Addendum to the 2006

Airport Master Plan

Brookings Regional Airport

May 2008

CITY OF BROOKINGS

HELMS and ASSOCIATES
CONSULTING ENGINEERS AND LAND SURVEYORS

HNTB

Master Plan Addendum

1.1. Introduction

This Addendum to the 2006 Brookings Regional Airport Master Plan documents the results of additional planning efforts undertaken in the fall of 2007 and the winter of 2007-2008.

The primary focus of those efforts was the evaluation of a new on-airport alternative (referred to here as Alternative I) and an update of airport activity, and an update to runway length requirements.

1.1.1. Master Plan Alternatives

The Master Plan examined eight alternatives aimed at resolving the existing safety and capacity issues at the Airport. Seven of those alternatives were on-airport and one was an off-airport (new airport) alternative. They were named alternatives A-H. See the Master Plan for more information on these alternatives and the issues they address.

With the exception of Alternatives A (no-action) and B (primary runway length reduction), the basic starting point of all on-airport alternatives was a resolution of incompatible land uses in the Runway 30 Runway Protection Zone (RPZ) through the realignment or relocation of the primary runway. The RPZ off south end of the crosswind runway (Runway 35) also has incompatible uses and the alternatives examined sought to resolve those as well.

1.1.2. Runway 30 RPZ Evolution

The primary factors determining the size of the Runway 30 RPZ are the visibility minimums contained in the published aircraft approaches for that runway end. The Runway 30 RPZ has the best possible visibility minimums (200 feet and ½ mile) for the type of approach it offers. Therefore, the Runway 30 RPZ is the largest possible RPZ.

Up until 1989, the Runway 30 RPZ was free of buildings and was completely owned by the airport, except for a small portion near the National Guard site on the southeast edge. In 1989 the RPZ dimensions were 1,700’ X 500’ X 1,010’ (length X inner-width X outer-width).

In 1990, the FAA installed an Instrument Landing System (ILS), which resulted in lower minimums and a wider, but not longer, RPZ. From 1990 – 1992, the RPZ dimensions were 1,700’ X 1,000’ X 1,510’. This increase in width resulted in three structures owned by a single business being encompassed by the RPZ. These buildings existed prior to the RPZ expanding.

In 1992, an approach lighting system known as a MALSR (Medium Intensity Approach Light System with Runway Alignment Indicator Lights) was installed. This resulted in the lowest possible minimums and a longer and wider RPZ (the same configuration that exists today). The RPZ dimensions from 1992 to the present are 2,500’ X 1,000’ X

1,750'. The number of buildings within the RPZ has varied over the years, but generally has remained greater than 10. Most of these buildings existed prior to the RPZ expanding in 1992.

Using Federal Airport Improvement Program (AIP) funding to the extent it was available, the Airport purchased property and obtained easements over portions of the RPZ. However, but successful lawsuits against the City have largely prevented them from enforcing zoning in the uncontrolled areas of the RPZ. In addition, due to the expense of purchasing all of the lots containing existing buildings, purchasing all of the remaining unowned land has not been feasible. As a result of these mostly unsuccessful attempts to get the RPZ into compliance, incompatible land uses have existed in the RPZ since 1990.

1.2. Alternative I Development

A plan to revert the RPZ to the 1990-1992 dimensions through a minimums increase came up early in the Master Plan process. It was discussed internally by HNTB personnel during the spring and early summer of 2005. At the time, the feasibility of the idea was questionable due to the fact that the FAA would need to approve any change to the approach minimums.

Helms and Associates and HNTB (airport consultants for the City) discussed the concept of reducing the RPZ size through a minimum increase with the FAA prior to the July 5, 2005 presentation of Master Plan concepts to the Brookings City Council. At the time, the FAA stated that it would not look favorably on any alternative that resolved the RPZ problems by reducing the usability of the airport (which an increase in approach minimums would do, however minimally). Therefore, FAA indicated that any scenario involving raising minimums was not preferred and could result in entire ILS being pulled. This general position was also expressed in the FAA's letter to the City dated April 3rd, 2006 (see Appendix 1).

Based on this, any alternative which raised the approach minimums was dropped from further consideration and the Master Plan was completed without including such an alternative.

Throughout the next two years, questions continued to come up regarding this alternative from the City Council, advisory committee and the general public. The explanation that the FAA did not prefer such an alternative satisfied most of those asking the questions.

