COTTONWOOD
MUNICIPAL AIRPORT

CHAPTER FOUR
Alternatives

ALTERNATIVES

Prior to defining the development program for Cottonwood Municipal Airport, it is important to consider development potential and constraints at the airport. The purpose of this chapter is to consider the actual physical facilities that are needed to accommodate projected demand and meet the program requirements as defined in Chapter Three, Aviation Facility Requirements.

In this chapter, a series of development scenarios is considered for the airport. In each of these scenarios, different physical facility layouts are presented for the purposes of evaluation. The ultimate goal is to develop the underlying rationale that supports the final master plan recommendations. Through this process, an evaluation of the highest and best uses of airport property is made while considering local goals, physical and environmental constraints, and appropriate federal airport design standards, where appropriate.

Any development proposed by a master plan evolves from an analysis of projected needs. Though the needs were determined by the best methodology available, it cannot be assumed that future events will not change these needs. The master planning process attempts to develop a viable concept for meeting the needs caused by projected demands through the entire planning period.

The number of potential alternatives that can be considered can be endless. Therefore, some judgment must be applied to identify the alternatives that have the greatest potential for implementation. The alternatives presented in this chapter have been identified as such.

The alternatives have been developed to meet the overall program objectives for the airport in a balanced manner. Through coordination with the planning advisory committee (PAC) and the City of Cottonwood, the alternatives (or combination thereof) will be refined and modified as necessary to develop the recommended development program. Therefore, the alternatives presented in this chapter can be considered a beginning point in the development of the recommended master plan development program, and input will be necessary to define the resultant development program.

AIRPORT DEVELOPMENT OBJECTIVES

It is the overall objective of this effort to produce a balanced airside and landside complex to serve forecast aviation demands. However, before defining and evaluating specific alternatives, airport development objectives should be considered. As owner and operator, the City of Cottonwood provides the overall guidance for the operation and development of Cottonwood Municipal Airport. It is of primary concern that the airport is marketed, developed, and operated for the betterment of the community and its users. With this in mind, the following development objectives have been defined for this planning effort:

1. Develop and maintain a safe, secure, and efficient aviation facility in accordance with applicable federal, state, and local regulations.

2. Identify facilities to efficiently serve the users of Cottonwood Municipal Airport.

3. Identify the necessary improvements that will provide sufficient airside and landside capabilities to accommodate the long term planning horizon level of demand for the area.

4. Target local economic development through the development of available property.

5. Maintain and operate the airport in compliance with applicable environmental regulations, standards, and guidelines.

Exhibit 4A outlines the key considerations for this alternatives analysis. They are summarized by airfield and landside functional use categories. These issues are the result of findings of the forecasts and facility requirements evaluations and consider preliminary input from the City of Cottonwood and the Master Plan PAC.

The airfield system typically requires the greatest commitment of land area and often imparts the greatest influence on the identification and development of other airport facilities. In addition, the FAA has established an array of design standards that must be considered when evaluating potential airfield improvements. These criteria can have a significant impact on the viability of various alternatives designed to meet airfield needs.

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AIRFIELD CONSIDERATIONS

- PLAN FOR AIRPORT REFERENCE CODE (ARC) B-II
- PROVIDE FOR 5,000' EFFECTIVE RUNWAY LENGTH
- HOLDING APRONS EACH END OF RUNWAY
- STRAIGHT-IN GPS CAPABILITY
- AWOS

LANDSIDE CONSIDERATIONS

- MAINTAIN TRANSIENT PARKING NEAR TERMINAL
- PROVIDE ADDITIONAL T-HANGARS
- PROVIDE FOR ADDITIONAL CONVENTIONAL/ EXECUTIVE HANGARS

COTTONWOOD MUNICIPAL AIRPORT

Exhibit 4A
AIRPORT CONSIDERATIONS

Key considerations for the runway include a potential upgrade to Airport Reference Code (ARC) B-II, as well as an increase in runway length up to 5,000 feet. With the continuing integration of the global positioning system (GPS), the airport will likely have the opportunity to establish straight-in instrument approaches to both runway ends in the future. Each of these improvements will require consideration of safety design standards, including safety areas and runway clearances.

Establishment of an instrument approach, as well as the upgrade to B-II, affects the current runway-taxiway separation. Holding aprons are also a consideration for each end. Another airfield consideration is an automated weather observation system (AWOS). In addition, the airport currently has a drop zone for use by skydivers. The location is such that various development alternatives could affect its future use. Thus, this chapter considers optional sites for relocation.

The landside facilities provide the interface between ground and air transportation. At Cottonwood Municipal Airport, key concerns involve the proper placement of future hangars and parking apron to efficiently serve the users. For example, apron parking for transient aircraft needs to be maintained in reasonable proximity to the terminal building. Additional hangars are anticipated to be needed over the planning period, and consideration needs to be given to functional efficiency, as much as cost.

A final consideration will be maximizing the ability of the airport to be as self-sustaining as possible. Alternatives must be considered that are not only cost-effective, but also can increase revenue potential for the airport, and/or economic enrichment for the community.

The remainder of this chapter will describe various development alternatives for the airside and landside facilities. Within each of these components, specific facilities are required or desired. Although each component is treated separately, planning must integrate the individual requirements so that they complement one another.

NON-DEVELOPMENT ALTERNATIVES

Non-development alternatives include the no action or "do nothing" alternative, transferring service to an existing airport, or developing an airport at a new location. Previous planning efforts, including the 1993 Master Plan, have considered these alternatives. The general conclusion has been to take advantage of the investment in Cottonwood Municipal Airport and its proximity to the city to maintain and develop the airport to meet most of the community's general aviation needs.

No Action Alternative

The "do-nothing" alternative essentially considers keeping the airport in its present condition and not providing for any type of improvement to the existing facilities. The primary result of this alternative would be the inability of the airport to satisfy the projected aviation demands of the airport service area.

The City of Cottonwood continues to experience socioeconomic growth, doubling its population in the last twenty years. This growth is forecast to continue. While the general aviation industry experienced an extended period of adjustment over the last twenty years, it is now seen as a growth industry once more. The fastest growing segment of general aviation is in the use of business and corporate aircraft.

The Master Plan's forecasts and analysis of facility requirements recognize this potential future need for an upgrade to accommodate a broader range of business class aircraft. This will require improvements in safety design standards and possibly a lengthened runway. Additionally, the facility requirements analysis indicated a need for the establishment of straight-in instrument approach procedures and additional hangar facilities.

In 2002, the City of Cottonwood has been updating its General Plan. Goals outlined for business development in the community included:

- Maintain Cottonwood as the commercial hub of the Verde Valley.
- Diversify local businesses.
- Provide support and assistance to existing businesses.
- Develop the foundations that are needed to support business development.
- Further develop the general manufacturing and retail development target areas.

Essentially, every one of these community goals can be aided by an airport facility that has the capability to provide local businesses direct access to the air transportation system. As a community grows, the airport, like the surface transportation system, must be able to respond to the essential demands. To do nothing with regards to development of the airport could ultimately impair the community in its endeavors to carry out its economic development goals.

