIN COUNTY AIRPORT
ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 8a

DATE: JUNE 24, 2014



RUNWAY 15 APPROACH PENETRATIONS

- 0' TO 10'
- 10' TO 20'
- 20' TO 30'
- 30' TO 40'
- 40' TO 50'
- 50' TO 60'
- 60' TO 70'

GRAPHIC SCALE
200 0 200 400
(IN FEET)

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ALTERNATIVE 8a

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RUNWAY 33 - VISUAL APPROACH SURFACE (20:1)

RUNWAY APPROACH SURFACE PENETRATION DUE TO EXISTING RUNWAY LONGITUDINAL GRADES

MAXIMUM RUNWAY 33 APPROACH SURFACE PENETRATION = 8'±

MAXIMUM RUNWAY 33 APPROACH SURFACE PENETRATION = 28'±

MAXIMUM RUNWAY 33 APPROACH SURFACE PENETRATION = 104'±

CONDITIONS

- SHIFT RUNWAY 80' WEST

RUNWAY 33 APPROACH PENETRATIONS

0' TO 10'	30' TO 40'	70' TO 80'	100' TO 110'	
10' TO 20'	40' TO 50'	80' TO 90'		
20' TO 30'	50' TO 60'	90' TO 100'		

GRAPHIC SCALE
200 0 200 400
(IN FEET)

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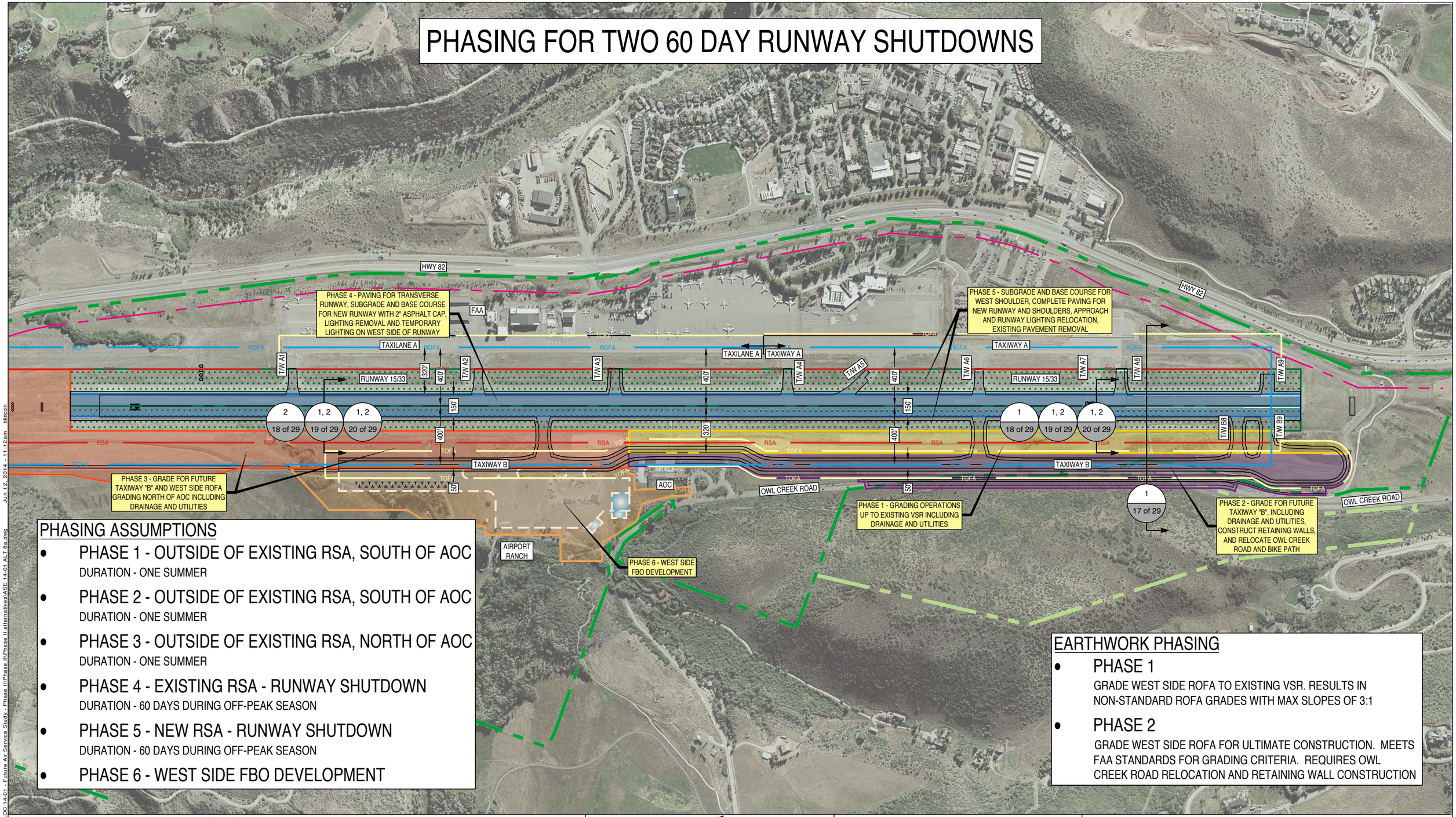
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 8a

DATE: JUNE 24, 2014

PHASING FOR TWO 60 DAY RUNWAY SHUTDOWNS



PHASING ASSUMPTIONS

- **PHASE 1 - OUTSIDE OF EXISTING RSA, SOUTH OF AOC**
  DURATION - ONE SUMMER
- **PHASE 2 - OUTSIDE OF EXISTING RSA, SOUTH OF AOC**
  DURATION - ONE SUMMER
- **PHASE 3 - OUTSIDE OF EXISTING RSA, NORTH OF AOC**
  DURATION - ONE SUMMER
- **PHASE 4 - EXISTING RSA - RUNWAY SHUTDOWN**
  DURATION - 60 DAYS DURING OFF-PEAK SEASON
- **PHASE 5 - NEW RSA - RUNWAY SHUTDOWN**
  DURATION - 60 DAYS DURING OFF-PEAK SEASON
- **PHASE 6 - WEST SIDE FBO DEVELOPMENT**

EARTHWORK PHASING

- **PHASE 1**
  GRADE WEST SIDE ROFA TO EXISTING VSR. RESULTS IN NON-STANDARD ROFA GRADES WITH MAX SLOPES OF 3:1
- **PHASE 2**
  GRADE WEST SIDE ROFA FOR ULTIMATE CONSTRUCTION. MEETS FAA STANDARDS FOR GRADING CRITERIA. REQUIRES OWL CREEK ROAD RELOCATION AND RETAINING WALL CONSTRUCTION

- ALL RSA'S, ROFA'S, AND TOFA'S SHOWN ARE FOR PROPOSED AIRCRAFT PAVEMENT

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- MASTER PLAN LAYOUT BUILDINGS
- PHASE 1
- PHASE 2
- PHASE 3
- PHASE 4
- PHASE 5
- PHASE 6
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- HIGHWAY 82 100' RIGHT-OF-WAY SETBACK

GRAPHIC SCALE
300 0 300 600
(IN FEET)

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AIR SERVICE STUDY - PHASE II
ALTERNATIVE 8a

DATE: JUNE 24, 2014

SHEET 16 OF 29

1
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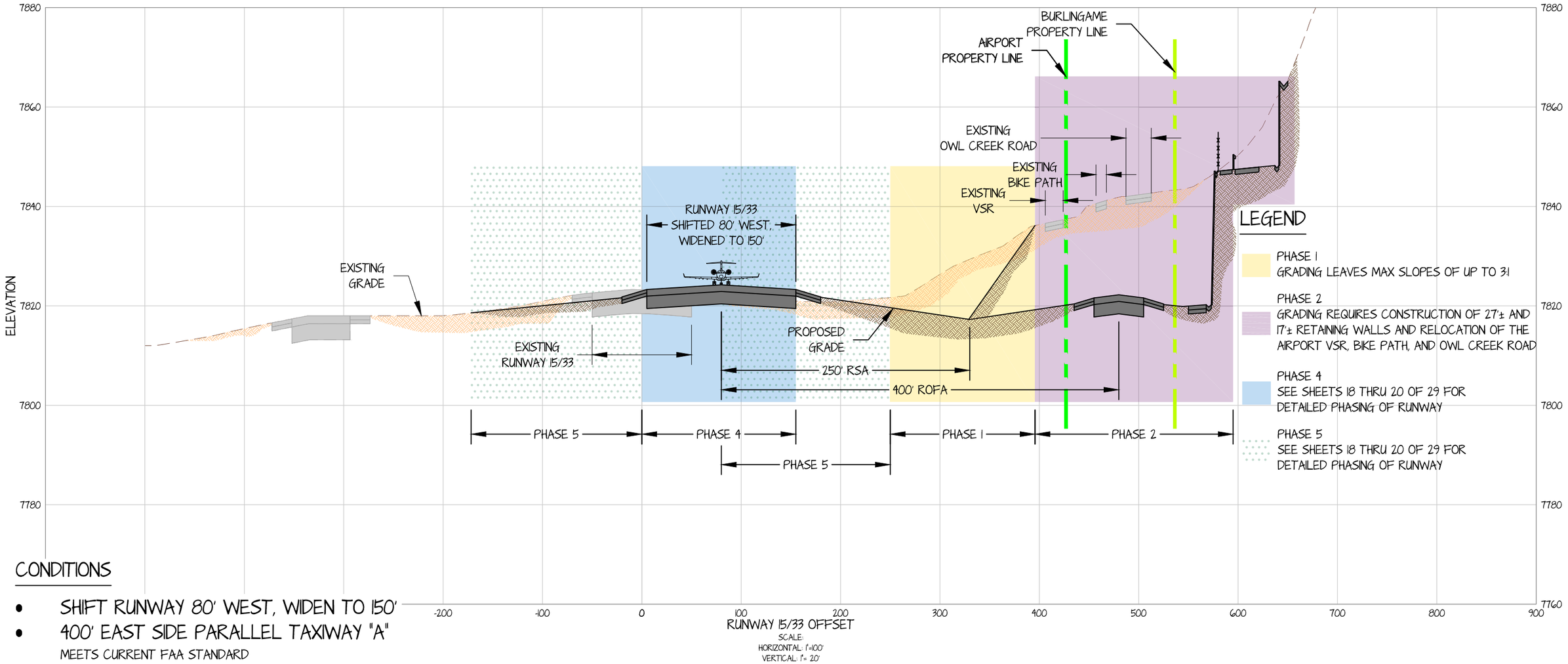
ALTERNATIVE 8a - RSA AND ROFA GRADING - TWO 60 DAY RUNWAY SHUTDOWNS



CONDITIONS

- SHIFT RUNWAY 80' WEST, WIDEN TO 150'
- 400' EAST SIDE PARALLEL TAXIWAY "A"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 400' WEST SIDE PARALLEL TAXIWAY "B"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 320' TAXIWAY "B" BUMP OUT AT AOC
  WOULD REQUIRE NEW FAA MODIFICATION TO STANDARD
  (320' RUNWAY/TAXIWAY SEPARATION)

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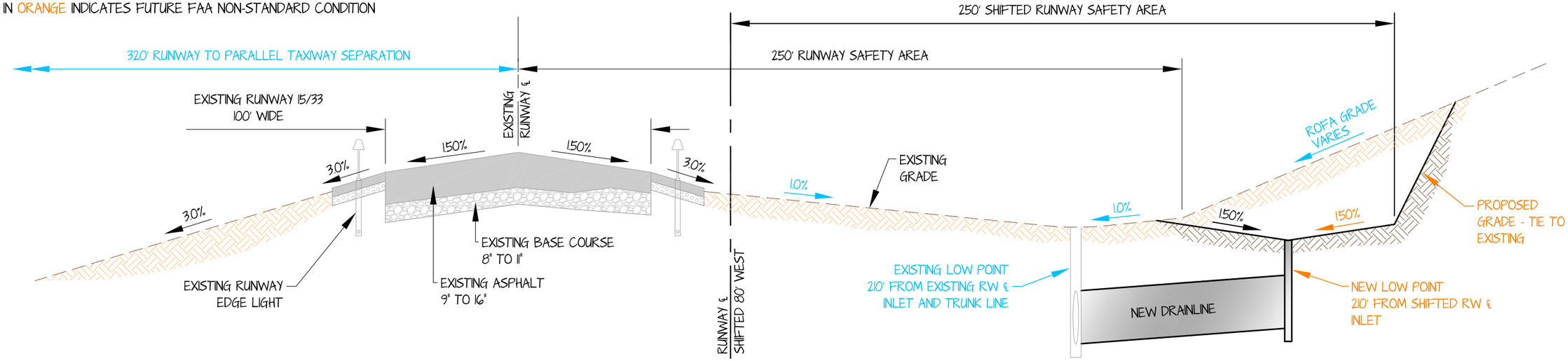
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 8a

DATE: JUNE 24, 2014 SHEET 17 OF 29

NOTE:

ALL TEXT IN BLUE INDICATES EXISTING FAA NON-STANDARD CONDITION

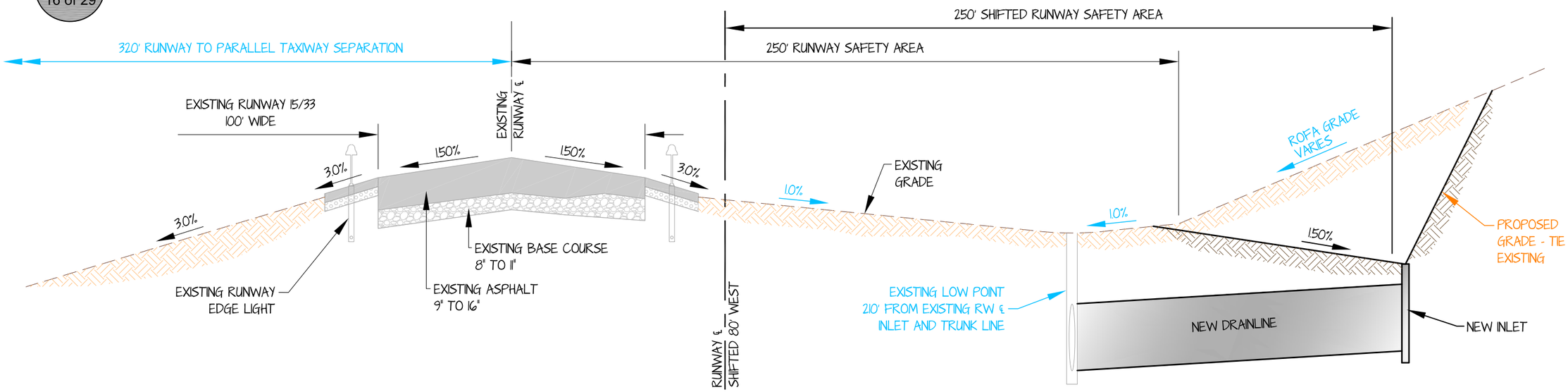
ALL TEXT IN ORANGE INDICATES FUTURE FAA NON-STANDARD CONDITION



1

16 of 29

ALTERNATIVE 8a - PHASE I - DRAINAGE IMPROVEMENTS/SAFETY AREA GRADING FOR 320' WEST SIDE TAXIWAY



2

16 of 29

ALTERNATIVE 8a - PHASE I - DRAINAGE IMPROVEMENTS/SAFETY AREA GRADING FOR 400' WEST SIDE TAXIWAY

PHASING ASSUMPTIONS

- NIGHT WORK WITHIN EXISTING RUNWAY SAFETY AREA
- FAA ALLOWS TEMPORARY NON-STANDARD ROFA GRADING BETWEEN PHASES 1 AND 2
- EXISTING DRAINAGE TRUNK LINES ON BOTH THE EAST AND WEST SIDE OF THE RUNWAY HAVE CAPACITY FOR ULTIMATE BUILDOUT

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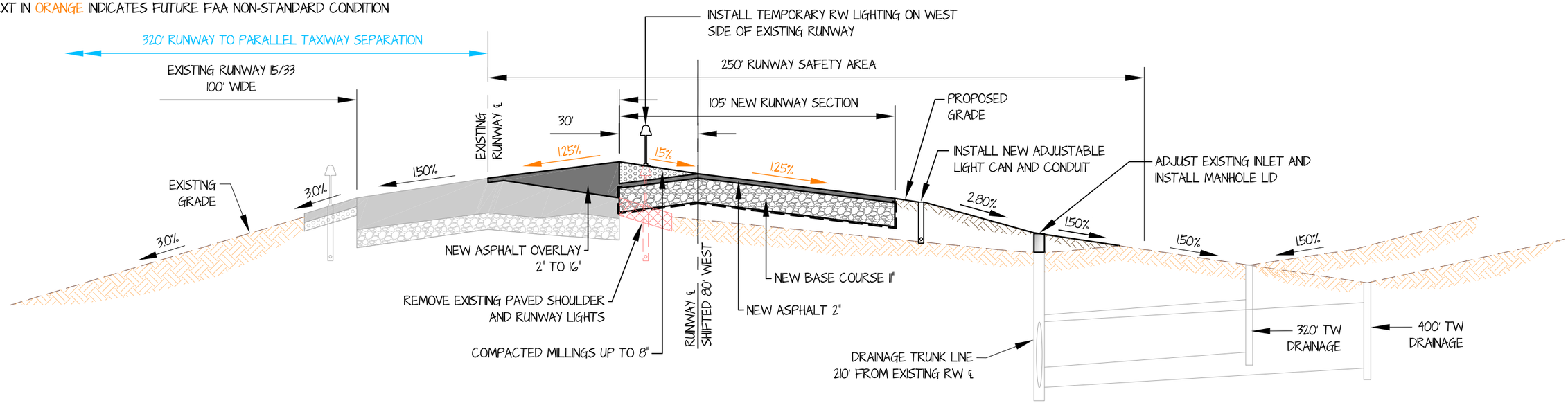
ALTERNATIVE 8a

DATE: JUNE 24, 2014 SHEET 18 OF 29

NOTE:

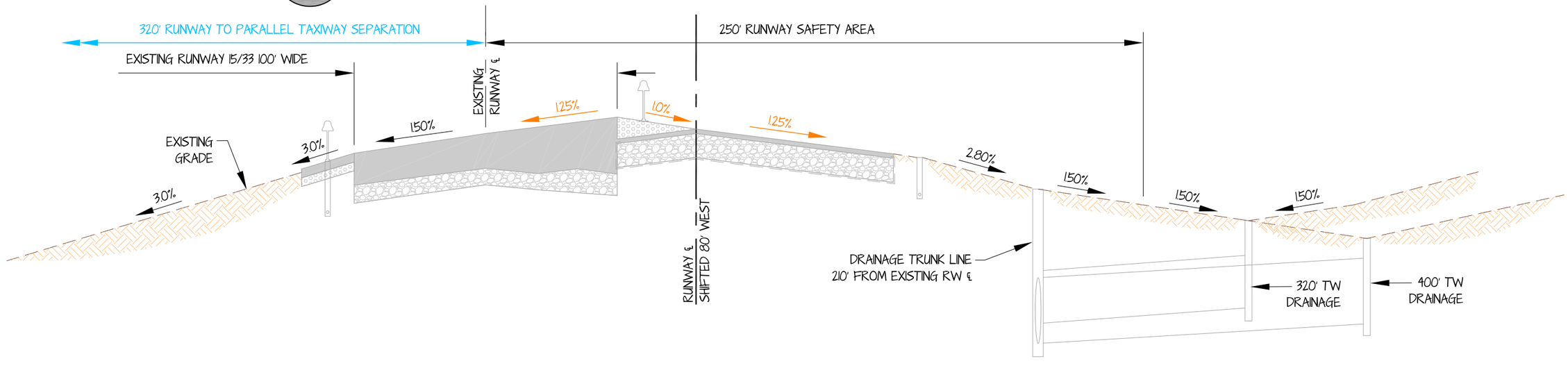
ALL TEXT IN BLUE INDICATES EXISTING FAA NON-STANDARD CONDITION

ALL TEXT IN ORANGE INDICATES FUTURE FAA NON-STANDARD CONDITION



1
16 of 29

ALTERNATIVE 8a - PHASE 4 - 80' RUNWAY SHIFT - FIRST 60 DAY SHUTDOWN



2
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ALTERNATIVE 8a - TEMPORARY RUNWAY CONDITION

PHASING ASSUMPTIONS

- ALL WORK IN PHASES 1-3 IS COMPLETE
- ALL MATERIAL FOR RUNWAY CONSTRUCTION IS STOCKPILED ON-SITE
- ASPHALT PLANT ON-SITE
- 24-HOUR WORK SCHEDULE DURING RUNWAY SHUTDOWN
- FAA ALLOWS ASPHALT CAP ON NEW BASE COURSE ON WEST SIDE OF RUNWAY DURING TEMPORARY RUNWAY OPERATING CONDITIONS

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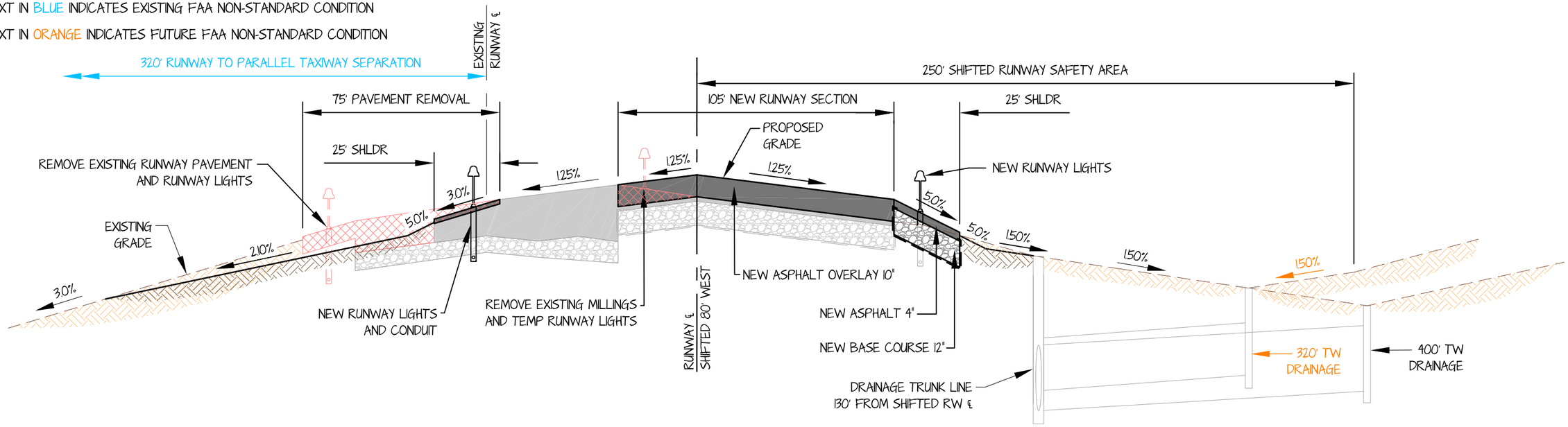
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 8a

DATE: JUNE 24, 2014

NOTE:

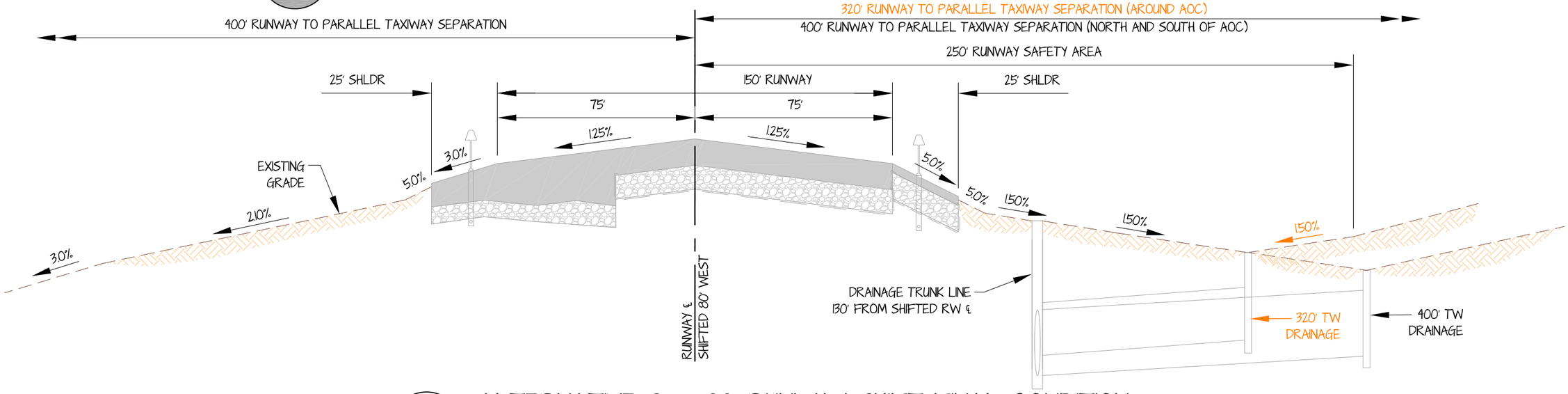
ALL TEXT IN BLUE INDICATES EXISTING FAA NON-STANDARD CONDITION

ALL TEXT IN ORANGE INDICATES FUTURE FAA NON-STANDARD CONDITION



1
16 of 29

ALTERNATIVE 8a - PHASE 5 - 80' RUNWAY SHIFT - SECOND 60 DAY SHUTDOWN



2
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ALTERNATIVE 8a - 80' RUNWAY SHIFT FINAL CONDITION

PHASING ASSUMPTIONS

- ALL WORK IN PHASES 1-4 IS COMPLETE
- ALL MATERIAL FOR RUNWAY CONSTRUCTION IS STOCKPILED ON-SITE
- ASPHALT PLANT ON-SITE
- 24-HOUR WORK SCHEDULE DURING RUNWAY SHUTDOWN
- CRITICAL CONNECTOR TAXIWAYS TIED IN ON EAST SIDE
- REMAINDER OF EAST SIDE CONNECTOR TAXIWAYS AND CONNECTOR TAXIWAYS "B8" AND "B9" TIED-IN AFTER RUNWAY SHIFT

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ASPEN/PITKIN COUNTY AIRPORT
ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 8a

DATE: JUNE 24, 2014 SHEET 20 of 29

LOCAL AND FEDERAL CONSIDERATIONS

PREPARED BY: TG MALLOY CONSULTING

LOCAL REVIEW AND APPROVALS

PITKIN COUNTY

- **LOCATION AND EXTENTS REVIEW**
  PROPOSED IMPROVEMENTS IN COMPLIANCE WITH THE WEST OF MAROON CREEK PLAN (WOMP)
- **ASPEN/PITKIN COUNTY AIRPORT DESIGN GUIDELINES APPROVAL**
  PROPOSED IMPROVEMENTS IN COMPLIANCE WITH AIRPORT DESIGN GUIDELINES (APRIL, 2014)
- **BUILDING PERMIT (TITLE 11)**
  ANY STRUCTURES MEETING THE "BUILDING" DEFINITION WHICH DOES NOT INCLUDE ROADS, PAVEMENT, FENCES, RETAINING WALLS OR OTHER SITE IMPROVEMENTS THAT DO NOT ENCLOSE SPACES FOR THE PROTECTION OF PERSONS, ANIMALS, OR PROPERTY
- **ENVIRONMENTAL HEALTH (TITLE 6)**
  ADDRESS APPLICABLE PROVISIONS OF TITLE 6 IN CONSTRUCTION DOCUMENTS AND CONTRACTS

CITY OF ASPEN

- **BURLINGAME OPEN SPACE PARCEL CHANGE IN USE (PUBLIC VOTE)**
  RELOCATION OF OWL CREEK TRAIL ONTO BURLINGAME OPEN SPACE PARCEL

ASPEN VALLEY LAND TRUST (AVLT)

- **CONSENT PURSUANT TO DEED OF CONSERVATION EASEMENT**
  RELOCATION OF OWL CREEK TRAIL ONTO BURLINGAME OPEN SPACE PARCEL REQUIRES APPROVAL BY THE AVLT BOARD OF DIRECTORS

FEDERAL REVIEW AND APPROVALS

UNITED STATES ARMY CORPS OF ENGINEERS (USACE)

- **404 PERMIT**
  PENDING DETERMINATION OF 3 WETLANDS AREAS DESCRIBED IN THE TEST OF THE 2012 MASTER PLAN UPDATE

FEDERAL AVIATION ADMINISTRATION

- ALP/MASTER PLAN UPDATE
- ENVIRONMENTAL ASSESSMENT
- OBSTRUCTION EVALUATION/AIRSPACE ANALYSIS
- NAVAID RELOCATION/UPDATE
- MODIFICATIONS TO DESIGN STANDARDS

  RUNWAY/PARALLEL TAXIWAY SEPARATION
  RUNWAY/TAXIWAY HOLDLINE SEPARATION
  RUNWAY AND TAXIWAY LONGITUDINAL GRADIENT
  RUNWAY SAFETY AREA LONGITUDINAL GRADIENT
  RUNWAY CENTERLINE TO AIRCRAFT PARKING AREA

NOTE: THE LOCAL AND FEDERAL CONSIDERATIONS PRESENTED FOR THIS ALTERNATIVE ARE NOT THE EXTENT OF REVIEWS AND APPROVALS. AS THE DESIGN OF ANY ALTERNATIVE PROGRESSES, IT IS LIKELY THAT MORE REVIEWS AND APPROVALS WILL BE REQUIRED. IT IS EXPECTED THAT THE REVIEW AND APPROVALS IDENTIFIED ABOVE WILL TAKE ONE YEAR OR LONGER TO COMPLETE.

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ASPEN/PITKIN COUNTY AIRPORT
ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 8a

DATE: JUNE 24, 2014

CONCEPTUAL GRADING LAYOUT

1. EXTENDED RSA GRADING - POTENTIAL FILL AREA OF 150,000 CY OR MORE

GRADING LIMITS

HWY 82

NORTH GA RAMP

FAA

F.B.O.

SOUTH GA RAMP

TERMINAL

TAXILANE A

TAXIWAY A

RUNWAY 15/33

RUNWAY 15/33

TAXIWAY B

TAXIWAY B

AOC

FUTURE FBO DEVELOPMENT

AIRPORT RANCH

OWL CREEK ROAD

OWL CREEK ROAD

2. 1,200'± LONG RETAINING WALL

3. 2,100'± LONG RETAINING WALL

4. 4,400'± LONG RETAINING WALL

GRADING ASSUMPTIONS

- AIRFIELD GRADED TO MINIMUM ALLOWABLE FAA CRITERIA TO MINIMIZE EARTHWORK
- TAXIWAY B RETAINING WALL LOCATED AT TOFA
- WEST SIDE VSR IN TOFA
- RETAINING WALL HEIGHTS AND LENGTHS MAY BE MITIGATED IN DESIGN PHASE

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- 7680 PROPOSED MAJOR CONTOUR
- 7682 PROPOSED MINOR CONTOUR
- 7680 EXISTING MAJOR CONTOUR
- 7682 EXISTING MINOR CONTOUR
- RETAINING WALL

GRAPHIC SCALE
350 0 350 700
(IN FEET)

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ASPEN/PITKIN COUNTY AIRPORT
ASPEN, COLORADO
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DATE: JUNE 24, 2014

CONCEPTUAL STORM SEWER LAYOUT

1. CONSTRUCT DETENTION POND
2. REMOVE EXISTING 30" PIPE AND REPLACE WITH 36" PIPE
3. PIPE OWL CREEK
4. REMOVE EXISTING STORM SEWER
5. REMOVE EXISTING INLETS AND PLACE MANHOLES ALONG EXISTING STORM SEWER ALIGNMENT
6. REMOVE EXISTING 18" PIPE AND REPLACE WITH 24" PIPE
7. REMOVE EXISTING 18" PIPE AND REPLACE WITH 24" PIPE
8. REMOVE EXISTING STORM SEWER
9. PIPE STAPLETON BROTHERS DITCH

HWY 82 · NORTH GA RAMP · FAA · F.B.O. · SOUTH GA RAMP · TERMINAL · TAXILANE A · TAXIWAY A · TAXIWAY B · RUNWAY 15/33 · RSA · STM · 36" · 24" · T/W A1 · T/W A2 · T/W A3 · T/W A4 · T/W A5 · T/W A6 · T/W A7 · T/W A8 · T/W A9 · T/W B8 · T/W B9 · 320' · 400' · 300' · 150' · 50' · FUTURE FBO DEVELOPMENT · AOC · AIRPORT RANCH · OWL CREEK ROAD

STORM SEWER ASSUMPTIONS

- PROPOSED BUILD OUT REQUIRES UP-SIZING OF EXISTING STORM PIPE
- RSA GRADING REQUIRES THE REMOVAL OF EXISTING INLET STRUCTURES AND REPLACEMENT WITH NEW MANHOLES
- STAPLETON BROTHERS DITCH TO BE REMOVED AND PIPED INTO OWL CREEK
- NEW FLOWS REQUIRE DETENTION POND

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- STM — EXISTING STORM DRAINAGE
- STM — PROPOSED STORM DRAINAGE
- STORM DRAINAGE TO BE REMOVED
- PROP/EX INLETS OR MANHOLES

N

GRAPHIC SCALE
350 0 350 700
(IN FEET)

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DATE: JUNE 24, 2014

CONCEPTUAL SANITARY SEWER LAYOUT

HWY 82
NORTH GA RAMP
FAA
SOUTH GA RAMP
TERMINAL
F.B.O.
TAXILANE A
TAXIWAY A
RUNWAY 15/33
RUNWAY 15/33
TAXIWAY B
TAXIWAY B
AOC
FUTURE FBO DEVELOPMENT
AIRPORT RANCH
OWL CREEK ROAD
OWL CREEK ROAD
HWY 82
T/W A1
T/W A2
T/W A3
T/W A4
T/W A5
T/W A6
T/W A7
T/W A8
T/W A9
T/W B8
T/W B9
RSA
SAN
320'
400'
300'
150'
50'

1. REMOVE EXISTING MANHOLE AND PIPE

2. CONSTRUCT SANITARY SEWER LINE (APPROX. 430 LF)

3. ADJUST EXISTING MANHOLE RIM ELEVATIONS TO MEET NEW GRADES (8 TOTAL)

SANITARY ASSUMPTIONS

- PROPOSED RUNWAY GEOMETRY REQUIRES EXISTING SANITARY SEWER PIPE AND MANHOLE TO BE RELOCATED. WORK TO BE COMPLETED DURING RUNWAY SHUTDOWN
- MANHOLE ADJUSTMENT WORK CAN BE COMPLETED AT NIGHT

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- SAN — EXISTING SANITARY SEWER
- SAN — PROPOSED SANITARY SEWER
- SANITARY SEWER TO BE REMOVED

GRAPHIC SCALE
350 0 350 700
(IN FEET)

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SHEET 24 OF 29

CONCEPTUAL NATURAL GAS LAYOUT

1. RELOCATE HIGH PRESSURE GAS MAIN TO ACCOMMODATE FUTURE RSA GRADING

2. LOWER LOW PRESSURE GAS LINE IN-PLACE. THE PORTIONS OF GAS LINE THAT CROSS THE AIRFIELD PAVEMENT WILL BE INSTALLED IN UTILITY SLEEVES

HWY 82

NORTH GA RAMP

FAA

F.B.O.

SOUTH GA RAMP

TERMINAL

TAXILANE A

TAXIWAY A

RUNWAY 15/33

T/W A1

T/W A2

T/W A3

T/W A4

T/W A5

T/W A6

T/W A7

T/W A8

T/W A9

T/W B8

T/W B9

TAXIWAY B

FUTURE FBO DEVELOPMENT

AOC

AIRPORT RANCH

OWL CREEK ROAD

RSA

GAS

320'

400'

300'

150'

50'

NATURAL GAS ASSUMPTIONS

- HIGH PRESSURE GAS MAIN TO BE RELOCATED AROUND FUTURE EXTENDED RSA GRADING DUE TO INCREASED COVER OVER MAIN
- GAS LINE TO BE RELOCATED IN-PLACE DUE TO RSA GRADING IN INFIELD AREA

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- EXISTING NATURAL GAS
- PROPOSED NATURAL GAS
- NATURAL GAS TO BE LOWERED
- NATURAL GAS TO BE REMOVED

GRAPHIC SCALE
350 0 350 700
(IN FEET)

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ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 8a

DATE: JUNE 24, 2014

SHEET 25 OF 29

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CONCEPTUAL ELECTRIC LAYOUT

HWY 82
NORTH GA RAMP
FAA
F.B.O.
SOUTH GA RAMP
TERMINAL
TAXILANE A
TAXIWAY A
RUNWAY 15/33
TAXIWAY B
AOC
FUTURE FBO DEVELOPMENT
AIRPORT RANCH
OWL CREEK ROAD
T/W A1
T/W A2
T/W A3
T/W A4
T/W A5
T/W A6
T/W A7
T/W A8
T/W A9
T/W B8
T/W B9
RSA
EL(UG)
EL(OH)
320'
400'
150'
300'
50'

1. LOWER SPARE ELECTRIC CONDUIT IN-PLACE

2. REMOVE ABANDONED ELECTRIC FROM FUTURE FBO DEVELOPMENT

3. RELOCATE ELECTRIC AROUND FUTURE FBO DEVELOPMENT

4. RELOCATE ELECTRIC FROM PROPOSED AIRFIELD

ELECTRIC ASSUMPTIONS

- ELECTRIC TO BE LOWERED IN-PLACE DUE TO RSA GRADING IN INFIELD AREA
- RELOCATED ELECTRIC ON SOUTHWEST SIDE OF AIRFIELD CAN BE PLACED ADJACENT TO BIKE PATH

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT

- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- EL(UG) EXISTING ELECTRIC
- EL(OH) EXISTING OVERHEAD ELECTRIC
- EL(UG) PROPOSED ELECTRIC
- EL(UG) ELECTRIC TO BE LOWERED
- ELECTRIC TO BE REMOVED

GRAPHIC SCALE
350 0 350 700
(IN FEET)

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ALTERNATIVE 8a

DATE: JUNE 24, 2014

CONCEPTUAL AIRFIELD ELECTRIC LAYOUT

1. RELOCATE MEDIUM INTENSITY APPROACH LIGHTING SYSTEM (MALSF)

2. RUNWAY 15/33 - INSTALL NEW RUNWAY EDGE LIGHTING, CENTERLINE LIGHTING, TOUCHDOWN ZONE LIGHTING, AND RUNWAY DISTANCE REMAINING SIGNS

3. RELOCATE PRECISION APPROACH PATH INDICATOR (PAPI)

4. RELOCATE RUNWAY SENSOR SYSTEM

5. REMOVE EXISTING RUNWAY AND TAXIWAY LIGHTING ELEMENTS

6. RELOCATE EXISTING SEGMENTED CIRCLE AND WINDCONE

7. INSTALL NEW CONSTANT CURRENT REGULATORS IN AIRFIELD ELECTRICAL VAULT. MODIFY AIRFIELD LIGHTING CONTROL SYSTEM.

8. TAXIWAY A - INSTALL NEW TAXIWAY EDGE LIGHTING AND GUIDANCE SIGNS. MODIFY EXISTING AIRFIELD LIGHTING ELEMENTS FOR NEW GEOMETRY.