In late summer 2007, the Dual Track process (which is to culminate in an Environmental Assessment (EA) for the preferred alternative) was at a critical point. A new airport site had been identified, the preferred on-airport realignment alternative from the 2006 Master Plan had been refined and the consultants were preparing to coordinate the work of the environmental specialists. The specialists work would involve considerable expense to the City and the FAA and also, for the first time, inform property owners on the preferred off-airport site that their land was formally being looked at as a possible location for a new airport.

At this time, after discussing the matter internally and informally with the City, the consultants once again began to look at an alternative that resolved the RPZ issue through an approach minimum increase (Alternative I). Throughout September, 2007, a new alternative was sketched out that included the smaller RPZ, but also showed how the other issues facing the airport would be addressed if the RPZ size reduction was approved.

Following meetings with the City on October 1st, 2007 and the FAA on October 2nd, 2007 all parties felt that Alternative I had enough merit that it should be presented to the City Council.

After further refinement of the Alternative I, it was presented to the City Council on October 23rd, 2007. At that meeting, the Council requested additional information. The alternative was again presented to the Council on November 13th, 2007 authorization was given to perform the Alternative I analysis, including an in depth runway length investigation.

1.3. Jet Operations

1.3.1. Jet Operations Estimation Method

BKX does not have an Air Traffic Control Tower so it is difficult to determine the number and types of operations at the airport. However, flights entering the national en route air traffic control system are recorded in an FAA database. All flights activating a flight plan enter the national en route system and the vast majority of jets activate a flight plan. Since jets are typically the most demanding aircraft regularly using an airport, using the FAA database information provides a way to evaluate the runway length needs at Brookings.

To establish an adequate timeframe, flight plan records from 2001 – 2007 were examined. Due to the timing of the analysis, each year was comprised of a November to October period. For simplicity, each time period was assigned a calendar year period which corresponded to when the majority of the operations occurred. For example, operations referred to as occurring in 2001 actually occurred from November, 2000 to October, 2001.

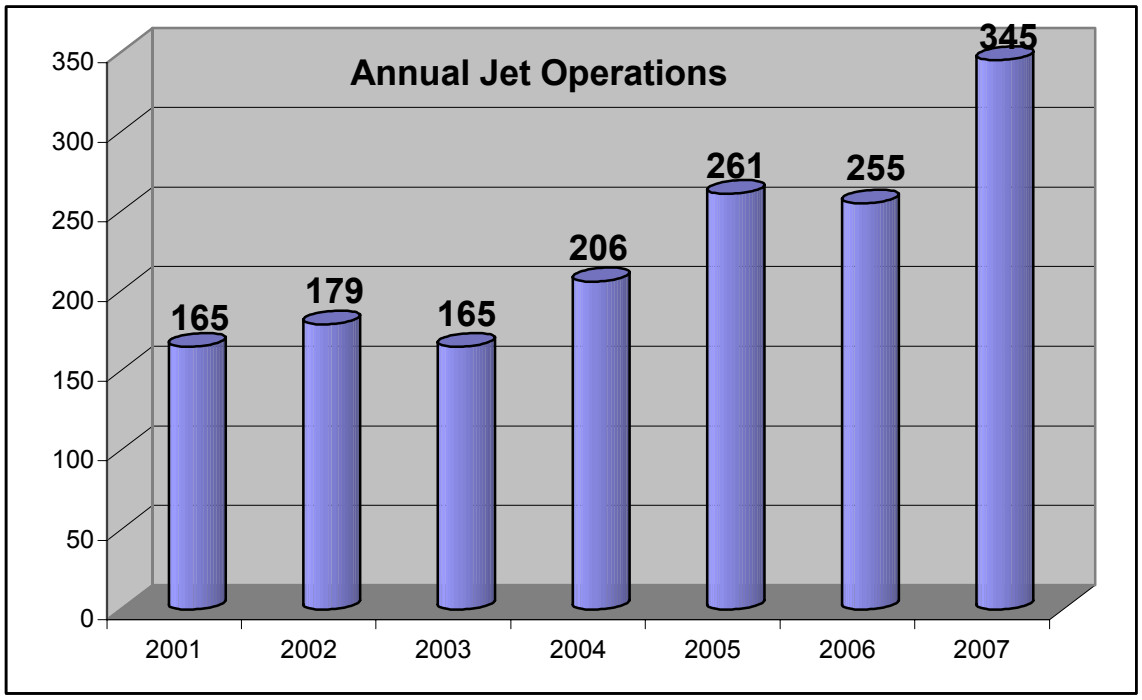
It is important to note the limitations of this method of estimating operations. The examination of flight plan records results in only a partial count of overall operations. Local flights that occur without a flight plan may never be seen by the en route system and therefore may be accounted for in the data. In addition, no effort was made to estimate how many aircraft were by passing Brookings due to concerns about the length of the existing runway.