Transfer Services To Another Airport

The relocation of services to either another existing airport or a new airport is an alternative that will often be favored by many residing close to the existing airport. The impacts and consequences of relocating services, however, usually have consequences beyond moving the airport "out-of-sight and out-of-mind."

In a sense, the Verde Valley region already relies upon other airports for some forms of air transportation. Local users of commercial airline service generally travel to Prescott, Flagstaff, or Phoenix to catch scheduled flights. This is because the level of local demand for commercial service is not, and will not be, sufficient enough to attract airline service, much less develop an airport capable of accommodating such service.

Similarly, the Cottonwood Municipal Airport is limited to general aviation users that can safely operate within the constraints of the current 4,250 foot-long runway. Essentially, any business or industry utilizing an aircraft that needs more length to operate must use either the Sedona Airport (5,132 feet) or the Earnest A. Love Field in Prescott (7,550 feet). Sedona is the closest, 20 miles away, over mountain roadways. Prescott is 37 miles over similar routes. The airport in Flagstaff is even further away at 68 miles.

These travel distances make it critical for Cottonwood and the Verde Valley region to have their own access to general aviation. The level of the airport's capability should be directed by the level of demand. The ability to accommodate a range of business aircraft will be important to the community's future.

The alternative of developing a new airport has the potential to create a whole new range of issues. Land acquisition, site preparation, and the construction of an entirely new airport can be a difficult and expensive action. In addition, walking away from a functioning airport that can still be utilized and developed further would mean the loss of a substantial investment. In a situation where public funds for airport development are limited, the replacement of an airport facility of this type would represent an unjustifiable loss of a significant public investment.

From social, political, and environmental standpoints, the commitment of a new land area must also be considered. New airports often face significant opposition from landowners and environmental groups. Furthermore, the development of a replacement airport would likely take a minimum of ten years to become a reality. The potential exists for significant environmental impacts associated with disturbing a large land area when developing a new airport site. In addition, the location of the new site would likely be less convenient than Cottonwood Municipal Airport.

Overall, transferring service to an existing airport or to an entirely new facility are unreasonable alternatives that should not be pursued further at this time. Cottonwood Municipal Airport is capable of accommodating the vast majority of the long range general aviation demands of the area and should be developed in response to those demands. The airport has the potential to continue to develop as a quality general aviation facility that could greatly enhance the economic development of the metropolitan area.

AIRFIELD ALTERNATIVES

The airfield system typically requires the greatest commitment of land area and often imparts the greatest influence on the identification and development of other airport facilities. In addition, the FAA has established an array of design standards that must be considered when evaluating potential airfield improvements. These criteria can have a significant impact on the viability of various alternatives designed to meet airfield needs.

DESIGN STANDARDS

As mentioned in the Facility Requirements, the design of airfield facilities is based, in part, on the physical and operational characteristics of aircraft using the airport. The FAA utilizes the Airport Reference Code (ARC) system to relate airport design requirements to the physical (wingspan) and operational (approach speed) characteristics of the largest and fastest aircraft conducting 500 or more operations annually at the airport. While this can at times be represented by one specific make and model of aircraft, most often the airport's ARC is represented by several different aircraft which collectively conduct more than 500 annual operations at the airport.

The FAA uses the 500 annual operations threshold when evaluating the need to develop and/or upgrade airport facilities to ensure that an airport is cost-effectively constructed to meet the needs of those aircraft that are using, or have the potential to use, the airport on a regular basis. Some aircraft outside the design ARC may occasionally operate at an airport, but are not expected to be enough to meet the 500 annual operations threshold.

At Cottonwood Municipal Airport, based aircraft fall within ARCs A-I and B-I. However, the mix of transient aircraft is more diverse and can include aircraft in ARCs B-I and B-II, as well as an occasional C-I or C-II. Aircraft in ARCs C-I and C-II are the most demanding aircraft to operate at the airport (due to their higher approach speeds); however, these aircraft are not anticipated to conduct more than 500 annual operations at the airport. Therefore, the most demanding approach category for the airport will remain Approach Category B.

A number of business class aircraft in Category B include turboprop and jet aircraft in Airport Design Group (ADG) II. The design standards for the runway and taxiway system vary across these two ARCs. In fact, the standards vary within ARC B-I, as there is a distinction between small (less than 12,500 pounds) and large airplanes. All based aircraft currently fall within Aircraft Design Group (ADG) I and weigh less than 12,500 pounds, so they are considered small aircraft. **Table 4A** compares the design standards for B-I and B-II against the existing conditions at Cottonwood Municipal Airport.

The standards for each ARC are met or exceeded for most of the key design standards at the airport. These include runway width and runway safety area. In fact, all design standards for B-I small aircraft are met. The runway

does not have adequate object free area width for B-II standards. The runway-taxiway separation and hold line positions are inadequate for B-I and B-II standards. **Exhibit 4B** is a photo showing the B-I design deficiencies at the airport.

TABLE 4A
Design Standards
Cottonwood Municipal Airport

	Existing Dimensions (ft.)	B-I Small Aircraft Standards (ft.)	B-I Standards (ft.)	B-II Standards (ft.)
RUNWAY				
Pavement Width	75	60	60	75
Shoulder Width	10	10	10	10
Safety Area				
Width	125	120	120	**150**
Length Beyond Stop End	300	240	240	300
Object Free Area				
Width	385	250	**400**	**500**
Length	300	240	240	300
Centerline to:				
Taxiway Centerline	150	150	**225**	**240**
Hold Position	125	125	**200**	**200**
Building Restriction Line				
20-foot height	370	265**	**390**	**390**
35-foot height	385	370**	**495**	**495**
Protection Zone				
Length	1,000	1,000	1,000	1,000
Inner Width	250	250	500	500
Outer Width	450	450	700	700
TAXIWAY				
Pavement Width	35	25	25	35
Shoulder Width	10	10	10	10
Centerline to Object	50	45	45	55*

Bold indicates B-II standard is not met.
Standards per FAA AC 150/5300-13, Change 6, **Airport Design**.
* Based upon maximum wingspan of 64 feet.
** Circling approach only.