9. RELOCATE WEATHER STATION

10. TAXIWAY B - INSTALL NEW TAXIWAY EDGE LIGHTING AND GUIDANCE SIGNS

11. RELOCATE RUNWAY END IDENTIFIER LIGHTS (REIL)

12. RELOCATE LOCALIZER SYSTEM

HWY 82

NORTH GA RAMP

FAA

SOUTH GA RAMP

TERMINAL

F.B.O.

TAXILANE A

TAXIWAY A

RUNWAY 15/33

TAXIWAY B

FUTURE FBO DEVELOPMENT

AIRPORT RANCH

AOC

OWL CREEK ROAD

RSA

T/W A1

T/W A2

T/W A3

T/W A4

T/W A5

T/W A6

T/W A7

T/W A8

T/W A9

T/W B8

T/W B9

320'

400'

300'

150'

50'

AIRFIELD ELECTRIC ASSUMPTIONS

- PROPOSED AIRFIELD LAYOUT REQUIRES RELOCATION OF ASSOCIATED AIRFIELD ELECTRICAL ITEMS
- NEW AC 150/5300-13A GEOMETRY REQUIRES CONNECTOR TAXIWAY LIGHTING TO BE REMOVED AND RELOCATED
- ADDITIONAL LOAD ON NEW CIRCUIT REQUIRES NEW CONSTANT CURRENT REGULATOR

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- RUNWAY THRESHOLD LIGHTS
- RUNWAY EDGE LIGHTS
- LOCALIZER
- MALSF (EQUIPMENT)
- RUNWAY SENSOR
- PAPI

GRAPHIC SCALE
350 0 350 700
(IN FEET)

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CONCEPTUAL COMMUNICATIONS LAYOUT

1. RELOCATE FIBER OPTIC AND TELEPHONE LINE AROUND FUTURE EXTENDED RSA GRADING

2. LOWER FIBER OPTIC AND TELEPHONE LINE IN-PLACE. ADJUST MANHOLE RIMS TO MEET NEW GRADES

3. RELOCATE FIBER OPTIC AND TELEPHONE LINE OUT OF PROPOSED AIRFIELD

HWY 82

NORTH GA RAMP

FAA

F.B.O.

SOUTH GA RAMP

TERMINAL

TAXILANE A

TAXIWAY A

RUNWAY 15/33

T/W A1

T/W A2

T/W A3

T/W A4

T/W A5

T/W A6

T/W A7

T/W A8

T/W A9

T/W B8

T/W B9

TAXIWAY B

AOC

FUTURE FBO DEVELOPMENT

AIRPORT RANCH

OWL CREEK ROAD

RSA

OPT

TEL

320'

400'

300'

150'

50'

COMMUNICATION ASSUMPTIONS

- FIBER OPTIC AND TELEPHONE LINE TO BE RELOCATED AROUND EXTENDED RSA GRADING DUE TO INCREASED COVER OVER CONDUIT
- FIBER OPTIC AND TELEPHONE TO BE LOWERED IN-PLACE DUE TO RSA GRADING IN INFIELD AREA
- RELOCATED FIBER OPTIC AND TELEPHONE LINE ON SOUTHWEST SIDE OF AIRFIELD CAN BE PLACED ADJACENT TO BIKE PATH

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- OPT — EXISTING FIBER OPTICS
- TEL — EXISTING TELEPHONE LINE
- OPT — PROPOSED FIBER OPTICS
- TEL — PROPOSED TELEPHONE LINE
- OPT — FIBER OPTICS TO BE LOWERED
- TEL — TELEPHONE TO BE LOWERED
- FIBER OPTICS TO BE REMOVED
- IMPACTED / PROPOSED COMMUNICATION MANHOLES

N

GRAPHIC SCALE
350 0 350 700
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CONCEPTUAL WATER LAYOUT

HWY 82
NORTH GA RAMP
FAA
F.B.O.
SOUTH GA RAMP
TERMINAL
TAXILANE A
TAXIWAY A
RUNWAY 15/33
T/W A1
T/W A2
T/W A3
T/W A4
T/W A5
T/W A6
T/W A7
T/W A8
T/W A9
T/W B8
T/W B9
RSA
320'
400'
150'
300'
50'
TAXIWAY B
AOC
FUTURE FBO DEVELOPMENT
AIRPORT RANCH
OWL CREEK ROAD
WAT

1. RELOCATE TWO FIRE HYDRANTS AT AOC. REROUTE WATER LINE FOR NORTH HYDRANT AROUND BACK-SIDE OF AOC TO AVOID CONCRETE RAMP

2. RELOCATE WATER OUTSIDE OF PROPOSED AIRFIELD

3. RELOCATE BUTTERMILK WATER DISTRICT PRESSURE REDUCING VALVE VAULT (PRV). THE PRV WILL BE PLACED BETWEEN THE BIKE PATH AND OWL CREEK ROAD.

WATER ASSUMPTIONS

- RELOCATED WATER ON SOUTHWEST SIDE OF AIRFIELD CAN BE LOCATED ADJACENT TO BIKEPATH

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- WAT — EXISTING WATER
- WAT — PROPOSED WATER
- TO BE REMOVED WATER

GRAPHIC SCALE
350 0 350 700
(IN FEET)

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ALTERNATIVE 8a

DATE: JUNE 24, 2014

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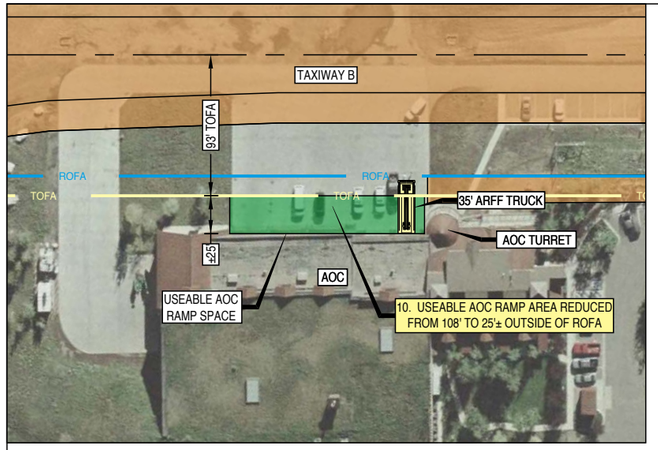

HWY 82

12. LOSS OF ONE FOOT OF NORTH GA AIRCRAFT PARKING DUE TO FULL WIDTH TOFA (APPROX. 1,250 SF)

13. LOSS OF ONE TO 13' OF SOUTH GA AIRCRAFT PARKING DUE TO FULL WIDTH TOFA (APPROX. 3,930 SF)

14. LOSS OF 13' OF COMMERCIAL RAMP DUE TO FULL WIDTH TOFA (APPROX. 13,065 SF)

NORTH GA RAMP

FAA

F.B.O.

SOUTH GA RAMP

TERMINAL

3. RELOCATE PRECISION APPROACH PATH INDICATOR

TAXILANE A

TAXIWAY A

T/W A1

T/W A2

T/W A3

T/W A4

T/W A5

T/W A6

T/W A7

T/W A8

T/W A9

T/W B8

T/W B9

RUNWAY 15/33

320'

400'

150'

50'

RSA

ROFA

TOFA

1
5 of 30

1
6 of 30

1
7 of 30

1
8 of 30

2. RELOCATE APPROACH LIGHTING SYSTEM

11. RELOCATE AIRPORT VSR

TAXIWAY B

AOC

SEE INSET ABOVE

OWL CREEK ROAD

FUTURE FBO DEVELOPMENT

AIRPORT RANCH

9. CONSTRUCT AIRCRAFT HOLDING PAD AND 12'± RETAINING WALL

8. OPERATIONAL RESTRICTIONS ON WEST SIDE TAXIWAY "B" SOUTH OF AOC

7. CONSTRUCT 20'± RETAINING WALL AND RELOCATE AIRPORT VSR INSIDE OF TOFA

6. RELOCATE OWL CREEK ROAD (900±)

5. IMPACTED LAND FOR AIRPORT VSR, OWL CREEK ROAD, AND BIKE PATH RELOCATION (APPROX. 2 AC)

1. RELOCATE LOCALIZER ANTENNA

4. CONSTRUCT AIRCRAFT HOLDING PAD AND 22'± RETAINING WALL AND RELOCATE BIKE PATH (1,800'±)

CONDITIONS

- SHIFT RUNWAY 80' WEST, WIDEN TO 150'
- 400' EAST SIDE PARALLEL TAXIWAY "A"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 400' PARTIAL WEST SIDE PARALLEL TAXIWAY "B" NORTH OF AOC
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 320' PARTIAL WEST SIDE PARALLEL TAXIWAY "B" SOUTH OF AOC
  WOULD REQUIRE NEW FAA MODIFICATION STANDARDS
  (320' RUNWAY/TAXIWAY SEPARATION)
- RESCINDS ONE MODIFICATION TO STANDARD
  EAST SIDE TAXIWAY "A" TOFA

- ALL RSA'S, ROFA'S, AND TOFA'S SHOWN ARE FOR PROPOSED AIRCRAFT PAVEMENT

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- IMPACT ON EXISTING AIRCRAFT PARKING
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- MASTER PLAN LAYOUT BUILDINGS
- CDOT PROPERTY LINE
- HIGHWAY 82 100' RIGHT-OF-WAY SETBACK

GRAPHIC SCALE
300 0 300 600
(IN FEET)

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ALTERNATIVE 12a

DATE: JUNE 24, 2014

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SEE SHEET 3 OF 30

TRANSIT CENTER

TERMINAL AREA PLAN IMPACTS (SEE SHEET 3 OF 30)

HWY 82

GSE BUILDING

HANGAR

SOUTH GA RAMP IMPACTS (SEE SHEET 3 AND 4 OF 30)

F.B.O.

TERMINAL

EXTENDED T-SHADE HANGARS

FAA

NORTH GA RAMP IMPACTS (SEE SHEET 4 OF 30)

TAXILANE A

TAXIWAY A

RUNWAY 15/33

T/W A1 T/W A2 T/W A3 T/W A4 T/W A5 T/W A6 T/W A7 T/W A8 T/W A9 T/W B8 T/W B9

320' 400' 150' 50

ROFA RSA TOFA DPA

TAXIWAY B

AOC

OWL CREEK ROAD

WEST SIDE DEVELOPMENT IMPACTS (SEE SHEET 4 OF 30)

AIRPORT RANCH

SEE SHEET 4 OF 30

MASTER PLAN COMPARISON TO PROPOSED LAYOUT FROM STUDY

- IMPACTS - CURRENT PROPOSED MASTER PLAN LAYOUT
  - TERMINAL AREA/COMMERCIAL RAMP
  - SOUTH AND NORTH GA RAMP
  - WEST SIDE DEVELOPMENT

- ALL RSA'S, ROFA'S, AND TOFA'S SHOWN ARE FOR PROPOSED AIRCRAFT PAVEMENT

PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY

ASE PROPERTY LINE

BURLINGAME RANCH PROPERTY LINE

CDOT PROPERTY LINE

HIGHWAY 82 100' RIGHT-OF-WAY SETBACK

LEGEND

MASTER PLAN LAYOUT AIRCRAFT PAVEMENT

MASTER PLAN LAYOUT BUILDINGS

MASTER PLAN LAYOUT ROADWAYS AND PARKING LOTS

GRAPHIC SCALE

300 0 300 600

(IN FEET)

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FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 12a

DATE: JUNE 24, 2014

HWY 82

TRANSIT CENTER

TERMINAL

F.B.O.

15. ADDITIONAL SOUTH GA RAMP FROM MASTER PLAN (APPROX. 215,020 SF)

17. APPROXIMATELY ONE TO 13' OF SOUTH GA RAMP LOST DUE TO FULL WIDTH TOFA (APPROX. 9,460 SF)

16. APPROXIMATELY 13' OF COMMERCIAL RAMP LOST DUE TO FULL WIDTH TOFA (APPROX. 14,775 SF)

POTENTIAL GRADE BREAK STRUCTURE

SOUTH GA RAMP

COMMERCIAL RAMP

TAXILANE A

TAXIWAY A

TAXIWAY A

RUNWAY 15/33

T/W A4

T/W A5

T/W A6

T/W A7

T/W A8

309'

145'

61'

13'

93'

400'

150'

TOFA

ROFA

RSA

TERMINAL AREA AND COMMERCIAL AND SOUTH GA RAMP IMPACTS

- **MASTER PLAN IMPACTS**
  - NET LOSS OF COMMERCIAL RAMP
  - NET LOSS OF SOUTH GA RAMP
- **COMMERCIAL RAMP AIRCRAFT**
  - CS100 AIRCRAFT (115' 1" WINGSPAN)

NET AIRCRAFT RAMP IMPACT (SF)

COMMERCIAL - 14,775 LESS THAN MASTER PLAN

SOUTH GA - 9,460 SF LESS THAN MASTER PLAN

- ALL RSA'S, ROFA'S, AND TOFA'S SHOWN ARE FOR PROPOSED AIRCRAFT PAVEMENT

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- IMPACT ON PROPOSED MASTER PLAN AIRCRAFT PARKING
- ASE PROPERTY LINE
- HIGHWAY 82 100' RIGHT-OF-WAY SETBACK
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT ROADWAYS AND PARKING LOTS

GRAPHIC SCALE
100 0 100 200
(IN FEET)

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ALTERNATIVE 12a

DATE: JUNE 24, 2014

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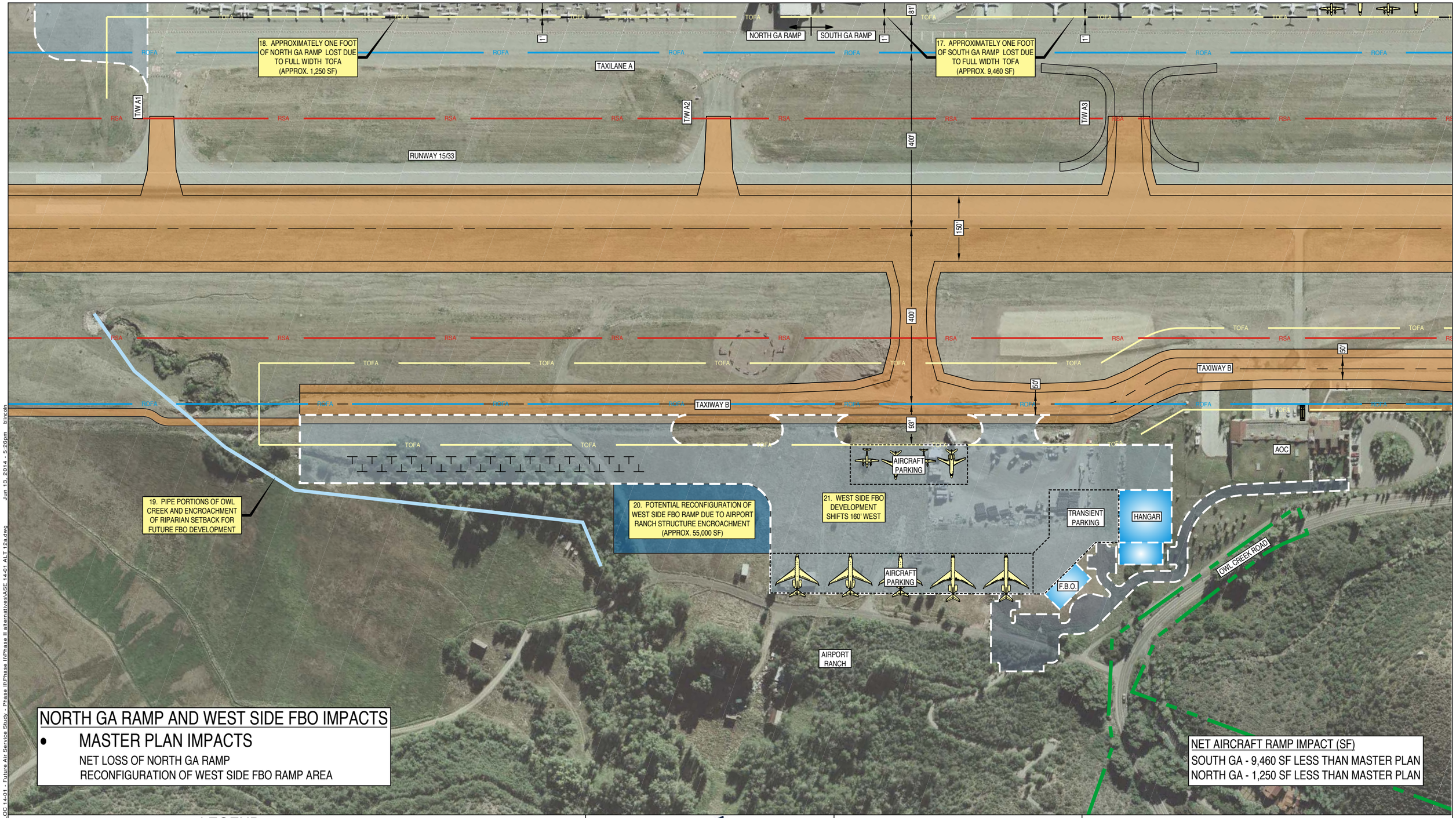

NORTH GA RAMP AND WEST SIDE FBO IMPACTS

- MASTER PLAN IMPACTS

  NET LOSS OF NORTH GA RAMP

  RECONFIGURATION OF WEST SIDE FBO RAMP AREA

NET AIRCRAFT RAMP IMPACT (SF)

SOUTH GA - 9,460 SF LESS THAN MASTER PLAN

NORTH GA - 1,250 SF LESS THAN MASTER PLAN

- ALL RSA'S, ROFA'S, AND TOFA'S SHOWN ARE FOR PROPOSED AIRCRAFT PAVEMENT

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- IMPACT ON PROPOSED MASTER PLAN AIRCRAFT PARKING
- ASE PROPERTY LINE
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT ROADWAYS AND PARKING LOTS
- RECONFIGURED AIRCRAFT PAVEMENT FROM FUTURE AIR SERVICE STUDY

GRAPHIC SCALE

100 0 100 200

(IN FEET)

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ASPEN, COLORADO
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ALTERNATIVE 12a

DATE: JUNE 24, 2014

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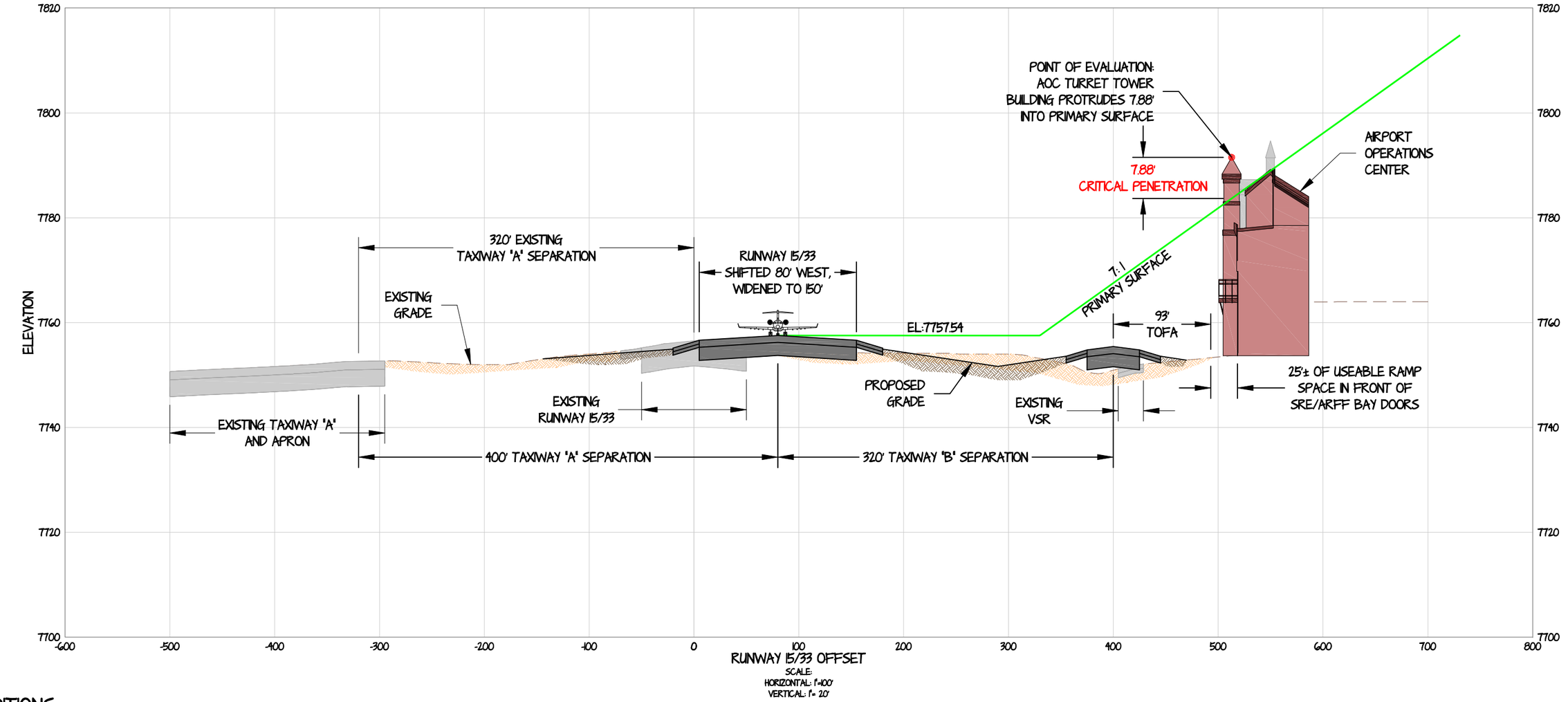
ALTERNATIVE 12a - AIRPORT OPERATIONS CENTER - PART 77 AND RAMP SPACE EVALUATION



SCALE:
HORIZONTAL: 1"=100'
VERTICAL: 1"= 20'

CONDITIONS

- SHIFT RUNWAY 80' WEST, WIDEN TO 150'
- 400' EAST SIDE PARALLEL TAXIWAY "A"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 400' PARTIAL WEST SIDE PARALLEL TAXIWAY "B" NORTH OF AOC
  RUNWAY CROSSING AT RUNWAY 15 THRESHOLD (CONFLICTS WITH FAA RECOMMENDATIONS)
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 320' PARTIAL WEST SIDE PARALLEL TAXIWAY "B" SOUTH OF AOC
  WOULD REQUIRE NEW FAA MODIFICATION TO STANDARD
  (320' RUNWAY/TAXIWAY SEPARATION)

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ALTERNATIVE 12a

DATE: JUNE 24, 2014

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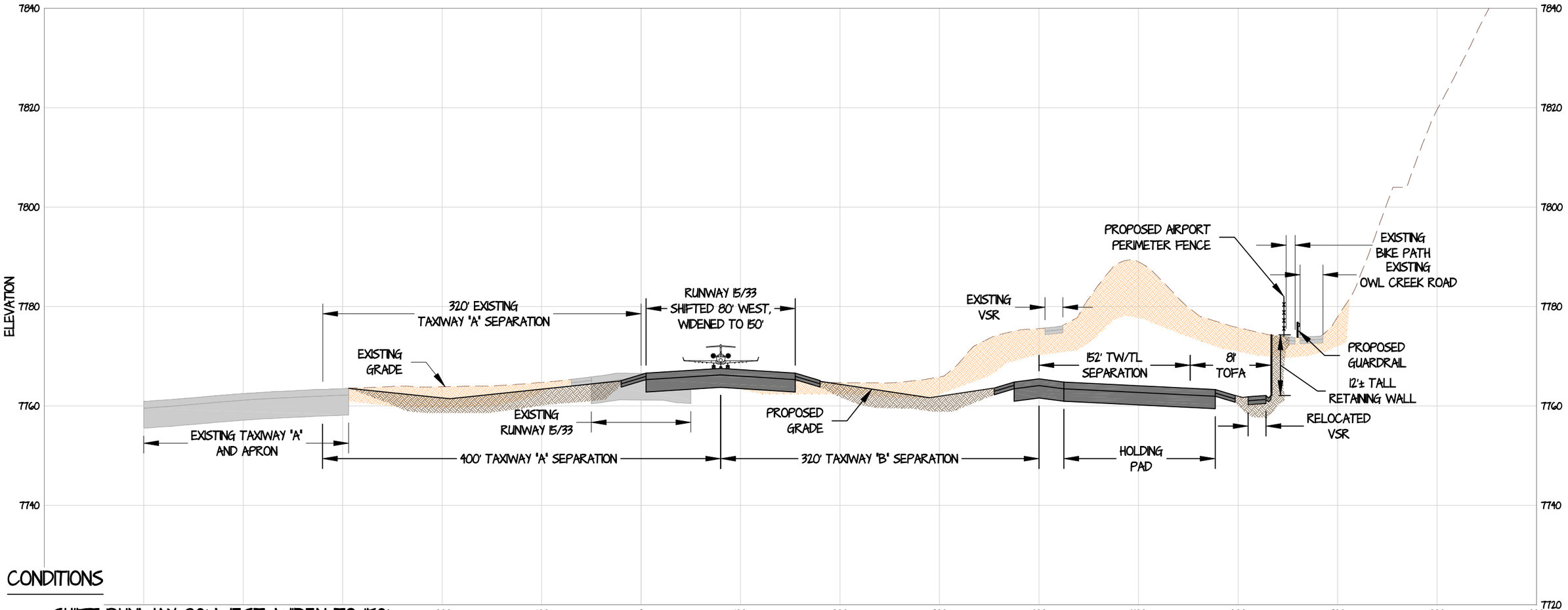
ALTERNATIVE 12a - TAXIWAY "A4" - TAXIWAY "B" HOLDING PAD EVALUATION



CONDITIONS

- SHIFT RUNWAY 80' WEST, WIDEN TO 150'
- 400' EAST SIDE PARALLEL TAXIWAY "A"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 400' PARTIAL WEST SIDE PARALLEL TAXIWAY "B" NORTH OF AOC
  RUNWAY CROSSING AT RUNWAY 15 THRESHOLD (CONFLICTS WITH FAA RECOMMENDATIONS)
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 320' PARTIAL WEST SIDE PARALLEL TAXIWAY "B" SOUTH OF AOC
  WOULD REQUIRE NEW FAA MODIFICATION TO STANDARD
  (320' RUNWAY/TAXIWAY SEPARATION)

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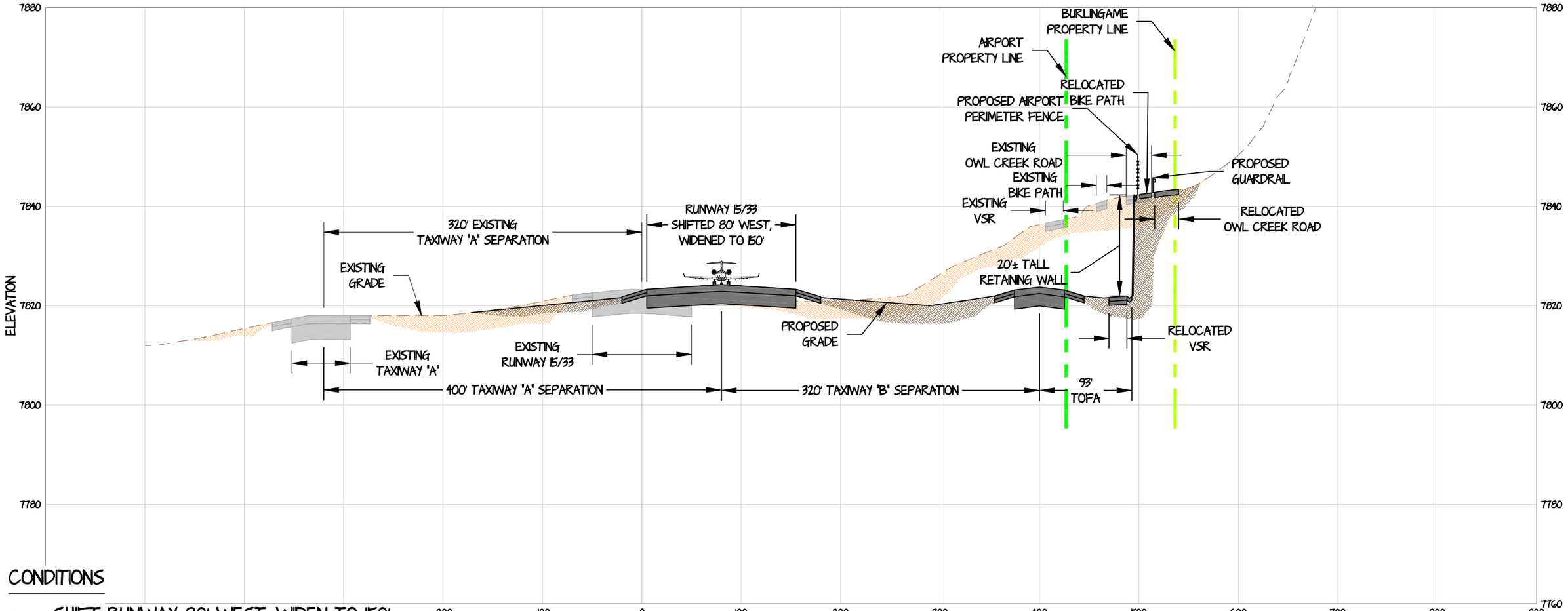
1 of 30

ALTERNATIVE 12a - SOUTH END OF AIRFIELD APPROXIMATELY TAXIWAY "A8" - OWL CREEK ROAD PINCH POINT EVALUATION



CONDITIONS

- SHIFT RUNWAY 80' WEST, WIDEN TO 150'
- 400' EAST SIDE PARALLEL TAXIWAY "A"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 400' PARTIAL WEST SIDE PARALLEL TAXIWAY "B" NORTH OF AOC
  RUNWAY CROSSING AT RUNWAY 15 THRESHOLD (CONFLICTS WITH FAA RECOMMENDATIONS)
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 320' PARTIAL WEST SIDE PARALLEL TAXIWAY "B" SOUTH OF AOC
  WOULD REQUIRE NEW FAA MODIFICATION TO STANDARD
  (320' RUNWAY/TAXIWAY SEPARATION)

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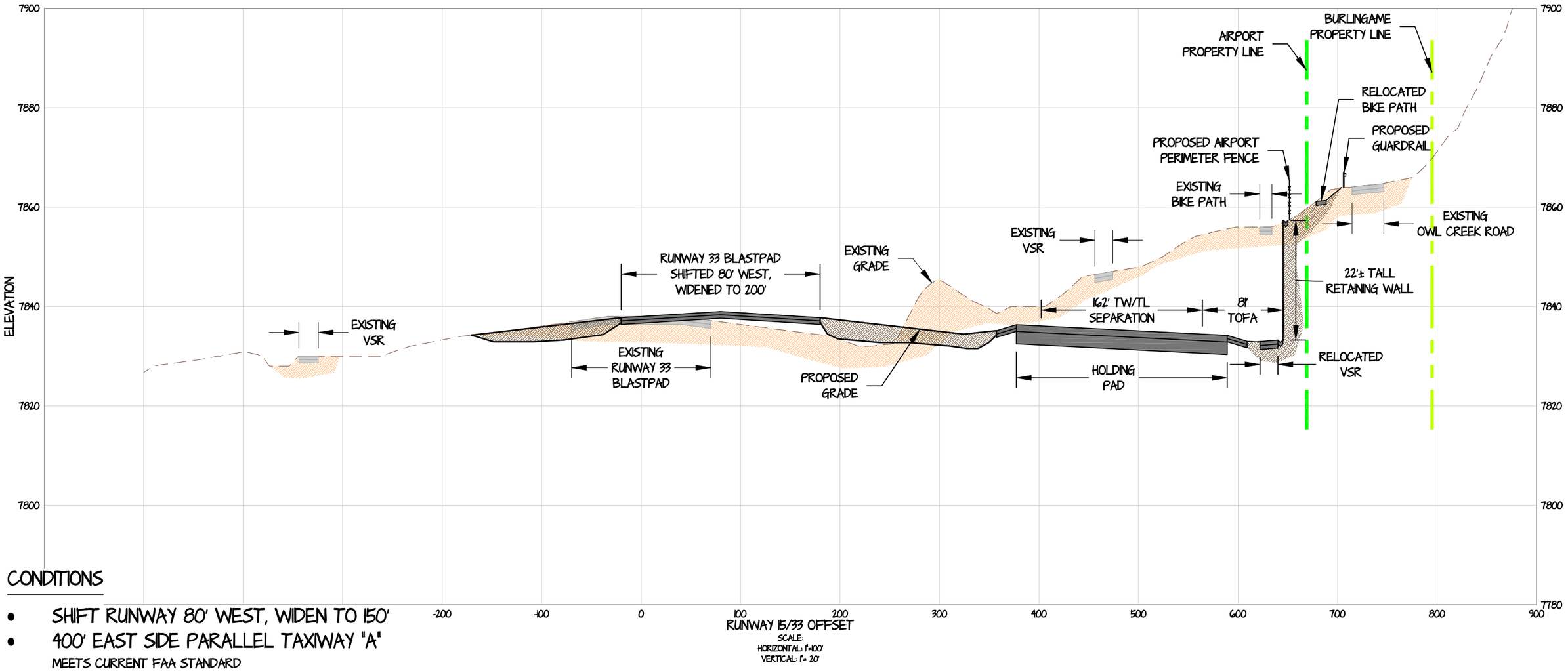
ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 12a

DATE: JUNE 24, 2014

ALTERNATIVE 12a - RUNWAY 33 BLAST PAD - SOUTH HOLDING PAD EVALUATION



SCALE:
HORIZONTAL: 1"=100'
VERTICAL: 1"= 20'

CONDITIONS

- SHIFT RUNWAY 80' WEST, WIDEN TO 150'
- 400' EAST SIDE PARALLEL TAXIWAY "A"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 400' PARTIAL WEST SIDE PARALLEL TAXIWAY "B" NORTH OF AOC
  RUNWAY CROSSING AT RUNWAY 15 THRESHOLD (CONFLICTS WITH FAA RECOMMENDATIONS)
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  (400' RUNWAY/TAXIWAY SEPARATION)
- 320' PARTIAL WEST SIDE PARALLEL TAXIWAY "B" SOUTH OF AOC
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FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 12a

DATE: JUNE 24, 2014

APPROACH PROCEDURES ANALYSIS

EXISTING STATE VS EXISTING STATE WITH UPDATED CRITERIA

PREPARED BY: LEAN PHOTOMETRICS

					Existing Runway Configuration					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					
Ranking by Usage	Runway	Proce dure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
1	15	LOC-DME - E	Circl ing Only	Public	9840 (2160) 3 mi	10020 (2520) 3 mi	10220 (2540) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Business Jets, Turboprop and smaller	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	Minor Impact
2	15	LOC-DME RWY 15	Straight In	Public-Special	9200 (1520) 2 3/4 mi	9200 (1520) 2 3/4 mi	9200 (1520) 2 3/4 mi	Several waivers exist for this procedure, visibility increased due to straight-in minimums	Regional Jets, Business Jets, Turboprops and smaller	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	Several waivers exist for this procedure, visibility increased due to straight-in minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	Minor Impact
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8760 (1080) 2 3/4 mi	8760 (1080) 2 3/4 mi	8760 (1080) 2 3/4 mi	MAP Climb of 330ft/nm to 11100ft Several waivers exist for this procedure, visibility increased due to straight-in minimums	Regional Jets, Business Jets, Turboprops and smaller	8880 (1199) 3 mi	8880 (1199) 3 mi	8880 (1199) 3 mi	MAP Climb of 330ft/nm to 11100ft Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	Moderate Impact due to increased vis and ceilings. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	9680 (2000) 3 mi	10320 (2640) 3 mi	10840 (3160) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums	Regional Jets, Business Jets, Turboprops and smaller	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	Moderate Impact due to increased vis and ceilings.
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13680 (6000) 10 mi	13680 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	13680 (6000) 10 mi	13680 (6000) 10 mi	13680 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	No Impact
6	15	Visual	Circling/FMS Visual	Private-Special	10200 (2520) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, several waivers exist for this procedure	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	No Impact
7	15	VOR/DME - C	Circling Only	Public	10220 (2540) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, A+B minimums are merged for unknown reasons, several waivers exist for this procedure	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minor Impact
8	15	RNAV/GPS - F	Circling Only	Public	10200 (2520) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, several waivers exist for this procedure	Turboprop and smaller	10140 (2459) 1 3/4 mi	10460 (2799) 1 3/4 mi	11740 (4099) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minor Impact
9	33	Visual	Circling	Public	10200 (2520) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, several waivers exist for this procedure. Approach to runway 33 is N/A at night due to 34:1 and 20:1 penetrations.	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No Impact
10	33	Visual	Circling/FMS Visual	Private-Special	10200 (2520) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, several waivers exist for this procedure. Approach to runway 33 is N/A at night due to 34:1 and 20:1 penetrations.	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No Impact
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8079 (399) MALSF On 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only	No Impact