In summary, the method used to estimate jet operations most likely undercounts those operations and does not provide a method to estimate overall operations. What this method does provide is an adequate way of determining jet operations for purposes of evaluating runway length.

1.3.2. Current Jet Operations

Using the data in the FAA database, jet operations per year were summarized. The results are shown in Figure 1.

Figure 1: 2001-2007 Annual Jet Operations

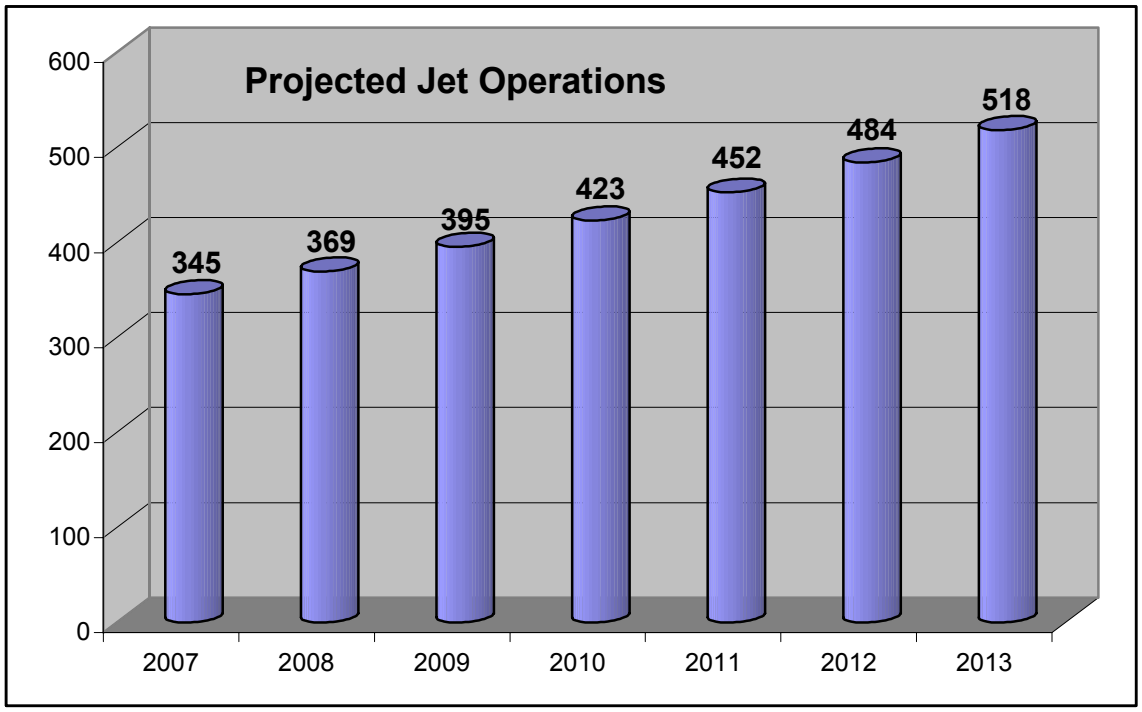


The table shows that from 2001 – 2007, jet activity increased by an average of 14% per year, with especially strong growth occurring in 2007. This growth was significantly higher than that forecast in the Master Plan. As a result, jet activity in 2007 was near the 360 operations forecast for 2015 in the Master Plan.

1.3.3. Projected Jet Operations

For purposes of projecting future jet operations, the 7% annual growth rate from the 2006 Master Plan forecasts was used. Using the 345 2007 jet operations as the baseline, the Airport should reach 500 jet operations by 2012 or 2013, as shown in Figure 2.

Figure 2: Projected Jet Operations



1.4. Runway Length Background

The Master Plan recommended an initial runway length of 5,500' and an ultimate length of 6,500'. The on-airport Master Plan alternatives either maintained the existing runway length but eliminated the possibility of continued Federal funding (Alternative A), significantly reduced the primary runway length (Alternative B), or completely realigned and extended the primary runway (Alternatives C-G).