Obstacle clearance at each runway end and laterally along each side of the runway is governed by Federal Aviation Regulations (FAR) Part 77, **Objects Affecting Navigable Airspace**. FAR Part 77 establishes approach surfaces for each runway end based upon the category of aircraft using the runway and the approach visibility minimums. The approach surface begins 200 feet

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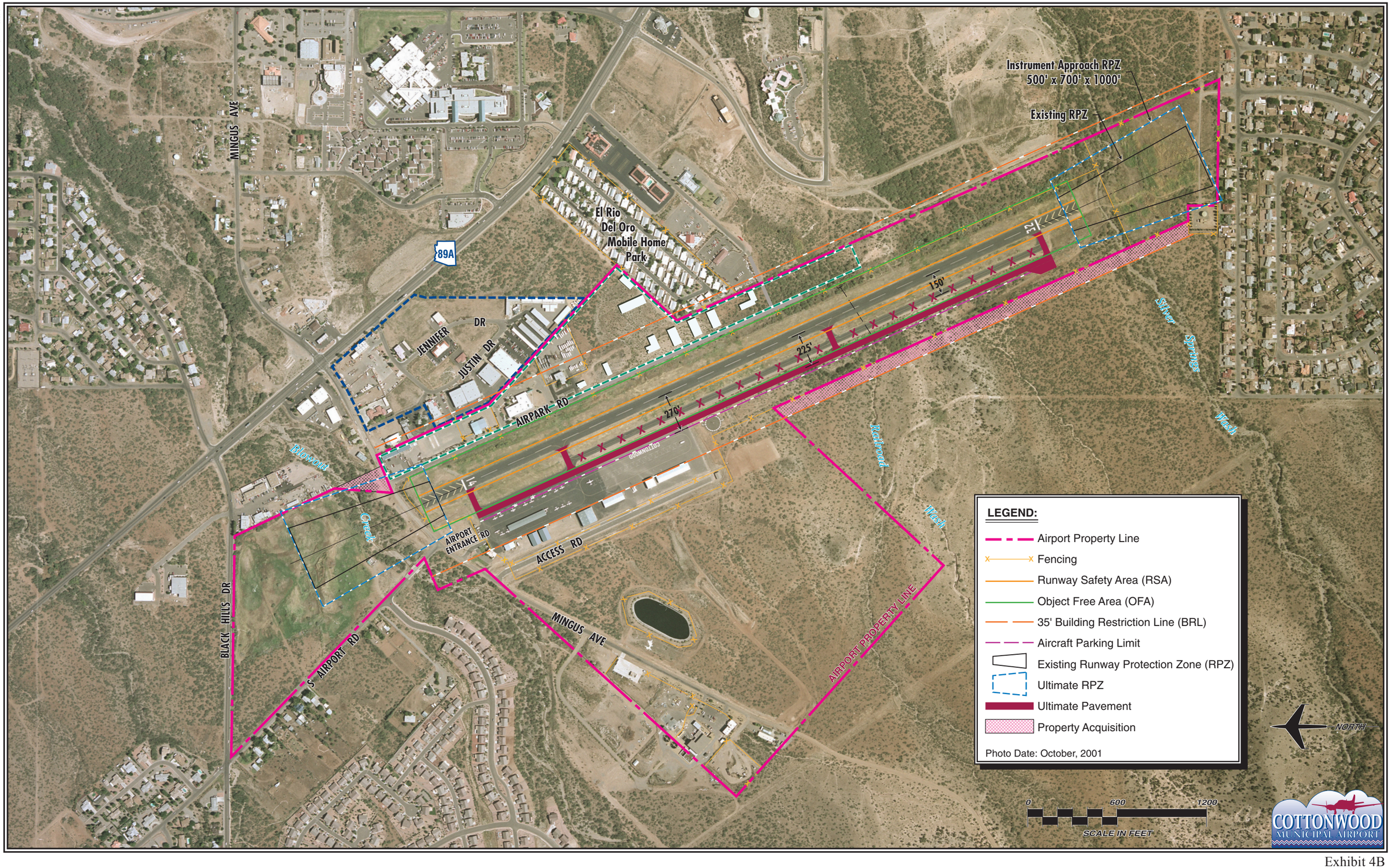

Exhibit 4B
B-I DESIGN STANDARDS

from each runway end. Based on the existing visual approaches, the existing approach slope for each runway is 20:1. Should instrument approach procedures be established for each runway end, the approach slope for Runway 14-32 would remain 20:1 for small aircraft, but increase to 34:1 for aircraft over 12,500 pounds in B-I and B-II. It appears that this lower approach criteria could be met with the existing runway. The subdivision to the south is just outside the runway protection zone (RPZ), but the 34:1 approach slope would still clear the closest home as long as its high point is less than 31 feet above the runway end elevation of 3,558 feet.

Obstacle clearance laterally on each side of the runway follows a 7:1 transitional surface that begins at the edge of the primary surface that surrounds the runway. Under the present visual and circling approach capabilities, the primary surface extends 125 feet from the runway centerline. This would increase to 250 feet for a straight-in instrument approach. To comply with Part 77, building heights should be below the transitional surface. Any object 35 feet high should be at least 495 feet from the runway centerline. Ideally, the airport should have positive control of property to at least this distance. It is common to establish the building restriction line (BRL) at this distance as well. Buildings and structures 20 feet high should be at least 390 feet from the runway centerline. This will normally be sufficient for T-hangars.

If existing structures penetrate the Part 77 surfaces, an aeronautical study will need to be performed by the FAA to ensure that the structure will not be a hazard to air navigation. The existing Airpark is within the 35-foot BRL depicted on **Exhibit 4B**. Subsequently, these buildings will need to be determined to not be a hazard before a straight-in approach could be approved.

Exhibit 4B depicts what would need to be done to meet the B-I requirements for aircraft weighing over 12,500 pounds and a straight-in approach. The following alternatives address the needs to upgrade to B-II, as well as options to provide additional runway length.

ALTERNATIVE A - EXTEND RUNWAY NORTH

The first B-II alternative looks at the options for a 750-foot extension to provide a runway length of 5,000 feet. To be considered is a full extension in either direction or a combination of shorter extensions in both directions. Unless the extension is to be deliberately phased over a period of time, it is generally preferred to place the entire extension on one end, unless development costs or environmental concerns outweigh the efficiencies of maintaining the work on one end.

An extension in either direction will not be simple. To the north, Mingus Avenue and Blowout Creek cross the area where the extension would go. Even a lesser extension would affect Mingus Avenue. The terrain generally falls off so that fill will be required. There is, however, sufficient space to physically accommodate the full runway extension.

An extension to the south, however, would face more severe constraints. As is evident from **Exhibit 4B**, the RPZ already extends to the subdivision immediately abutting the airport. In fact, the larger RPZ that would be required with a straight-in approach would encroach slightly upon one backyard. The RPZ is designed for the protection of people and property on the ground, so residences and congregations of people should be avoided. Any extension of the runway would place the RPZ in the subdivision, thus requiring the acquisition of homes and the relocation of residences. As a result, no extension will be considered that would shift the RPZ any further south.

Exhibit 4C presents the north runway extension. As indicated above, Mingus Avenue would need to be rerouted. This roadway is planned as a minor arterial in the City's General Plan. The intersection of Mingus Avenue with Highway 89 is signalized. The extension is long enough that it would be very difficult to reroute Mingus around the end of the extended runway object free area. The curves would be tight and several businesses would need to be relocated to allow the road to tie back in before the intersection. The exhibit depicts an option where Mingus is rerouted to intersect with Black Hills Drive to the north. Another option would be to simply tie Mingus into South Airport Road. If Black Hills Drive and Mingus Avenue to the east met at Highway 89A, rerouting to Black Hills Drive would be more desirable.