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

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ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 12a

DATE: JUNE 24, 2014

APPROACH PROCEDURES ANALYSIS

EXISTING STATE WITH UPDATED CRITERIA VS 80' RUNWAY SHIFT

PREPARED BY: LEAN PHOTOMETRICS

					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					80ft Offset to the West Configuration (State 5)					
Ranking by U sage	Runway	Procedure Nam e	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	9740 (2059) 3 mi	10420 (2759) 3 mi	11660 (4019) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, IASE LOC and DME shifted to the west, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	Minimal impact when compared to state 1
2	15	LOC-DME RWY 15	Straight In	Public-Special	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	Several waivers exist for this procedure, visibility increased due to straight-in minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Minimal impact when compared to state 1
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8880 (1199) 3 mi	8880 (1199) 3 mi	8880 (1199) 3 mi	MAP Climb of 330ft/nm to 11100ft Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	8940 (1259) 3 mi	8940 (1259) 3 mi	8940 (1259) 3 mi	MAP Climb of 330ft/nm to 10000ft New circling criteria, runway 15/33 shifted 80ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Moderate impact when compared to state 1. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9740 (2059) 3 mi	10420 (2759) 3 mi	11660 (4019) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Minimal impact when compared to state 1
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13680 (6000) 10 mi	13680 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	13681 (6000) 10 mi	13681 (6000) 10 mi	13681 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	No impact when compared to state 1.
6	15	Visual	Circling/FMS Visual	Private-Special	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	No impact when compared to state 1.
7	15	VOR/DME - C	Circling Only	Public	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	9780 (2099) 1 3/4 mi	10420 (2759) 1 3/4 mi	11660 (4019) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minimal impact when compared to state 1
8	15	RNAV/GPS - F	Circling Only	Public	10140 (2459) 1 3/4 mi	10460 (2799) 1 3/4 mi	11740 (4099) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	10140 (2459) 1 3/4 mi	10400 (2719) 1 3/4 mi	11780 (4139) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minimal impact when compared to state 1
9	33	Visual	Circling	Public	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No impact when compared to state 1.
10	33	Visual	Circling/FMS Visual	Private-Special	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No impact when compared to state 1.
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8300 (619) 1 1/2 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Initial estimates based on procedure design results. Shifting the runway any amount will have significant impacts on this particular approach which will cause a complete redesign	High Performance BusinessJets Only	High impact when compared to state 1

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

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FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 12a

DATE: JUNE 24, 2014

DEPARTURE PROCEDURES ANALYSIS

EXISTING STATE VS EXISTING STATE WITH UPDATED CRITERIA

PREPARED BY: LEAN PHOTOMETRICS

				Existing Runway Configuration					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					
Runway	Procedu re Name	Type	Publ ic/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Commen t	Typical Aircraft Using Procedure	Operational Impact
33	LINDZ 8	Convent ional	Public	(40 0) 1 mi			465ft/nm to 10000	Regional Jets, Business Jets, Turboprops and smaller	(200) 1 mi			465ft/nm to 10000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	No Impact
33	SARDD 3	Conventional	Public	(400) 1 mi			460ft/nm to 14000	Regional Jets, Business Jets, Turboprops and smaller	(200) 1 mi			460ft/nm to 14000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	No Impact
33	PITKIN 4	RNAV	Public	(400) 1 mi			500ft/nm to 16000	High Performance Aircraft only, FMS issues with short 2nd leg	(200) 1 mi			500ft/nm to 16000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only, FMS issues with short 2nd leg	No Impact
33	GLENO 2	RNP-AR	Private - Special	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	No impact assumed based on existing deviation from visibility requirements due to obstacles in the ICA and extended ICA.
33	ASPEN 6	Conventional	Public	(400) 1 mi			650ft/nm to 13000	High Performance Aircraft only	(200) 1 mi			650ft/nm to 13000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only	No Impact
33	RWY 33 EOSID RNAV	RNAV	Private - Special	(400) 1 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(200) 1 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	No Imapct
33	RWY 33 EOSID	Conventional	Private - Special	(400) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(200) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	No Imapct

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

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ALTERNATIVE 12a

DATE: JUNE 24, 2014

DEPARTURE PROCEDURES ANALYSIS

EXISTING STATE WITH UPDATED CRITERIA VS 80' RUNWAY SHIFT

PREPARED BY: LEAN PHOTOMETRICS

				Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					80ft Offset to the West Configuration (State 5)					
Runw ay	Proce dure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comme nt	Typical Aircraft Using Procedure	Oper ational Impact
33	LINDZ 8	Conventional	Public	(200) 1 mi			465ft/nm to 10000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	(300) 1 mi			465ft/nm to 10000	Regional Jets, Business Jets, Turboprops and smaller	No impact when compared to state 1.
33	SARDD 3	Conventional	Public	(200) 1 mi			460ft/nm to 14000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	(300) 1 mi			460ft/nm to 14000	Regional Jets, Business Jets, Turboprops and smaller	No impact when compared to state 1.
33	PITKIN 4	RNAV	Public	(200) 1 mi			500ft/nm to 16000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only, FMS issues with short 2nd leg	(300) 1 mi			500ft/nm to 16000	High Performance Aircraft only, FMS issues with short 2nd leg	No impact when compared to state 1.
33	GLENO 2	RNP-AR	Private - Special	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	No impact when compared to state 1. Based on assumption that current deviation from visibility requirements will be upheld.
33	ASPEN 6	Conventional	Public	(200) 1 mi			650ft/nm to 13000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only	(300) 1 mi			605ft/nm to 13000	High Performance Aircraft only	No impact when compared to state 1.
33	RWY 33 EOSID RNAV	RNAV	Private - Special	(200) 1 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(300) 1 mi			SID Based Operators: 460ft/nm to 14000, 14ft HAR, 58ft from DER Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, 14ft HAR, 58ft from DER	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	Minimal impact to all operators when compared to state 1.
33	RWY 33 EOSID	Conventional	Private - Special	(200) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(300) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, 14ft HAR, 58ft from DER Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, 14ft HAR, 58ft from DER Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	Minimal impact to all operators when compared to state 1.

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

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ALTERNATIVE 12a

FUTURE PROCEDURES ANALYSIS

EXISTING STATE VS EXISTING STATE WITH UPDATED CRITERIA

PREPARED BY: LEAN PHOTOMETRICS

					Existing Runway Configuration					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					
Runway	Procedure	Navigation Mode	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8079 (399) MALSF On 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only	No Impact
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	Does Not Currently Exist	Does Not Currently Exist	Does Not Currently Exist	No public or public-special RNP procedures have been created. RNP/LPV approaches are slated for development by FAA in 2016.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 377ft/nm to 13340ft. RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	Significant increase in airport access, completion factor and overall flight safety
15	Approach	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	Does Not Currently Exist	Does Not Currently Exist	Does Not Currently Exist	No public or public-special RNP procedures have been created. RNP/LPV approaches are slated for development by FAA in 2016.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 376ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	Significant increase in airport access, completion factor and overall flight safety
15	Approach	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	Does Not Currently Exist	Does Not Currently Exist	Does Not Currently Exist	No public or public-special RNP procedures have been created. RNP/LPV approaches are slated for development by FAA in 2016.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 372 ft/nm to 12700ft, then 364ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	Significant increase in airport access, completion factor and overall flight safety

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

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FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 12a

FUTURE PROCEDURES ANALYSIS

EXISTING STATE WITH UPDATED CRITERIA VS 80' RUNWAY SHIFT

PREPARED BY: LEAN PHOTOMETRICS

					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					80ft Offset to the West Configuration (State 5)					
Runway	Procedure	Navigation Mode	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8300 (619) 1 1/2 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only	High impact when compared to state 1
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 377ft/nm to 13340ft. RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	8610 (929) MALSF On 2 1/2 mi MALSF Out 3 mi	8610 (929) MALSF On 2 1/2 mi MALSF Out 3 mi	8610 (929) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 374ft/nm to 13340ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	No Impact when compared to state 1.
15	Approach	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 376ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 370ft/nm to 13340ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	No Impact when compared to state 1.
15	Approach	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 372 ft/nm to 12700ft, then 364ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	MAP Climb of 368ft/nm to 12700ft, then 361 ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	Minor Impact when compared to state 1.

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

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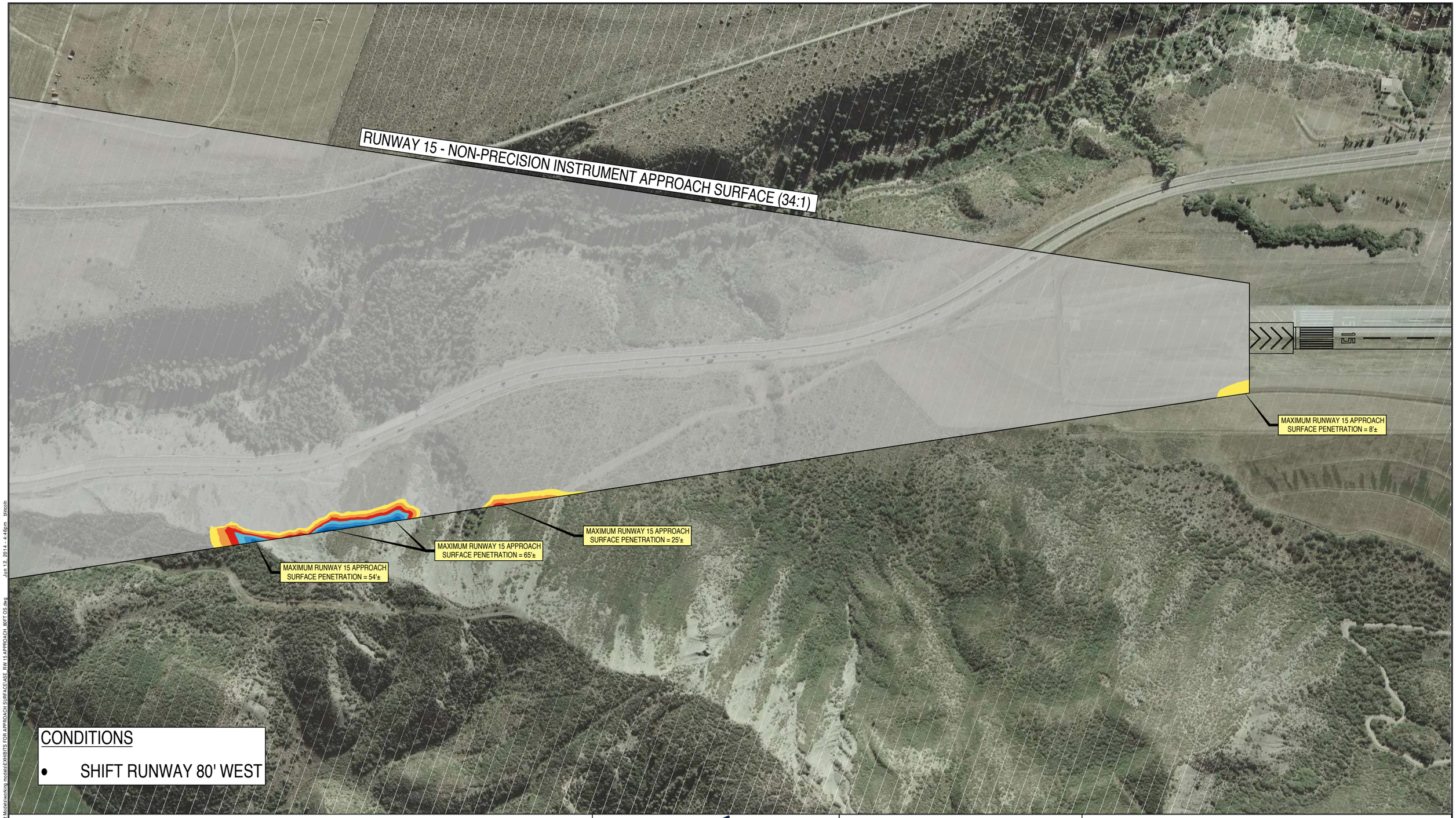
ALTERNATIVE 12a

DATE: JUNE 24, 2014



RUNWAY 15 APPROACH PENETRATIONS

- 0' TO 10'
- 10' TO 20'
- 20' TO 30'
- 30' TO 40'
- 40' TO 50'
- 50' TO 60'
- 60' TO 70'

GRAPHIC SCALE
200 0 200 400
(IN FEET)

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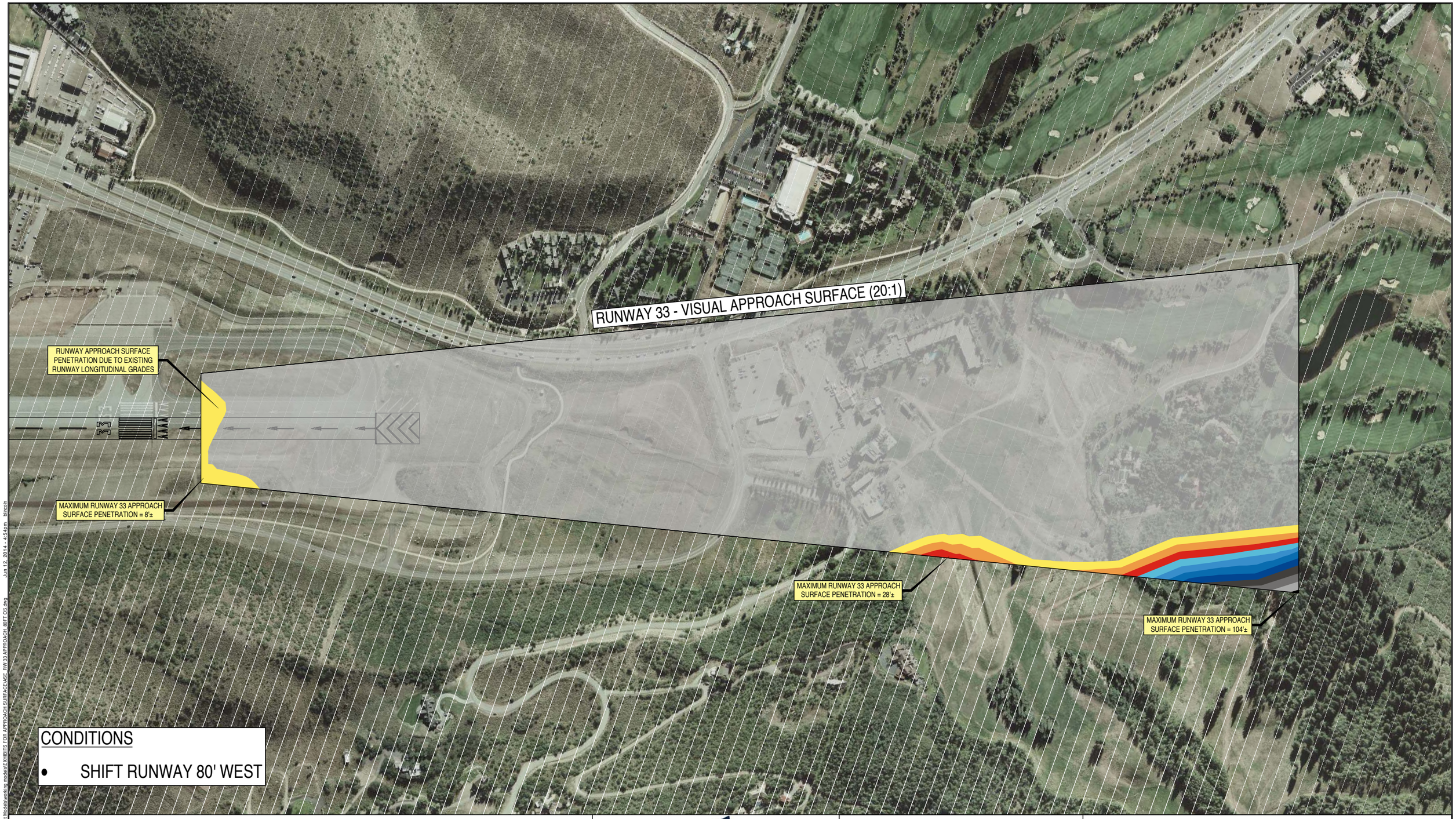

RUNWAY 33 APPROACH PENETRATIONS

0' TO 10'	30' TO 40'	70' TO 80'	100' TO 110'	
10' TO 20'	40' TO 50'	80' TO 90'		
20' TO 30'	50' TO 60'	90' TO 100'		

GRAPHIC SCALE
200 0 200 400
(IN FEET)

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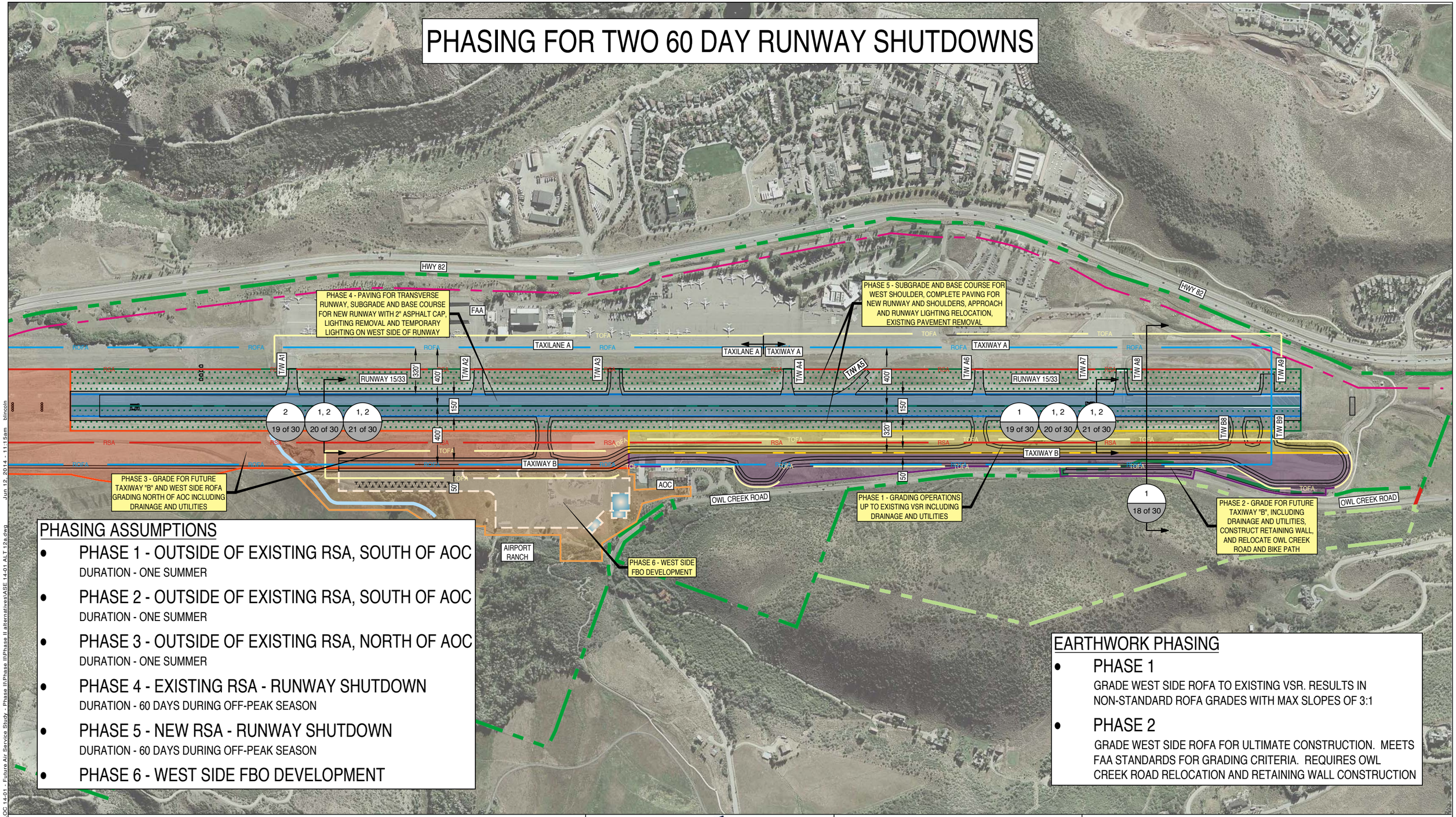
PHASING FOR TWO 60 DAY RUNWAY SHUTDOWNS



PHASING ASSUMPTIONS

- PHASE 1 - OUTSIDE OF EXISTING RSA, SOUTH OF AOC
  DURATION - ONE SUMMER
- PHASE 2 - OUTSIDE OF EXISTING RSA, SOUTH OF AOC
  DURATION - ONE SUMMER
- PHASE 3 - OUTSIDE OF EXISTING RSA, NORTH OF AOC
  DURATION - ONE SUMMER
- PHASE 4 - EXISTING RSA - RUNWAY SHUTDOWN
  DURATION - 60 DAYS DURING OFF-PEAK SEASON
- PHASE 5 - NEW RSA - RUNWAY SHUTDOWN
  DURATION - 60 DAYS DURING OFF-PEAK SEASON
- PHASE 6 - WEST SIDE FBO DEVELOPMENT

EARTHWORK PHASING

- PHASE 1
  GRADE WEST SIDE ROFA TO EXISTING VSR. RESULTS IN NON-STANDARD ROFA GRADES WITH MAX SLOPES OF 3:1
- PHASE 2
  GRADE WEST SIDE ROFA FOR ULTIMATE CONSTRUCTION. MEETS FAA STANDARDS FOR GRADING CRITERIA. REQUIRES OWL CREEK ROAD RELOCATION AND RETAINING WALL CONSTRUCTION

- ALL RSA'S, ROFA'S, AND TOFA'S SHOWN ARE FOR PROPOSED AIRCRAFT PAVEMENT

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- MASTER PLAN LAYOUT BUILDINGS
- PHASE 1
- PHASE 2
- PHASE 3
- PHASE 4
- PHASE 5
- PHASE 6
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- HIGHWAY 82 100' RIGHT-OF-WAY SETBACK

N

GRAPHIC SCALE
300 0 300 600
(IN FEET)

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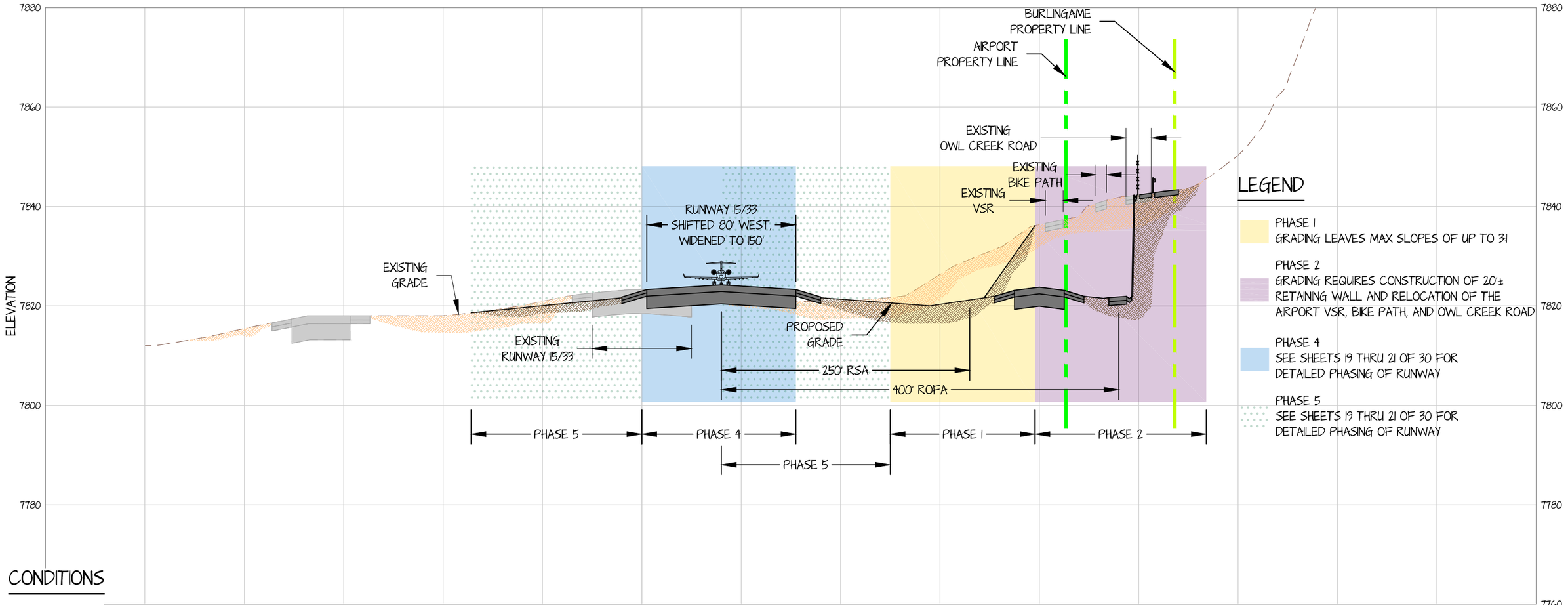
SHEET 17 OF 30

1
17 of 30

ALTERNATIVE 12a - RSA AND ROFA GRADING - TWO 60 DAY RUNWAY SHUTDOWNS



SCALE:
HORIZONTAL: 1"=100'
VERTICAL: 1"= 20'

CONDITIONS

- SHIFT RUNWAY 80' WEST, WIDEN TO 150'
- 400' EAST SIDE PARALLEL TAXIWAY "A"
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 400' PARTIAL WEST SIDE PARALLEL TAXIWAY "B" NORTH OF AOC
  RUNWAY CROSSING AT RUNWAY 15 THRESHOLD (CONFLICTS WITH FAA RECOMMENDATIONS)
  MEETS CURRENT FAA STANDARD
  (400' RUNWAY/TAXIWAY SEPARATION)
- 320' PARTIAL WEST SIDE PARALLEL TAXIWAY "B" SOUTH OF AOC
  WOULD REQUIRE NEW FAA MODIFICATION TO STANDARD
  (320' RUNWAY/TAXIWAY SEPARATION)

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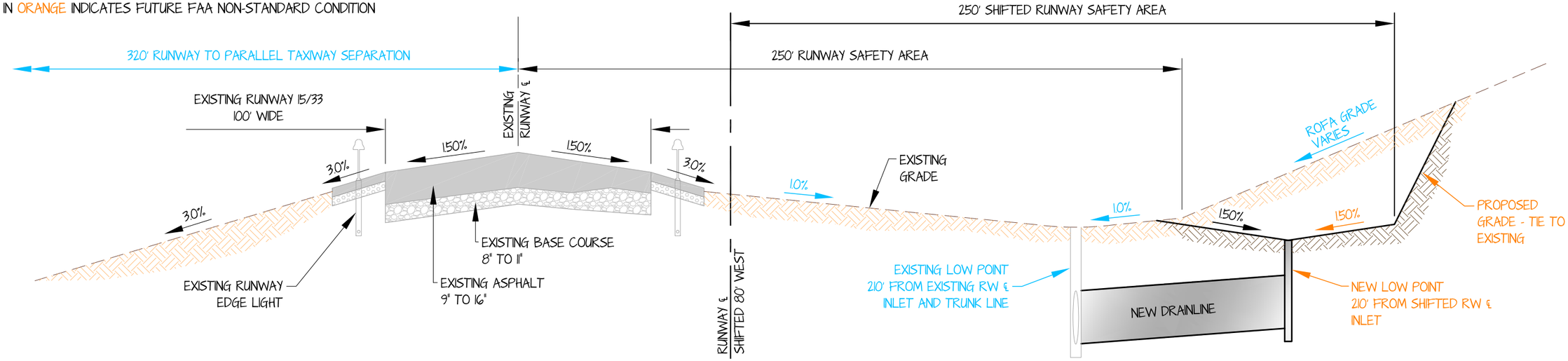
ALTERNATIVE 12a

DATE: JUNE 24, 2014 SHEET 18 OF 30

NOTE:

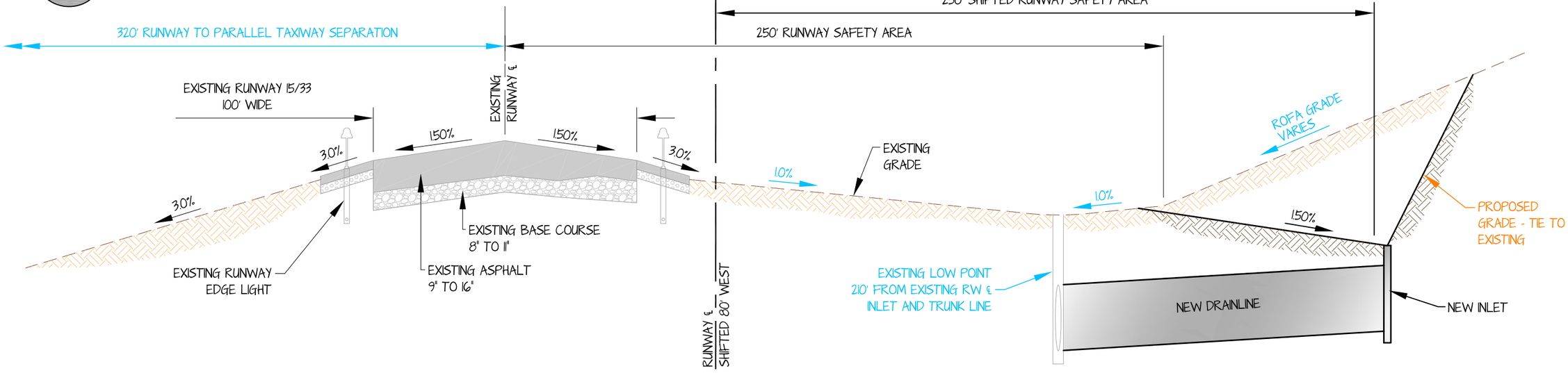
ALL TEXT IN BLUE INDICATES EXISTING FAA NON-STANDARD CONDITION

ALL TEXT IN ORANGE INDICATES FUTURE FAA NON-STANDARD CONDITION



1
17 of 30

ALTERNATIVE 12a - PHASE 1 - DRAINAGE IMPROVEMENTS/SAFETY AREA GRADING FOR 320' WEST SIDE TAXIWAY



2
17 of 30

ALTERNATIVE 12a - PHASE 1 - DRAINAGE IMPROVEMENTS/SAFETY AREA GRADING FOR 400' WEST SIDE TAXIWAY

PHASING ASSUMPTIONS

- NIGHT WORK WITHIN EXISTING RUNWAY SAFETY AREA
- FAA ALLOWS TEMPORARY NON-STANDARD ROFA GRADING BETWEEN PHASES 1 AND 2
- EXISTING DRAINAGE TRUNK LINES ON BOTH THE EAST AND WEST SIDE OF THE RUNWAY HAVE CAPACITY FOR ULTIMATE BUILDOUT

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NOTE:

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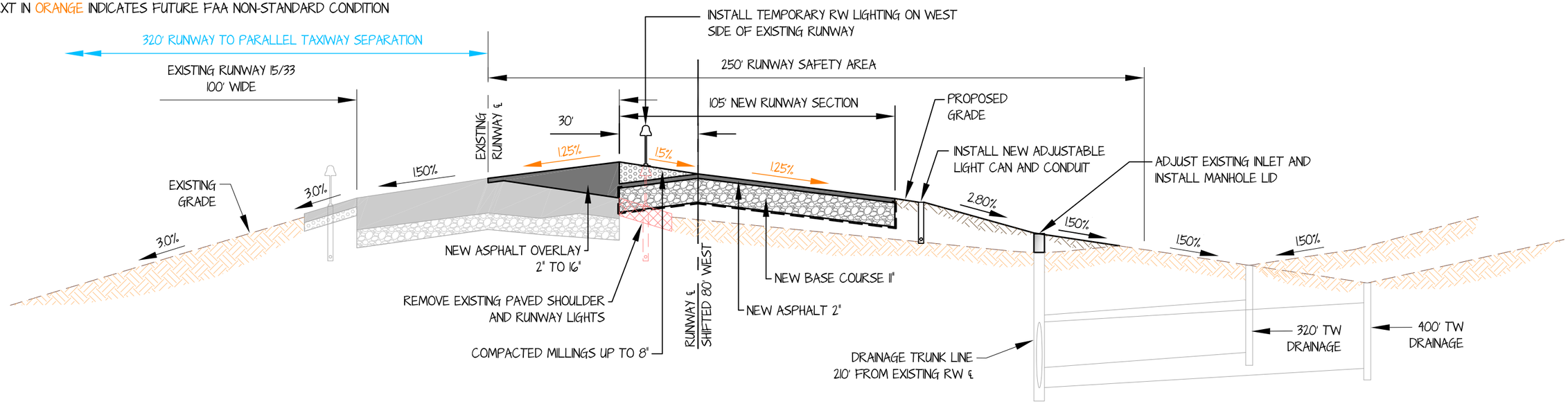
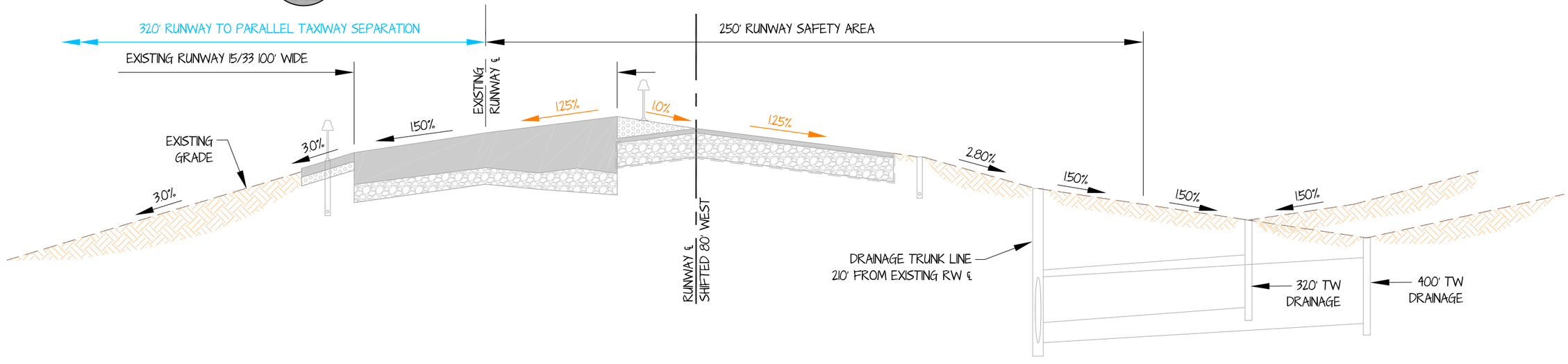
ALL TEXT IN ORANGE INDICATES FUTURE FAA NON-STANDARD CONDITION



1
17 of 30

ALTERNATIVE 12a - PHASE 4 - 80' RUNWAY SHIFT - FIRST 60 DAY SHUTDOWN



2
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ALTERNATIVE 12a - TEMPORARY RUNWAY CONDITION

PHASING ASSUMPTIONS

- ALL WORK IN PHASES 1-3 IS COMPLETE
- ALL MATERIAL FOR RUNWAY CONSTRUCTION IS STOCKPILED ON-SITE
- ASPHALT PLANT ON-SITE
- 24-HOUR WORK SCHEDULE DURING RUNWAY SHUTDOWN
- FAA ALLOWS ASPHALT CAP ON NEW BASE COURSE ON WEST SIDE OF RUNWAY DURING TEMPORARY RUNWAY OPERATING CONDITIONS