With this range of options, the question of how simply maintaining the existing runway length would impact the Airport's ability to serve its role in the community was not examined because there was no viable option that allowed the current runway length to be maintained.

With the emergence of Alternative I (which does not allow for any runway extension but does allow the current runway length to be maintained with Federal funding), the question of how the existing runway length would impact existing and future airport users became very important. The number and type of current and forecast flights (also known as operations) were re-examined in an attempt to judge the impact of freezing the runway at its current length.

1.5. Runway Length Requirements

1.5.1. Design Aircraft Selection

The FAA publishes guidance for determining runway lengths in Advisory Circular (AC) 150/5325-4B "Runway Length Requirements for Airport Design" (7-2005). Two basic ways to determine runway length requirements are outlined in this AC. One is to use the requirements of a particular group of aircraft (e.g. aircraft having a maximum take-off weight of less than 12,500 pounds), and the other is to use the requirements of a specific aircraft (e.g. a regional jet).

The Master Plan used a specific aircraft (the regional jet Embraer 135) on the basis of its potential use as a charter aircraft and as a baseline for future business jet aircraft. The recommended runway length was based on its needs. In order to base runway lengths on an aircraft family or specific aircraft, it must be shown that the aircraft family or specific aircraft will have at least 500 operations a year. As shown in Figure 2, jet operations at BKX are projected to reach this threshold within five to six years.

Therefore, it is now appropriate to use a family of aircraft to determine runway length requirements. The FAA provides different aircraft families in the AC. Based on the fleet mix of aircraft using BKX today, the family defined as aircraft weighing over 12,500 pounds but not more than 60,000 pounds was chosen.

The FAA breaks this family down into two subgroups. The first comprises 75% of the fleet, the second 100%. The second group is made up of the more demanding aircraft. Based on the aircraft using BKX today, it was determined that the group comprising 75% of the fleet mix should be used as the primary design aircraft family. However, approximately 30% of the identifiable jets using the airport in 2007 fell into those comprising the more demanding 100% group. Therefore, the requirements of this group will also be considered when determining runway length requirements.

1.5.2. Useful Load Factor

The term "useful load" generally refers to the weight of passengers, cargo and useable fuel on an aircraft. Two useful load percentages are used in the AC – 60% and 90%. According to the AC, the useful load percentage selection should be based on "the haul lengths and service needs of the critical design airplanes" (Paragraph 302) and the 60% recommendation should only be used for "those airplanes operating with no more than a 60 percent useful load factor" (Paragraph 303).

1.5.3. Basic Runway Length Recommendation

The runway length calculation figure that corresponds to the 75% of the design aircraft family is AC Figure 3-1. The BKX temperature and elevation and an adjustment for wet and slippery runways was applied to the figure and resulted in runway length recommendations of 5,500' for 60% of useful load and 7,000' for 90% of useful load.

The AC also references design software that can be used to provide estimates of runway length needs. The results of running that program for BKX are summarized in Table 1. These results formed the basis of the updated runway length needs for BKX.

The specific results that apply to this analysis are in bold text. As can be seen, the computer application recommended a runway length between 5,500' and 7,000' for 75% of the family and between 5,910' and 8,730' for 100% of the family.

Table 1 Runway Length Requirements from AC 150/5300-13

Airport and Runway Data	
Airport elevation	1648 feet
Mean daily maximum temperature of the hottest month	85 F
Maximum difference in runway centerline elevation	22 feet
Length of haul for airplanes of more than 60,000 pounds	1,400 miles
Wet and slippery runways	
Runway Lengths Recommended for Airport Design	
Small airplanes with approach speeds of less than 30 knots	350 feet
Small airplanes with approach speeds of less than 50 knots	930 feet
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	3,010 feet
95 percent of these small airplanes	3,590 feet
100 percent of these small airplanes	4,210 feet
Small airplanes with 10 or more passenger seats	4,500 feet
Large airplanes of 60,000 pounds or less	
75 percent of these large airplanes at 60 percent useful load	**5,500 feet**
75 percent of these large airplanes at 90 percent useful load	**7,000 feet**
100 percent of these large airplanes at 60 percent useful load	**5,910 feet**
100 percent of these large airplanes at 90 percent useful load	8,730 feet
Airplanes of more than 60,000 pounds	7,410 feet

Source: FAA's Airport Design software (Version 4.2D)

1.5.4. Near-Term and Ultimate Runway Length Recommendations

The 7,000' runway associated with 90% useful load for 75% of the aircraft family should be planned for as the ultimate condition but its immediate construction is not warranted. In the near term, limiting the runway to 5,500' would restrict the amount of fuel, cargo and/or passengers that jets using the airport could place aboard the aircraft prior to departure. Therefore a runway longer than 5,500' but less than 7,000' should be built.