The extension will need to be placed on fill for most, if not all, of its length. The Runway 14 end elevation is 3,517 feet above mean sea level (MSL), and the end of the north overrun is at 3,512 feet MSL. Thus, the existing grade of the overrun is 1.7 percent. While this is within the Category B runway gradient design standard of two percent, the gradient over the length of the existing runway is one percent. Extending the one percent gradient would be better for the higher performance aircraft, as well as all aircraft landing on Runway 14. The terrain also rises to the west, so the higher runway elevation ensures clearance over the surrounding terrain.

A portion of that rising terrain could be utilized to provide the fill for the extension. A preliminary estimate indicates that approximately 110,000 cubic yards of fill will be needed for the runway and parallel taxiway extension. Blowout Creek crosses the proposed extension near the runway end. It would likely be directed through a drainage structure beneath the runway similar to what was done near midfield on Railroad Wash. This will likely require a 404 permit from the Army Corps of Engineers.

As depicted on the exhibit, the runway protection zone would extend across Black Hills Drive, to abut a commercial/industrial building. The area within the RPZ would need to be controlled either by fee simple acquisition or an avigation easement. Approach clearances over the existing building could be a factor as well.

Any extension to the north moves the departure threshold to Runway 14 further from the residential subdivision to the south. This will serve to raise the

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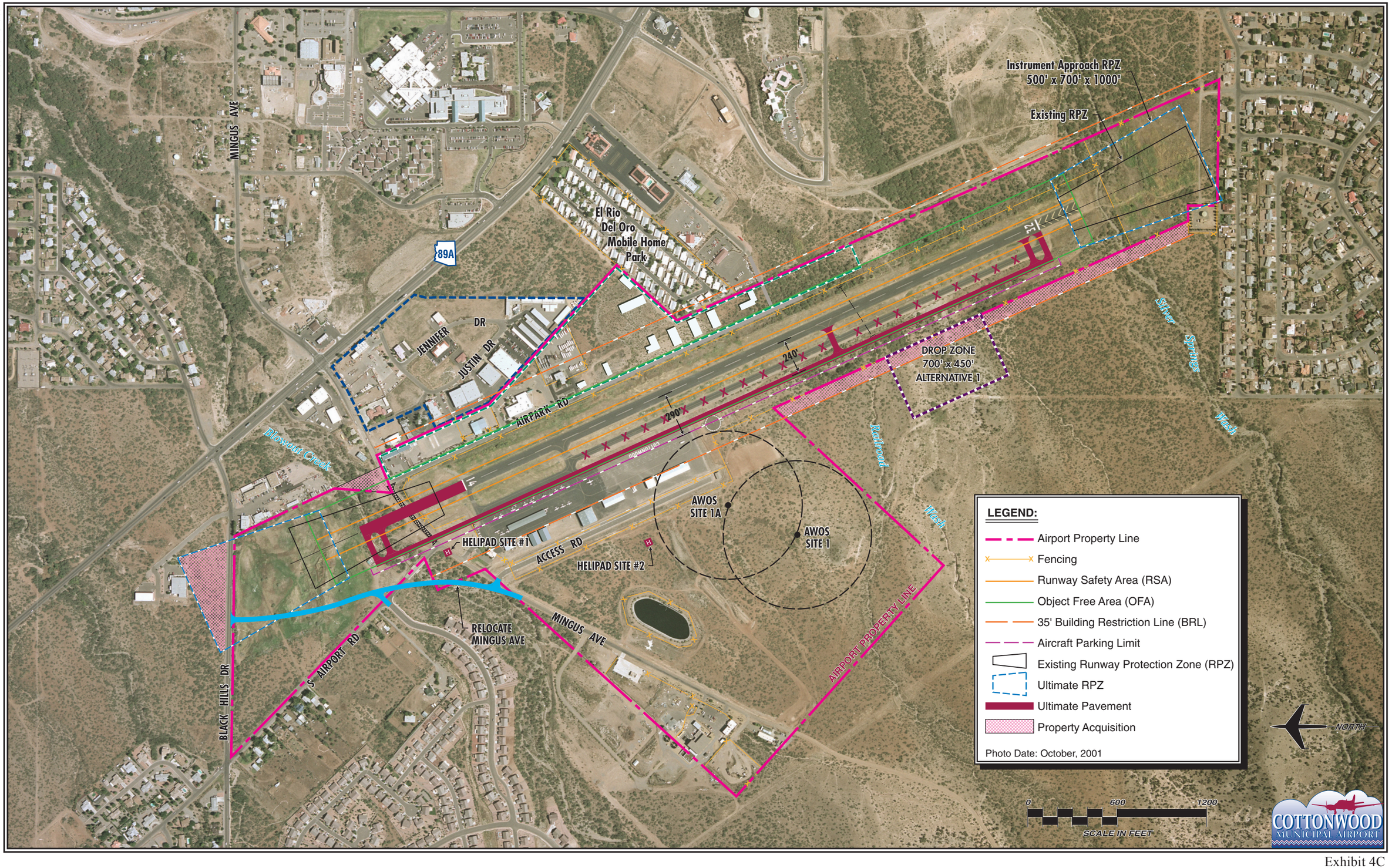

Exhibit 4C
AIRFIELD ALTERNATIVE A
EXTEND RUNWAY 750' NORTH

altitude of departure overflights of this noise-sensitive area.

From an operational standpoint, the extension presented by this alternative would provide the full 5,000 feet for takeoff or landing. As the following alternatives will show, there are options that will have less cost and development impact, but at some expense in effective runway length.

ALTERNATIVE B - CONVERT OVERRUNS TO RUNWAY

Given the constraints already discussed to the south, the only other options to a full extension to the north involve either a lesser extension or the use of a concept known as "declared distances" to comply with object free area (OFA) and runway safety area (RSA) design standards. Declared distances ensure that the full safety areas are provided during critical aircraft operational activities by notifying pilots of the length of runway available for landing or departure. Specifically, declared distances incorporate the following concepts:

Takeoff Runway Available (TORA) - The runway length declared available and suitable for the ground run of an airplane taking off;

Takeoff Distance Available (TODA) - The TORA plus the length of any remaining runway and/or clearway beyond the far end of the TORA;

Accelerate-Stop Distance Available (ASDA) - The runway plus stopway length declared available for the acceleration and deceleration of an aircraft aborting a takeoff; and

Landing Distance Available (LDA) - The runway length declared available and suitable for landing.

The ASDA and the LDA are the most critical declared distances as they take into account the safety areas on approach, rollout, and departure.

The use of declared distances requires specific approval from the FAA Western-Pacific Region. While FAA AC 150/5300-13, *Airport Design*, specifies the use of declared distances for complying with OFA, obstacle free zone (OFZ), and RSA design standard deficiencies, the FAA has limited the implementation of declared distances at general aviation airports. In most cases, the FAA has approved declared distances only at those airports that are constrained in meeting these standards at each runway end.