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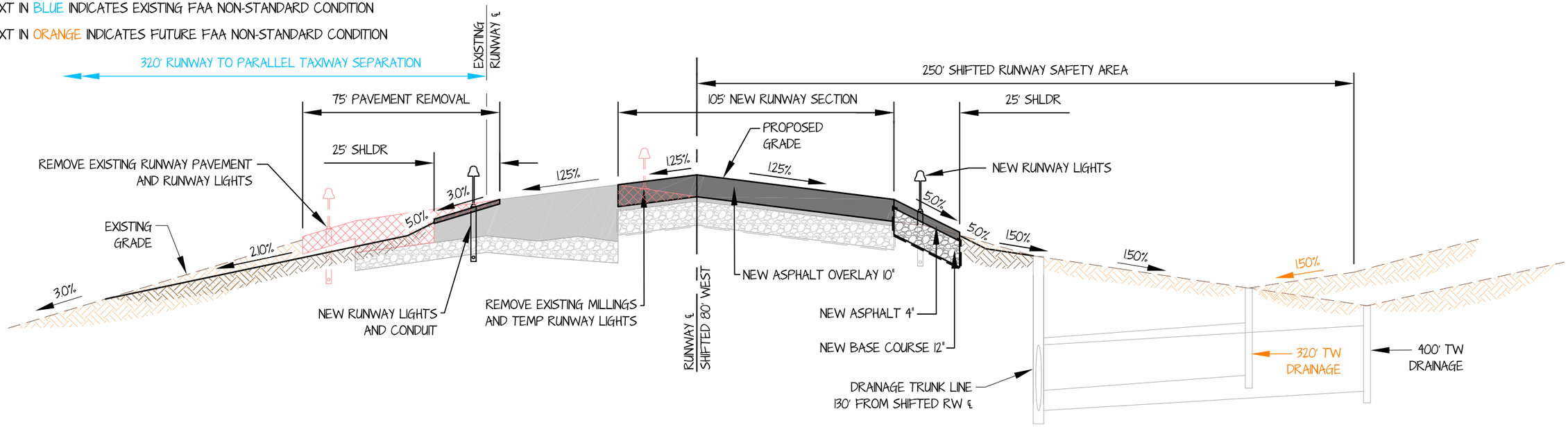
DATE: JUNE 24, 2014

NOTE:

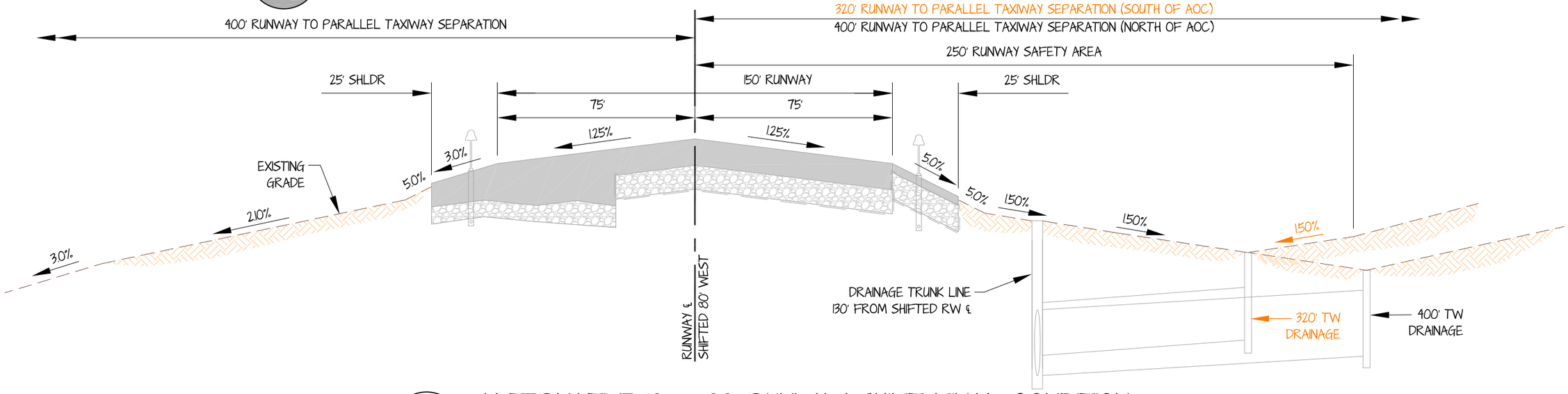
ALL TEXT IN BLUE INDICATES EXISTING FAA NON-STANDARD CONDITION

ALL TEXT IN ORANGE INDICATES FUTURE FAA NON-STANDARD CONDITION



1
17 of 30

ALTERNATIVE 12a - PHASE 5 - 80' RUNWAY SHIFT - SECOND 60 DAY SHUTDOWN



2
17 of 30

ALTERNATIVE 12a - 80' RUNWAY SHIFT FINAL CONDITION

PHASING ASSUMPTIONS

- ALL WORK IN PHASES 1-4 IS COMPLETE
- ALL MATERIAL FOR RUNWAY CONSTRUCTION IS STOCKPILED ON-SITE
- ASPHALT PLANT ON-SITE
- 24-HOUR WORK SCHEDULE DURING RUNWAY SHUTDOWN
- CRITICAL CONNECTOR TAXIWAYS TIED IN ON EAST SIDE
- REMAINDER OF EAST SIDE CONNECTOR TAXIWAYS AND CONNECTOR TAXIWAYS "B8" AND "B9" TIED-IN AFTER RUNWAY SHIFT

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ASPEN/PITKIN COUNTY AIRPORT
ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 12a

DATE: JUNE 24, 2014

LOCAL AND FEDERAL CONSIDERATIONS

PREPARED BY: TG MALLOY CONSULTING

LOCAL REVIEW AND APPROVALS

PITKIN COUNTY

- **LOCATION AND EXTENTS REVIEW**
  PROPOSED IMPROVEMENTS IN COMPLIANCE WITH THE WEST OF MAROON CREEK PLAN (WOMP)
- **ASPEN/PITKIN COUNTY AIRPORT DESIGN GUIDELINES APPROVAL**
  PROPOSED IMPROVEMENTS IN COMPLIANCE WITH AIRPORT DESIGN GUIDELINES (APRIL, 2014)
- **BUILDING PERMIT (TITLE 11)**
  ANY STRUCTURES MEETING THE "BUILDING" DEFINITION WHICH DOES NOT INCLUDE ROADS, PAVEMENT, FENCES, RETAINING WALLS OR OTHER SITE IMPROVEMENTS THAT DO NOT ENCLOSE SPACES FOR THE PROTECTION OF PERSONS, ANIMALS, OR PROPERTY
- **ENVIRONMENTAL HEALTH (TITLE 6)**
  ADDRESS APPLICABLE PROVISIONS OF TITLE 6 IN CONSTRUCTION DOCUMENTS AND CONTRACTS

CITY OF ASPEN

- **BURLINGAME OPEN SPACE PARCEL CHANGE IN USE (PUBLIC VOTE)**
  RELOCATION OF OWL CREEK TRAIL ONTO BURLINGAME OPEN SPACE PARCEL

ASPEN VALLEY LAND TRUST (AVLT)

- **CONSENT PURSUANT TO DEED OF CONSERVATION EASEMENT**
  RELOCATION OF OWL CREEK TRAIL ONTO BURLINGAME OPEN SPACE PARCEL REQUIRES APPROVAL BY THE AVLT BOARD OF DIRECTORS

FEDERAL REVIEW AND APPROVALS

UNITED STATES ARMY CORPS OF ENGINEERS (USACE)

- **404 PERMIT**
  PENDING DETERMINATION OF 3 WETLANDS AREAS DESCRIBED IN THE TEST OF THE 2012 MASTER PLAN UPDATE

FEDERAL AVIATION ADMINISTRATION

- ALP/MASTER PLAN UPDATE
- ENVIRONMENTAL ASSESSMENT
- OBSTRUCTION EVALUATION/AIRSPACE ANALYSIS
- NAVAID RELOCATION/UPDATE
- MODIFICATIONS TO DESIGN STANDARDS

  RUNWAY/PARALLEL TAXIWAY SEPARATION
  RUNWAY/TAXIWAY HOLDLINE SEPARATION
  RUNWAY AND TAXIWAY LONGITUDINAL GRADIENT
  RUNWAY SAFETY AREA LONGITUDINAL GRADIENT
  RUNWAY CENTERLINE TO AIRCRAFT PARKING AREA

NOTE:

- THE LOCAL AND FEDERAL CONSIDERATIONS PRESENTED FOR THIS ALTERNATIVE ARE NOT THE EXTENT OF REVIEWS AND APPROVALS. AS THE DESIGN OF ANY ALTERNATIVE PROGRESSES, IT IS LIKELY THAT MORE REVIEWS AND APPROVALS WILL BE REQUIRED. IT IS EXPECTED THAT THE REVIEW AND APPROVALS IDENTIFIED ABOVE WILL TAKE ONE YEAR OR LONGER TO COMPLETE.
- ALTERNATIVE 12a MAY NOT REQUIRE A PUBLIC VOTE FOR BURLINGAME OPEN SPACE PARCEL OR AVLT BOARD OF DIRECTOR APPROVAL DEPENDING UPON FINAL CDOT RIGHT-OF-WAY APPROVAL

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ALTERNATIVE 12a

DATE: JUNE 24, 2014

CONCEPTUAL GRADING LAYOUT

1. EXTENDED RSA GRADING - POTENTIAL FILL AREA OF 150,000 CY OR MORE

GRADING LIMITS

HWY 82

NORTH GA RAMP

FAA

F.B.O.

SOUTH GA RAMP

TERMINAL

TAXILANE A

TAXIWAY A

RUNWAY 15/33

TAXIWAY B

AOC

FUTURE FBO DEVELOPMENT

AIRPORT RANCH

OWL CREEK ROAD

2. 1,200± LONG RETAINING WALL

3. 600'± LONG RETAINING WALL

4. 2,800'± LONG RETAINING WALL

GRADING ASSUMPTIONS

- AIRFIELD GRADED TO MINIMUM ALLOWABLE FAA CRITERIA TO MINIMIZE EARTHWORK
- TAXIWAY B RETAINING WALL LOCATED AT TOFA
- WEST SIDE VSR IN TOFA
- RETAINING WALL HEIGHTS AND LENGTHS MAY BE MITIGATED IN DESIGN PHASE

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- 7680 PROPOSED MAJOR CONTOUR
- 7682 PROPOSED MINOR CONTOUR
- 7680 EXISTING MAJOR CONTOUR
- 7682 EXISTING MINOR CONTOUR
- RETAINING WALL

GRAPHIC SCALE
350 0 350 700
(IN FEET)

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ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 12a

DATE: JUNE 24, 2014

CONCEPTUAL STORM SEWER LAYOUT

1. CONSTRUCT DETENTION POND

2. REMOVE EXISTING 30" PIPE AND REPLACE WITH 36" PIPE

3. PIPE OWL CREEK

4. REMOVE EXISTING STORM SEWER

5. REMOVE EXISTING INLETS AND PLACE MANHOLES ALONG EXISTING STORM SEWER ALIGNMENT

6. REMOVE EXISTING 18" PIPE AND REPLACE WITH 24" PIPE

7. REMOVE EXISTING 18" PIPE AND REPLACE WITH 24" PIPE

8. REMOVE EXISTING STORM SEWER

9. PIPE STAPLETON BROTHERS DITCH

HWY 82

NORTH GA RAMP

FAA

F.B.O.

SOUTH GA RAMP

TERMINAL

TAXILANE A

TAXIWAY A

RUNWAY 15/33

TAXIWAY B

AOC

FUTURE FBO DEVELOPMENT

AIRPORT RANCH

OWL CREEK ROAD

RSA

STM

TW A1 TW A2 TW A3 TW A4 TW A5 TW A6 TW A7 TW A8 TW A9 TW B8 TW B9

320' 400' 150' 50'

36" 24"

STORM SEWER ASSUMPTIONS

- PROPOSED BUILD OUT REQUIRES UP-SIZING OF EXISTING STORM PIPE
- RSA GRADING REQUIRES THE REMOVAL OF EXISTING INLET STRUCTURES AND REPLACEMENT WITH NEW MANHOLES
- STAPLETON BROTHERS DITCH TO BE REMOVED AND PIPED INTO OWL CREEK
- NEW FLOWS REQUIRE DETENTION POND

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- EXISTING STORM DRAINAGE
- PROPOSED STORM DRAINAGE
- STORM DRAINAGE TO BE REMOVED
- PROP/EX INLETS OR MANHOLES

N

GRAPHIC SCALE
350 0 350 700
(IN FEET)

ASPEN/PITKIN COUNTY AIRPORT
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ASPEN/PITKIN COUNTY AIRPORT
ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 12a

DATE: JUNE 24, 2014

CONCEPTUAL SANITARY SEWER LAYOUT

HWY 82
NORTH GA RAMP
FAA
SOUTH GA RAMP
TERMINAL
F.B.O.
TAXILANE A
TAXIWAY A
RUNWAY 15/33
TAXIWAY B
AOC
FUTURE FBO DEVELOPMENT
AIRPORT RANCH
OWL CREEK ROAD
RSA
TWY A1
TWY A2
TWY A3
TWY A4
TWY A5
TWY A6
TWY A7
TWY A8
TWY A9
TWY B8
TWY B9
SAN
320'
400'
150'
50'

1. REMOVE EXISTING MANHOLE AND PIPE

2. CONSTRUCT SANITARY SEWER LINE (APPROX. 430 LF)

3. ADJUST EXISTING MANHOLE RIM ELEVATIONS TO MEET NEW GRADES (8 TOTAL)

SANITARY ASSUMPTIONS

- PROPOSED RUNWAY GEOMETRY REQUIRES EXISTING SANITARY SEWER PIPE AND MANHOLE TO BE RELOCATED. WORK TO BE COMPLETED DURING RUNWAY SHUTDOWN
- MANHOLE ADJUSTMENT WORK CAN BE COMPLETED AT NIGHT

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- SAN — EXISTING SANITARY SEWER
- SAN — PROPOSED SANITARY SEWER
- SANITARY SEWER TO BE REMOVED

GRAPHIC SCALE
350 0 350 700
(IN FEET)

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ASPEN/PITKIN COUNTY AIRPORT
ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 12a

DATE: JUNE 24, 2014

CONCEPTUAL NATURAL GAS LAYOUT

1. RELOCATE HIGH PRESSURE GAS MAIN TO ACCOMMODATE FUTURE RSA GRADING

2. LOWER LOW PRESSURE GAS LINE IN-PLACE. THE PORTIONS OF GAS LINE THAT CROSS THE AIRFIELD PAVEMENT WILL BE INSTALLED IN UTILITY SLEEVES

HWY 82

NORTH GA RAMP

FAA

F.B.O.

SOUTH GA RAMP

TERMINAL

TAXILANE A

TAXIWAY A

RUNWAY 15/33

TAXIWAY B

AOC

FUTURE FBO DEVELOPMENT

AIRPORT RANCH

OWL CREEK ROAD

NATURAL GAS ASSUMPTIONS

- HIGH PRESSURE GAS MAIN TO BE RELOCATED AROUND FUTURE EXTENDED RSA GRADING DUE TO INCREASED COVER OVER MAIN
- GAS LINE TO BE RELOCATED IN-PLACE DUE TO RSA GRADING IN INFIELD AREA

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- EXISTING NATURAL GAS
- PROPOSED NATURAL GAS
- NATURAL GAS TO BE LOWERED
- NATURAL GAS TO BE REMOVED

GRAPHIC SCALE
350 0 350 700
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ASPEN/PITKIN COUNTY AIRPORT
ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 12a

DATE: JUNE 24, 2014

CONCEPTUAL ELECTRIC LAYOUT

HWY 82
NORTH GA RAMP
FAA
F.B.O.
SOUTH GA RAMP
TERMINAL
TAXILANE A
TAXIWAY A
RUNWAY 15/33
TAXIWAY B
AOC
FUTURE FBO DEVELOPMENT
AIRPORT RANCH
OWL CREEK ROAD
RSA
EL(UG)
EL(OH)

1. LOWER SPARE ELECTRIC CONDUIT IN-PLACE

2. REMOVE ABANDONED ELECTRIC FROM FUTURE FBO DEVELOPMENT

3. RELOCATE ELECTRIC AROUND FUTURE FBO DEVELOPMENT

4. RELOCATE ELECTRIC FROM PROPOSED AIRFIELD

ELECTRIC ASSUMPTIONS

- ELECTRIC TO BE LOWERED IN-PLACE DUE TO RSA GRADING IN INFIELD AREA
- RELOCATED ELECTRIC ON SOUTHWEST SIDE OF AIRFIELD CAN BE PLACED ADJACENT TO BIKE PATH

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- EL(UG) EXISTING ELECTRIC
- EL(OH) EXISTING OVERHEAD ELECTRIC
- EL(UG) PROPOSED ELECTRIC
- EL(UG) ELECTRIC TO BE LOWERED
- ELECTRIC TO BE REMOVED

GRAPHIC SCALE
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(IN FEET)

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ASPEN/PITKIN COUNTY AIRPORT
ASPEN, COLORADO
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ALTERNATIVE 12a

DATE: JUNE 24, 2014

CONCEPTUAL AIRFIELD ELECTRIC LAYOUT

1. RELOCATE MEDIUM INTENSITY APPROACH LIGHTING SYSTEM (MALSF)

2. RUNWAY 15/33 - INSTALL NEW RUNWAY EDGE LIGHTING, CENTERLINE LIGHTING, TOUCHDOWN ZONE LIGHTING, AND RUNWAY DISTANCE REMAINING SIGNS

3. RELOCATE PRECISION APPROACH PATH INDICATOR (PAPI)

4. RELOCATE RUNWAY SENSOR SYSTEM

5. REMOVE EXISTING RUNWAY AND TAXIWAY LIGHTING ELEMENTS

6. RELOCATE EXISTING SEGMENTED CIRCLE AND WINDCONE

7. INSTALL NEW CONSTANT CURRENT REGULATORS IN AIRFIELD ELECTRICAL VAULT. MODIFY AIRFIELD LIGHTING CONTROL SYSTEM.

8. TAXIWAY A - INSTALL NEW TAXIWAY EDGE LIGHTING AND GUIDANCE SIGNS. MODIFY EXISTING AIRFIELD LIGHTING ELEMENTS FOR NEW GEOMETRY.

9. RELOCATE WEATHER STATION

10. TAXIWAY B - INSTALL NEW TAXIWAY EDGE LIGHTING AND GUIDANCE SIGNS

11. RELOCATE RUNWAY END IDENTIFIER LIGHTS (REIL)

12. RELOCATE LOCALIZER SYSTEM

HWY 82 · NORTH GA RAMP · FAA · TAXILANE A · F.B.O. · SOUTH GA RAMP · TERMINAL · TAXIWAY A · RUNWAY 15/33 · TAXIWAY B · AOC · FUTURE FBO DEVELOPMENT · AIRPORT RANCH · OWL CREEK ROAD · RSA · TWY A1 · TWY A2 · TWY A3 · TWY A4 · TWY A5 · TWY A6 · TWY A7 · TWY A8 · TWY A9 · TWY B8 · TWY B9

AIRFIELD ELECTRIC ASSUMPTIONS

- PROPOSED AIRFIELD LAYOUT REQUIRES RELOCATION OF ASSOCIATED AIRFIELD ELECTRICAL ITEMS
- NEW AC 150/5300-13A GEOMETRY REQUIRES CONNECTOR TAXIWAY LIGHTING TO BE REMOVED AND RELOCATED
- ADDITIONAL LOAD ON NEW CIRCUIT REQUIRES NEW CONSTANT CURRENT REGULATOR

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- RUNWAY THRESHOLD LIGHTS
- RUNWAY EDGE LIGHTS
- LOCALIZER
- MALSF (EQUIPMENT)
- RUNWAY SENSOR
- PAPI

GRAPHIC SCALE
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ALTERNATIVE 12a

DATE: JUNE 24, 2014

CONCEPTUAL COMMUNICATIONS LAYOUT

1. RELOCATE FIBER OPTIC AND TELEPHONE LINE AROUND FUTURE EXTENDED RSA GRADING

2. LOWER FIBER OPTIC AND TELEPHONE LINE IN-PLACE. ADJUST MANHOLE RIMS TO MEET NEW GRADES

3. RELOCATE FIBER OPTIC AND TELEPHONE LINE OUT OF PROPOSED AIRFIELD

HWY 82

NORTH GA RAMP

FAA

F.B.O.

SOUTH GA RAMP

TERMINAL

TAXILANE A

TAXIWAY A

RUNWAY 15/33

TAXIWAY B

AOC

FUTURE FBO DEVELOPMENT

AIRPORT RANCH

OWL CREEK ROAD

TWY A1 · TWY A2 · TWY A3 · TWY A4 · TWY A5 · TWY A6 · TWY A7 · TWY A8 · TWY A9 · TWY B8 · TWY B9

320' · 400' · 150' · 50'

COMMUNICATION ASSUMPTIONS

- FIBER OPTIC AND TELEPHONE LINE TO BE RELOCATED AROUND EXTENDED RSA GRADING DUE TO INCREASED COVER OVER CONDUIT
- FIBER OPTIC AND TELEPHONE TO BE LOWERED IN-PLACE DUE TO RSA GRADING IN INFIELD AREA
- RELOCATED FIBER OPTIC AND TELEPHONE LINE ON SOUTHWEST SIDE OF AIRFIELD CAN BE PLACED ADJACENT TO BIKE PATH

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT

- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- OPT — EXISTING FIBER OPTICS
- TEL — EXISTING TELEPHONE LINE
- OPT — PROPOSED FIBER OPTICS
- TEL — PROPOSED TELEPHONE LINE
- OPT — FIBER OPTICS TO BE LOWERED
- TEL — TELEPHONE TO BE LOWERED
- FIBER OPTICS TO BE REMOVED
- IMPACTED / PROPOSED COMMUNICATION MANHOLES

N

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350 0 350 700
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CONCEPTUAL WATER LAYOUT

HWY 82
NORTH GA RAMP
FAA
F.B.O.
TAXILANE A
SOUTH GA RAMP
TERMINAL
TAXIWAY A
RUNWAY 15/33
RSA
TW A1
TW A2
TW A3
TW A4
TW A5
TW A6
TW A7
TW A8
TW A9
TW B8
TW B9
320'
400'
150'
TAXIWAY B
50'
AOC
FUTURE FBO DEVELOPMENT
AIRPORT RANCH
OWL CREEK ROAD
WAT

1. RELOCATE TWO FIRE HYDRANTS AT AOC. REROUTE WATER LINE FOR NORTH HYDRANT AROUND BACK-SIDE OF AOC TO AVOID CONCRETE RAMP

2. RELOCATE WATER OUTSIDE OF PROPOSED AIRFIELD

3. RELOCATE BUTTERMILK WATER DISTRICT PRESSURE REDUCING VALVE VAULT (PRV). THE PRV WILL BE PLACED BETWEEN THE BIKE PATH AND OWL CREEK ROAD.

WATER ASSUMPTIONS

- RELOCATED WATER ON SOUTHWEST SIDE OF AIRFIELD CAN BE LOCATED ADJACENT TO BIKEPATH

LEGEND

- PROPOSED AIRFIELD AND ROAD LAYOUT FROM AIR SERVICE STUDY
- MASTER PLAN LAYOUT BUILDINGS
- MASTER PLAN LAYOUT AIRCRAFT PAVEMENT
- ASE PROPERTY LINE
- BURLINGAME RANCH PROPERTY LINE
- CDOT PROPERTY LINE
- WAT — EXISTING WATER
- WAT — PROPOSED WATER
- WATER TO BE REMOVED

GRAPHIC SCALE
350 0 350 700
(IN FEET)

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ASPEN, COLORADO
FUTURE AIR SERVICE STUDY - PHASE II
ALTERNATIVE 12a

DATE: JUNE 24, 2014

Study Summary

The Future Air Service Planning Study Phase II involved development of 18 alternatives (including all variants) which were evaluated during three separate stakeholder meetings held within a six month period. The stakeholder group included members of the Airport, the FAA and industry experts. During these meetings the alternatives were redefined and modified using three key objectives to determine the viability of each option:

1. Maximize compliance with the FAA standards of safety, efficiency and operational capacity
2. Develop an airport layout plan that is congruent with the 2012 Master Plan Update
3. Devise an airport layout plan to accommodate the larger future commercial service regional aircraft

Table 1: Alternative Refinement

Alternative	Study Step/Meeting		
	STEP B APRIL 3, 2014 MEETING	STEP C MAY 30, 2014 MEETING	STEP D JUNE 24, 2014 FINAL REPORT
ALTERNATIVE 1	☑	☒	
ALTERNATIVE 2	☒		
ALTERNATIVE 3	☒		
ALTERNATIVE 4	☑	☒	
ALTERNATIVE 5	☑	☒	
ALTERNATIVE 5a	☑	☑	☒
ALTERNATIVE 6	☑	☑	☒
ALTERNATIVE 7	☑	☒	
ALTERNATIVE 7a	☑	☒	
ALTERNATIVE 7b	☑	☒	
ALTERNATIVE 8	☑	☒	
ALTERNATIVE 8a			☑
ALTERNATIVE 9	☒		
ALTERNATIVE 10	☑	☑	☒
ALTERNATIVE 11		☑	☒
ALTERNATIVE 12		☑	☒
ALTERNATIVE 12a			☑
ALTERNATIVE 13		☑	☒

☑ Viable Alternative
☑ Viable Alternative Carried Forward from Previous Step
☒ Alternative Eliminated during Previous Step

Through the course of this complex study, there were a couple of key concepts that became apparent during the Study. The first was that maintaining the existing modification to standards into the future was determined not to be a viable solution since doing so would eliminate the next generation of aircraft from utilizing the Airport. This would place future commercial air service to the community at risk and impact the economic health of the community. The second was, that laying out the Airport to full FAA separation standards was determined not to be feasible since doing so would either detrimentally impact the existing east side infrastructure and facilities, and require extensive reconfiguration to the west side, specifically the relocation of the Airport Operations Center (AOC).

Through this study, additional pieces of crucial information became known. Initially, it was thought that relocating the runway would not be possible due to negative impacts of the surrounding terrain on the flight procedures analysis; however, a detailed investigation into the various approach and departure procedures alleviated those concerns and opened up the reality that an 80' runway shift to the west could be done. This investigation shed light on the impacts to the airport property and informed where future development could occur. The process of this study from Step A through Step D has sifted and distilled two Alternatives that best meet the goals outlined in the study: Alternative 8a and Alternative 12a.

Compliance with FAA Regulations

There has been a strong national focus from the FAA over the last few years to minimize the approval of new Modifications to Standards in order to bring more airports, and especially any new developments, up to current FAA criteria. The FAA's position is that they prefer not to participate in funding projects if standards are not met when it is possible to meet them, even when doing so may be challenging. Meeting the full Runway Design Code (RDC) D-III design standards, and thereby bringing the airport in line with standards to the maximum extent possible, which includes lifting the 95' wingspan restriction, was identified as a top priority of the FAA. As was reported in the Phase I study, aircraft manufacturers design their aircraft to fit within the FAA's published standards. An airport with commercial service aircraft that operates under restrictions and operational restrictions will eventually find itself in a situation where the feasibility of maintaining that service will need

to be re-examined. As we have seen, the current wingspan restriction at Aspen/Pitkin County Airport places the airport at a disadvantage in adapting to changing industry trends in aircraft manufacturing. Given the large investment into the airport the FAA has already made, it is in their highest interest to see the airport configured to meet the full RDC D-III standards to best provide commercial air service for the community for the long term.

The most significant requirement to accommodating larger next generation regional aircraft is to meet the FAA standard for a 400' RW/TW separation distance. Alternatives 8a and 12a were developed in close coordination with the FAA to meet this requirement to the maximum extent possible given the physical constraints of the airport. Also, the alternatives meet another very important consideration for the FAA, which was to reduce the amount of Modification to Standards that Aspen/Pitkin county Airport currently has. Through these two alternatives, two existing Modification to Standards are rescinded: 1) RW/Holdbar separation in Alternative 8a and 2) east side Taxiway "A" Object Free Area in Alternatives 8a and 12a.

In addition, both of these alternatives achieve the goal of eliminating operational restrictions on the east side of the airfield. Operational restrictions will only exist on the portion of the proposed west side taxiway that is at 320' offset from the relocated runway centerline. This restriction will consist of sterilizing this section of taxiway during runway operations. The aircraft in area will be controlled by the air traffic control tower and holdlines will be placed on the taxiway at locations leading to the 320' section. Compared to Alternative 12a, the shorter restricted distance in Alternative 8a will dramatically reduce the impact of the restrictions on aircraft movement.

Consistency with the Master Plan

The Master Plan process involved abundant opportunities for the community to be involved in the conversation surrounding the future of the airport. The consensus achieved during that process shaped the

result of the Master Plan. As such, the alternative's adherence to, or deviation from, the Master Plan's proposed layout was used as a metric for evaluating the merit of the proposed alternatives. Beginning in Step B, all of the remaining alternatives were assessed according to their deviations from the approved airport Master Plan. The remaining two alternatives were preferred, in part, because of their minimal impact to the existing east side infrastructure, which is a highly utilized, but very constrained area for commercial and GA aircraft operations. Both alternatives produced minimal change to the Master Plan and provide the opportunity to accomplish the development described in the recently approved 2012 Master Plan Update.

Future Commercial Air Service to ASE

Both alternatives secure the ability for next generation regional commercial aircraft to operate at ASE. In addition, these alternatives achieve the goal of complete operational freedom on the east side, void of any restrictions. The extent of operational restrictions on the west side taxiway will be limited to the 320' offset section. This section of taxiway will be sterilized during take-off and landing operations in both alternatives. The aircraft in that area will be controlled by the air traffic control tower and will be required to stay on the 400' section during runway operations. The shorter distance in Alternative 8a will dramatically reduce the impact of the restrictions on aircraft movement.

Community Support

The airport is a vital asset to the entire Roaring Fork Valley and beyond, as both an economic generator for the area and an essential link to the global community. Over the last decade the local community has been deeply vested and engaged in discussing the direction of the Airport. The County and the Airport have been committed to an open and thorough dialogue about the future of the Airport and facility improvements. This continues to be well supported and necessary. Ongoing discussions with the community moving forward regarding the role of the airport, the importance of maintaining air service to the region, and to garner the community input and support in further developing and refining feasible alternatives is essential.

The regulatory research performed in the section will provide an examination of the FAA required Runway centerline to Taxiway/Taxilane centerline separation and the approved Runway centerline to Taxiway/Taxilane centerline separation Modification to Standards at the Aspen/Pitkin County Airport. Additionally, other airports that have similar Modification to Standards for Runway centerline to Taxiway/Taxilane centerline separation will be identified. Finally, a brief discussion on ACRP Report 51, a study that examines risk assessment for non-standard separations on airfields, will conclude this regulatory research section.

FAA Requirement

Runway to Parallel Taxiway Separation

The FAA defines the requirements for Runway centerline to Taxiway/Taxilane centerline through a Runway Design Code (RDC). Per the AC 150/5300-13A for Airport Design, the RDC is established using three specific criteria:

Aircraft Approach Category (AAC). This criteria relates to specific aircraft approach speeds (operational characteristics). The FAA has 5 categories as follows[1]:

- **Category A –** Approach Speeds of less than 91 knots
- **Category B –** Approach speeds 91 knots or more but less than 121 knots
- **Category C –** Approach speeds of 121 knots or more but less than 141 knots
- **Category D –** Approach speeds of 141 knots or more but less than 166 knots
- **Category E –** Approach speeds 166 knots or more

Airplane Design Group (ADG). This criteria relates to either the aircraft tail height or wingspan (physical characteristics). The FAA has six Group numbers as follows[2]:

- **Group I –** Tail Height less than 20 feet and wingspan less than 49 feet
- **Group II –** Tail Height 20 feet or more but less than 30 feet and wingspan 49 feet or more but less than 79 feet
- **Group III –** Tail Height 30 feet or more but less than 45 feet and wingspan 79 feet or more but less than 118 feet
- **Group IV –** Tail Height 45 feet or more but less than 60 feet and wingspan 118 feet or more but less than 171 feet
- **Group V –** Tail Height 60 feet or more but less than 66 feet and wingspan 171 feet or more but less than 214 feet
- **Group VI –** Tail Height 66 feet or more but less than 80 feet and wingspan 214 feet or more but less than 262 feet

Visibility Minimums. The minimum visibility specified for approach, landing, or takeoff of aircraft, expressed in statute miles, or in feet where RVR is reported. The FAA has four categories of Visibility Minimums for airport design as follows[3]:

- Visual (A runway without an instrument approach)
- Not Lower Than 1 Mile
- Not Lower Than 3/4 Mile
- Lower than 3/4 Mile

For the Aspen/Pitkin County Airport, the Aircraft Approach Category is defined as "D", with highest approach speeds for aircraft above 141 knots but less than 166 knots. The Airplane Design Group is defined as "III", with the largest aircraft having tail heights greater than 30 feet but less than 45 feet and wing spans greater than 79 feet but less than 118 feet. Finally, the Visibility Minimums for Aspen/Pitkin County airport are 3 miles. Based upon these three criteria, the RDC for the Aspen/Pitkin County Airport is D-III with visibility minimums not lower than 1 mile.

When the RDC values for the Aspen/Pitkin County Airport are utilized in connection with the Runway Design Standards Matrix found in Appendix 7 of the 150/5300-13A Airport Design Advisory Circular, the FAA required separation for Runway centerline to Taxiway/Taxilane centerline at Aspen/Pitkin County Airport is 400 feet.

Modification of Standards for Runway Centerline to Taxiway/Taxilane Centerline

Aspen/Pitkin County Airport

The Aspen/Pitkin County Airport currently has an approved Modification of Standards for Runway centerline to Taxiway/Taxilane centerline separation of 320 feet, which is 80 feet less than the FAA standard of 400 feet for a RDC D-III airport. This Modification of Standards for the reduced Runway centerline to Taxiway/Taxilane centerline separation was approved by the FAA under Airspace Case No. 97-DEN-178-NRA, dated March 5, 1999.

The 320-foot Runway centerline to Taxiway/Taxilane centerline separation was recommended as part of the 1998 Airport Layout Plan (ALP) Update[4] in which Pitkin County had an analysis performed that examined the existing constraints that prohibited the Airport from complying with FAA's design standards. The goal of the 1998 ALP update was to make recommendations to provide foremost an acceptable level of safety along with an acceptable level of economy. Prior to this approval of the Runway centerline to Taxiway/Taxilane centerline separation, the airport was operating as a RDC D-III airport that had a Runway to parallel Taxiway separation of 221.5 feet.

There were two primary factors that led to the 320-foot Runway centerline to Taxiway/Taxilane centerline separation recommendation. The first factor, as previously mentioned, was the constraints that exist at the Aspen/Pitkin County Airport. The airport is physically constrained due to its surrounding topography as well as its proximity to State Highway 82. In particular, on the east side of the airfield where the existing parallel taxiway and aircraft parking ramps are located, the limited space available due to the location of Highway 82 makes it impractical to meet the FAA standard for Runway centerline to Taxiway/Taxilane centerline separation and have enough available area for aircraft parking.

The other factor that was considered was the current and future aircraft fleet mix. In order for the FAA to consider approving a non-standard Runway centerline to Taxiway/Taxilane centerline separation, the maximum size of aircraft with regard to wingspan would need to be limited. The airport wanted to determine whether such a limitation would impact their existing fleet mix or the known future fleet mix at the time. The goal was to determine a maximum wingspan for an aircraft that could safely function at the airport with a reduced Runway centerline to Taxiway/Taxilane centerline separation of 320 feet with no operational limitations imposed on the airport. The rationale that was used to determine the wingspan was as follows:

- FAA required Runway centerline to Taxiway/Taxilane centerline separation is 300 feet for Aircraft Approach Category C/D/E, Airplane Design Group II (wingspans less than 79 feet)[5]
- FAA required Runway centerline to Taxiway/Taxilane centerline separation is 400 feet for Aircraft Approach Category C/D/E, Airplane Design Group III through IV (wingspans 79 feet or more but less than 171 feet)[6]
- Assuming the level of safety is similar for a 78-foot wingspan aircraft with a 300-foot Runway centerline to Taxiway/Taxilane centerline separation and a 170-foot wingspan aircraft with a 400-

foot Runway centerline to Taxiway/Taxilane centerline separation, the following equation was used:

  - » 400' – 300' (difference in separation requirements for ADG C/D/E III through IV and ADG C/D/E II)
  - » 170' – 78' (difference in maximum aircraft wingspans for ADG IV and ADG II)
  - » Results in 1.09 feet of additional separation for each one foot of additional wingspan.
- Applying this 1.09 feet of additional separation required for each one foot of wingspan results in a 319-foot Runway centerline to Taxiway/Taxilane centerline:
  - » 95' – 78' = 17 (difference in wingspan limitation at ASE and ADG II maximum wingspan)
  - » 300' + (1.09 x 17') = 319' (separation proposed for ASE based upon 95-foot wingspan restriction)

The Runway centerline to parallel Taxiway separation at ASE was rounded up to 320'. This justification was coordinated with the FAA and the FAA concurred that by placing a 95-foot wingspan limitation on aircraft, a 320-foot Runway to parallel Taxiway separation would provide an acceptable level of safety. However, approval of this Modification of Standard was contingent on an ordinance being enacted that limited operations to aircraft with wingspans 95 feet or less. On October 3, 2001, Pitkin County Ordinance 041-2001 was adopted, which as codified, provides: "No person shall operate any Aircraft to, from, or on the Airport which has a tip-to-tip wingspan of greater than 95 feet."[7]

The methodologies that led to the conclusion that a non-standard 320-foot Runway centerline to Taxiway/Taxilane centerline separation with a limit on aircraft wingspan of 95 feet or less were considered to be reasonable and acceptable to the FAA to provide an acceptable level of safety. There are no specific methodologies provided by the FAA that address non-standard Runway centerline to Taxiway/Taxilane centerline separation.