As mentioned previously, aircraft comprising 100% of the aircraft family made up 30% of the jets using the airport in 2007. For this group, the software program recommended a 5,910' runway. Additional analysis of individual aircraft operational requirements indicated that 40% - 45% of aircraft using Brookings need a 6,000' foot runway.

Therefore, a 6,000' runway is justified according to FAA guidelines and supported by individual aircraft operational requirements. A 6,000' runway will be 669' longer than

the current runway and allow for greater aircraft operational flexibility than is currently the case. It also aligns with the near-term runway length recommendation from the Master Plan. Therefore, up to a 6,000' runway is recommended as the initial build length, subject to adjustments related to ultimate runway end elevations. Depending on those elevations, the recommended length could decrease to 5,700 feet.

Despite the fact that construction of a 7,000' runway is not justified at this time, long term plans should include a runway of this length to provide the greatest degree of flexibility to accommodate future growth. Therefore, an ultimate length of 7,000' should be included on future Airport Layout Plans (ALPs).

1.6. Alternative I Recommendation

As shown in the previous analysis, a longer runway is essential in allowing the airport to continue serving its role in the community. Any alternative that does not provide for a longer runway should not be pursued. Since Alternative I does not provide for a longer runway, it should not be pursued. A recommendation not to pursue Alternative I any further was made to the City Council on January 22, 2008. They voted to not pursue Alternative I in the EA.

1.7. Alternative I Description

Alternative I involves a reduction of the Runway 30 RPZ through a visibility minimum increase. There would still be three buildings in the PRZ which would need to be purchased. The other primary component of Alternative I is a relocated crosswind runway, which improves the runways' intersection and the incompatible uses off Runway 35. Other issues are also addressed (see Figure 3 for overall configuration)

1.8. Alternative Scoring

In order to put Alternative I in context with the other alternatives contained in the 2006 Master Plan, it was scored in a similar way. The following criteria are taken directly out of the 2006 Master Plan. Each alternative in that document was scored based on how well it achieved each objective under each goal. Alternative I was scored in the same way.

The alternative was scored based on how well it met the objectives outlined in the following subsections.

1.8.1. Safety-related objectives

- Minimize obstructions
- Achieve full taxiway object free area (TOFA)
- Achieve standard runway - taxiway separation
- Achieve intersecting runways
- Minimize incompatible land use in RPZs
- Achieve standard runway object free areas

Improving the functionality of the existing AWOS was another objective. This objective was not included in the following analysis as it was assumed that this issue will be

addressed regardless of which alternative is chosen.

A related objective was implementing new or modifying existing zoning. This objective also was not included in the following analysis since this issue needs to be addressed regardless of which alternative is chosen.

1.8.2. Capacity-related objectives

- Provide room for terminal expansion
- Provide primary runway extension (to 6,000' near term and 7,000' ultimately*)
    - *This was updated as part of the Master Plan Addendum process
- Provide crosswind runway extension to 4,400' and upgrade to B-II standards
- Provide area for new hangars
- Provide room for expanded maintenance facilities
- Improve wind coverage during poor weather conditions

1.8.3. Compatibility and cost-effectiveness-related objectives

- Minimize land acquisition
- Minimize road closures
- Minimize home and business purchases
- Minimize impact to wetlands
- Minimize need to relocate hangars
- Capital improvement cost

1.9. Scoring System

Scoring was divided into three categories, corresponding to the objective groupings above. If an alternative fully met a given objective under a goal, it was awarded 10 points. If it somewhat met the objectives, 5 points were awarded and if it clearly did not meet the objective, 0 points were awarded. Each alternative could score a maximum of 60 points under each category, for a total of 180 points.

The scoring was not strictly relative; so many alternatives could receive the same score under a given objective. Variations between 0, 5, and 10 were also allowed, meaning that an alternative could receive a 2, 7, 9 etc under a given objective.