Exhibit 4D depicts an alternative that attempts to maximize the capability within the existing pavement by utilizing declared distances. Under this alternative, the overruns are converted to pavement to be included in the start of takeoff roll. The landing thresholds would remain in their current locations, and the pavement beyond the threshold at the stop end would be considered runway safety area in declared distance calculations.

As shown on the exhibit, the parallel taxiway would be extended to the new runway end. The south overrun is essentially level with the elevation at the end of the overrun, the same as at

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DECLARED DISTANCES		
	Runway 14	Runway 32
Landing Distance Available (LDA)	4,250'	4,250'
Accelerate-Stop Distance Available (ASDA)	4,550'	4,550'
Takeoff Runway Available (TORA)	4,550'	4,550'
Takeoff distance Available (TODA)	4,850'	4,850'

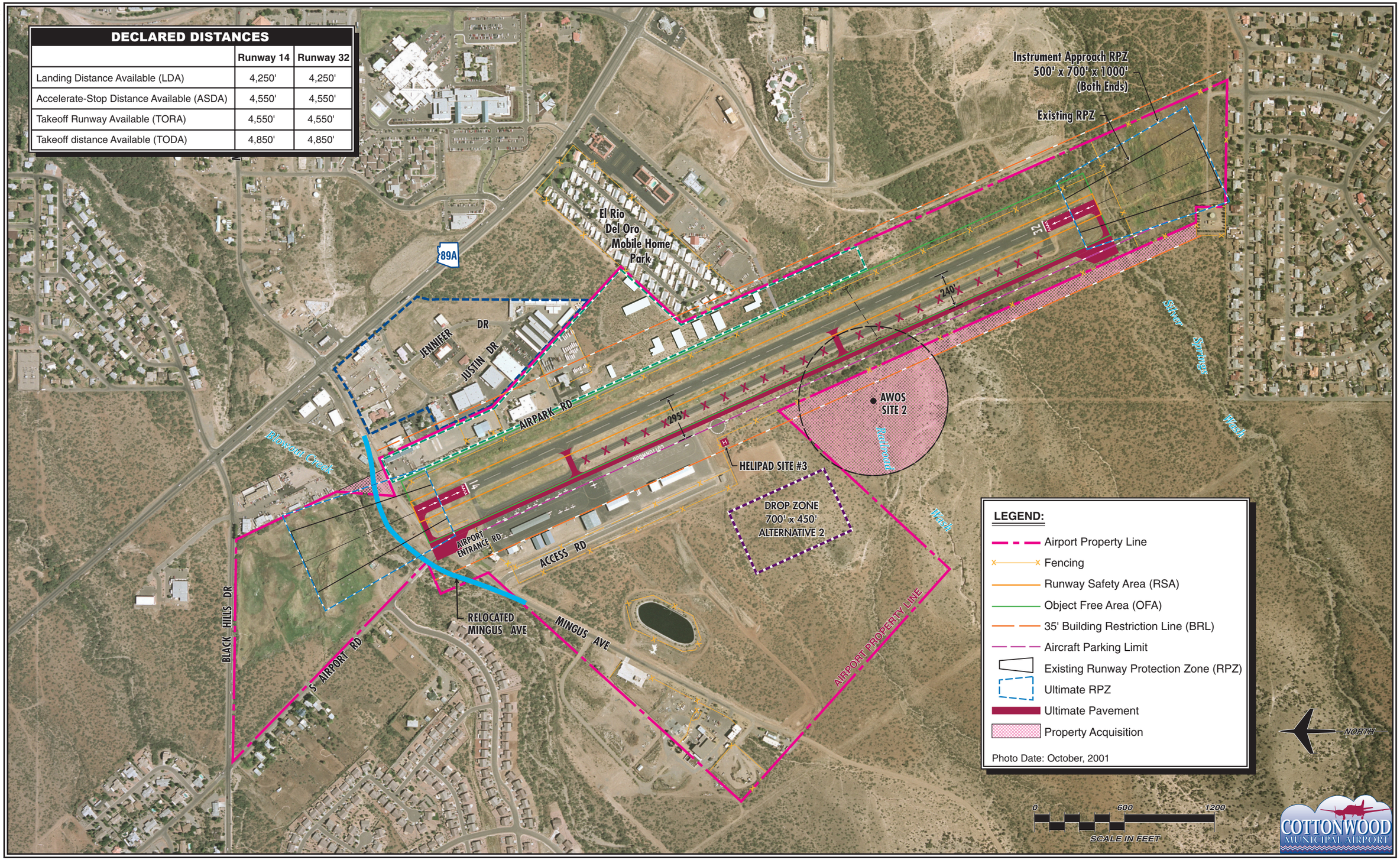

Exhibit 4D
AIRFIELD ALTERNATIVE B
CONVERT OVERRUNS TO RUNWAY

the current threshold to Runway 32. As the terrain rises to the west, the parallel taxiway extension would need to be cut into the surface. The remainder of the conversion would involve strengthening the overrun pavement and, if necessary, remarking as a displaced threshold and adjusting the runway lighting.

The south overrun conversion would not be as simple. The 1.67 percent design slope could reduce the effectiveness of the 300 additional pavement feet for takeoff. Raising the elevation of the north overrun could be necessary, requiring some fill. Raising the runway pavement to a one percent gradient as in Alternative A, the elevation at the end of the pavement would be 3,514 feet MSL. This would place the runway 12 feet above Mingus Avenue. If business jet aircraft are accommodated, a blast fence will be needed because of the proximity of the runway to the road.

To accommodate the extension of the parallel taxiway, however, Mingus Avenue will need to be relocated anyway. **Exhibit 4D** depicts this relocation. The roadway would be able to remain south of the channel to Blowout Creek. None of the businesses along Mingus Avenue would need to be relocated.

The declared distances for this alternative are shown on the exhibit and are the same for each direction of operation. The LDA would remain at the existing length of 4,250 feet. The declared distances related to takeoff would increase. The ASDA and the TORA would increase to 4,550 feet, while the TODA would increase to 4,850 feet.

As with Alternative A, the Runway 14 end is moved further north, away from the subdivision south of the airport. While not as much as Alternative A, it does raise the height of overflights on departure to the south.

This alternative would reduce the cost and impacts associated with a runway extension, but it does fall short of providing the 5,000-foot length identified in the facility requirements.

ALTERNATIVE C - EXTENSION AND CONVERSION

This alternative attempts to utilize declared distances to maximize the effective runway length while reducing the extension to the north. As shown on **Exhibit 4E**, the runway would be extended north 450 feet, while the overrun at the south end would be converted as in Alternative B. The length of the pavement from end to end would be 5,000 feet, but the south extension would be considered as safety area for LDA calculations in both directions and ASDA to the south. This would provide an LDA of 4,700 feet in both directions. The ASDA and TORA to the south would also be 4,700 feet. For takeoffs to the north, however, the ASDA would be the desired 5,000 feet. The TODA would be 5,000 feet in both directions.