Modification of Standards for Runway to Parallel Taxiway Separation

Other Airports

The Aspen/Pitkin County Airport is not unique when it comes to having an FAA approved Modifications of Standard for Runway centerline to Taxiway/Taxilane centerline separation. There are other airports that have similar physical constraints from the area surrounding the airfield as the Aspen/Pitkin County Airport for which a non-standard Runway centerline to Taxiway/Taxilane centerline separation exists. Below are some examples of airports that have approved Modifications to Standards for these conditions:

Airport	Airport Reference Code	Modification of Standard	FAA Standard	Existing Condition	Approval Date
Addison Airport, Addison, TX	C-III	Runway/Taxiway separation	400 ft.	300 ft.	11/18/2008 *

** Conditions for Approval - None*

Airport	Airport Reference Code	Modification of Standard	FAA Standard	Existing Condition	Approval Date
Igor I. Sikorsky Memorial Airport, Stratford, CT	C-II	Runway/Taxiway separation	300 ft.	268 - 300 ft.	08/04/2003 *

** Conditions for Approval – Location of Taxiway holding positions at 250 ft. from Runway centerline*

Airport	Airport Reference Code	Modification of Standard	FAA Standard	Existing Condition	Approval Date
Barnstable Municipal Airport, Hyannis, MA	B-III	Runway/Taxiway separation	400 ft.	300 ft.	08/17/1998 *

** Conditions for Approval – Maintain ATR-42 or less demanding design aircraft*

Airport	Airport Reference Code	Modification of Standard	FAA Standard	Existing Condition	Approval Date
Laconia Municipal Airport, Gilford, NH	C-III	Runway/Taxiway separation	400 ft.	210 ft.	04/24/1974 *

** Conditions for Approval – Continue commuter substitute seasonal service. Construct taxiway safety area to general aviation transport criteria*

Airport	Airport Reference Code	Modification of Standard	FAA Standard	Existing Condition	Approval Date
Taunton Municipal Airport, Taunton, NH	B-II	Runway/Taxiway separation	240 ft.	197 ft.	6/26/2002 *

** Conditions for Approval – Restudy of the proposed Modification of Standard if a significant change in aircraft size or volume operations occur at Taunton*

With the continued evolution of the aviation industry, existing airports may not have the capacity to meet FAA standards for some new aircraft, which are more efficient and environmentally friendly, but may have larger physical characteristics, such as wingspans, than the aircraft that currently operate at the airport. Recent examples of such aircraft are the Airbus A380 and the Boeing 747-8. To address the situation for the Boeing 747-8, the FAA conducted an analysis to determine whether the 747-8, which is an AGD VI aircraft, could operate on airfields designed for ADG V aircraft with an acceptable level of safety. The conclusion of the study, which was authorized by the FAA on March 12, 2010 under Engineering Brief No. 81, stated that "the Boeing 747-8, an ADG VI airplane, can operate with existing design standard ADG V runway centerline to taxiway/taxilane centerline separations as long as the tail height is within the ADG V limit of 66 feet."[8] The Engineering Brief No. 81 guidance only applied to non-standard Runway centerline to Taxiway/Taxilane centerline separation in regard to the 747-8 aircraft and the FAA still required airports that could not meet the FAA standard to submit a Modification of Standards request. The table to the right shows some airports which have an FAA approved Modification of Standard for Runway centerline to Taxiway/Taxilane centerline separation.

The Modification of Standards for Runway centerline to Taxiway/Taxilane centerline separation listed above is by no means a complete listing of airports that have this non-standard condition. However, what this list does show is that throughout the country, there are airports where the FAA has accepted a non-standard Runway centerline to Taxiway/Taxilane centerline separation as providing an acceptable level of safety, as they have done at the Aspen/Pitkin county Airport. It should be noted that with the continual development of new technologies in material and design that make flying larger aircraft possible and more efficient, existing airports are going to continue to find it difficult to meet FAA criteria for such aircraft due to limited room for expansion.

Airport Cooperative Research Program (ACRP) Report 51

The Transportation Research Board of the National Academies was authorized by the FAA to perform a study that could assist in development of a methodology for assessing the risk of aircraft collisions associated with non-standard airfield separations. The result of this study was published in 2011 under the title *ACRP Report 51 - Risk Assessment method to Support Modification of Airfield Separation Standards.*

In examining the ACRP Report 51 methodology specifically for risk of aircraft collisions associated with non-standard Runway centerline to Taxiway/Taxilane centerline, there were two different methods used

Airport	Airport Reference Code	Modification of Standard	FAA Standard	Existing Condition	Approval Date
Boston Logan International Airport, Boston, MA	D-V	Runway/Taxiway separation	500 ft. * 500 ft. #	400 ft.	03-16-2011
Chicago O'Hare International Airport, Chicago, IL	D-V	Runway/Taxiway separation	500 ft. * 550 ft. #	400 ft. 450 ft. 500 ft.	08/16/2011
Cincinnati/Northern Kentucky International Airport, Hebron, KY	D-V	Runway/Taxiway separation	500 ft. * 550 ft. #	400 ft.	11/26/2012
Detroit Metropolitan Wayne County Airport, Detroit, MI	D-V	Runway/Taxiway separation	500 ft. * 550 ft. #	400 ft.	04/12/2011
Denver International Airport, Denver, CO	D-V	Runway/Taxiway separation	604.34 ft. (includes elev. adj)	600 ft.	02/09/2011
Hartsfield Jackson Atlanta International Airport, Atlanta, GA	D-V	Runway/Taxiway separation	500 ft. * 550 ft. #	450 ft.	03/23/2011
Huntsville International Airport, Huntsville, AL	D-V	Runway/Taxiway separation	500 ft. * 550 ft. #	400 ft. 450 ft.	02/03/2011
John F. Kennedy International Airport, Jamaica, NY	D-V	Runway/Taxiway separation	500 ft. * 550 ft. #	400 ft. 450 ft.	02/03/2011
Newark Liberty International Airport, Newark, NJ	D-V	Runway/Taxiway separation	500 ft. * 550 ft. #	400 ft.	12/02/2011
Rafael Hernandez Airport, Aguadillo, P.R.	D-V	Runway/Taxiway separation	500 ft. * 550 ft. #	405 ft.	01/25/2013
San Francisco International Airport, San Francisco, CA	D-V	Runway/Taxiway separation	500 ft. * 550 ft. #	400 ft.	03/11/2011
Seattle-Tacoma International Airport, Seattle, WA	D-V	Runway/Taxiway separation	500 ft. * 550 ft. #	400 ft.	11/2010
Toledo Express Airport, Toledo, OH	D-V	Runway/Taxiway separation	500 ft. * 550 ft. #	500 ft.	02/07/2011

** For approaches with visibility less than 3/4 statute mile, separation is 500 ft. plus elevation adjustment*[9]
 # For approaches with visibility less than 1/2 statute mile, separation is 550 ft. plus elevation adjustment

for developing risk models. The FAA/ICAO Collision Risk Model (CRM) was used to develop Collision Risk Plots for aircraft during the airborne (approach) phase of landing based on the statistical probability of vertical and lateral deviations of approaching aircraft. For the ground phase during landing (landing rollout) and takeoff risk models, ACRP used data taken from veer-off accident/incident reports from several countries for aircraft with Maximum Takeoff Weight greater than 5,600 pounds. All of the data and statistics gathered are then plotted onto collision risk curves.

The overall collision risk curves for both landing during the airborne (approach) phase and ground (landing rollout) phase and during the takeoff phase are intended to show the statistical probability per number of operations (landing or takeoff) that a collision will occur for a specific ADG at a specific Runway centerline to Taxiway/Taxilane centerline separation. In general, when the collision risk curve tables in the ACRP Report 51 are used to determine the risk of an aircraft collision for situation stated above, the statistical probability ends up being so remote that non-standard separations could easily be justified. However, the collision risk tables also show that the smaller amount of operations an airport has for any ADG, the less airfield separation is required. The ADG for an airport is determined by a critical or design aircraft for which the airfield geometry is constructed for that aircraft to safely operate. The FAA defines a critical or design aircraft as the most demanding aircraft with at least *500 annual operations,* that operates, or is expected to operate, at the airport. Based upon that small number of annual operations, one can come to the conclusion, using the ACRP Report 51 collision risk curve tables, that no airfield separations for safety should be required. This conclusion would certainly not be acceptable to the FAA nor could it be justified.

Therefore, although a large amount of data and statistical research went into the ACRP Report 51, and such information could be valuable in the future as part of a broader safety/risk assessment for non-standard airfield separations, the resulting collision risk models leave room for question. In addition because the FAA has not officially adopted the ACRP Report 51 as a way to justify a non-standard condition for airfield separation, the Aspen/Pitkin County Airport will not use this report for any justification in the Future Air Service Planning Study.

Sources

[1] FAA Advisory Circular 150/5300-13A – Airport Design, Page 13, Table 1-1

[2] FAA Advisory Circular 150/5300-13A – Airport Design, Page 14, Table 1-2

[3] FAA Advisory Circular 150/5300-13A – Airport Design, Page 276, Appendix 7, Table A7-10

[4] Isbill Associates, Aspen-Pitkin County Airport, Airport Layout Plan Update (Dec. 1998)

[5] FAA Advisory Circular 150/5300-13A – Airport Design, Page 274, Appendix 7, Table A7-8

[6] FAA Advisory Circular 150/5300-13A – Airport Design, Page 275-276, Appendix 7, Tables A7-9 and A7-10

[7] Pitkin County Code § 10.12.030(C)

[8] FAA Engineering Brief No. 81, March 12, 2010, Front Page

[9] FAA Advisory Circular 150/5300-13A – Airport Design, Page 279, Appendix 7, Footnote 6

Appendix B

Please see separate document.

Appendix C

Please see separate document.

Appendix D

Please see separate document.

Part I: Introduction

Lean Photometrics (LP), as a subconsultant to Jviation, performed an flight procedure impact assessment at the Aspen/Pitkin County Airport (ASE) to review the impact of shifting Runway 15/33 to the west of its current location. Four runway shifting options were considered. The runway shift options are intended to achieve a design goal of increasing the maximum permissible wingspan for runway/taxiway separation from its current 95' limitation to 115'. While the shift in runway will cause changes to the existing and future instrument flight procedures at the airport, the shift in the runway is not seen as means to "improve" the airspace capabilities. Therefore the analysis performed by LP was to determine the potential impact on existing and future procedures, rather than determine an ideal runway location for the purposes of maximizing airspace capacity or VFR/IFR capabilities.

Of the 4 options reviewed, the analysis performed by Lean revealed that none of the proposed options would have a significant impact on the ability of aircraft operators to use the existing and future instrument flight procedures at ASE. In addition, none of the options carried the need to discontinue or change an existing instrument approach or departure procedure in such a way as to render it unusable to current or future aircraft operations. However, this conclusion was based not only on changes to the runway and NAVAID locations but also on upcoming changes to the existing procedures at the current location of the runway.

While not the purpose of this study, the analysis revealed that the FAA has yet to implement changes which are based on updated circling criteria implemented in 8260.3B Change 21 as well as an updated AC-150-5300-18B Vertically Guided Approach obstruction survey available in June of 2013. These changes to instrument procedures at ASE, will have a non-trivial impact on the airport and aircraft operator's ability to successfully land at their destination in inclement weather conditions. As a result of these imminent changes, coupled with the airports ability to handle larger more capable aircraft, the development of broadly accessible RNP-AR approaches should be considered as a strong risk mitigation against a reduction in aircraft completion factors.

Part II: Overview

Lean Photometrics was tasked to review the airspace impacts of shifting Runway 15/33 to the west of its current location. The shift in the runway location is intended to achieve FAA standard taxiway safety area compliance and increase the maximum aircraft wingspan at the airport from 95' to 115'. This increase in maximum span would accommodate future aircraft operations like the C-Series, 2nd generation E-Jets, MRJs, Global Express 7000/8000 and the G-650.

The airspace impact analysis was intended to identify the potential impacts on current and future approach, departure and special flight procedures for runways 15 and 33 by comparing the changes to ceilings and visibilities, NAVAID issues and operating restrictions. The contents of this report, and associated appendices, are intended to describe the methods, information and analysis used to make an impact assessment based on the comparison of changes between a baseline state and the proposed future runway states. It is important to note, this report was performed without discussions with FAA flight procedures group, FAA Engineering Services, and FAA Flight Standards as well as other FAA and airline stakeholders. While we have been granted permission to use the same instrument procedure development software/systems available to the US government, our analysis does not constitute an FAA approved procedure, nor was it generated within any assets of the FAA aeronautical data enterprise. As such these results are applicable only for comparative purposes, and any final versions of public or private procedures must still be designed and approved by the FAA and aircraft operators.

Part III: Background

Airport

Aspen/Pitkin County Airport (ASE) is a single runway airport situated west of the Continental Divide in the Rocky Mountains of Colorado. The airport reference point is 7838ft MSL with mountains reaching heights above 14000ft MSL within 10 to 12nm of the airport. In addition to precipitous terrain, the airport is also situated in a valley with mountains rising from 9000ft to 12000ft in the immediate vicinity of the approach and departure paths of both ends of the runway.

The airport, and any non-slaved NAVAIDs at the airport, currently has a magnetic variation of 09E in the 2015 epoch.

The airport has been designated by the FAA as a Special Airport that needs to be addressed via the requirements set forth in FAR 121.445 Pilot in command airport qualification: Special areas and airports. This means that in addition to increased awareness of the area around the airport, scheduled flight crews must be specially trained in order to fly scheduled service and fly approaches into the airport at altitudes less than 1000ft below the MEA/MOCA or with visibilities less than 3 miles. While this rule is specific to 121 operations, many Principle Operations Inspectors also require a non-121 aircraft operator wishing to use any of the public or private special procedures at the airport to comply with this higher standard of training prior to operating at the airport.

Runway

ASE has a single 8006ft x 100ft grooved runway, named 15/33, oriented northwest/southeast on a bearing of 159.63 True (150.63 Magnetic) and 339.64 True (330.64 Magnetic). The runway has a slope of 2% uphill when proceeding in the southeast direction.

The runway currently has declared distances in place on the south end of the runway and a displaced threshold for landing on Runway 33 which is collocated with the end of the ASDA for Runway 15. This creates the following distances available for aircraft operators and their performance computations:

Declared Distances for Runways

Runway	TORA	TODA	ASDA	LDA
15*	7006	7006	7006	7006
33	8006	8006	8006	7006

** Some aircraft operators under FAR 91, 91-K and 135, do not use declared distances for performance calculations. Those operators would utilize 8006ft for all declared distances.*

Runway 15

Runway 15 is the primary runway for arrivals into ASE. It is served by several non-vertically guided approach procedures utilizing a localizer and DME equipment (I-ASE) for improved lateral guidance to the runway. Departures on Runway 15 are prohibited without consent from the airport and the tower.

Runway 15 has a VGSI set to a non-standard 3.5 degree angle with restrictions on its usage due to rapidly rising terrain to the west of the straight-in approach path on the runway.

The Runway 15 approach end has a 1400ft MALSF system installed leading to a medium intensity runway edge lighting system along the entire length of the runway.

Runway 15 currently has a clear 20:1 and 34:1 surface, but the 40:1 surface and POFZ are both penetrated by obstructions.

Runway 33

Runway 33 is the primary runway for departures out of ASE. Operators can execute visual or circling approaches to the runway, but this is an uncommon situation.

Runway 33 has no VGSI and is marked by a runway end indicator light system and a medium intensity runway edge lighting system.

All Runway 33 protection surfaces pertinent to instrument and visual flight procedure design are penetrated.

NAVAIDs

Runway 15 is served by a localizer/DME combination (I-ASE) with an extended service volume which has been previously flight checked to assure approach waypoints up to 20nm away from the source. The airport is also serviced by an LDA (I-PKN) located to the south of the airport which provides a normal sensing signal for aircraft to utilize when executing either conventional navigation departure procedures from Runway 33 or the conventional navigation missed approach procedures to Runway 15.

Flight Procedures

Overview

ASE is situated in class D/E airspace and is controlled by a local Tower, operating under limited hours, with handoffs to Denver Center (ZDV) for departure and arrivals. Under periods of intense traffic (December through April), the airport will revert to a slot controlled system.

Arrivals into ASE typically commence in the vicinity of the Rifle VOR (RIL) or the Red Table VOR (DBL). Several approach procedures into the airport involve long feeder legs with steep descent gradients which high speed aircraft operators have developed special procedures to accommodate. Most approaches are intended to stay "above" the departure procedures coming from Runway 33

Departures out of ASE typically head to the north or northwest following visual maneuvering, dead reckoning or RNAV turns within the first 3nm from the departure end of Runway 33.

There are no published departure procedures, public or private, for use on Runway 15.

There are no public instrument approach procedures to Runway 33. However, several FMS visual procedures have been successfully implemented in conjunction with circling approaches to the runway. These procedures are an extension of visual flight rules and are approved for private operator use only.

The airport currently has no public RNP, LNAV/VNAV or LPV, approach procedures. However, the FAA instrument procedure coordination website indicates that RNP procedures are currently slated for development in the 2015/2016 timeframe.

The following is a list of public and private procedures currently in use at the airport which were analyzed as a part of the airspace impact analysis.

This list does not include the RNAV (GPS) – Z special approach to Runway 15 (20SEP12, Rev 0A) for two reasons. The first was that the procedure was not available in time for inclusion into this analysis. The second reason is that the range of operators currently using this procedure is unknown as it is not in use by any schedule air carrier (although it may be used by a business jet operator).

Approaches at ASE

Runway	Procedure Name	Procedure Revision	Procedure Type	Ownership
15* or 33*	LOC-DME E	20SEP12 Rev 1B	Circling	Public
15	LOC-DME 15	20SEP12 Rev 1B and 28SEP14 Rev 2	Straight-In	Public – Special
15* or 33*	RNAV (GPS) - F	20SEP12 Original A	Circling	Public
15	RNAV (RNP) - Y	20SEP12 Rev 0A	Straight-In, RNP-AR	Private – Special**
15* or 33*	VOR/DME - C	26OCT12 Rev 5	Circling	Public
15*	Roaring Fork Visual	26OCT12 Rev Original	Visual	Public

**Procedure not authorized at night*
***The FAA lists this procedure as public-special, but there is limited evidence of more than one operator utilizing the procedure*

Departures at ASE

Runway	Procedure Name	Procedure Revision	Procedure Type	Ownership
33	ASPEN SIX	16AUG13	Conventional SID	Public
33	SARDD THREE	21JUN13	Conventional ODP	Public
33	LINDZ EIGHT	16AUG13	Conventional SID	Public
33	PITKIN FOUR	21JUN13	RNAV SID	Public
33	GLENO TWO	18JAN13	RNAV SID	Private – Special**
33	33 EOSID	Various (2009 – 2013)	Conventional DP	Private – Special
33	33 EOSID	Various (2009 – 2013)	RNAV DP	Private – Special

***The FAA lists this procedure as public-special, but there is limited evidence of more than one operator utilizing the procedure*

Public Procedures

Approaches

LOC DME-E

The LOC DME-E approach is a public, conventional navigation, circling only instrument flight procedure to runways 15 and 33 originating either at the Red Table VOR (DBL) or an IASE LOC/DME fix called AJAXX at D19.1. The approach course follows the I-ASE LOC course along the extended centerline of the runway. The approach begins at an altitude of 13400ft and utilizes several step-down fixes in the intermediate segment to ultimately reach a minimum descent altitude and visibility of:

CAT A: 9840ft (2003 ft HAT), 3 miles

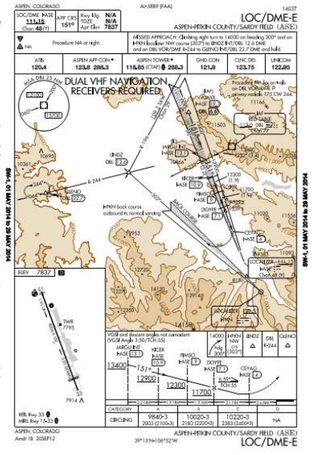
CAT B: 10020ft (2183 ft HAT), 3 miles

CAT C: 10220ft (2383 ft HAT), 3 miles

The current version of this procedure, Amdt 1B 20SEP12, has not yet been analyzed for updated circling criteria and has not been amended to incorporate the latest obstruction information.

There are no circling restrictions, other than the general prevention of circling at night time.

The missed approach commences at an I-ASE LOC/DME fix called CEYAG located at D4.0 and requires a right turn to the northwest to track the I-PKN Localizer back course outbound to the LINDZ intersection and then on to a holding pattern at a fix defined by the DBL VOR called GLENO south of the Rifle-Garfield County Airport (KRIL).



The approach procedure requires dual VHF navigation due to the requirement to utilize the I-ASE Localizer, the I-PKN Localizer and the DBL VOR.

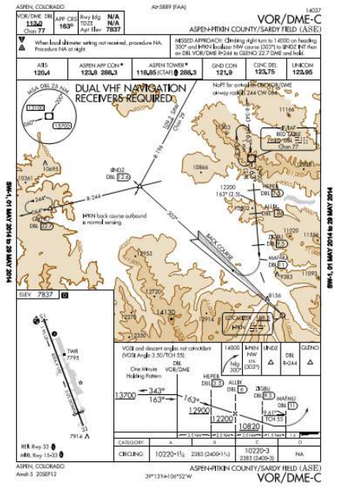
The descent angle from the final approach fix to the TCH point on the runway is extremely steep, at 6.59 degrees, and usually requires operators to visually create a more shallow descent angle to the runway.

VOR DME-C

The VOR DME-C approach is a public, conventional navigation, circling only instrument procedure to runways 15 and 33 originating at the Red Table VOR (DBL). The approach course follows a radial on a slaved magnetic bearing of 163° towards the Runway 15 threshold. The approach

begins at an altitude of 13700ft and utilizes step-down fixes in both the intermediate and final approach segments to ultimately reach a minimum descent altitude and visibility of:

- CAT A: 10220ft (2383 ft HAT), 1 3/4 miles
- CAT B: 10220ft (2383 ft HAT), 1 3/4 miles
- CAT C: 10220ft (2383 ft HAT), 3 miles



There are no circling restrictions, other than the general prevention of circling at night time.

The missed approach commences at a DBL VOR/DME fix called MAFMU located at R-163/D11.1 and requires a right turn to the northwest to track the I-PKN Localizer back course outbound to the LINDZ intersection and then on to a holding pattern at a fix defined by the DBL VOR called GLENO south of the Rifle-Garfield County Airport (KRIL).

The approach procedure requires dual VHF navigation due to the requirement to utilize the I-PKN Localizer and the DBL VOR.

The descent angle from the final approach fix to the TCH point on the runway is extremely steep, at 9.61°, and usually requires operators to visually create a more shallow descent angle to the runway.

RNAV (GPS) – F

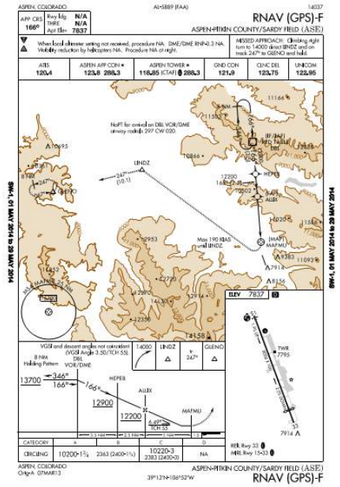
The RNAV (GPS) - F approach is a public, RNAV, circling only instrument procedure to runways 15 and 33 originating at the Red Table VOR (DBL). The approach course follows a magnetic heading of 166° towards the Runway 15 threshold. The approach begins at an altitude of 13700ft and utilizes a step-down fix in the intermediate approach segment to ultimately reach a minimum descent altitude and visibility of:

- CAT A: 10200ft (2363 ft HAT), 1 3/4 miles
- CAT B: 10200ft (2363 ft HAT), 1 3/4 miles
- CAT C: 10220ft (2383 ft HAT), 3 miles

The current version of this procedure, Orig A 07MAR13, has not yet been analyzed for updated circling criteria and has not been amended to incorporate the latest obstruction information.

There are no circling restrictions, other than the general prevention of circling at night time.

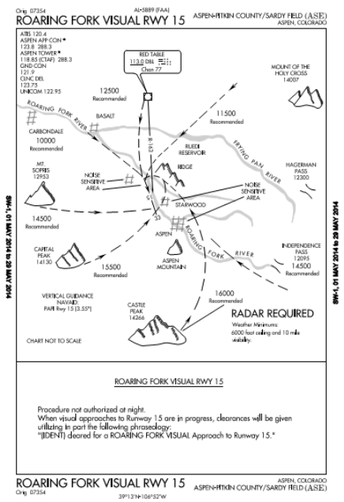
The missed approach commences at the RNAV equivalent of the DBL VOR/DME fix called MAFMU and requires a right turn to the northwest to the LINDZ intersection (Direct to Fix) and then on to a holding pattern at the RNAV equivalent of the DBL VOR/DME fix called GLENO south of the Rifle-Garfield County Airport (KRIL). Due to the lack of positive course guidance from the IPKN localizer, the initial turn in the missed approach has a speed restriction of 190 KIAS to avoid significant terrain to the south and southwest of the missed approach path.



The descent angle from the final approach fix to the TCH point on the runway is extremely steep, at 6.69°, and usually requires operators to visually create a more shallow descent angle to the runway.

Roaring Fork Visual RWY 15

The Roaring Fork Visual approach is a public, visual procedure to Runway 15 originating from various directions around the ASE airport. As a visual approach, pilots are expected to maintain separation from terrain and obstructions and can descend towards Runway 15 using visual references. In order to utilize this procedure operators must confirm that weather conditions in the area have higher than standard visual meteorological (2000ft below the MEA/MOCA) conditions as follows:

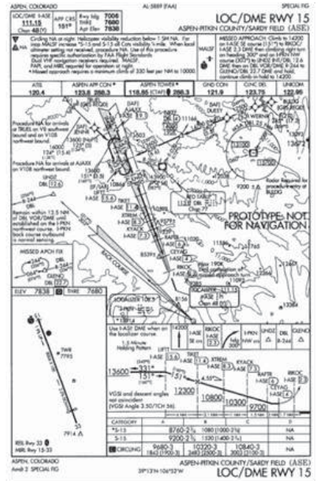


- CAT A: 13680ft (6000 ft HAT), 10 miles
- CAT B: 13680ft (6000 ft HAT), 10 miles
- CAT C: 13680ft (6000 ft HAT), 10 miles

Visual approaches do not have circling maneuvers or missed approach "procedures" and as such the current version of the Roaring Fork Visual is not affected by the change in TERPS criteria or the latest obstruction survey.

Special LOC-DME RWY 15

The LOC DME-E approach is a public special, conventional navigation, straight-in instrument procedure to Runway 15 and circling approach to runways 15 and 33. The approach originates either at the Red Table VOR (DBL), an I-ASE LOC/DME fix called AJAXX at D19.1 or via several feeder legs identified by RNAV fixes from both the northwest of DBL and the East/Northeast of DBL. The approach follows the I-ASE LOC course along the extended centerline of the runway. The approach begins at an altitude of 13600ft and utilizes several step-down fixes in the final approach segment to ultimately reach a straight-in minimum descent altitude and visibility of:



- CAT A: 9200ft (1520 ft HAT), 2 3/4 miles
- CAT B: 9200ft (1520 ft HAT), 2 3/4 miles
- CAT C: 9200ft (1520 ft HAT), 2 3/4 miles

When operators can provide an acceptable means of compliance with the alternate missed approach procedure, or a non-standard climb gradient requirement on the standard missed approach procedure, then the straight-in minimum descent altitude and visibility is reduced to:

CAT A: 8760ft (1080 ft HAT), 2 3/4 miles

CAT B: 8760ft (1080 ft HAT), 2 3/4 miles

CAT C: 8760ft (1080 ft HAT), 2 3/4 miles

The circling minimums for this procedure have also been published under the latest TERPS criteria, but do not apparently reflect the latest

terrain and obstruction information available at the airport. Circling ceilings and visibility are:

- CAT A: 9680ft (1900 ft HAT), 3 miles
- CAT B: 10320ft (2483 ft HAT), 3 miles
- CAT C: 10840ft (3003 ft HAT), 3 miles

The version of the LOC-DME special procedure considered for this analysis is currently pending publication on 28SEP14, Amdt 2. **According to the instrument procedure coordination forms, the procedure has been analyzed for updated circling criteria and the latest obstruction information.** However, the circling radius used for Category C is not currently detecting limiting terrain to the southwest of the airport and should result in a further increase to the CAT C circling ceiling required to at least 11640ft.

There are no circling restrictions, other than the general prevention of circling at night time. For straight-in approaches to Runway 15, the PAPI must be operational. In the event that the MALSF is out of service, then the straight in visibilities will increase to 3 miles.

The LOC-DME special approach has a standard and alternate missed approach procedure, both of which commence at an I-ASE LOC/DME fix called RIKOC located at D2.3. The primary missed approach method requires a right turn to the northwest to track the I-PKN Localizer back course outbound to the LINDZ intersection and then on to a holding pattern at a fix defined by the DBL VOR called GLENO south of the Rifle-Garfield County Airport (KRIL). This missed approach procedure can either be flown at a standard missed approach gradient (200ft/nm), with higher ceilings, or at 330ft/nm to 10000ft, with lower ceilings. The initial turn to the Northwest must be made at a reduced speed of 190 KIAS and additional restrictions were implemented by requesting that flight crews remain within 13.5nm of the DBL VOR/DME to ensure separation from rapidly rising terrain to the southwest of the missed approach path.

The alternate missed approach procedure requires crews to fly heading 325° and DME Arc (D10.0 DBL VOR/DME) until intercepting the DBL VOR R-244 outbound to the GLENO intersection. This procedure also has a 190KIAS speed restriction and a climb gradient requirement of 330ft/nm to 11100ft.

The approach procedure requires dual VHF navigation due to the requirement to utilize the I-ASE Localizer, the I-PKN Localizer and the DBL VOR.

The descent angle from the final approach fix to the TCH point on the runway is steep, at 4.55°, and usually requires operators to visually create a more shallow descent angle to the runway.

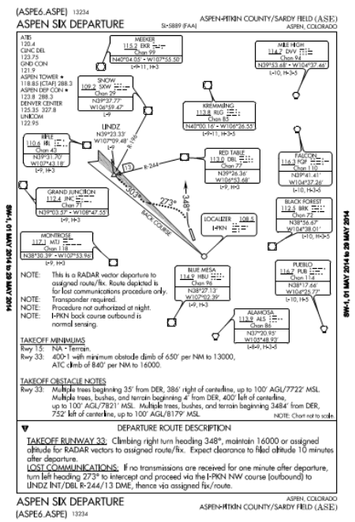
As a special procedure, operators must request the use of this approach procedure from their POI or CMO and then show additional compliance with pilot training, aircraft equipment and aircraft performance before being approved to fly the approach. Due to the nature of this approach being classified as "special" several portions of the approach require waivers and deviations from standard TERPS, including alternate missed approach design criteria, missed approach climb gradients, short intermediate segments and high descent angles to name a few.

Although this procedure is "special", it is maintained by the FAA and kept current via NOTAM and AIRAC updates.

Departures

ASPEN 6

The ASPEN Six departure is a conventional navigation, Standard Instrument Departure procedure for Runway 33 only. Aircraft that utilize the SID are expected to comply with standard departure procedures by climbing on runway heading to 400ft HAR before turning to a magnetic heading of 348°. Once the aircraft reaches 16000ft, or earlier if the aircraft appears on radar sooner, the pilot will receive vectors from Denver ARTCC (ZDV).

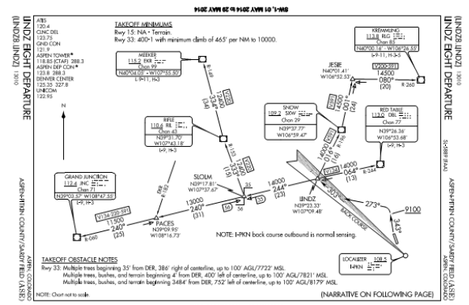


The current ceilings and visibility of 400ft HAR and 1 mile are predicated on visually avoiding terrain and obstructions in the initial diverse departure area. Continued obstacle clearance beyond the initial climb area is dependent on the aircraft maintaining 650ft/nm to 13000ft. For ATC vectoring purposes, aircraft are required to maintain 840ft/nm to 16000ft.

This procedure has a lost communications alternate departure route based on the SARDD DP.

LINDZ 8

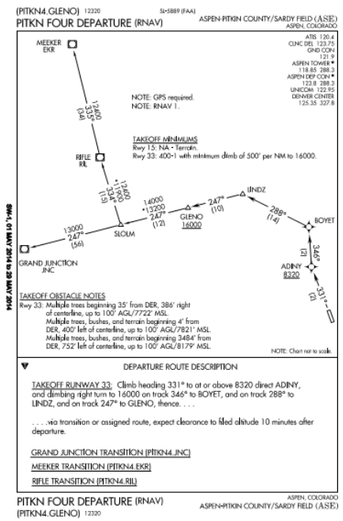
The LINDZ Eight departure is a conventional navigation, Standard Instrument Departure procedure for use on Runway 33 only. Aircraft that utilize this SID are expected to comply with standard departure procedures by climbing on runway heading to 400ft HAR before turning to a magnetic heading of 343°. Once the aircraft reaches 9100ft, the aircraft will initiate a turn to the west on a heading of 273° until intercepting the I-PKN Localizer back course (normal sensing) outbound to the LINDZ intersection. From there the aircraft can fly in one of several different predefined directions, or accept radar vectors from Denver ARTCC (ZDV).



The current ceilings and visibility of 400ft HAR and 1 mile are predicated on visually avoiding terrain and obstructions in the initial diverse departure area. Continued obstacle clearance beyond the initial climb area is dependent on the aircraft maintaining 465ft/nm to 10000ft. This climb rate ensures obstacle clearance and ensures that aircraft reach the 9100ft turning point prior to encountering higher terrain in the departure OCS.

PITKIN 4 RNAV

The PITKIN FOUR RNAV departure is a GPS based, RNAV 1.0, Standard Instrument Departure procedure for use on Runway 33 only. Aircraft utilizing this SID are expected to disregard standard departure procedures and proceed directly to the first fly-by waypoint at ADINY, which is approximately 2.3nm from the DER of Runway 33 along the extended runway centerline. Aircraft must be at or above 8320ft by the time they cross ADINY which requires an unpublished climb gradient of approximately 276ft/nm (based on the precise location of ADINY). From ADINY, the aircraft will continue North up the Roaring Fork River valley to the BOYET



waypoint and then execute a follow on turn to the LINDZ intersection before proceeding on to the GLENO intersection south of the Rifle-Garfield County Airport (KRIL). From there the aircraft can fly in one of two published transitions: North towards the Meeker VOR (EKR) near Hayden, CO or West towards the Grand Junction VOR (JNC) near Grand Junction, CO. Alternatively the aircraft can accept radar vectors from Denver ARTCC (ZDV).

The current ceilings and visibility of 400ft HAR and 1 mile are predicated on visually avoiding terrain and obstructions in the initial diverse departure area. Continued obstacle clearance beyond the initial climb area, and extended initial climb area, are dependent on the aircraft maintaining 500ft/nm to 16000ft. This climb rate ensures both obstacle clearance and an acceptable climb rate to obtain 16000ft prior to crossing the GLENO waypoint.

SARDD 3

The SARDD Three departure is a conventional navigation, Obstacle Departure procedure for use on Runway 33 only. Aircraft that utilize this ODP are expected to comply with standard departure procedures by climbing on runway heading to 400ft HAR before turning to a magnetic heading of 343°. Once the aircraft reaches 9100ft, the aircraft will initiate a turn to the west on a heading of 273° until intercepting the I-PKN Localizer backcourse outbound to the LINDZ intersection. From there the aircraft must climb in a holding pattern until cleared on course by Denver ARTCC (ZDV) or until reaching the MEA for the intended route of flight.

The current ceilings and visibility of 400ft HAR and 1 mile are predicated on visually avoiding terrain and obstructions in the initial diverse departure area. Continued obstacle clearance beyond the initial climb area is dependent on the aircraft maintaining 460ft/nm to 14000ft. This climb rate ensures obstacle clearance and ensures that aircraft reach the 9100ft turning point prior to encountering higher terrain in the departure OCS. The higher termination altitude on this procedure, when compared to the LINDZ 8 procedure, ensures that aircraft will enter the climb in hold at GLENO at an appropriate altitude.

Because of its status as the Obstacle Departure Procedure for ASE, this procedure, and its weather minimums/climb gradient requirement, is considered to represent the minimum requirement for departing the airport under instrument meteorological conditions. If an operator cannot meet the minimum performance requirements defined in the SARDD departure procedure, then they must depart under visual conditions.

Private Procedures

Approaches

RNAV (RNP) – Y

The RNAV (RNP) – Y approach is a private-special, RNP-AR, straight-in instrument flight procedure to Runway 33 only. The procedure originates at the Red Table VOR (DBL). The approach course consists of a series of track to fix and radius to fix legs that bring the aircraft in along the Roaring Fork Valley until the aircraft reaches the minimum descent altitude at a position offset from the runway centerline between the fixes of UCISE and SAYYO. The approach begins at an altitude of 12800ft and one step down fix in the intermediate segment and numerous vertically guided step-down fixes (divided across to descent angles) in the final approach segment to ultimately reach a minimum descent altitude and visibility of:

CAT C*: 8079ft (342 ft HAT), 1 ½ miles

**This approach was designed for one operator utilizing CAT C aircraft*

The current version of this procedure, Amdt 0A 20SEP12, has not yet been analyzed for the latest obstruction information.

Because of the approach's status as an RNP-AR approach, it can only be used as a straight in maneuver to Runway 15 with no circling permitted. In the event that the MALSF is out of service, then the straight in visibilities will increase to 1 ¾ miles.