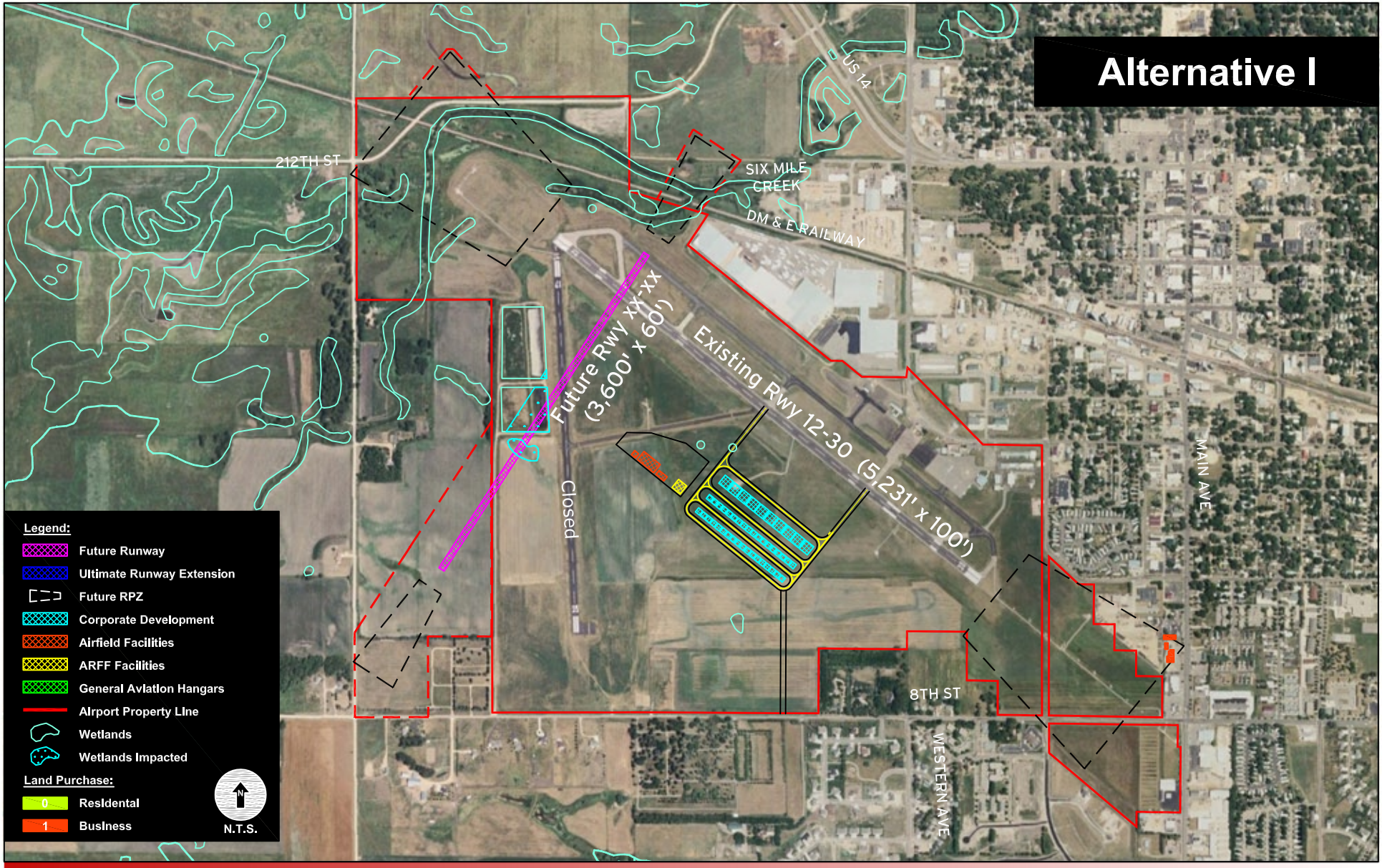
1.10. Alternative I Scoring

Alternative I Scoring Summary

	Score	Comments
Option Summary	**N/A**	Alternative I depicts the resolution of the Runway 30 RPZ through an increase in visibility minimums and depicts a new crosswind runway
Goal 1: Safety (60 Points)	**35**	
Minimize obstructions	5	No action taken.
Achieve full taxiway OFA	0	No action taken.
Achieve standard runway - taxiway separation	10	Achieved.
Achieve intersecting runways	10	Achieved.
Minimize incompatible land use in RPZs	10	Achieved.
Achieve standard runway object free areas	0	No action taken.
Goal 2: Capacity (60 Points)	**30**	
Provide room for terminal expansion	10	Achieved.
Provide primary runway extension	0	No action taken.
Provide crosswind runway extension and upgrade	0	No action taken.
Provide area for new hangars	10	Achieved.
Provide room for expanded maintenance facilities	10	Achieved.
Improved wind coverage during poor weather conditions	0	No action taken.
Goal 3: Meet Goals 1 and 2 in a compatible and cost-effective manner (60 Points)	**50**	
Minimize land acquisition	8	Requires purchase of 54 acres of undeveloped land.
Minimize road / railroad closures	10	No action taken.
Minimize home and business purchases	8	1 business purchased.
Minimize impact to wetlands	10	No Impact.
Minimize need to relocate hangars	10	Achieved.
Capital Improvement Cost (20 points)	4	$12.9M
Total (180 Possible Points)	**115**	
Percent of Possible Points	**64%**	

Scoring:
Meets objective: 10 points
Somewhat meets objective: 5 points
Does not meet objective: 0 points

All objectives worth 10 points unless otherwise noted



Airport Master Plan

Brookings Regional Airport

Figure 1-3

HNTB

U.S. Department
of Transportation
**Federal Aviation
Administration**

Federal Aviation Administration
Bismarck Airports District Office
2301 University Drive, Building 23B
Bismarck, North Dakota 58504

April 3, 2006

The Honorable Scott D. Munsterman, Mayor
City of Brookings
PO Box 270
Brookings, SD 57006

Dear Mayor Munsterman:

We have reviewed your letter, dated February 15, 2006, responding to our concerns about compliance issues at the Brookings Municipal Airport. As the sponsor of a Federally obligated airport, the City of Brookings has a number of issues before it, regarding the operation and future development of the Brookings Municipal Airport.

Our initial letter to the City of Brookings, dated May 10, 2005, expressed the concern that the City may not be complying with its grant assurances regarding incompatible land use in several of the airport's Runway Protection Zones (RPZs). We had requested the City provide our office with documentation of the actions the City had taken that would constitute a reasonable effort to mitigate the incompatible land use in the RPZs.