While the pavement of this alternative would not extend into Blowout Creek, the runway safety area would. As with

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DECLARED DISTANCES		
	Runway 14	Runway 32
Landing Distance Available (LDA)	4,700'	4,700'
Accelerate-Stop Distance Available (ASDA)	4,700'	5,000'
Takeoff Runway Available (TORA)	4,700'	5,000'
Takeoff distance Available (TODA)	5,000'	5,000'

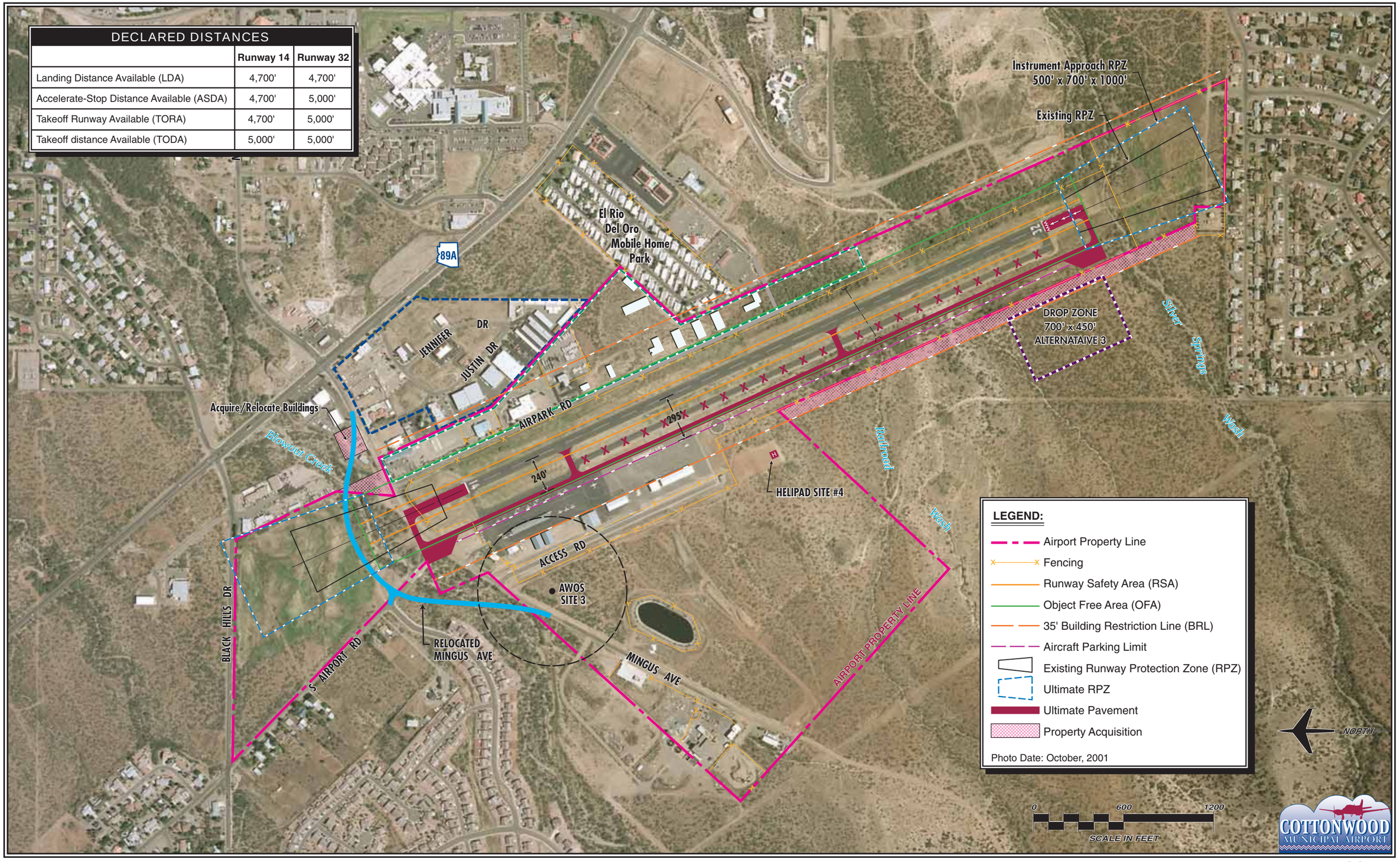

Exhibit 4E
AIRFIELD ALTERNATIVE C
EXTEND RUNWAY 450' NORTH

Alternative A, this would require placing the creek bed in a drainage structure beneath the runway safety area. Fill in the area will likely require a 404 permit from the Corps of Engineers.

As with each of the previous alternatives, Mingus Avenue would need to be relocated around the end of the runway and the extended object free area. As shown on the exhibit, this rerouting can tie back into Mingus Avenue east of the airport, prior to the intersection with Highway 89. Some smaller buildings may need to be relocated on the east side, but the road could remain as a minor arterial street.

As with Alternative A, this shorter extension will still need to be placed on fill for most, if not all of its length. With a one percent slope continued, the elevation at the new runway end would be 3,514 feet MSL.

A portion of that rising terrain on airport property to the west could be utilized to provide the fill for this extension. A preliminary estimate indicates that approximately 80,000 cubic yards of fill will be needed for the runway and parallel taxiway extension. Blowout Creek crosses the proposed extension near the runway end.

The primary advantage to this alternative is that a 5,000-foot ASDA could be achieved while maintaining Mingus Avenue as a through roadway around the runway end. The extension would be used in its entirety for both landing and takeoff, as there would be an extended runway safety area beyond the north end. To attain the 5,000-foot ASDA, however, will require the south overrun be converted to runway for takeoff to the north.

As indicated earlier, the Western Pacific Region of the FAA has preferred to avoid using declared distances on general aviation airports. They have generally approved declared distances only in cases where the extended runway safety area cannot be provided beyond at least one end. Therefore, the FAA's first preference will likely be Alternative A. If the routing of Mingus Avenue north to Black Hills Road is not a feasible solution for the City, a lesser extension, as in Alternative C, may be acceptable. The displaced thresholds will be less desirable to the FAA and may receive approval only as a last resort.

AWOS

The facility requirements analysis determined that an automated weather observation system (AWOS) is needed at Cottonwood Municipal Airport to provide important weather details to pilots, especially transient and charter aircraft operators (charter companies cannot operate to the airport without current weather data). An AWOS includes various sensors for recording cloud height, visibility, wind, temperature, dew point, and precipitation.

FAA Order 6560.20A, *Siting Criteria For Automated Weather Observing Systems* (AWOS) was reviewed for general siting requirements. While each AWOS sensor has specific siting requirements, all AWOS sensors should

be located together and outside the runway and taxiway OFAs. Generally, AWOS sensors are best placed between 1,000 feet and 3,000 feet from the primary runway threshold and between 500 feet and 1,000 feet from the runway centerline. Alternatives for AWOS placement are presented on each of the airfield alternative exhibits.