The missed approach commences approximately 1.3nm from the runway threshold and requires the aircraft to proceed to a fly-over fix close to the runway before executing an RF/TF leg direct to the LINDZ intersection and then on to a holding pattern at a fix defined by the DBL VOR called GLENO south of the Rifle-Garfield County Airport (KRIL). This missed approach procedure requires a dual missed approach climb gradient of 1000ft/nm to 9100ft followed by 475ft/nm to 10900ft. The initial turn to the Northwest must be made at a reduced speed of 165 KIAS and be executed by aircraft with RNP 0.3 missed approach capability.

The approach requires numerous waivers from the FAA in order to be used by an RNP-AR approved aircraft operator and this particular approach is proprietary to that operator. For this purpose, a copy of the instrument approach page will not be issued in this report, but can be made available with permission from the procedure owner.

The FAA currently lists this approach procedure as a public special, but only one aircraft operator is known to be approved for its use and as such LEAN considers this to be a private procedure.

Departures

GLENO 2

The GLENO Two departure is a special GPS based, RNP departure procedure for use on Runway 33 only under all engines operating (AEO) and one engine inoperative (OEI) conditions. Aircraft that utilize this DP are expected to fly on an initial heading of 342 direct to the ILOME fix. After crossing ILOME (flying by ILOME) the aircraft will maneuver along a series of RF and DF legs through the Roaring Fork Valley to the Northwest until reaching the GLENO intersection/fix by 14000ft, or 11100ft OEI. From there the aircraft must climb in a holding pattern until cleared on course by Denver ARTCC (ZDV) or until reaching the MEA for the intended route of flight.

The current ceilings and visibility are dependent on the aircraft operators approval contained in their OpSpec and can be as low as 0ft HAR and ¼ mile due to the coincident path of both the AEO and OEI to ensure obstacle avoidance in the ICA. Continued obstacle clearance beyond the initial climb area is dependent on the aircraft maintaining 490ft/nm to 8900ft AEO and 150ft/nm to 10000ft OEI.

The only graphical depictions of this procedure available to the Lean Photometrics team are proprietary to a particular operator and will not be used in this report.

EOSID RWY 33

Most multi-engined aircraft operators at ASPEN have either purchased or developed a special engine-out departure procedure using RNAV or conventional navigation methods. In all cases, the procedures require the aircraft to make an immediate, or very low altitude, turn to a heading of 342/343 degrees before making a left turn to the northwest up the Roaring Fork Valley. From there, different operators utilize different engine failure procedures, specific to their company, to further contain the engine failure either by holding at unpublished fixes, holding at GLENO or LINDZ, or by proceeding directly to KRIL or KEGE.

Current regulations from the FAA and ICAO do not mandate an operator to place minimums on an EOSID, but many operators follow the best practices of various industry groups in establishing minimums for using elaborate procedures or during outages of the I-ASE LOC/DME or the DBL VOR/DME.

The only RNAV EOSID available to Lean Photometrics, other than the GLENO 2, was a "visual" EOSID requiring minimums of 3100ft and 3 miles.

Aircraft Operators

The Aspen/Pitkin County Airport has and is currently restricted by three primary issues for aircraft operators:

1. **Runway wingspan limitation of 95ft.**
2. **Runway width of 100ft.**
3. **A lack of straight-in instrument approaches, with reasonable missed approach climb gradients, under CAT C and D.**
4. **No circling or straight-in instrument approaches under CAT D conditions.**

These four elements combine to essentially restrict many narrow-body (and larger) aircraft from flying into or out of ASE under any FAR or foreign regulatory authority. While the purpose of this study is to support potential runway designs that can positively affect issue 1, the increase in the wingspan limitation to 115ft will not automatically enable narrow-body aircraft to begin operating at the airport until issues 2 - 4 can be resolved. Therefore, this section will be used to describe the kinds of operators that were examined to determine high level impact statements as a part of the analysis.

Regional Jets

Regional Jets refers to the group of aircraft with 50 to 130 seats, typically operated under a capacity purchase agreement or a pro-rated contract agreement between a FAR 121 certificated aircraft operator and a "major" air carrier (also operating under FAR 121). Aircraft in this segment, operating at ASE, have traditionally been restricted to either 4 engine aircraft (like the BAE-146/RJ-85) or the newer CRJ-700/701 series airplanes. These airplanes are not currently RNP capable, although some variants can be upgraded to WAAS, and rely solely on the LOC-DME Special, LOC-DME E and FMS visual procedures to safely fly in and out of the airport.

Larger regional jets typically utilize category C straight in and circling minimums.

Figure 1:
Bombardier CRJ-700

Figure 2:
Bombardier CS-100

In the future, the expansion of the runway wingspan limitation to 115ft will potentially allow for additional regional aircraft to operate into ASE. This can include aircraft like the Embraer ERJ-170/175/190/195 (1st or 2nd generation), Mitsubishi MRJ-70/90 and the Bombardier CS-100/300 aircraft. In addition to these aircraft, the possibility of flying CRJ-900 aircraft is still possible. The newer regional jets, like the C-Series or second generation E-Jets, are all expected to be RNP-AR capable and will easily overcome the previous issues that may have limited their operations currently.

Business Jets

Business Jets refers to the diverse group of aircraft catering to the corporate or fractional jet owner with seating that can accommodate between 2 to 18 occupants. These flights are operated across a spectrum of regulations from FAR 91, to FAR 135. However, it is uncommon to find aircraft in this category operated under FAR 121.

Figure 3:
Gulfstream Aircraft

Business Jets are usually divided into standard and "high-performance" categories when discussing instrument procedure impacts at airports like Aspen. While all business jets are "high performance" based on their design and limited payload, the medium and large cabin business jets like various Gulfstream models, Bombardier Global Express Family and various Dassault are all capable of achieving significant climb gradients during a missed approach and most of the newer models come with RNP-AR like capabilities. Standard business jets are more often thought of as the VLJ, small cabin and older medium cabin aircraft like the Embraer, Cessna, Hawker and LearJet aircraft. Even these aircraft are highly capable airplanes, but many of them aren't quite as adept at making such extreme climb gradients at the demanding density altitudes at ASE.

Business Jets typically operated under straight in approach categories of A to C and are more often required to use circling minimums in category B and C.

Business Jet operators at ASE typically rely on the LOC-DME E or the LOC-DME Special. The larger operators have also been responsible for much of the existing RNAV and RNP procedure capabilities at the airport and while they are not often required to fly those procedures, their access to them in the planning phases ensures that they can carry lower fuel loads and reduce their chances of a diversion due to inclement or changing weather.

The next generation of business jets will bring more RNP-AR capability (including 0.1 in the missed) along with better performance capabilities at an airport that is considered to be a gold standard for determining the effectiveness of the aircraft.

Turboprops

Turboprops cover a very wide range of aircraft, but in the context of this analysis the focus is on single and multi-engine turboprop aircraft used in scheduled, chartered or business jet operations. This included larger aircraft like the Bombardier DHC-8 series, and it can also include smaller aircraft like the Beechcraft King Air series or even the Pilatus PC-12. The distinction to be made in this group is of a category of aircraft that have relatively slow approach speeds, coupled with highly capable missed approach climb gradient performance.

Figure 4:
Bombardier DASH-8-Q400

The turboprop aircraft can utilize virtually all of the current instrument procedures at ASE due to their slower speeds and ability to safely achieve steep descent gradients. Several scheduled turboprop operators utilize visual FMS procedures for circling to Runway 33 when weather conditions permit. This is currently the only "scheduled" service that can use Runway 33 for approach.

Turboprops are usually operate under CAT A or B minimums, with most utilizing CAT B circling minimums.

The next generation of turboprops will most likely not usher in significant improvements in aircraft performance, but will carry additional RNAV capabilities similar to what Horizon Airlines has been able to achieve with their RNP 0.1 WAAS implementation on the DHC-8-Q400 aircraft.

Smaller Aircraft

The term smaller aircraft is being used in this analysis to represent all the aircraft types that are smaller than what would otherwise be considered a turboprop or business jet. These aircraft vary widely size, performance and operating speeds, but typically do not have seating for more than 6 – 8 passengers and are void of turbine engines. Smaller

Figure 5:
Cirrus SR-22

aircraft tend to operate under visual meteorological conditions due to their limited performance capabilities at Density altitudes above 8000ft, but can utilize any of the approaches at the airport under Category A or B minimums due to their relatively low approach speeds.

Part IV: Analysis

Overview

The airspace impact analysis on Runway 15/33 at ASE required the comparison of instrument procedure minimums and climb gradients supporting the current state of the runway against the changes required to maintain the same instrument procedure inventory for each of the proposed runway shift options. The analysis also looked for any approach or departure procedures that would be structurally or functionally eliminated by a runway shift.

In order to accomplish the analysis the current runway, NAVAID, geospatial data and design criteria were used to create a baseline instrument procedure state, referred to as State 1. The importance of establishing a baseline state for comparing future procedures against, rather than simply starting with the published procedures, is to reveal both the methods and underlying data used by the FAA and private operators in their current procedure inventory.

Through the establishment of a baseline procedure set, the LEAN Photometrics team was able to uncover a significant amount of information not otherwise published on the public approach and departure diagrams available to the public. This included FAA approved criteria deviations (waivers), the extent of terrain and obstacles which have not yet been assessed and the lack of new criteria application to currently published approach procedures. While none of these are particularly uncommon discoveries, they are very important to the conclusions drawn by this analysis as several of the "impacts" that will be encountered to at the Aspen/Pitkin County Airport are related to updates in FAA criteria and obstacle data and not the proposed runway shift options.

The baseline procedures were analyzed using access to FAA and USAF technology which enable the design, evaluation and publication of TERPS and PBN approach and departure procedures. For one engine inoperative procedures, establishing a baseline required the use of additional technology which is used by aircraft operators and performance engineering vendors, but is not publicly supported by any government agency.

The latest runway, obstacle, terrain, NAVAID, lighting, airspace, waypoint, airway, operator policy and aircraft performance information was used in establishing the baseline. However, significant changes to next generation aircraft availability and navigation methods must be considered in this analysis due to the timescale required to complete the construction for the proposed runway shift options. Therefore, additional aircraft capabilities, navigation methods and operator policies were considered beyond those typically used for EA, design or construction management. This included analyzing "new" RNP approach procedures at and below RNP 0.3, as well as updates to operator policies and FAA criteria related to SMS and circling minimums.

Once the baseline, state 1, procedures had been established, each of the 4 runway options was given a state, from 2 through 5 and the instrument procedures were re-analyzed using the same geospatial elements, design criteria (including some waivers discovered in state 1) and operator policies to determine the new minimums and gradient requirements.

A brief analysis of the change in minimums and gradients was performed based on the Flight Operations Engineering experience of the LEAN Team. However, no formal environmental, operator impact or aircraft performance evaluation was conducted in support of the impact assessment listed in this analysis. Therefore the impacts were organized into a nominal scale ranging from no impact to high impact.

Data Collection

Geospatial Data

In order to properly design and evaluate instrument procedures in the area around the Aspen/Pitkin County Airport, a 100nm square work area was constructed using a customized Transverse Mercator projection centered on the current ARP. This work area contained all of the aeronautical and geospatial elements required to analyze FAA and private special instrument procedures for the current runway state and the 4 proposed runway shifts.

Runway

Primary runway information was provided by Jviation including the physical end coordinates, threshold coordinates, touchdown zones and elevations to be considered for runway states 1 through 5. Where supplemental information was required, the FAA NFDC and eNASR was consulted to ensure that no immediate (1 AIRAC cycle) would create a change to the analysis. The coordinates used were as follows:

The State column represents which runway shift would constitute an airspace "state" for the impact analysis.

RUNWAY 15 Threshold STA 10+13.12

State	GP D/ IP DS	RW Shift	X	Y	Lat	Long	Elev
1	Current	0'	2611059.1820	1512394.4600	39°13'55.8329"	106°52'23.3351"	7680.33
2	A	25'	2611035.6163	1512386.1140	39°13'55.7469"	106°52'23.6330"	7680.71
3	B	43' @0.17°	2611018.6489	1512380.1049	39°13'55.6850"	106°52'23.8474"	7680.71
4	C	50'	2611012.0505	1512377.7680	39°13'55.6609"	106°52'23.9308"	7680.71
5	D	80'	2610983.7716	1512367.7528	39°13'55.5577"	106°52'23.2883"	7680.71

RUNWAY 15 TDZE STA 40+13.12

State	GP D/ IP DS	RW Shift	X	Y	Lat	Long	Elev
1	Current	0'	2612060.7006	1509566.5703	39°13'28.0339"	106°52'10.0662"	7737.12
2	A	25'	2612037.1349	1509558.2243	39°13'27.9479"	106°52'10.3641"	7737.50
3	B	43' @0.17°	2612011.7726	1509549.2560	39°13'27.8555"	106°52'10.6846"	7737.50
4	C	50'	2612013.5691	1509549.8783	39°13'27.8619"	106°52'10.6619"	7737.50
5	D	80'	2611985.2902	1509539.8631	39°13'27.7587"	106°52'11.0193"	7737.50

RUNWAY 33 Physical End STA 90+18

State	GP D/ IP DS	RW Shift	X	Y	Lat	Long	Elev
1	Current	0'	2613730.5105	1504851.6921	39°12'41.6842"	106°51'47.9498"	7837.92
2	A	25'	2613706.9448	1504843.3461	39°12'41.5982"	106°51'48.2476"	7838.30
3	B	43' @0.17°	2613667.5859	1504829.4442	39°12'41.4550"	106°51'48.7449"	7838.30
4	C	50'	2613683.3790	1504835.0001	39°12'41.5122"	106°51'48.5454"	7838.30
5	D	80'	2613655.1002	1504824.9849	39°12'41.4091"	106°51'48.9027"	7838.30

RUNWAY 33 Threshold and TDZE STA 80+18

State	GP D/ IP DS	RW Shift	X	Y	Lat	Long	Elev
1	Current	0'	2613396.6710	1505794.3220	39°12'50.9508"	106°51'52.3708"	7820.37
2	A	25'	2613373.1053	1505785.9760	39°12'50.8649"	106°51'52.6686"	7820.75
3	B	43' @0.17°	2613336.5446	1505773.0605	39°12'50.7318"	106°51'53.1306"	7820.75
4	C	50'	2613349.5395	1505777.6300	39°12'50.7789"	106°51'52.9664"	7820.75
5	D	80'	2613321.2606	1505767.6148	39°12'50.6757"	106°51'53.3238"	7820.75

The GPD/IPDS column represents how the runways were represented in the primary instrument procedure design system. State 4 is intentionally set to "D" and state 5 is intentionally set to "C" based on the order in which the runways were analyzed in the procedure software and does not represent a "ranking" of options.

The "RW Shift" column is a brief note to describe the extent of the runway shift being analyzed. All "shifts" of the runway were moved to the West.

"X" and "Y" coordinates presented in these tables are assumed to be in the Colorado Central State Plane. However, due to the scale of instrument procedure design beyond the airport boundaries, a custom transverse Mercator projection using the WGS-84 geographic coordinate system was used and the state plane coordinates were not utilized by the LEAN team. The "Lat" and "Long" coordinates presented in the table were derived by the Jviation team into the WGS-84 geographic coordinate system for direct import into the LEAN workspaces. The "Elev" field presented in the tables is AMSL in feet.

LOCALIZER STA 95+63.5							
State	GP D/ IP DS	RW Shift	X	Y	Lat	Long	Elev
1	Current	0'	2613913.6404	1504334.6063	39°12'.36.6009"	106°51'45.5247"	7839.77
2	A	25'	2613890.0750	1504326.2592	39°12'.36.5149"	106°51'45.8225"	7840.15
3	B	43' @0.17°	2613849.1807	1504311.8173	39°12'.36.3661"	106°51'46.3393"	7840.15
4	C	50'	2613866.5089	1504317.9143	39°12'.36.4289"	106°51'46.1203"	7840.15
5	D	80'	2613838.2301	1504307.8988	39°12'.36.3258"	106°51'46.4776"	7840.15

LOC DME							
State	GP D/ IP DS	RW Shift	X	Y	Lat	Long	Elev
1	Current	0'			39°12'35.07"	106°51'43.57"	7857.4
2	A	25'			39°12'34.9840"	106°51'43.8678"	7857.4
3	B	43' @0.17°			39°12'34.8352"	106°51'44.3846"	7857.4
4	C	50'			39°12'34.8980"	106°51'44.1656"	7857.4
5	D	80'			39°12'34.7949"	106°51'44.5229"	7857.4

Although other airports were present in workspace for ASE, no runway information was used in the development or evaluation of instrument procedures at ASE.

NAVAID information was obtained for the equipment located on the field, near the field and in the area around the airport.

NAVAIDs located on the airport included the I-ASE localizer and localizer DME equipment. The LEAN and Jviation teams decided that it would be best to relocate this equipment to keep it aligned with the runway centerline for each of the states. Therefore, coordinates for the localizer were provided by the Jviation team, and LEAN derived coordinates for the DME are shown on the tables to the right.

Because the LEAN team derived the LOC DME positions for use in the instrument procedure design tools, no state plane coordinates (X and Y) were created.

NAVAIDs near to ASE included an additional localizer, I-PKN, which is a back course LOC used under normal sensing, located to the south of the ARP. This localizer was analyzed to see if relocation would be required, but it was quickly determined that it would not need to be moved for any of the runway shifts being proposed.

NAVAIDs in the area around the airport included:

- Red Table VOR/DME (DBL)
- Snow VOR/DME (SXW)
- Rifle VOR/DME (RIL)
- Grand Junction VOR/DME (JNC)
- Kremmling VOR/DME (RLG)
- Meeker VOR/DME (EKR)

All the NAVAID information was taken from FAA AIRNAV 1.0 (AVNIS website) and slaved magnetic variations were used where appropriate, as opposed to magnetic variations.

While the purpose of this study was to determine the impact on instrument procedure for the proposed runway shifts, no formal NAVAID analysis was performed on the I-ASE LOC/DME to determine critical area accountability or possible interference. Therefore, the existing restrictions on the LOC/DME were assumed to remain true including restrictions on its use west of the centerline, and below certain altitudes. A major assumption of this report is that the NAVAIDs can be relocated in conjunction with shifting of the runways. This requires additional field verification as well as NAVAID modeling to ensure this assumption is true.

Lighting

The current lighting information listed in the FAA NFDC and FAA AIRNAV 1.0 were presumed to continue to be in place for each of the runway states. This includes the continued availability of a 1400ft MALSF on the Runway 15 approach end, REILs on the 33 approach end and medium intensity runway edge lighting.

The current VGSI (PAPI) was also considered to shift to the necessary location relative to the threshold of Runway 15 under its current nominal angle of 3.5°. This includes restrictions on its use for positions to the west of the extended runway centerline.

Terrain

Digital terrain information was used in accordance with FAA procedure design and aircraft operator methods. The terrain dataset used is based on the latest USGS NED 30m resolution data set, with a 20m horizontal uncertainty applied for PBN procedure design purposes. The primary dataset was downloaded through the USGS webportal and then converted to a DTED2 format for incorporation into the procedure design software. Terrain analysis in the instrument procedure design systems used by LEAN are all raster based, and not contour based, therefore no contour generation was performed.

Due to the presence of high precision VGA survey information for Runway 15/33 at ASE, terrain exclusion areas were created to avoid any issues which can arise between differences in the coarsely defined NED 30m tiles and the precisely defined runway thresholds and physical ends.

Vegetative allowances of 100ft were added on to the terrain, per FAA instrument procedure design records available for the LOC DME 15 Special, and a 200ft AAO additive was applied to the base terrain outside the VGA survey boundaries (approximately 2.8nm beyond the ARP).

Obstacles

The 100nm workspace around ASE created a significant area for obstacle information collection. This is complicated by the current state of obstacle information in the United States being divided across several different repositories.

The primary sources for obstacle information were the FAA Third Party Surveyor System (FAA TPSS), the FAA OE/AAA program, the FAA Digital Obstacle File (DOF), and the NOAA AOC UDDF Series.

The FAA TPSS provides UDDF formatted versions of AGIS obstruction surveys for import into FAA instrument procedure design tools and for use by operators when designing special procedures. This is a point based file with accuracy information based on the survey methods and size/shape of the object to be surveyed. The immediate area around ASE had a Vertically Guided Approach (VGA) survey available from 2012 that had been published in 2013 which covered an area of approximately 3nm abeam to the runway. Other airports in the workspace had surveys

included in TPSS and were included in the workspace.

An extract of the FAA Digital Obstacle File for Colorado, Wyoming and Utah was used from 04MAY14 to include only those obstacles in the immediate 100nm square around ASE. The DDOF includes numerous obstructions which are traditionally not incorporated in close in VGA (or previous 405 Spec) surveys. This database is currently being improved and occasionally incorporates obstructions which have been decommissioned or includes significant structures captured either in VGA or 405 Spec surveys.

The NOAA AOC UDDF series were considered for any airport that was in the ASE work area, which did not have obstacle survey information in TPSS. Several smaller airports required the usage of these files as the latest information in the TPSS was only collected for specialized purposes (one approach end).

The FAA OE/AAA program web page and obstacle database was also consulted to collect all OEs from 2012 to 04MAY2012 which had been proposed, circularized and determined (both on and off the airport) and which had not yet been constructed or otherwise incorporated into the DDOF.

Obstacle information used in instrument procedure design must consider the accuracy codes provided by the surveyor, or determined by the FAA. This turns a "point" in space into a cylinder with a radius equal to the horizontal uncertainty and a height equal to the AGL value plus the vertical uncertainty. Obstacles which do not have an accuracy code are automatically assigned one by the procedure tools used by LEAN. OE/AAA obstructions which do not have an accuracy code entered by the person or group filing the 7260 forms will receive a "4D" accuracy equivalent to 250ft horizontal uncertainty and 50ft of vertical uncertainty. Most close-in VGA surveys are performed at a "1A" accuracy equivalent to 20ft horizontal uncertainty and 3ft of vertical uncertainty. Certain airport surfaces and aircraft EOSID procedures are not required to analyze obstacles as cylinders, but trends in SMS and PBN design are pushing the aircraft operators to consider the uncertainty in obstructions in their future procedure designs.

Aeronautical Data

Procedures

The current instrument procedures previously described in this report were determined from a combination of public and private graphical and textual sources. Public procedures were available directly from the FAA website (NFDC or Instrument Procedure Coordination webpage) or from the LEAN subscription to Jeppesen Airways Manuals. Private procedures and public special procedures were collected by the LEAN

Figure 6: Area around ASE, with obstacles (in grey) from FAA TPSS, FAA DDOF, OE/AAA and NOAA AOC

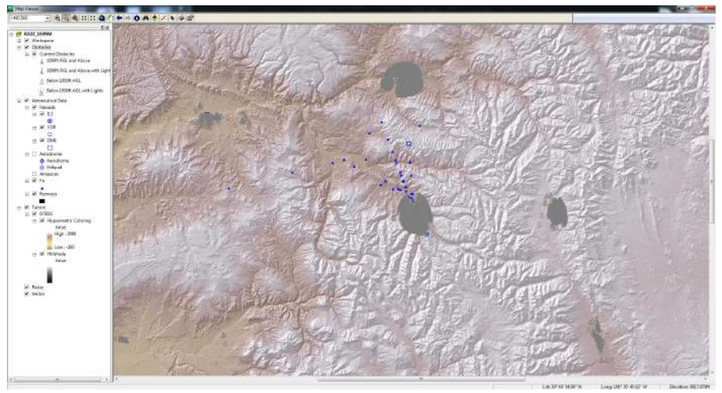


Figure 7: Close-Up View of ASE with obstacles, airspace information and terrain exclusion areas (pink)

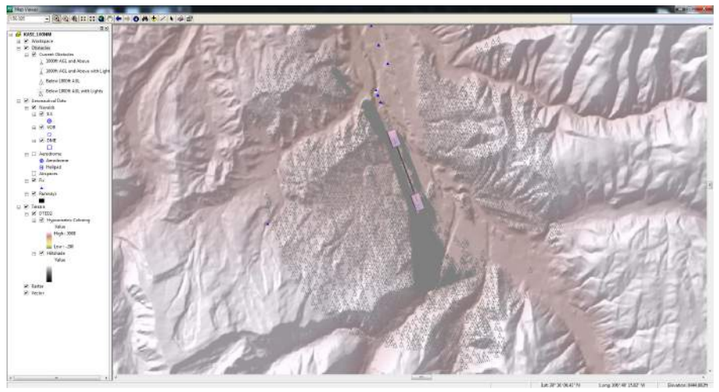


Figure 8: Close-Up View of ASE RWY 15 with each of the terrain exclusion areas visible as overlapping rectangles

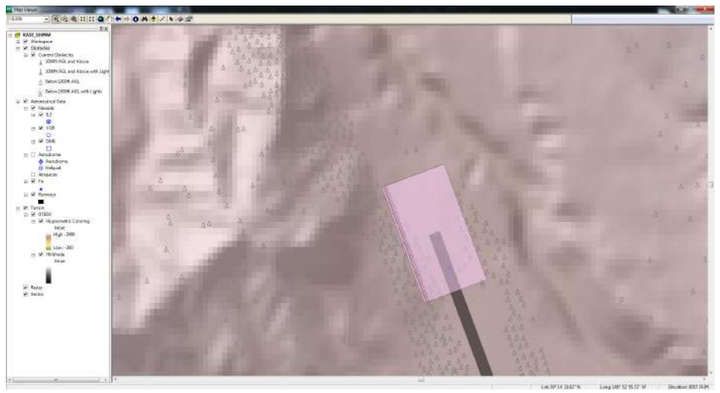


Figure 9: Close-up view of ASE Rwy 33 with iterated version of the IASE LOC and DME (in blue) for each of the shifted runway states

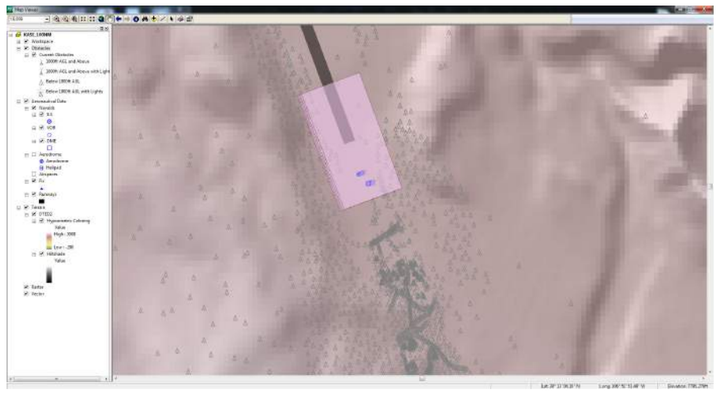


Figure 10: Visual Circling Area (Green) to Rwy 15 with 3d obstacles, and their uncertainty cylinders, depicted in yellow. Viewing position is from the future CAT B MDA.

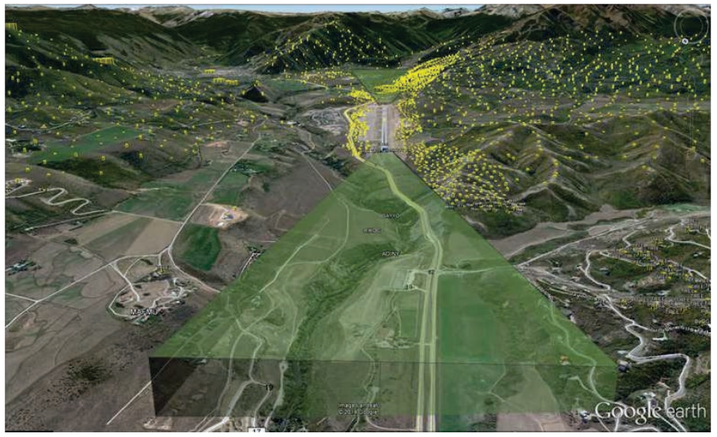


Figure 11: Visual Circling Area (Green) to Rwy 33 with 3d obstacles, and their uncertainty cylinders, depicted in yellow. Viewing position is from the future CAT B MDA. Visual circling area "disappears" into the mountain and obstacles due to numerous penetrations that restrict nighttime maneuvers to this runway.

team from past experience with other Flight Operations Engineering projects in support of aircraft operators. At no point did the LEAN team use an NFDD or ARINC 424 file as the basis for an instrument procedure evaluation or recreation.

The FAA Instrument Procedure Coordination webpage was used extensively to evaluate recently updated instrument procedures (as far back as 2012) and to evaluate any upcoming changes to existing instrument procedures that should be considered as a part of "State 1" due to their changes being unrelated to the existing runway or its possible relocation. The only procedure which has any upcoming changes pending for it was the LOC DME Rwy 15 special procedure. The transmittal package and coordination packages for this procedure were considered to represent State 1, while the currently published LOC DME Rwy 15 special was used for comparison of changes from the current state to State 1.

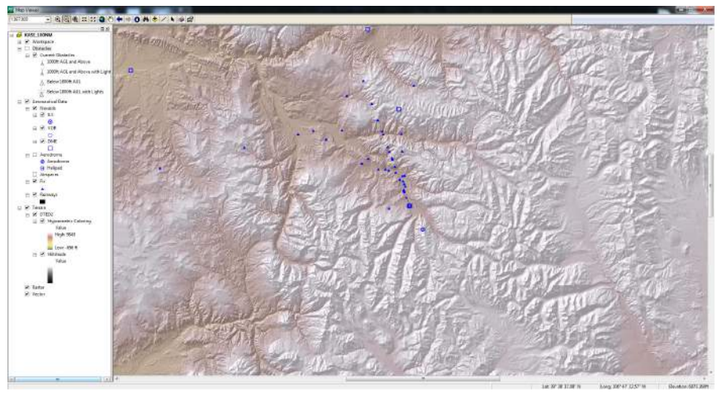
Existing procedure restrictions, minimums (including ceilings and visibility) and climb gradients were recorded directly from the graphical or textual procedure depictions. In the event that the information was not presented, the LEAN team referred to standard operating procedures required by FAR Part 91 or policies specific to an operator that would dictate the minimums to be used.

Fixes/Waypoints

Fixes, waypoints and intersections were created based on their usage with any instrument procedure analyzed at ASE for the runway shift. This eliminated the clutter which would otherwise be associated with the entirety of high and low altitude information in the 100nm area around ASE.

When a procedure required the use of a published fix, the LEAN team consulted the FAA NFDC or FAA AIRNAV 1.0 system for precise lat/long coordinate information, primary NAVAIDs, service volumes and other information required by the procedure design tools for evaluation.

Figure 12: Area around ASE, without obstacles, indicating current waypoints, fixes and NAVAIDS in blue



Airspace

The airspace in the immediate vicinity of ASE was analyzed for any special use airspaces or restricted areas that would influence the current or future instrument procedures at ASE. While several SUAs exist, or have existed, in the 100nm work area around ASE, there were no known SUAs in the immediate vicinity of the airport that were considered for the analysis. This excludes the potential for forest fire fighting areas and TFRs issued for special events, but neither were considered to be germane to the runway relocation impact assessment.

For future state approaches, airspace restrictions presented by general KEGE airspace control area were considered as an area that should be avoided for initial or feeder legs or departures of any phase.

Procedure Design Tools

Global Procedure Designer

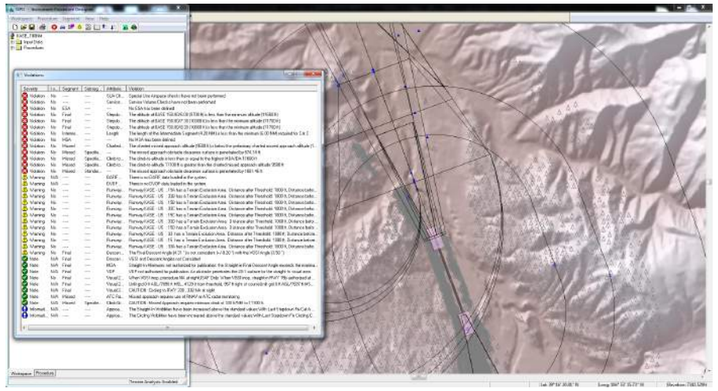
LEAN utilizes Flight Operations Engineering, a Software based company that exclusive access to the US Department of Defense Global Procedure Designer (GPD) version sp 6.3. This version contains most of the latest conventional TERPS and RNAV criteria used by both the FAA and USAF for procedure design and assessment at US airports and USAF bases. GPD is used to both design new procedures and evaluate existing procedures through an interactive method of creating procedures and clearing deviations to criteria until only those criteria deviations (waivers) that remain are acceptable either by historical precedent or for design purposes.

While GPD can analyze RNAV approaches, the current service pack used for this analysis is using an older criteria model than the current FAA standards. Therefore, GPD usage was restricted to conventional approaches, conventional departures and RNAV departures only.

For complex FAA procedures, like the missed approaches at ASE, certain non-standard criteria assumptions were used by the FAA which are not documented in TERPS. While the FAA has the ability to take such actions in the interest of aviation safety, the innovative use of a second localizer back course for missed approach positive course guidance is something which occurs too infrequently to have been incorporated into an enterprise software application like GPD. As such, certain criteria deviations were required to accurately model the missed approach paths in GPD based on geometric overlays imported into the system.

The version of GPD used by LEAN for work in the non-military world is void of several NGA controlled aeronautical data products including DAFIF, DVOF of low-close in obstacle information.

Figure 13: Typical workflow in GPD and IPDS demonstrated here on the Rwy 15 LOC-DME Special Approach Procedure working to either clear or justify TERPS violations in the design



Instrument Procedure Development System

LEAN utilizes exclusive access to the FAA Instrument Procedure Development System (IPDS) release 2.0.6.1 for evaluation of FAA PBN approach procedure design. This is the same system currently used by the FAA Flight Procedures Team and AFS-460 to design and evaluate public, public-special and private RNAV/RNP procedures. It works in a nearly identical manner to GPD, as both tools were created by the same company on behalf of the MDA, but does not incorporate any elements from the US DoD.

There is at least one newer release of IPDS available from MDA, but this has not yet been implemented by the FAA and does not contain any significant updates to design criteria.

Geospatial Deconfliction

The first step in creating a baseline state to analyze instrument procedures against is to perform a process called geospatial deconfliction. This is the process by which the discrepancies which exist between multiple data sources for obstacle, terrain and airport information must be reconciled until only one work area exists that represents the current and future airspace states.

Most of the geospatial deconfliction which was performed at ASE involved processing of the DDOF files, to remove any references to decommissioned obstructions, and the processing of the OE/AAA information.

The deconfliction process on the DDOF removed over 600 obstructions from the work area around ASE.

The deconfliction process on the OE/AAA process removed approximately 30 obstructions related to on-airport projects. Many of these obstructions were related to projects which had already started and finished, but lingered in the database. While it is not unrealistic to assume that these obstructions could occur again in the future, it was important to remove them for two reasons:

1. **The obstructions were only present during periods when the airport was closed.**
2. **The lat/long position of the obstructions were located at the ARP.**

Obstacles located on the ARP, which is in the approximate center of Runway 15/33, don't necessarily impact the existing instrument procedures at ASE in the way that one might expect at a typical airport. This is because of the high altitudes associated with the MDAs for missed approach procedures and offset approach courses caused by significant terrain while on final approach to Runway 15. While these "on airport" obstacles are penetrations to the RSA and ROFA, they are not penetrations to the instrument procedure design surfaces. When evaluating future state instrument approaches to Runway 15, however, these obstacles located at the ARP needed to be removed to evaluate missed approaches that began closer to the runway and proceeded in a path along the runway centerline and off airport towards the southeast.

The deconfliction process on the OE/AAA process also detected at least one significant obstacle issue on the Runway 33 approach end related to a potentially erroneous obstacle 2014-ANM-24-OE. This particular OE was approved based on the following information:

This obstacle appears to have been part of the X-Games coverage in 2014. Since the X-Games is an event that is anticipated to potentially return to Aspen in the future, all OE obstructions related to the X-Games were considered to exist for the baseline state and future states including the runway shifts.

The issue encountered by the LEAN team was that this structure's latitude and longitude, coupled with a 250ft horizontal uncertainty, penetrates the Runway 33 20:1 and visual straight in surface by over 1000ft. Since there are no approaches, or missed approaches, that currently overfly this particular obstruction, the FAA's ruling of no hazard is technically correct. However, the site elevation for the structure is listed as 9017ft AMSL, whereas the actual site elevation at those coordinates is just over 8000ft AMSL. This means that either the obstacle's location is incorrect or its base elevation is incorrect.

Figure 14: Excerpt from the FAA OE/AAA website depicting a temporary light stand for the X-Games

Case Number	City	State	Latitude	Longitude	Site Elevation	Structure Height	Total Height
2014-ANM-24-OE	Aspen	CO	39° 12' 12.71" N	106° 51' 48.41" W	9017	45	9062

Given the limited amount of time available for this analysis, and this obstacle's impact on future state RNP approaches, the LEAN team removed this obstacle from consideration for all runway/airspace states.

Procedure Modeling

Instrument procedures were evaluated by re-designing them either in GPD or IPDS using the deconflicted geospatial, aeronautical and procedural data collected for each of the five states.

Each approach or departure procedure was only modeled up to the point where changes in the runway location would no longer impact the overall results of the analysis. For approaches the procedure evaluation started at the initial approach fix and terminated after the first or second turn in the missed approach. For departures the procedure evaluation started at the diverse departure point and terminated after the first or second turn in the procedure.