Although the City has recently begun efforts to address the issue of incompatible land use in the RPZs, we are disappointed by the City's lack of action in the past. The City's past efforts on this issue have been less than effective and have placed the City of Brookings in a difficult position. Further, the limited documentation provided in response to our request makes it difficult to determine the reasonableness of the City's actions in controlling incompatible land use.

We concur with the City's assessment that shortening runways, eliminating the Instrument Landing System (ILS), or reducing approach minimums are undesirable alternatives. The runways and ILS were constructed with Federal aid as an investment to support aeronautical users and the City of Brookings. Taking these steps to correct a situation created by the City's action or lack of action would be extremely difficult to justify and would be in direct opposition of the City's stated needs for development of the airport. Considerable analysis of the potential impacts to aeronautical users and determination of reimbursement costs would be required before we could consider approval of such actions.

The current effort to develop a master plan for the airport is critical in identifying solutions to address the airport's development needs. At the same time, some of the identified solutions

may be equally effective in addressing the airport's current compliance issues. However, solutions requiring significant funding or complex construction usually take a considerable amount of time to implement and complete. In the interim, the incompatible land use in the RPZs continues.

We recognize that it may not be fiscally prudent to make large investments to resolve the incompatible land use issue when the City may adopt a master plan recommendation that would eliminate the need for such action. Therefore, we will hold in abeyance any further action regarding incompatible land use in the RPZs for Runways 30 and 35, provided the following actions occur:

1. The City takes aggressive and expeditious action to bring the master plan effort to conclusion and implement an acceptable course of action.
2. The City takes reasonable action where appropriate to prevent additional incompatible land use in the Brookings Municipal Airport's RPZs.
3. The City meets with our office on a periodic basis to discuss progress on the selected course of action.

We will continue to monitor the City's efforts to control incompatible land use in the airport's RPZs and address the airport's development needs. If the City's selected course of action does not adequately address the issue of incompatible land use or if additional incompatible land use occurs, we will be obligated to resume the process of making a compliance determination.

If you have any questions, please contact our office at 701-323-7380.

Sincerely,

Steven J. Obenauer, Manager
Bismarck Airports District Office

cc: SDDOT
AGL-620
AAS-400