The siting search was limited to the west side of the airport, as property on the east side has access to the highway and is more likely to be developed for other purposes. The terrain in the area slopes upward to the west, at a gradient of three to four percent. The siting criteria require that the sensor be placed at least 33 feet above the average ground level within the 500-foot radius. While structures can be located within that radius, they must be at least 15 feet beneath the sensors. Objects 500 feet to 1,000 feet from the sensor tower must be cleared by at least 10 feet.

AWOS Alternative #1 meets all the criteria above, but takes up a large portion of the available landside property on the airport, as shown on **Exhibit 4C**. It would not require any land acquisition and remains out of the way of terminal development along the runway. The site is 1,200 feet from the runway centerline, and beyond the preferred location of 500 feet to 1,000 feet. This also makes it slightly more remote to extend power to the site.

With the slope of the terrain, the tower should be at least 50 feet tall in this location. This would allow typical buildings up to 35 feet in height to be placed within the eastern half of the radius. In that case, the tower could be moved closer to the terminal area, as depicted with **AWOS Alternative #1A**. This would also be closer to existing power sources. This location is more accessible from the airport access road and allows for more property to be put into revenue-producing purposes.

AWOS Alternative #2 is located further to the south along the flight line, as depicted on **Exhibit 4D**. The design in this case would place the AWOS outside the potential landside development areas on the airport. As a result, the tower site and much of the radius are outside the existing airport property. As shown on the exhibit, the location would still need to be at least 50 feet high due to the rising terrain, so it would need to be at least 600 feet from the runway centerline. The property within the radius should be acquired fee simple. If this is not possible, an avigation easement restricting the height of development within the radius should be obtained. While the site is somewhat more remote, power could be extended from the lighting along the runway.

AWOS Alternative #3 is located near the entrance to the airport and just west of the terminal area as shown on **Exhibit 4E**. As with the other alternatives, the rising terrain would likely require a 50 foot-plus tower. The 500-foot radius extends beyond the airport boundary to the north, crossing Mingus Avenue. The majority of the radius, however, would remain within the confines of the airport. In addition, the off-airport property within the radius is also owned by the City. As with **Alternative #2**, the off-airport

property would need to be controlled by either fee simple or an avigation easement. While readily accessible and close to power, this alternative would not meet the criteria of being 1,000 feet to 3,000 feet down the runway from its end.

DROP ZONE

The current drop zone for parachutists is located at the south end of the terminal area. Since this is the most logical direction in which to develop additional hangars in the future, it is highly likely the drop zone will need to move. Potential locations were examined and are discussed below.

Drop Zone Alternative #1 is depicted on **Exhibit 4C**. The site is located further south from the present site and off existing airport property. This property would need to be acquired to support the 700-foot by 450-foot drop zone. Access could be extended from the north or south. This location would provide ample room for terminal development.

Drop Zone Alternative #2 is depicted on **Exhibit 4D**. This site would be located just west of the current site. While this site would require minimal change in current skydiving procedures, it is located on property that is currently leased for development as an industrial airpark. Besides the costs involved in buying-out the lease, the drop zone would cut off potential taxiway access to the airpark.

Drop Zone Alternative #3 is depicted on **Exhibit 4E**. This site is located even further south than Alternative #1. Access would likely be developed from the south. This site could operate more independently from future landside development than the other two sites. It is further from the midfield area and closer to the approach.

OTHER AIRSIDE CONSIDERATIONS

The City is examining the possibility of locating a new public cemetery in the northwest corner of airport property. This would be located at the intersection of Black Hills Drive and South Airport Road. The site has been designed to remain outside the north RPZ of all alternatives. A cemetery can be considered compatible with a runway approach in many ways.

If a cemetery were to be put in this location, it will need to be approved by the FAA. The FAA will consider whether this an appropriate use for property on an airport that receives federal funds. If approved, it is likely a lease that would provide market rate revenues to the airport would be required.

LANDSIDE ALTERNATIVES

The orderly development of the terminal area is a critical element of airport capability, but it is typically the most difficult to control. Many general aviation airports have been developed without proper foresight in regard to the functional elements to be served, often taking the least expensive short term solution. A development approach

that picks the path of least resistance can often turn out to be an impediment to the strategic long term growth and viability of the airport. Allowing operators and tenants to develop wherever they please, without regard to a functional plan, can result in a haphazard array of buildings and small ramp areas, which can eventually preclude the most efficient use of valuable space along the flight line.

As indicated earlier, the primary issues in the terminal area are: providing for hangar facilities as needed in the future and maintaining transient parking spaces near the terminal. A wash rack location is also a consideration.

The current layout of the terminal area has the terminal building and the FBO hangar located at the north end of the ramp, near the entrance to the airport. Other hangars are located along the west side of the ramp, adjacent to the access road. Tie-downs are located on the ramp between the hangar row and the parallel taxiway. Twelve (12) tie-downs are covered by a shade hangar. All of these spaces are presently leased to based aircraft owners. The location of the shade hangar affects the number of spaces available for transient parking near the terminal building. Essentially every alternative considers removing or relocating the shade hangar to another location on the airport. Four alternative layouts for the terminal area are presented on **Exhibit 4F**.

ALTERNATIVE A

Alternative A considers a layout that could be implemented if the airport were to remain in ARC B-I. A B-I designation would permit aircraft parking to remain 25 feet closer to the runway than under B-II standards. Still, one row of 12 tie-downs would be lost. Moving the shade hangar to the south end of the ramp would open up more spaces close to the terminal for transient aircraft.

This alternative shows not only the relocated shade hangar, but an additional T-hangar located on the south portion of the ramp. T-hangars are typically 16 to 20 feet in height, and should be kept at least below the 7:1 transitional slope of FAR Part 77. Currently, this slope begins 125 feet from runway centerline. If the runway is commissioned for a straight-in instrument approach, that beginning point will be pushed outward 125 feet.

While the shade hangar is considered as a cover over tie-downs, the T-hangar is not necessarily viewed in the same light. A T-hangar is viewed as a revenue-producing structure, and as such, is not normally allowed to be placed directly over ramp that has been constructed with federal funds.