State 1 procedures were modeled using existing waypoints, altitudes and missed approach gradients. In situations where the information currently being used by the public or private procedures did not match up precisely with the results from GPD or IPDS, the following steps were taken:

1. **Review the inputs used to ensure that the same data is being used (Quality Assurance)**
2. **Review the deviations from standard criteria to determine if they have been previously accepted by the FAA, including:**
   - » Criteria deviations related to descent gradients
   - » Criteria deviations related to minimum segment lengths
   - » Criteria deviations related to non-standard missed approach gradients
   - » Criteria deviations related to terrain exclusion areas
   - » Criteria deviations related to incomplete procedure design
   - » Criteria deviations related to turn geometry
   - » Criteria deviations related to speed restrictions
   - » Criteria deviations related to Dual VHF receivers
   - » Criteria deviations related to service volumes
3. **Check for differences between the current procedures and state 1 related to new obstacle information**
   - » Accept changes to minimums first
   - » Increase missed approach climb gradients
   - » Move waypoints

4. **Check for differences between the current procedures and state 1 caused by updated criteria**
    - » Circling criteria
    - » PBN criteria updates
    - » RNP departure criteria updates

The instrument procedures evaluated in states 2 through 5 were modeled using as many of the features that were common to the state 1 procedure, including accepted criteria deviations, altitudes, segments, step down fixes and other elements. However, since the runway and I-ASE relocation will cause changes to the straight in approaches and any approach using the localizer/DME, the fixes were relocated to accommodate the runway shift to the west, without diminishing segment lengths or altitudes where possible. Because changes to the instrument procedures were anticipated between state 1 and states 2 through 5, the procedure design and evaluation focused on the introduction of new criteria deviations (which didn't previously exist) or significant increases in minimums that might render the procedure unusable.

All procedures modeled in GPD or IPDS were exported with design and criteria packages detailing the precise features for each approach and departure. These packages can be used by FAA or DoD personnel to recreate the identical procedures in their respective systems.

Describing Approach and Departure Impacts

The impact assessment is compiled into a series of tables comparing one runway state to another via approach/departure minimums, comments, and a high level impact statement based on the team's Flight Operations Engineering experience, and not on a detailed historical or performance based Operator Impact Assessment.

Each table contains information on the left hand columns that describes the runway for which the procedure applies, the current procedure name (as published by the FAA), the type of procedure, whether the procedure is public or private and the relative importance of the procedure identified by an hierarchical "Ranking by Usage" column for approach procedures. Departure procedures do not have this ranking as there was insufficient data available to quantify the relative usage of departures. However, the departure procedures at the top of the page are considered to be more frequently used over those on the bottom.

Next to the procedural information are two series of columns for the baseline, or current, runway configuration and the runway state being compared against it. The columns "A, B and C" are references to the approach categories for aircraft. At the present time, there are no procedures available for category D or E aircraft and those columns were eliminated for that reason. In each approach category column three numbers will appear. The top two numbers represent the minimum descent altitude which must be compared against the ceiling at the airport for an aircraft to safely continue the landing, or execute the departure. The number which is not in parenthesis is the pressure altitude, and the number in parenthesis is the height above the threshold or DER. Both the pressure altitude and height are measured in feet. The third numbed

Figure 15: Excerpt of an impact analysis table

					Existing Runway Configuration					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					
Ranking by Usage	Runway	Procedure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	9840 (2160) 3 mi	10020 (2520) 3 mi	10220 (2540) 3 mi	Several waivers exist for this procedure. Visibility increased due to straight minimums, even though they aren't published	Business Jets, Turboprop and smaller	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, approach modeled as an LOC-straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	Minor Impact

in the cell is the visibility, which is identified as a number followed by a "mi" to represent the number of miles of visibility required to continue executing the approach or departure procedure.

The Comment column is a space where notes about the procedure, or any gradient requirements will be listed that are particular to the procedure, its minimums or issues encountered that need to be brought to the reader's attention.

The "Typical Aircraft Using Procedure" column uses the previously defined aircraft categories in this report (see "Aircraft Operators" section for more information) to identify which aircraft typically use the approach or departure procedure.

Finally, on the far right side of each table exists a column titled "Operational Impact". This column contains basic descriptive information about the team's assessment of the impacts to aircraft operators based on the changes between the baseline or current data set on the left and the target runway state on the right. The impacts are color coded with green cells representing a minor or negligible impact in the procedures, with colors increasing with red levels representing increasing impact (yellow, orange and red). Since the analysis did no detect any approach or departure procedures that would be eliminated by any of the proposed runway shift options, the reader of these tables will not detect any "red" cells.

Part V: Impact Assessment

Part A. Current Flight Procedures

Baseline Assessment (State 1)

The impact assessment to compare the current published runway instrument procedures to the collected baseline data and criteria, state 1, revealed several impacts to procedures that will most likely occur regardless of the proposed runway shift options evaluated in states 2 – 5. While both approach and departure procedures were analyzed, there were no detectable differences in the departure procedures. The impacts on approach procedures are summarized in the table on the following page focusing on Category C approach minimums, with a more detailed discussion available in Appendix 1, Tables 1 and 2.

A quick comparison of ceilings and visibility reveals that several currently published circling approach procedures will potentially have increases in the ceiling in excess of 1400ft. While this is certainly a significant increase in the procedure minimums, the overall impact on the procedure is difficult to quantify as the current ceiling requirements are already well in excess of standard visual meteorological conditions. The impacts on category A and B ceilings were less severe which is why the effected procedures only received a "minor" impact assessment.

The impact on the circling approaches is a direct result of the update to the TERPS circling criteria 8260.3B change 21, first implemented in 2009. At that time, the FAA stated that they would begin updating existing approach procedures with these new circling criteria that significantly increase the area considered for obstacle clearance at high altitude airports. A comparison between the previous circling criteria and the new circling criteria can be seen in the figures 16 and 17.

The increase in circling criteria for category A through C approach minimums was validated by the FAA both in the pending instrument procedure coordination update on the LOC-DME Rwy 15 special approach procedure, and through a draft document submitted from the FAA IPT for consideration during a meeting with the FAA ADO, Airport Director and Jviation team pertaining to the RNAV (GPS) – F approach procedure.

However, the LOC-DME Rwy 15 special procedure, currently pending publication, appears to have an error in the controlling obstacle for category C. This error appears in the summary table above as an increase in the circling minimums from 3160ft HAT to 3999ft HAT. In the FAA submission package (Figure 18) the controlling obstacles assessed by the FAA IAPA program clearly show the obstacle considered by the software for category C circling minimums to be east of the ARP at an altitude of approximately 10539ft.

Comparison of Current Runway to Baseline Runway Approach Procedures

Ranking by Usage	Runway	Procedure Name	Type	Public/Private	Current Published Category C Minimums	Baseline State 1 Category C Minimums	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	10220 (2540) 3 mi	11640 (3999) 3 mi	Minor Impact
2	15	LOC-DME RWY 15	Straight In	Public-Special	9200 (1520) 2 3/4 mi	9380 (1699) 3 mi	Minor Impact
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8760 (1080) 2 3/4 mi	8880 (1199) 3 mi	Moderate Impact due to increased vis and ceilings. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	10840 (3160) 3 mi	11640 (3999) 3 mi	Moderate Impact due to increased vis and ceilings.
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13680 (6000) 10 mi	No Impact
6	15	Visual	Circling/FMS Visual	Private-Special	10220 (2540) 3 mi	11640 (3999) 3 mi	No Impact
7	15	VOR/DME - C	Circling Only	Public	10220 (2540) 3 mi	11640 (3999) 3 mi	Minor Impact
8	15	RNAV/GPS - F	Circling Only	Public	10220 (2540) 3 mi	11740 (4099) 3 mi	Minor Impact
9	33	Visual	Circling	Public	10220 (2540) 3 mi	11640 (3999) 3 mi	No Impact
10	33	Visual	Circling/FMS Visual	Private-Special	10220 (2540) 3 mi	11640 (3999) 3 mi	No Impact
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121	8079 (399) MALSF On 1 1/2 mi MALSF Out 1 3/4 mi	8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	No Impact

However, the process of analyzing the circling areas in GPD is fully automated with the system indicating that an identical circling radius, without circling restrictions, would place the controlling obstacle to the south and east of the ARP at a base elevation of 11240ft (see figure 19). The difference in controlling obstacles between the GPD assessment and the FAA pending assessment accounts for the difference, even in this pending procedure update.

Because the FAA was able to provide the team with a sample analysis for the updated runway analysis on the RNAV (GPS) – F approach, which validated the increase in circling minimums to account for the same terrain detected in GPD, the baseline analysis for comparison used the higher circling minimums (caused by the terrain to the southeast) as the controlling obstacle as opposed to the LOC-DME Rwy 15 pending assessment.

In addition to the increase in minimums on circling approaches, the straight in approaches to Runway 15 experienced a 100 to 150ft increase which could have a moderate impact when considering that these approaches are currently the primary means for scheduled air carriers to

Figure 16: Previous Circling Criteria, with limiting obstacle for category A highlighted in the table (blue row), and indicated on the image by a green triangle

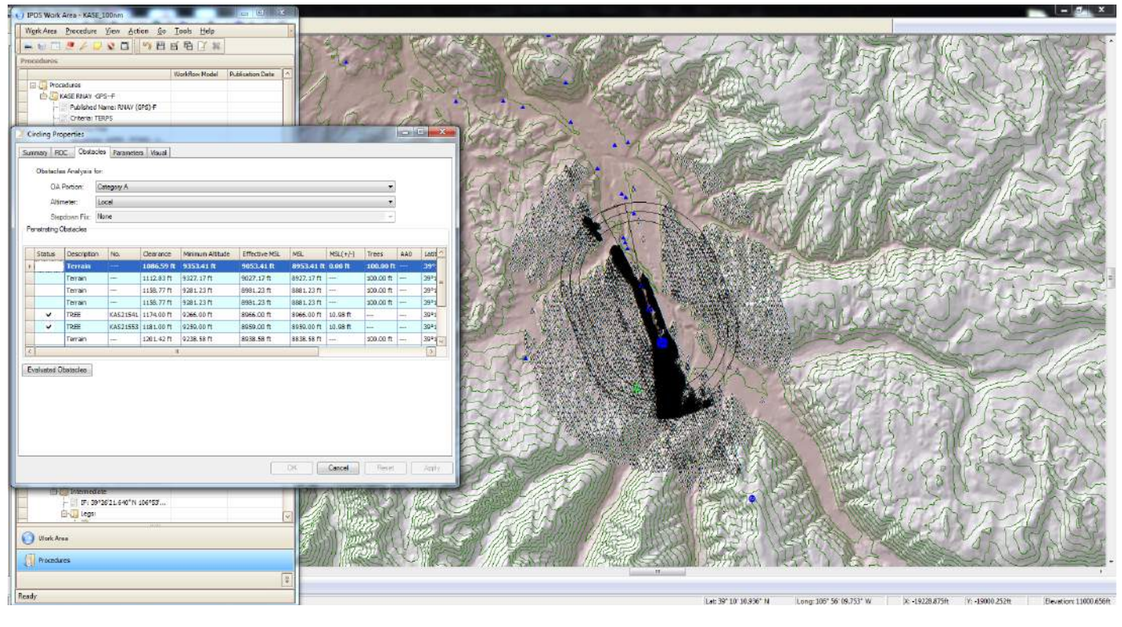


Figure 17: New Circling Criteria, with limiting obstacle for category A highlighted in the table (blue row), and indicated on the image by a green triangle

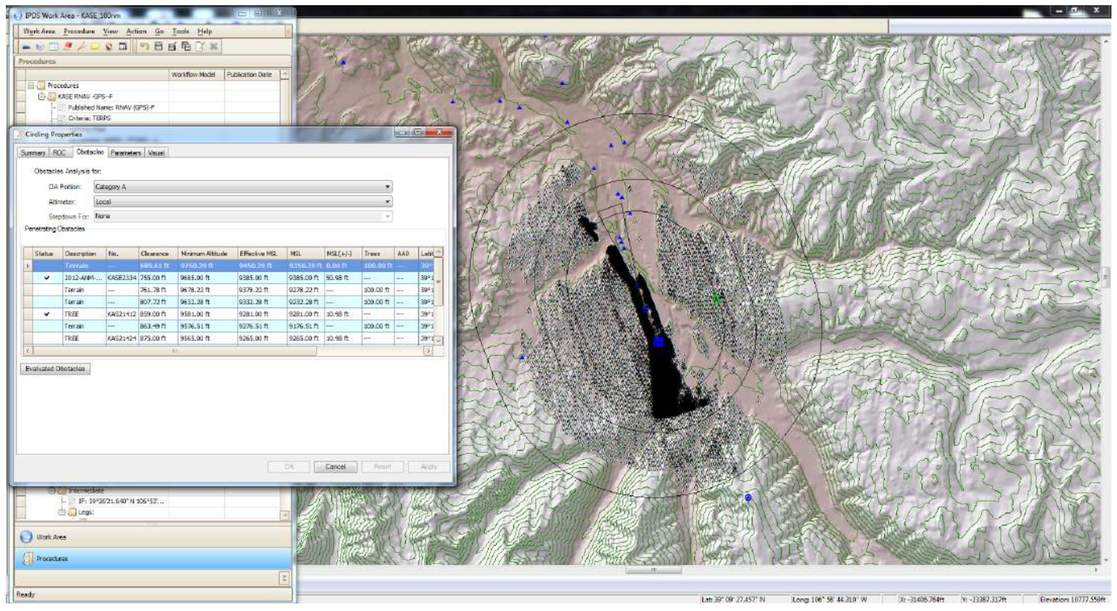
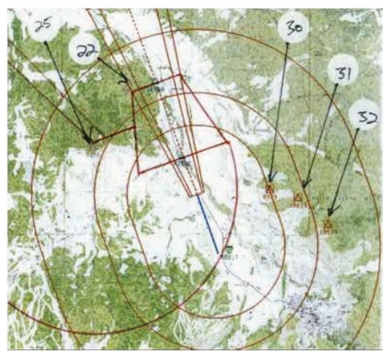


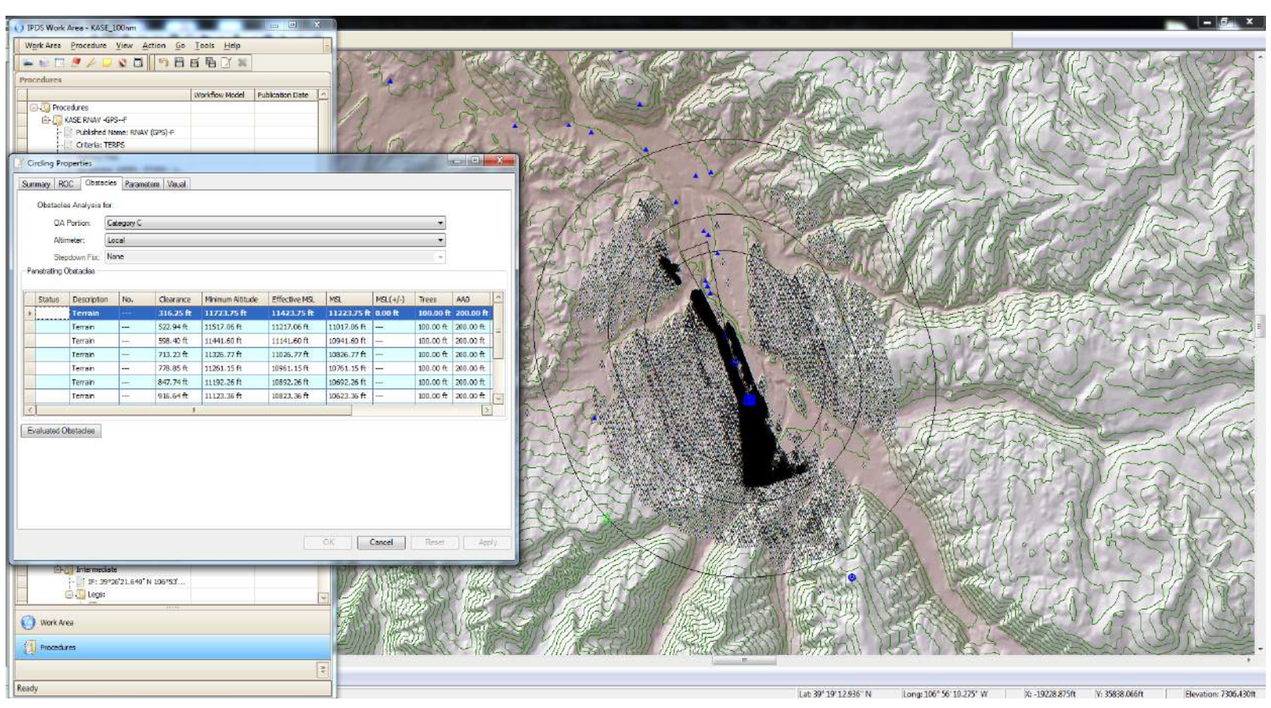
Figure 18: FAA Record of obstacles considered for circling areas on the LOC-DME Rwy 15 Special Approach Procedure. Obstacle "32" is the controlling obstacle currently considered for the pending publication in September of 2014.



operate under inclement weather conditions. The increase in minimums over the pending LOC-DME Rwy 15 special procedure appear to be driven by the updated obstruction survey which has not yet been assessed by the FAA in the pending procedure update and will be considered in any future updates to the approach or departure procedures at the airport.

While it is not the purpose of this report to analyze upcoming impacts to the instrument procedures at the Aspen/Pitkin County Airport, for the existing location of the runway, the analysis performed lead to the conclusion that the increased ceiling requirements coming from new circling criteria application and obstruction survey information will create the need for additional instrument procedure design activities utilizing RNP technology. The FAA has RNP approaches slated to be published in the late 2015/2016 timeframe and the Lean team decided to create sample procedures to be assessed against the runway shift options. These impact assessment on these options is discussed in the "Future Runway Capabilities" section of this report.

Figure 19: New Circling Criteria, with limiting obstacle for category C highlighted in the table (blue row), and indicated on the image by a green triangle



State 2

The impact assessment for the 25ft shift of Runway 15/33 to the west involved the comparison of the procedures developed in state 1 to the updated versions of the same procedures required to accommodate the relocation of both the runway and I-ASE LOC/DME. The analysis revealed several small to negligible impacts to the primary procedures spread across categories A through C, with the exception of a moderate impact on the LOC-DME Rwy 15 special approach procedure, with a missed approach climb gradient, and a high impact on the RNAV (RNP) – Y special approach procedure. While both approach and departure procedures were analyzed, there were no detectable differences in the departure procedures. The impacts on approach procedures are summarized in the table on the next page focusing on Category C approach minimums, with a more detailed discussion available in Appendix 1, Tables 3 and 4.

Increases in the approach minimums on the LOC-DME Rwy 15 special procedure, with missed approach gradients, were caused by additional obstructions in the missed approach segment for either the standard or alternate missed approach instructions. Missed approach climb gradients were unaltered, but could be increased to mitigate the increase in minimums.

Increases in the approach minimums on the RNAV (RNP 0.3) 15 approach are caused by a multitude of issued created by the total number of current waivers necessary for the approach to be approved by the FAA. Any shift in the runway location to the west will only further complicate the approval of the current procedure design, and will require a complete redesign that could eliminate one or two waivers in the process. As such, the increase in the minimums is based on new obstruction detected in the final approach segment and missed approach which will combine to create at least a 200ft increase in minimums, which is considered to be of high impact. However, due to the lack of total flight operations utilizing this procedure, its individual impact will do very little to the overall capability of the airport to continue handling traffic.

None of the approach or departure procedures analyzed under state 2 would be eliminated or changed in such a way as to render them ineffective or unsafe. Because the overall impact on those approaches used most by the airport is relatively low, the 25ft runway shift was deemed to create no undue impact on the ASE airspace.

State 3

The impact assessment for the 50ft shift of Runway 15/33 to the west involved the comparison of the procedures developed in state 1 to the updated versions of the same procedures required to accommodate the relocation of both the runway and I-ASE LOC/DME. The analysis

Comparison of State 1 (Current Runway) to State 2 (25ft shift to the west)

Ranking by Usage	Runway	Procedure Name	Type	Public/Private	State 1 (Current) Category C Minimums	State 2 (25ft Shift) Category C Minimums	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	11640 (3999) 3 mi	11640 (3999) 3 mi	Minimal impact when compared to state 1
2	15	LOC-DME RWY 15	Straight In	Public-Special	9380 (1699) 3 mi	9380 (1699) 3 mi	Minimal impact when compared to state 1
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8880 (1199) 3 mi	8940 (1259) 3 mi	Moderate impact when compared to state 1. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	11640 (3999) 3 mi	11640 (3999) 3 mi	Minimal impact when compared to state 1
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13681 (6000) 10 mi	No impact when compared to state 1.
6	15	Visual	Circling/FMS Visual	Private-Special	11640 (3999) 3 mi	11640 (3999) 3 mi	No impact when compared to state 1.
7	15	VOR/DME - C	Circling Only	Public	11640 (3999) 3 mi	11640 (3999) 3 mi	Minimal impact when compared to state 1
8	15	RNAV/GPS - F	Circling Only	Public	11740 (4099) 3 mi	11760 (4119) 3 mi	Minimal impact when compared to state 1
9	33	Visual	Circling	Public	11640 (3999) 3 mi	11640 (3999) 3 mi	No impact when compared to state 1.
10	33	Visual	Circling/FMS Visual	Private-Special	11640 (3999) 3 mi	11640 (3999) 3 mi	No impact when compared to state 1.
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121	8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	8300 (619) 1 1/2 mi	High impact when compared to state 1

Comparison of State 1 (Current Runway) to State 3 (50ft shift to the west)

Ranking by Usage	Runway	Procedure Name	Type	Public/Private	State 1 (Current) Category C Minimums	State 3 (50ft Shift) Category C Minimums	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	11640 (3999) 3 mi	11640 (3999) 3 mi	Minimal impact when compared to state 1
2	15	LOC-DME RWY 15	Straight In	Public-Special	9380 (1699) 3 mi	9420 (1739) 3 mi	Minor impact when compared to state 1
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8880 (1199) 3 mi	9060 (1379) 3 mi	Moderate impact when compated to state 1. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	11640 (3999) 3 mi	11640 (3999) 3 mi	Minor impact when compared to state 1
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13681 (6000) 10 mi	No impact when compared to state 1.
6	15	Visual	Circling/FMS Visual	Private-Special	11640 (3999) 3 mi	11640 (3999) 3 mi	No impact when compared to state 1.
7	15	VOR/DME - C	Circling Only	Public	11640 (3999) 3 mi	11640 (4019) 3 mi	Minimal impact when compared to state 1
8	15	RNAV/GPS - F	Circling Only	Public	11740 (4099) 3 mi	11760 (4119) 3 mi	Minimal impact when compared to state 1
9	33	Visual	Circling	Public	11640 (3999) 3 mi	11640 (3999) 3 mi	No impact when compared to state 1.
10	33	Visual	Circling/FMS Visual	Private-Special	11640 (3999) 3 mi	11640 (3999) 3 mi	No impact when compared to state 1.
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121	8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	8300 (619) 1 1/2 mi	High Impact when compared to state 1

revealed several small to negligible impacts to the primary procedures spread across categories A through C, with the exception of a moderate impact on the LOC-DME Rwy 15 special approach procedure, with a missed approach climb gradient, and a high impact on the RNAV (RNP) – Y special approach procedure. While both approach and departure procedures were analyzed, there were no appreciable differences in the departure procedures. The impacts on approach procedures are summarized in the table at the top right focusing on Category C approach minimums, with a more detailed discussion available in Appendix 1, tables 5 and 6.

State 4

The impact assessment for the 43ft shift of Runway 15/33, to the west, with a 0.17E deflection, involved the comparison of the procedures developed in state 1 to the updated versions of the same procedures required to accommodate the relocation of both the runway and I-ASE LOC/DME. The analysis revealed several small to negligible impacts to the primary procedures spread across categories A through C, with the exception of a moderate impact on the LOC-DME Rwy 15 special approach procedure, with a missed approach climb gradient, and a high impact on the RNAV (RNP) – Y special approach procedure. While both approach and departure procedures were analyzed, there were no appreciable differences in the departure procedures. The impacts on approach procedures are summarized in the table on the following page focusing on Category C approach minimums, with a more detailed discussion available in Appendix 1, Tables 7 and 8.

Increases in the approach minimums on the LOC-DME Rwy 15 special procedure, with missed approach gradients, were caused by additional obstructions in the missed approach segment for either the standard or alternate missed approach instructions. Missed approach climb gradients were unaltered, but could be increased to mitigate the increase in minimums.

Increases in the approach minimums on the RNAV (RNP 0.3) 15 approach are caused by a multitude of issues created by the total number of current waivers necessary for the approach to be approved by the FAA. Any shift in the runway location to the west will only further complicate the approval of the current procedure design, and will require a complete redesign that could eliminate one or two waivers in the process. As such, the increase in the minimums is based on new obstruction detected in the final approach segment and missed approach which will combine to create at least a 200ft increase in minimums, which is considered to be of high impact. However, due to the lack of total flight operations utilizing this procedure, its individual impact will do very little to the overall capability of the airport to continue handling traffic.

None of the approach or departure procedures analyzed under state 4 would be eliminated or changed in such a way as to render them ineffective or unsafe. Because the overall impact on those approaches used most by the airport is relatively low, the 43ft runway shift (with 0.17E twist) was deemed to create no undue impact on the ASE airspace.

State 5

The impact assessment for the 43ft shift of Runway 15/33, to the west, with a 0.17 deflection to the west, involved the comparison of the

Comparison of State 1 (Current Runway) to State 4 (43ft shift to the west, with 0.17E twist)

Ranking by Usage	Runway	Procedure Name	Type	Public/Private	State 1 (Current) Category C Minimums	State 4 (43ft Shift and 0.17E Twist) Category C Minimums	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	11640 (3999) 3 mi	11660 (4019) 3 mi	Minimal impact when compared to state 1
2	15	LOC-DME RWY 15	Straight In	Public-Special	9380 (1699) 3 mi	9380 (1699) 3 mi	Minimal impact when compared to state 1
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8880 (1199) 3 mi	8940 (1259) 3 mi	Moderate impact when compated to state 1. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	11640 (3999) 3 mi	11660 (4019) 3 mi	Minimal impact when compared to state 1
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13681 (6000) 10 mi	No impact when compared to state 1.
6	15	Visual	Circling/FMS Visual	Private-Special	11640 (3999) 3 mi	11640 (3999) 3 mi	No impact when compared to state 1.
7	15	VOR/DME - C	Circling Only	Public	11640 (3999) 3 mi	11660 (4019) 3 mi	Minimal impact when compared to state 1
8	15	RNAV/GPS - F	Circling Only	Public	11740 (4099) 3 mi	11760 (4119) 3 mi	Minimal impact when compared to state 1
9	33	Visual	Circling	Public	11640 (3999) 3 mi	11640 (3999) 3 mi	No impact when compared to state 1.
10	33	Visual	Circling/FMS Visual	Private-Special	11640 (3999) 3 mi	11640 (3999) 3 mi	No impact when compared to state 1.
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121	8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	8300 (619) 1 1/2 mi	High Impact when compared to state 1

Comparison of State 1 (Current Runway) to State 5 (80ft shift to the west)

Ranking by Usage	Runway	Procedure Name	Type	Public/Private	State 1 (Current) Category C Minimums	State 5 (80ft Shift) Category C Minimums	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	11640 (3999) 3 mi	11660 (4019) 3 mi	Minimal impact when compared to state 1
2	15	LOC-DME RWY 15	Straight In	Public-Special	9380 (1699) 3 mi	9380 (1699) 3 mi	Minimal impact when compared to state 1
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8880 (1199) 3 mi	8940 (1259) 3 mi	Moderate impact when compared to state 1. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	11640 (3999) 3 mi	11660 (4019) 3 mi	Minimal impact when compared to state 1
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13681 (6000) 10 mi	No impact when compared to state 1.
6	15	Visual	Circling/FMS Visual	Private-Special	11640 (3999) 3 mi	11640 (3999) 3 mi	No impact when compared to state 1.
7	15	VOR/DME - C	Circling Only	Public	11640 (3999) 3 mi	11660 (4019) 3 mi	Minimal impact when compared to state 1
8	15	RNAV/GPS - F	Circling Only	Public	11740 (4099) 3 mi	11780 (4139) 3 mi	Minimal impact when compared to state 1
9	33	Visual	Circling	Public	11640 (3999) 3 mi	11640 (3999) 3 mi	No impact when compared to state 1.
10	33	Visual	Circling/FMS Visual	Private-Special	11640 (3999) 3 mi	11640 (3999) 3 mi	No impact when compared to state 1.
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121	8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	8300 (619) 1 1/2 mi	High Impact when compared to state 1

procedures developed in state 1 to the updated versions of the same procedures required to accommodate the relocation of both the runway and I-ASE LOC/DME. The analysis revealed several small to negligible impacts to the primary procedures spread across categories A through C, with the exception of a moderate impact on the LOC-DME Rwy 15 special approach procedure, with a missed approach climb gradient, and a high impact on the RNAV (RNP) – Y special approach procedure. While both approach and departure procedures were analyzed, there were no appreciable differences in the departure procedures. The impacts on approach procedures are summarized in the table at the top right focusing on Category C approach minimums, with a more detailed discussion available in Appendix 1, Tables 9 and 10.

Increases in the approach minimums on the LOC-DME Rwy 15 special procedure, with missed approach gradients, were caused by additional obstructions in the missed approach segment for either the standard or alternate missed approach instructions. Missed approach climb gradients were unaltered, but could be increased to mitigate the increase in minimums.

Increases in the approach minimums on the RNAV (RNP 0.3) 15 approach are caused by a multitude of issues created by the total number of current waivers necessary for the approach to be approved by the FAA. Any shift in the runway location to the west will only further complicate the approval of the current procedure design, and will require a complete redesign that could eliminate one or two waivers in the process. As such, the increase in the minimums is based on new obstruction detected in the final approach segment and missed approach which will combine to create at least a 200ft increase in minimums, which is considered to be of high impact. However, due to the lack of total flight operations utilizing this procedure, its individual impact will do very little to the overall capability of the airport to continue handling traffic.

It should also be mentioned that while the impacts on the critical departure procedures used at the airport would be relatively unchanged. The EOSIDs on the 80ft option will potentially include new obstructions for those operators using an ICAO splay definition, or an Initial Climb Area 40:1 penetration procedure note as the basis for one engine inoperative obstacle clearance. The absolute impact on the takeoff weights, or payload range, was not assessed in this analysis, but in the experience of the LEAN team it is clearly understood that low close-in obstructions at high altitude airports will create the potential for payload hits under summer temperatures or operations requiring the use of Anti-Ice near 10C OAT.

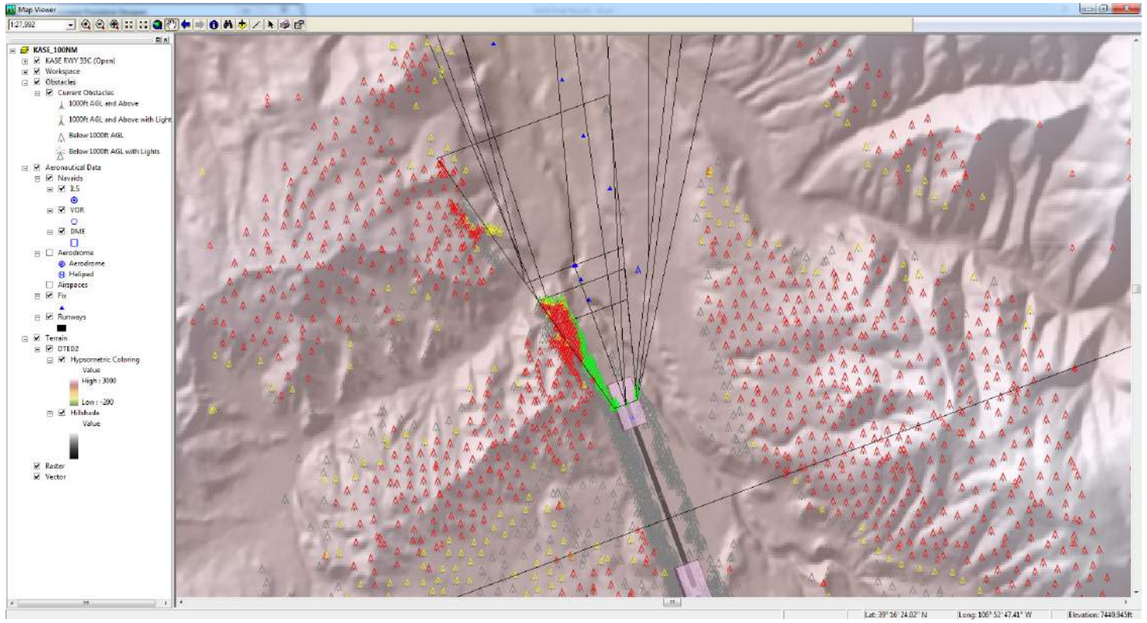
None of the approach or departure procedures analyzed under state 5 would be eliminated or changed in such a way as to render them ineffective or unsafe. Because the overall impact on those approaches used most by the airport is relatively low, the 80ft runway shift was deemed to create no undue impact on the ASE airspace.

Part B. Future Flight Procedures

Overview

The primary goal of the proposed runway relocation options at ASE are to achieve both a fully compliant aircraft separation area between the taxiways and the runways, and increase the maximum wingspan limitation of aircraft to 115ft that will permit a new generation of larger

Figure 20: 80ft shift design alternative for ASE Rwy 33 departures with diverse departure obstruction/ penetrations identified by 3 level color code intensity with green being acceptable obstructions, yellow requiring a climb gradient and red representing significant obstructions requiring increased ceilings, visibility and potentially climb gradient solutions.



regional jets and business jets to operate into and out of the airport. These new aircraft will have better approach and departure performance and navigation capabilities that will enable them to fly approaches with smaller obstacle detection areas and fly missed approaches along paths that previously were not available. In addition to new aircraft, the impact from upcoming changes to the existing instrument procedures at ASE, due to reasons unrelated to the potential relocation of the runway, will drive the airport stakeholders to consider new approach types that can safely bring aircraft closer to the runway while still provided balked and rejected landing accountability.

In order to evaluate the airspace impact against the future state of the airport, it is therefore important to evaluate any potential impacts that the runway relocation might have on future approaches (using RNP-AR).

Current vs Future Approach

At the time of this assessment, the only RNP or RNP-AR approaches available at the airport were private, special RNP-AR procedures requiring numerous waivers, extremely high missed approach climb gradients and special RNP capabilities to maintain RNP 0.3 with RF legs in the final and RNP 0.3 with RF legs in the missed. This procedure, while producing some of the lowest possible minimums for aircraft operations, is so complex that only one aircraft operator is known to operate with it.

Given the current complexity of RNP approaches at the airport, the goal of any future approach capabilities at ASE would achieve the following:

1. **Instrument approach minimums < 1000ft and 1 ½ mi visibility**
2. **A single final descent angle**
3. **Realistic speed limitations on both the final approach and missed approach**
4. **A straight in portion on the last segment of the final approach, leading into the visual approach segment**
5. **Missed approach climb gradients of less than 400ft/nm to altitudes below 10000ft**
6. **Missed approach points that diverge from the centerline of the runway on the runway or, preferably, after the DER of Runway**

Figure 21: Example of a Future RNP procedure modeled against the 42ft shift with 0.17E twist on Rwy 15, with 3 levels of RNP (0.1, 0.2, and 0.3) following a straight-in approach with a missed approach path following state highway 82

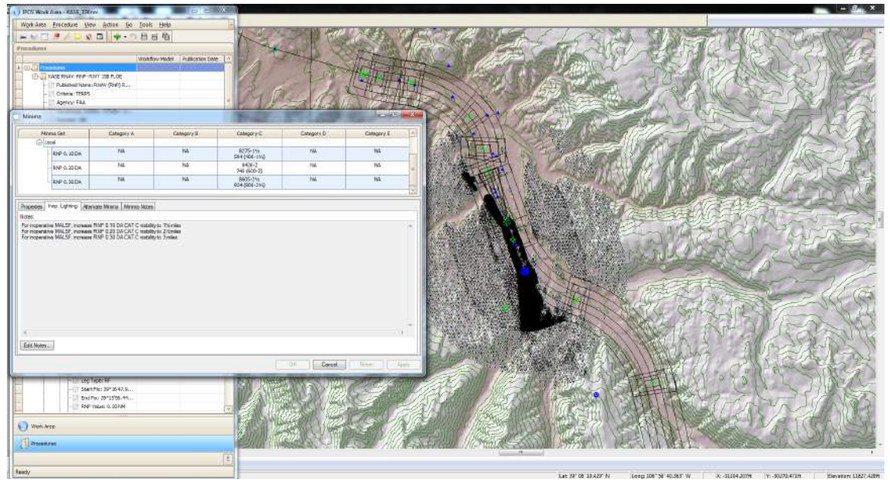
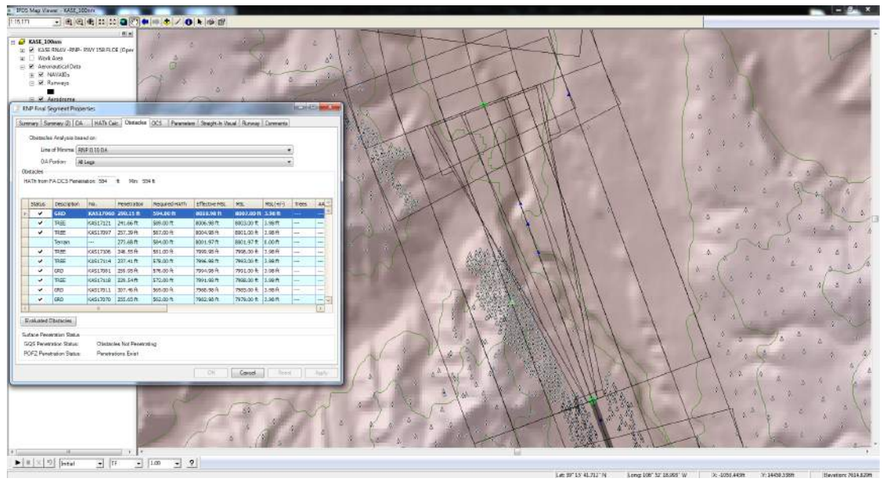


Figure 22: Close-In view of a Future procedure modeled against the 42ft shift with 0.17E twist on Rwy 15. RNP 0.1 controlling obstacle is identified in the table (blue row) and on the image by a green triangle.