A second T-hangar is located just off the south end of the ramp. This is acceptable because the ramp is utilized for access to the T-hangar and not as the floor of the hangar. In this alternative, the south side of the T-hangar shares an access taxiway with a series of executive hangar development parcels. Under the B-I design, most of the parcels can be somewhat smaller than for a B-II design because of the shorter wingspans. The segmented circle would need to be moved for this

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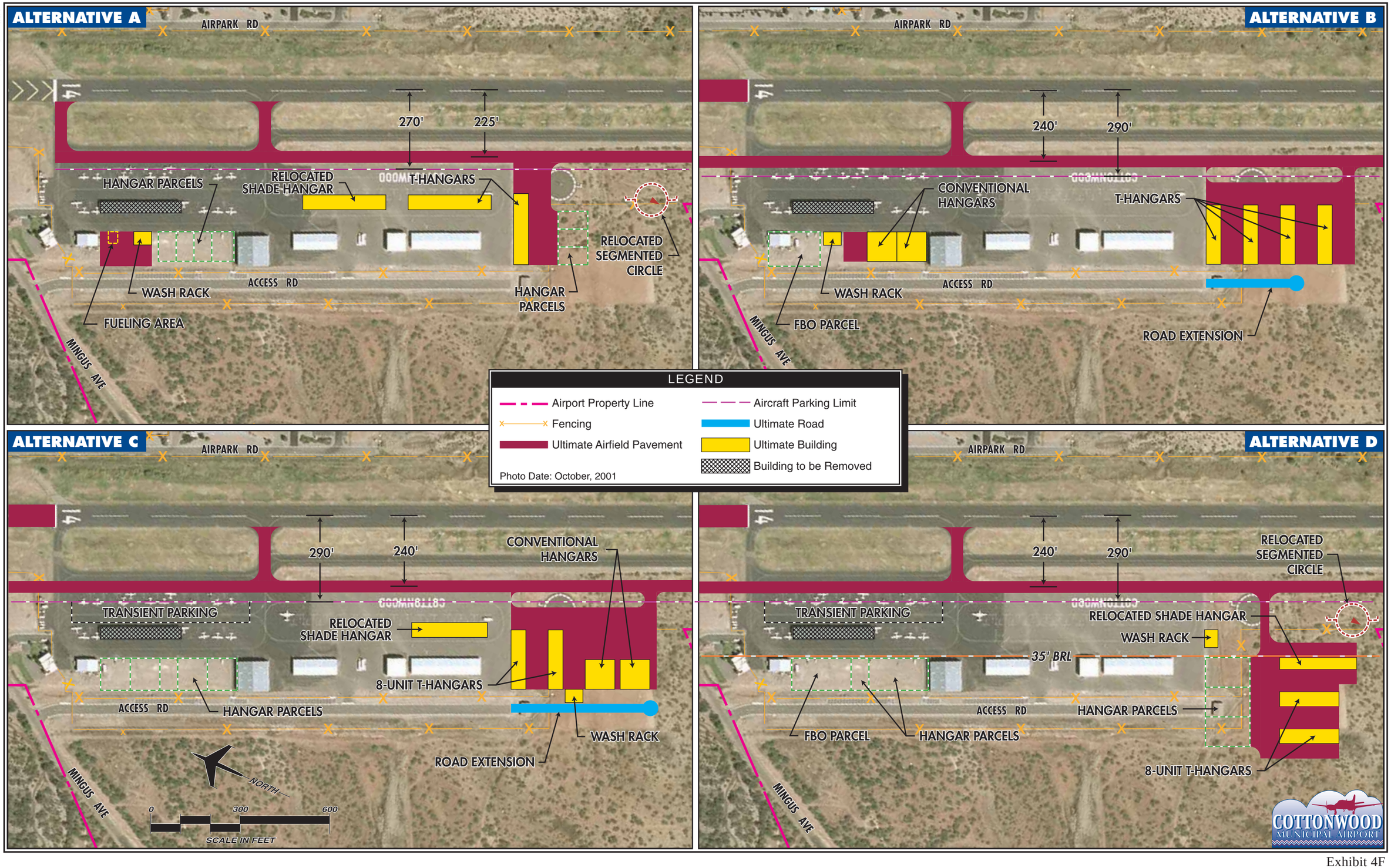

Exhibit 4F
TERMINAL AREA ALTERNATIVES

development. However, its proximity to the relocated parallel taxiway will require that it be relocated on all alternatives anyway.

The remainder of the hangars are located on the west side of the ramp. This includes all the existing hangars, as well as plans for filling in additional hangar parcels. The airport recently leased a 60-foot by 100-foot parcel for a hangar approximately 200 feet south of the FBO hangar. It is also 200 feet north of another private hangar. Alternative A shows three additional parcels 60 feet to 80 feet wide and 100 feet deep between the two leased areas. The area immediately south of the FBO is shown to support a fueling area, as well as a wash rack.

ALTERNATIVE B

Alternative B is the first of three layouts depicting B-II design standards. A large block of 24 tie-downs could be lost with the conversion to B-II. In this alternative, the remaining tie-downs are kept in their current locations. As with all the alternatives, the shade hangar is removed from the tie-downs closest to the terminal to open up the parking area for transient aircraft. It would be replaced at the south end with T-hangars or shades running perpendicular to the runway. This orientation is generally more efficient for putting a series of T-hangars in. It also leaves open the potential to extend the taxiways to the west.

This alternative reserves a large parcel inclusive of the FBO hangar. This would permit the FBO to develop a larger hangar next to, or in place of, the existing hangar. A wash rack is shown immediately south of the FBO parcel. The currently leased 60-foot x 100-foot parcel is next, followed by two new 100-foot x 100-foot parcels. The larger parcels are sized to better accommodate multiple aircraft and/or the wingspans of B-II aircraft.

ALTERNATIVE C

Alternative C shows a different approach to the transient tie-down area that could be created with the relocation of the shade hangar. A large block of transient parking is depicted. This space would primarily be drive-thru, but could accommodate nested positions on very busy days. This layout allows for more taxilane clearance for the circulation of B-II aircraft. It would also allow aircraft to be pulled out of the hangars on the west side of the ramp without blocking the taxilane.

The south end of the ramp would remain for local tie-downs, including the relocated shade hangar. The west ramp south of the FBO is dedicated primarily to 100-foot x 100-foot hangar parcels. Additional T-hangars would be developed off the south end of the ramp. There is also room for additional hangars in that area as well. A wash rack is located at the west end of the new T-hangars.

ALTERNATIVE D

Alternative D maintains the same transient ramp layout as the previous alternative, but does not move the shade hangar to the south portion of the

ramp. Rather, it is located even further south along to a new T-hangar area. The difference in this layout from the previous alternatives is that the T-hangars run parallel to the runway, similar to the existing T-hangars.

A taxiway connects the new hangar area to the parallel taxiway. Three 100-foot x 150-foot hangar parcels are also accessed by the taxiway. The taxiway can also be continued to the west for access to the remainder of the airport's property. Any development in this area for taxiway access would require some earthwork, however, as the grades are rising to the west at three to four percent. A wash rack is shown off the south end of the existing ramp. This becomes feasible if water is extended to the new hangar parcels.

SUMMARY

The process utilized in identifying and evaluating the airfield and landside development alternatives involves consideration of short term and long term needs, as well as future growth potential. Current airport design standards are considered in every scenario. Safety, both air and ground, is given high priority in the analyses.

The recommended development concept for Cottonwood Municipal Airport must represent a means by which the airport can grow in a balanced manner to accommodate the planning horizons. In addition, the plan must provide the flexibility to meet activity growth beyond the long range planning horizon.

Through further meetings and discussions with the Planning Advisory Committee, City staff, and the FAA, a recommended concept has been developed. The plan will represent a means by which the airport can continue to effectively serve general aviation needs within the overall operation and development of the airport. This will further evolve into a plan for maintaining and improving Cottonwood Municipal Airport in the interest of its users and the City.