Comparison of Current Runway to Baseline Runway with Future Approach Procedures

Runway	Procedure Name	Type	Public/Private	Current Published Category C Minimums	Baseline State 1 Category C Minimums	Operational Impact
15	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121	8079 (399) MALSF On 1 1/2 mi MALSF Out 1 3/4 mi	8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	No Impact
15	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	Does Not Currently Exist	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	Significant increase in airport access, completion factor and overall flight safety
15	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	Does Not Currently Exist	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	Significant increase in airport access, completion factor and overall flight safety
15	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	Does Not Currently Exist	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	Significant increase in airport access, completion factor and overall flight safety

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While achieving all of these objectives is the purpose of a formal instrument procedure development process, it was possible for LEAN to create an approach type that accomplished most of these objectives for the purposes of evaluating how the runway shifts might impact the ability to meet these design goals.

The procedure that was developed was an RNP-AR approach to Runway 15 for RNP 0.3, 0.2 and 0.1 in both the final approach and missed approach segments. The procedure requires operators to fly RF legs in the intermediate, final and missed approach phases, all while maintain the initial RNP level of the final approach throughout the missed approach.

The procedure was not heavily optimized for either the current state or future state, but was created with initial and intermediate approach legs which matched other RNP and RNAV approaches, and utilized a missed approach path which improves the rejected/balked landing capability while reducing the required climb gradients to levels that are possible by a wider range of current and next generation regional aircraft. This requires a missed approach path that proceeds to the south and east of Runway 15, over the city of ASPEN, terminating at a fix called KEBLR (which is about halfway between ASE and KGUC).

This missed approach path, to the southeast, may not necessarily be the optimal trajectory. But it does represent a path which would be more sensitive to shifts in the runway to the west. This is in contrast to other current rejected/balked landing procedures which involve 200+ degree turns to the left "inside" the valley occupied by the airport. These procedures, while possible for high performance business jets and turboprop aircraft, will only be improved by shifting the runway any distance to the west. Therefore, a more desirable, and complex path was chosen that could be more heavily impacted by the numerous obstructions that will exist off of the Runway 33 approach end.

The breakdown of the current state of the runway as compared to the baseline for the proposed RNP-AR approaches can be seen in the table at the left. The detailed assessments for these procedures is presented in Appendix 1 Tables 11 through 15.

It is important to note that the proposed RNP-AR procedures did not achieve the same minimums as those available from the current RNP-AR special procedure in use today. However, the missed approach climb gradient requirements were all reduced to values below 400ft/nm with terminating altitudes from 10000ft to 13000ft. This would immediately allow for additional RNP-AR capable aircraft to utilize the approach procedure designed for this analysis which would increase the airport's access during periods of inclement weather. This procedure would also improve the overall Safety Risk Management, High level risk assessment process, used by most aircraft operators, in determining the skill level and training for pilots required to successfully use the airport.

States 2 through 4

The future state impact assessment for all of the Runway 15/33 shifts to the west involved the comparison of the existing and proposed RNP-AR procedures developed in state 1 to the updated versions of the same procedures required to accommodate the new runway location and alignment for the state (2-5). This meant creating a series of new fixes and legs for the final approach segments, as well as the first few legs of the missed approach segments, to correctly recreate the approach.

No significant effort was spent on re-optimizing the points for this particular state, over state 1, as this would potentially defeat the goal of assessing any impact that the runway location might impose. Therefore, it should be noted that the minimums presented on a comparative basis for this state are not the lowest possible.

As previously discussed, the existing RNP-AR procedure will become significantly altered with any shift in the Runway 15 threshold location (see Current Flight Procedures, States 2 - 5). The changes to the new RNP-AR procedures are relatively insignificant and could be overcome with optimal procedure design attention. The impacts on approach procedures are summarized in the table below focusing on Category

Comparison of State 1 (Current Runway) to State 2 (25ft Shift)

Runway	Procedure Name	Type	Public/Private	State 1 (Current) Category C Minimums	State 2 (25ft Shift) Category C Minimums	Operational Impact
15	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121	8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	8300 (619) 1 1/2 mi	High impact when compared to state 1
15	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8627 (946) 3 mi	Minor Impact when compared to state 1.
15	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8493 (812) 2 1/2 mi	Minor Impact when compared to state 1.
15	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	No Impact when compared to state 1.

Comparison of State 1 (Current Runway) to State 3 (50ft Shift)

Runway	Procedure Name	Type	Public/Private	State 1 (Current) Category C Minimums	State 3 (50ft Shift) Category C Minimums	Operational Impact
15	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121	8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	8300 (619) 1 1/2 mi	High impact when compared to state 1
15	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8606 (925) MALSF On 2 1/2 mi MALSF Out 3 mi	No Impact when compared to state 1.
15	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	No Impact when compared to state 1.
15	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	Minor Impact when compared to state 1.

Comparison of State 1 (Current Runway) to State 4 (43ft Shift with 0.17E Twist)

Runway	Procedure Name	Type	Public/Private	State 1 (Current) Category C Minimums	State 4 43ft Shift with 0.17E Twist Category C Minimums	Operational Impact
15	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121	8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	8300 (619) 1 1/2 mi	High impact when compared to state 1
15	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	No Impact when compared to state 1.
15	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	No Impact when compared to state 1.
15	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	No Impact when compared to state 1.

Comparison of State 1 (Current Runway) to State 5 (80ft Shift)

Runway	Procedure Name	Type	Public/Private	State 1 (Current) Category C Minimums	State 5 80ft Shift Category C Minimums	Operational Impact
15	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121	8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	8300 (619) 1 1/2 mi	High impact when compared to state 1
15	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8610 (929) MALSF On 2 1/2 mi MALSF Out 3 mi	No Impact when compared to state 1.
15	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	No Impact when compared to state 1.
15	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	Minor Impact when compared to state 1.

C approach minimums, with a more detailed discussion available in Appendix 1, Tables 11 through 15.

None of the future approaches analyzed under any of the runway states 2 - 5 would be eliminated or changed in such a way as to render them ineffective or unsafe. Because the overall impact on those approaches that would be used most often by the next generation of aircraft flying to ASE is relatively low, all of the runway shift options were deemed to create no undue impact on the future possibilities for operations at ASE.

Part VI. Conclusion

The airspace impact assessment found minor to moderate impacts to the current and future instrument and visual flight procedures at the Aspen-Pitkin County/Sardy Airport. The most significant impacts detected were those caused by updates to circling criteria and the application of a recent VGA obstruction survey data. These two impacts will most likely be applied to the airport, and its current instrument procedures, over the next one to two years irrespective of any plans for the runway relocation to the west. Since no discussion was performed with FAA flight procedures, FAA flight standards, and other FAA stakeholders, it is unknown if the FAA will grant future waivers to mitigate any impacts caused by new criteria.

The impacts on flight procedures directly related to shifting Runway 15/33 from 25ft to 80ft west of the current centerline are relatively minor once the new criteria and obstruction data is accounted for. In addition, no instrument approach or departure procedure analyzed in this assessment would be altered in such a way by the runway relocation that would cause the procedure to either be impractical or unsafe for continued use. This assumes that the existing NAVAIDs can be relocated to the new locations required by each runway shift.

Based on the collective insight from the participants at a meeting held on 30MAY14 in Denver, CO to present the preliminary results of this analysis, the group believed that the vast majority of operators will not be impacted by any of the increases in ceilings or visibilities caused by any of the four proposed runway shifts. In order to conduct a detailed assessment on the impact to specific operators or aircraft type, a historical environmental assessment and operator impact assessment must be performed. However, since no such analysis has been performed at the time of this report, LEAN can only endorse the impact levels presented in this report and state that only those procedures with no change in ceilings, visibilities and missed approach climb gradients will definitively avoid any impact on aircraft operations and airspace.

The proposed relocation options will not alleviate any of the long term flight operations issues encountered at the airport, including missed approach climb gradients in excess of 200ft/nm and a lack of widely used instrument approaches with ceilings below 1000ft HAT. In fact these issues will be exacerbated by the application of new circling criteria and the latest obstruction surveys. Therefore, it is highly recommended that the airport and FAA consider the implementation of new public RNP-AR procedures which will accommodate both the current and proposed runway shifts as well as the next wave of aircraft instrument approach capabilities.

Appendix 1

Detailed breakdown of flight procedure impacts for all runway states and procedures.

Table 1: Comparison of Approach Procedures between the Existing Runway to State 1

					Existing Runway Configuration					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					
Ranking by Usage	Runway	Procedure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	9840 (2160) 3 mi	10020 (2520) 3 mi	10220 (2540) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Business Jets, Turboprop and smaller	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	Minor Impact
2	15	LOC-DME RWY 15	Straight In	Public-Special	9200 (1520) 2 3/4 mi	9200 (1520) 2 3/4 mi	9200 (1520) 2 3/4 mi	Several waivers exist for this procedure, visibility increased due to straight-in minimums	Regional Jets, Business Jets, Turboprops and smaller	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	Several waivers exist for this procedure, visibility increased due to straight-in minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	Minor Impact
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8760 (1080) 2 3/4 mi	8760 (1080) 2 3/4 mi	8760 (1080) 2 3/4 mi	MAP Climb of 330ft/nm to 11100ft Several waivers exist for this procedure, visibility increased due to straight-in minimums	Regional Jets, Business Jets, Turboprops and smaller	8880 (1199) 3 mi	8880 (1199) 3 mi	8880 (1199) 3 mi	MAP Climb of 330ft/nm to 11100ft Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	Moderate Impact due to increased vis and ceilings. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	9680 (2000) 3 mi	10320 (2640) 3 mi	10840 (3160) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums	Regional Jets, Business Jets, Turboprops and smaller	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	Moderate Impact due to increased vis and ceilings.
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13680 (6000) 10 mi	13680 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	13680 (6000) 10 mi	13680 (6000) 10 mi	13680 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	No Impact
6	15	Visual	Circling/FMS Visual	Private-Special	10200 (2520) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, several waivers exist for this procedure	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	No Impact
7	15	VOR/DME - C	Circling Only	Public	10220 (2540) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, A+B minimums are merged for unknown reasons, several waivers exist for this procedure	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minor Impact
8	15	RNAV/GPS - F	Circling Only	Public	10200 (2520) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, several waivers exist for this procedure	Turboprop and smaller	10140 (2459) 1 3/4 mi	10460 (2799) 1 3/4 mi	11740 (4099) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minor Impact
9	33	Visual	Circling	Public	10200 (2520) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, several waivers exist for this procedure. Approach to runway 33 is N/A at night due to 34:1 and 20:1 penetrations.	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No Impact
10	33	Visual	Circling/FMS Visual	Private-Special	10200 (2520) 1 3/4 mi	10220 (2540) 1 3/4 mi	10220 (2540) 3 mi	Old circling criteria, several waivers exist for this procedure. Approach to runway 33 is N/A at night due to 34:1 and 20:1 penetrations.	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No Impact
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8079 (399) MALSF On 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only	No Impact

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 2: Comparison of Departure Procedures between the Existing Runway to State 1

				Existing Runway Configuration					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					
Runway	Procedure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
33	LINDZ 8	Conventional	Public		(400) 1 mi		465ft/nm to 10000	Regional Jets, Business Jets, Turboprops and smaller		(200) 1 mi		465ft/nm to 10000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	No Impact
33	SARDD 3	Conventional	Public		(400) 1 mi		460ft/nm to 14000	Regional Jets, Business Jets, Turboprops and smaller		(200) 1 mi		460ft/nm to 14000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	No Impact
33	PITKIN 4	RNAV	Public		(400) 1 mi		500ft/nm to 16000	High Performance Aircraft only, FMS issues with short 2nd leg		(200) 1 mi		500ft/nm to 16000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only, FMS issues with short 2nd leg	No Impact
33	GLENO 2	RNP-AR	Private - Special		(0) 1/4 mi		490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets		(0) 1/4 mi		490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	No impact assumed based on existing deviation from visibility requirements due to obstacles in the ICA and extended ICA.
33	ASPEN 6	Conventional	Public		(400) 1 mi		650ft/nm to 13000	High Performance Aircraft only		(200) 1 mi		650ft/nm to 13000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only	No Impact
33	RWY 33 EOSID RNAV	RNAV	Private - Special		(400) 1 mi		SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops		(200) 1 mi		SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	No Imapct
33	RWY 33 EOSID	Conventional	Private - Special		(400) WITH IASE 1 mi (400) WITH IASE 1 mi Without IASE 3 mi		SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops		(200) WITH IASE 1 mi (200) WITH IASE 1 mi Without IASE 3 mi		SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	No Imapct

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 3: Comparison of Approach Procedures between State 1 and State 2

					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					25ft Offset to the West Configuration (State 2)					
Ranking by Usage	Runway	Procedure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	9740 (2059) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, runway 15/33 shifted 25ft to the west, IASE LOC and DME shifted to the west, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	Minimal impact when compared to state 1
2	15	LOC-DME RWY 15	Straight In	Public-Special	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	Several waivers exist for this procedure, visibility increased due to straight-in minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	New circling criteria, runway 15/33 shifted 25ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Minimal impact when compared to state 1
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8880 (1199) 3 mi	8880 (1199) 3 mi	8880 (1199) 3 mi	MAP Climb of 330ft/nm to 11100ft Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	8940 (1259) 3 mi	8940 (1259) 3 mi	8940 (1259) 3 mi	MAP climb of 330ft/nm to 11100ft New circling criteria, runway 15/33 shifted 25ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Moderate impact when compared to state 1. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9740 (2059) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, runway 15/33 shifted 25ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Minimal impact when compared to state 1
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13680 (6000) 10 mi	13680 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	13681 (6000) 10 mi	13681 (6000) 10 mi	13681 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	No impact when compared to state 1.
6	15	Visual	Circling/FMS Visual	Private-Special	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	No impact when compared to state 1.
7	15	VOR/DME - C	Circling Only	Public	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	New circling criteria, runway 15/33 shifted 25ft to the west, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minimal impact when compared to state 1
8	15	RNAV/GPS - F	Circling Only	Public	10140 (2459) 1 3/4 mi	10460 (2799) 1 3/4 mi	11740 (4099) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	10140 (2459) 1 3/4 mi	10440 (2759) 1 3/4 mi	11760 (4119) 3 mi	New circling criteria, runway 15/33 shifted 25ft to the west, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minimal impact when compared to state 1
9	33	Visual	Circling	Public	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No impact when compared to state 1.
10	33	Visual	Circling/FMS Visual	Private-Special	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No impact when compared to state 1.
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8300 (619) 1 1/2 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Initial estimates based on procedure design results. Shifting the runway any amount will have significant impacts on this particular approach which will cause a complete redesign	High Performance BusinessJets Only	High impact when compared to state 1

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 4: Comparison of Departure Procedures between State 1 and State 2

				Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					25ft Offset to the West Configuration (State 2)					
Runway	Procedure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
33	LINDZ 8	Conventional	Public	(200) 1 mi			465ft/nm to 10000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	(200) 1 mi			465ft/nm to 10000	Regional Jets, Business Jets, Turboprops and smaller	No impact when compared to state 1.
33	SARDD 3	Conventional	Public	(200) 1 mi			460ft/nm to 14000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	(200) 1 mi			460ft/nm to 14000	Regional Jets, Business Jets, Turboprops and smaller	No impact when compared to state 1.
33	PITKIN 4	RNAV	Public	(200) 1 mi			500ft/nm to 16000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only, FMS issues with short 2nd leg	(200) 1 mi			500ft/nm to 16000	High Performance Aircraft only, FMS issues with short 2nd leg	No impact when compared to state 1.
33	GLENO 2	RNP-AR	Private - Special	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	No impact when compared to state 1. Based on assumption that current deviation from visibility requirements will be upheld.
33	ASPEN 6	Conventional	Public	(200) 1 mi			650ft/nm to 13000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only	(200) 1 mi			605ft/nm to 13000	High Performance Aircraft only	No impact when compared to state 1.
33	RWY 33 EOSID RNAV	RNAV	Private - Special	(200) 1 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(200) 1 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	No impact when compared to state 1.
33	RWY 33 EOSID	Conventional	Private - Special	(200) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(200) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	No impact when compared to state 1.

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 5: Comparison of Approach Procedures between State 1 and State 3

					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					50ft Offset to the West Configuration (State 3)					
Ranking by Usage	Runway	Procedure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	9740 (2059) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, runway 15/33 shifted 50ft to the west, IASE LOC and DME shifted to the west, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	Minimal impact when compared to state 1
2	15	LOC-DME RWY 15	Straight In	Public-Special	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	Several waivers exist for this procedure, visibility increased due to straight-in minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9420 (1739) 3 mi	9420 (1739) 3 mi	9420 (1739) 3 mi	New circling criteria, runway 15/33 shifted 50ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Minor Impact when compared to state 1
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8880 (1199) 3 mi	8880 (1199) 3 mi	8880 (1199) 3 mi	MAP Climb of 330ft/nm to 11100ft Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9060 (1379) 3 mi	9060 (1379) 3 mi	9060 (1379) 3 mi	MAP Climb of 330ft/nm to 10000ft New circling criteria, runway 15/33 shifted 50ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Moderate impact when compated to state 1. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9740 (2059) 3 mi	10440 (2759) 3 mi	11640 (3999) 3 mi	New circling criteria, runway 15/33 shifted 50ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Minor Impact when compared to state 1
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13680 (6000) 10 mi	13680 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	13681 (6000) 10 mi	13681 (6000) 10 mi	13681 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	No impact when compared to state 1.
6	15	Visual	Circling/FMS Visual	Private-Special	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	No impact when compared to state 1.
7	15	VOR/DME - C	Circling Only	Public	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	9780 (2099) 1 3/4 mi	10440 (2779) 1 3/4 mi	11640 (4019) 3 mi	New circling criteria, runway 15/33 shifted 50ft to the west, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minimal impact when compared to state 1
8	15	RNAV/GPS - F	Circling Only	Public	10140 (2459) 1 3/4 mi	10460 (2799) 1 3/4 mi	11740 (4099) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	10140 (2459) 1 3/4 mi	10440 (2759) 1 3/4 mi	11760 (4119) 3 mi	New circling criteria, runway 15/33 shifted 50ft to the west, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minimal impact when compared to state 1
9	33	Visual	Circling	Public	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No impact when compared to state 1.
10	33	Visual	Circling/FMS Visual	Private-Special	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No impact when compared to state 1.
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8300 (619) 1 1/2 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Initial estimates based on procedure design results. Shifting the runway any amount will have significant impacts on this particular approach which will cause a complete redesign	High Performance BusinessJets Only	High Impact when compared to state 1

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 6: Comparison of Departure Procedures between State 1 and State 3

				Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					50ft Offset to the West Configuration (State 3)					
Runway	Procedure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
33	LINDZ 8	Conventional	Public	(200) 1 mi			465ft/nm to 10000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	(200) 1 mi			465ft/nm to 10000	Regional Jets, Business Jets, Turboprops and smaller	No impact when compared to state 1.
33	SARDD 3	Conventional	Public	(200) 1 mi			460ft/nm to 14000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	(200) 1 mi			460ft/nm to 14000	Regional Jets, Business Jets, Turboprops and smaller	No impact when compared to state 1.
33	PITKIN 4	RNAV	Public	(200) 1 mi			500ft/nm to 16000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only, FMS issues with short 2nd leg	(200) 1 mi			500ft/nm to 16000	High Performance Aircraft only, FMS issues with short 2nd leg	No impact when compared to state 1.
33	GLENO 2	RNP-AR	Private - Special	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	No impact when compared to state 1. Based on assumption that current deviation from visibility requirements will be upheld.
33	ASPEN 6	Conventional	Public	(200) 1 mi			650ft/nm to 13000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only	(200) 1 mi			605ft/nm to 13000	High Performance Aircraft only	No impact when compared to state 1.
33	RWY 33 EOSID RNAV	RNAV	Private - Special	(200) 1 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(200) 1 mi			SID Based Operators: 460ft/nm to 14000, 14ft HAR, 58ft from DER Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	Minimal impact when compared to state 1 for Business Jets and smaller aircraft operators. Regional Jets and Turboprops will most likely be unaffected.
33	RWY 33 EOSID	Conventional	Private - Special	(200) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(200) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, 14ft HAR, 58ft from DER Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	Minimal impact when compared to state 1 for Business Jets and smaller aircraft operators. Regional Jets and Turboprops will most likely be unaffected.

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 7: Comparison of Approach Procedures between State 1 and State 4

					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					42ft Offset to the West with a 0.17 E Deflection Configuration (State 4)					
Ranking by Usage	Runway	Procedure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	9740 (2059) 3 mi	10420 (2759) 3 mi	11660 (4019) 3 mi	New circling criteria, runway 15/33 shifted 43ft to the west and angled 0.17E, IASE LOC and DME shifted to the west, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	Minimal impact when compared to state 1
2	15	LOC-DME RWY 15	Straight In	Public-Special	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	Several waivers exist for this procedure, visibility increased due to straight-in minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	New circling criteria, runway 15/33 shifted 43ft to the west and angled 0.17E, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Minimal impact when compared to state 1
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8880 (1199) 3 mi	8880 (1199) 3 mi	8880 (1199) 3 mi	MAP Climb of 330ft/nm to 11100ft Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	8940 (1259) 3 mi	8940 (1259) 3 mi	8940 (1259) 3 mi	MAP Climb of 330ft/nm to 10000ft New circling criteria, runway 15/33 shifted 43ft to the west and angled 0.17E, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Moderate impact when compated to state 1. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9740 (2059) 3 mi	10420 (2759) 3 mi	11660 (4019) 3 mi	New circling criteria, runway 15/33 shifted 43ft to the west and angled 0.17E, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Minimal impact when compared to state 1
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13680 (6000) 10 mi	13680 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	13681 (6000) 10 mi	13681 (6000) 10 mi	13681 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	No impact when compared to state 1.
6	15	Visual	Circling/FMS Visual	Private-Special	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	No impact when compared to state 1.
7	15	VOR/DME - C	Circling Only	Public	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	9780 (2099) 1 3/4 mi	10420 (2759) 1 3/4 mi	11660 (4019) 3 mi	New circling criteria, runway 15/33 shifted 43ft to the west and angled 0.17E, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minimal impact when compared to state 1
8	15	RNAV/GPS - F	Circling Only	Public	10140 (2459) 1 3/4 mi	10460 (2799) 1 3/4 mi	11740 (4099) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	10140 (2459) 1 3/4 mi	10420 (2739) 1 3/4 mi	11760 (4119) 3 mi	New circling criteria, runway 15/33 shifted 43ft to the west and angled 0.17E, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minimal impact when compared to state 1
9	33	Visual	Circling	Public	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No impact when compared to state 1.
10	33	Visual	Circling/FMS Visual	Private-Special	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No impact when compared to state 1.
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8300 (619) 1 1/2 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Initial estimates based on procedure design results. Shifting the runway any amount will have significant impacts on this particular approach which will cause a complete redesign	High Performance BusinessJets Only	High Impact when compared to state 1

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 8: Comparison of Departure Procedures between State 1 and State 4

				Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					42ft Offset to the West with a 0.17 E Deflection Configuration (State 4)					
Runway	Procedure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
33	LINDZ 8	Conventional	Public	(200) 1 mi			465ft/nm to 10000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	(200) 1 mi			465ft/nm to 10000	Regional Jets, Business Jets, Turboprops and smaller	No impact when compared to state 1.
33	SARDD 3	Conventional	Public	(200) 1 mi			460ft/nm to 14000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	(200) 1 mi			460ft/nm to 14000	Regional Jets, Business Jets, Turboprops and smaller	No impact when compared to state 1.
33	PITKIN 4	RNAV	Public	(200) 1 mi			500ft/nm to 16000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only, FMS issues with short 2nd leg	(200) 1 mi			500ft/nm to 16000	High Performance Aircraft only, FMS issues with short 2nd leg	No impact when compared to state 1.
33	GLENO 2	RNP-AR	Private - Special	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	No impact when compared to state 1. Based on assumption that current deviation from visibility requirements will be upheld.
33	ASPEN 6	Conventional	Public	(200) 1 mi			650ft/nm to 13000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only	(200) 1 mi			605ft/nm to 13000	High Performance Aircraft only	No impact when compared to state 1.
33	RWY 33 EOSID RNAV	RNAV	Private - Special	(200) 1 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(200) 1 mi			SID Based Operators: 460ft/nm to 14000, 14ft HAR, 56ft from DER Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	Minimal impact when compared to state 1 for Business Jets and smaller aircraft operators. Regional Jets and Turboprops will most likely be unaffected.
33	RWY 33 EOSID	Conventional	Private - Special	(200) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(200) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, 14ft HAR, 56ft from DER Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	Minimal impact when compared to state 1 for Business Jets and smaller aircraft operators. Regional Jets and Turboprops will most likely be unaffected.

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 9: Comparison of Approach Procedures between State 1 and State 5

					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					80ft Offset to the West Configuration (State 5)					
Ranking by Usage	Runway	Procedure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
1	15	LOC-DME - E	Circling Only	Public	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	9740 (2059) 3 mi	10420 (2759) 3 mi	11660 (4019) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, IASE LOC and DME shifted to the west, several waivers are required, approach modeled as an LOC straight in, but straight in minimums are disregarded	Business Jets, Turboprop and smaller	Minimal impact when compared to state 1
2	15	LOC-DME RWY 15	Straight In	Public-Special	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	Several waivers exist for this procedure, visibility increased due to straight-in minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9380 (1699) 3 mi	9380 (1699) 3 mi	9380 (1699) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Minimal impact when compared to state 1
3	15	LOC-DME RWY 15	Straight In (With MAP CG and Alternate Instructions)	Public-Special	8880 (1199) 3 mi	8880 (1199) 3 mi	8880 (1199) 3 mi	MAP Climb of 330ft/nm to 11100ft Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	8940 (1259) 3 mi	8940 (1259) 3 mi	8940 (1259) 3 mi	MAP Climb of 330ft/nm to 10000ft New circling criteria, runway 15/33 shifted 80ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Moderate impact when compared to state 1. No change to MAP gradient will result in reduced OEI SMAP landing weight impacts.
4	15	LOC-DME RWY 15	Circling	Public-Special	9760 (2079) 3 mi	10460 (2799) 3 mi	11640 (3999) 3 mi	Several waivers exist for this procedure, visibility increased due to straight minimums, even though they aren't published	Regional Jets, Business Jets, Turboprops and smaller	9740 (2059) 3 mi	10420 (2759) 3 mi	11660 (4019) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, IASE LOC and DME shifted to the west, several waivers are required	Regional Jets, Business Jets, Turboprops and smaller	Minimal impact when compared to state 1
5	15	Visual	Straight In	Public	13680 (6000) 10 mi	13680 (6000) 10 mi	13680 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	13681 (6000) 10 mi	13681 (6000) 10 mi	13681 (6000) 10 mi	Visual manuever with radar guidance for "straight in" approach to runway 15 following visual references.	Turboprop and smaller	No impact when compared to state 1.
6	15	Visual	Circling/FMS Visual	Private-Special	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments	Turboprop and smaller	No impact when compared to state 1.
7	15	VOR/DME - C	Circling Only	Public	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	9780 (2099) 1 3/4 mi	10420 (2759) 1 3/4 mi	11660 (4019) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minimal impact when compared to state 1
8	15	RNAV/GPS - F	Circling Only	Public	10140 (2459) 1 3/4 mi	10460 (2799) 1 3/4 mi	11740 (4099) 3 mi	New circling criteria, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	10140 (2459) 1 3/4 mi	10400 (2719) 1 3/4 mi	11780 (4139) 3 mi	New circling criteria, runway 15/33 shifted 80ft to the west, several waivers are required, stepdown fix altitude increased to accommodate category C approach MDA which will require another waiver for the new Final Descent Angle	Turboprop and smaller	Minimal impact when compared to state 1
9	33	Visual	Circling	Public	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No impact when compared to state 1.
10	33	Visual	Circling/FMS Visual	Private-Special	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	9780 (2099) 1 3/4 mi	10460 (2799) 1 3/4 mi	11640 (3999) 3 mi	Procedure will not require significant adjustments. Approach to runway 33 will remain N/A at night due to 34:1 and 20:1 penetrations	Turboprop and smaller	No impact when compared to state 1.
11	15	RNAV (RNP 0.3) 15	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8300 (619) 1 1/2 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Initial estimates based on procedure design results. Shifting the runway any amount will have significant impacts on this particular approach which will cause a complete redesign	High Performance BusinessJets Only	High impact when compared to state 1

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 10: Comparison of Departure Procedures between State 1 and State 5

				Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					80ft Offset to the West Configuration (State 5)					
Runway	Procedure Name	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
33	LINDZ 8	Conventional	Public	(200) 1 mi			465ft/nm to 10000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	(300) 1 mi			465ft/nm to 10000	Regional Jets, Business Jets, Turboprops and smaller	No impact when compared to state 1.
33	SARDD 3	Conventional	Public	(200) 1 mi			460ft/nm to 14000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	Regional Jets, Business Jets, Turboprops and smaller	(300) 1 mi			460ft/nm to 14000	Regional Jets, Business Jets, Turboprops and smaller	No impact when compared to state 1.
33	PITKIN 4	RNAV	Public	(200) 1 mi			500ft/nm to 16000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only, FMS issues with short 2nd leg	(300) 1 mi			500ft/nm to 16000	High Performance Aircraft only, FMS issues with short 2nd leg	No impact when compared to state 1.
33	GLENO 2	RNP-AR	Private - Special	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	(0) 1/4 mi			490 ft/nm to 8600ft (ATC) 150ft/nm to 10000 then 90ft/nm to 11700 (OBS)	NetJets Aircraft	No impact when compared to state 1. Based on assumption that current deviation from visibility requirements will be upheld.
33	ASPEN 6	Conventional	Public	(200) 1 mi			650ft/nm to 13000 FAA is potentially enforcing the 400ft minimum height to ensure ICA obstruction avoidance	High Performance Aircraft only	(300) 1 mi			605ft/nm to 13000	High Performance Aircraft only	No impact when compared to state 1.
33	RWY 33 EOSID RNAV	RNAV	Private - Special	(200) 1 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(300) 1 mi			SID Based Operators: 460ft/nm to 14000, 14ft HAR, 58ft from DER Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, 14ft HAR, 58ft from DER	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	Minimal impact to all operators when compared to state 1.
33	RWY 33 EOSID	Conventional	Private - Special	(200) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, no low close-in Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, no low close-in Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	(300) WITH IASE 1 mi Without IASE 3 mi			SID Based Operators: 460ft/nm to 14000, 14ft HAR, 58ft from DER Generic Performance Customers: 86ft/nm to 8100, 15ft obstacle at DER Specialized Performance Customers: 86ft/nm to 8100, 14ft HAR, 58ft from DER Several Operators are still using DBL DME references at OEI altitudes below 9100ft. This requires FMS/RNAV or Visual References to successfully initiate the turn.	SID Based: Business Jets and smaller aircraft Generic Perofrmance: Business Jets, Regional Jets and Turboprops Specialized Performance: Business Jets, Regional Jets and Truboprops	Minimal impact to all operators when compared to state 1.

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 11: Comparison of Future Approach Procedures between the existing runway and State 1

					Existing Runway Configuration					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					
Runway	Procedure	Navigation Mode	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8079 (399) MALSF On 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only	No Impact
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	Does Not Currently Exist	Does Not Currently Exist	Does Not Currently Exist	No public or public-special RNP procedures have been created. RNP/LPV approaches are slated for development by FAA in 2016.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 377ft/nm to 13340ft. RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	Significant increase in airport access, completion factor and overall flight safety
15	Approach	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	Does Not Currently Exist	Does Not Currently Exist	Does Not Currently Exist	No public or public-special RNP procedures have been created. RNP/LPV approaches are slated for development by FAA in 2016.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 376ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	Significant increase in airport access, completion factor and overall flight safety
15	Approach	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	Does Not Currently Exist	Does Not Currently Exist	Does Not Currently Exist	No public or public-special RNP procedures have been created. RNP/LPV approaches are slated for development by FAA in 2016.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 372 ft/nm to 12700ft, then 364ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	Significant increase in airport access, completion factor and overall flight safety

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 12: Comparison of Future Approach Procedures between State 1 and State 2

					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					25ft Offset to the West Configuration (State 2)					
Runway	Procedure	Navigation Mode	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8300 (619) 1 1/2 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only	High impact when compared to state 1
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 377ft/nm to 13340ft. RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	8627 (946) 3 mi	8627 (946) 3 mi	8627 (946) 3 mi	MAP Climb of 377ft/nm to 13340ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	Minor Impact when compared to state 1.
15	Approach	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 376ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8493 (812) 2 1/2 mi	8493 (812) 2 1/2 mi	8493 (812) 2 1/2 mi	MAP Climb of 376ft/nm to 13340ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	Minor Impact when compared to state 1.
15	Approach	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 372 ft/nm to 12700ft, then 364ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 372ft/nm to 12700ft, then 364 ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	No Impact when compared to state 1.

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 13: Comparison of Future Approach Procedures between State 1 and State 3

					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					50ft Offset to the West Configuration (State 3)					
Runway	Procedure	Navigation Mode	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8300 (619) 1 1/2 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only	High impact when compared to state 1
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 377ft/nm to 13340ft. RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	8606 (925) MALSF On 2 1/2 mi MALSF Out 3 mi	8606 (925) MALSF On 2 1/2 mi MALSF Out 3 mi	8606 (925) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 377ft/nm to 13340ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	No Impact when compared to state 1.
15	Approach	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 376ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 376ft/nm to 13340ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	No Impact when compared to state 1.
15	Approach	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 372 ft/nm to 12700ft, then 364ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	MAP Climb of 371ft/nm to 12700ft, then 363 ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	Minor Impact when compared to state 1.

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 14: Comparison of Future Approach Procedures between State 1 and State 4

					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					42ft Offset to the West with a 0.17 E Deflection Configuration (State 4)					
Runway	Procedure	Navigation Mode	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8300 (619) 1 1/2 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only	High impact when compared to state 1
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 377ft/nm to 13340ft. RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 377ft/nm to 13340ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	No Impact when compared to state 1.
15	Approach	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 376ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 376ft/nm to 13340ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	No Impact when compared to state 1.
15	Approach	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 372 ft/nm to 12700ft, then 364ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 372ft/nm to 12700ft, then 364 ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	No Impact when compared to state 1.

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft

Table 15: Comparison of Future Approach Procedures between State 1 and State 5

					Existing Runway Configuration with Updated Criteria and Obstacles (State 1)					80ft Offset to the West Configuration (State 5)					
Runway	Procedure	Navigation Mode	Type	Public/Private	A	B	C	Comment	Typical Aircraft Using Procedure	A	B	C	Comment	Typical Aircraft Using Procedure	Operational Impact
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Private - RNP-AR - Non FAR 121			8078 (397) MALSF On 1 3/8mi MALSF Out 1 5/8 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only			8300 (619) 1 1/2 mi	MAP Climb of 1000ft/nm to 9100, then 475 ft/nm to 10900ft Numerous waivers exist for this procedure	High Performance BusinessJets Only	High impact when compared to state 1
15	Approach	RNAV (RNP 0.3)	Straight In (With MAP CG)	Public Special - RNP-AR	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	8605 (924) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 377ft/nm to 13340ft. RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	8610 (929) MALSF On 2 1/2 mi MALSF Out 3 mi	8610 (929) MALSF On 2 1/2 mi MALSF Out 3 mi	8610 (929) MALSF On 2 1/2 mi MALSF Out 3 mi	MAP Climb of 374ft/nm to 13340ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series	No Impact when compared to state 1.
15	Approach	RNAV (RNP 0.2)	Straight In (With MAP CG)	Public Special - RNP-AR	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 376ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	8426 (745) MALSF On 2 mi MALSF Out 2 1/2 mi	MAP Climb of 370ft/nm to 13340ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, CRJ-700, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	No Impact when compared to state 1.
15	Approach	RNAV (RNP 0.1)	Straight In (With MAP CG)	Public Special - RNP-AR	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	8275 (594) MALSF ON 1 1/2 mi MALSF Out 1 3/4 mi	MAP Climb of 372 ft/nm to 12700ft, then 364ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	8333 (652) MALSF On 1 3/4 mi MALSF Out 2 mi	MAP Climb of 368ft/nm to 12700ft, then 361 ft/nm to 13540ft RNP-AR with RF legs on final, speed restrictions on the intermediate, and missed approach, along with several other leg length waivers which were previously approved at other airports.	High Performance Business Jets, Q400, E-Jets and C-Series with WAAS and EFVS/HUD	Minor Impact when compared to state 1.

Note: Detailed environmental analysis has not been performed for this study. Operational impacts on specific aircraft/operators have been generalized to match average environmental conditions.
Missed Approach climb gradients which terminate at altitudes above 10000ft require special performance analysis techniques not available for all aircraft