



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

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November 4, 2019

Mr. Paul Brake
City of Morgantown
389 Spruce Street
Morgantown, WV 26505

Dear Mr. Brake:

The FAA has completed its review of the BCA for the proposed project to extend runway 18/36 from 5,199' to 6,200' at Morgantown Municipal Airport.

We concur that a runway extension would result in improved aircraft operational efficiencies, savings in passenger time and avoided ground transportation costs. In addition to the operational benefits, the large cost devoted to earthwork for the runway extension will offer considerable environmental benefits such as improving water quality, as it will result in the removal of an abandoned coal seam and the need for an Acid Mine Drainage Treatment Remediation System.

In summary, the analysis adequately illustrates that the benefits described above are sufficient to satisfy the benefit cost ratio requirement. This determination is not a commitment for AIP Discretionary Funding. In the coming months, we will work with you to update your 5 year Capital Improvements Plan, which identifies the upcoming projects for which you will request funding. If you have any questions regarding this determination, please feel free to contact me directly at (304)253-1417.

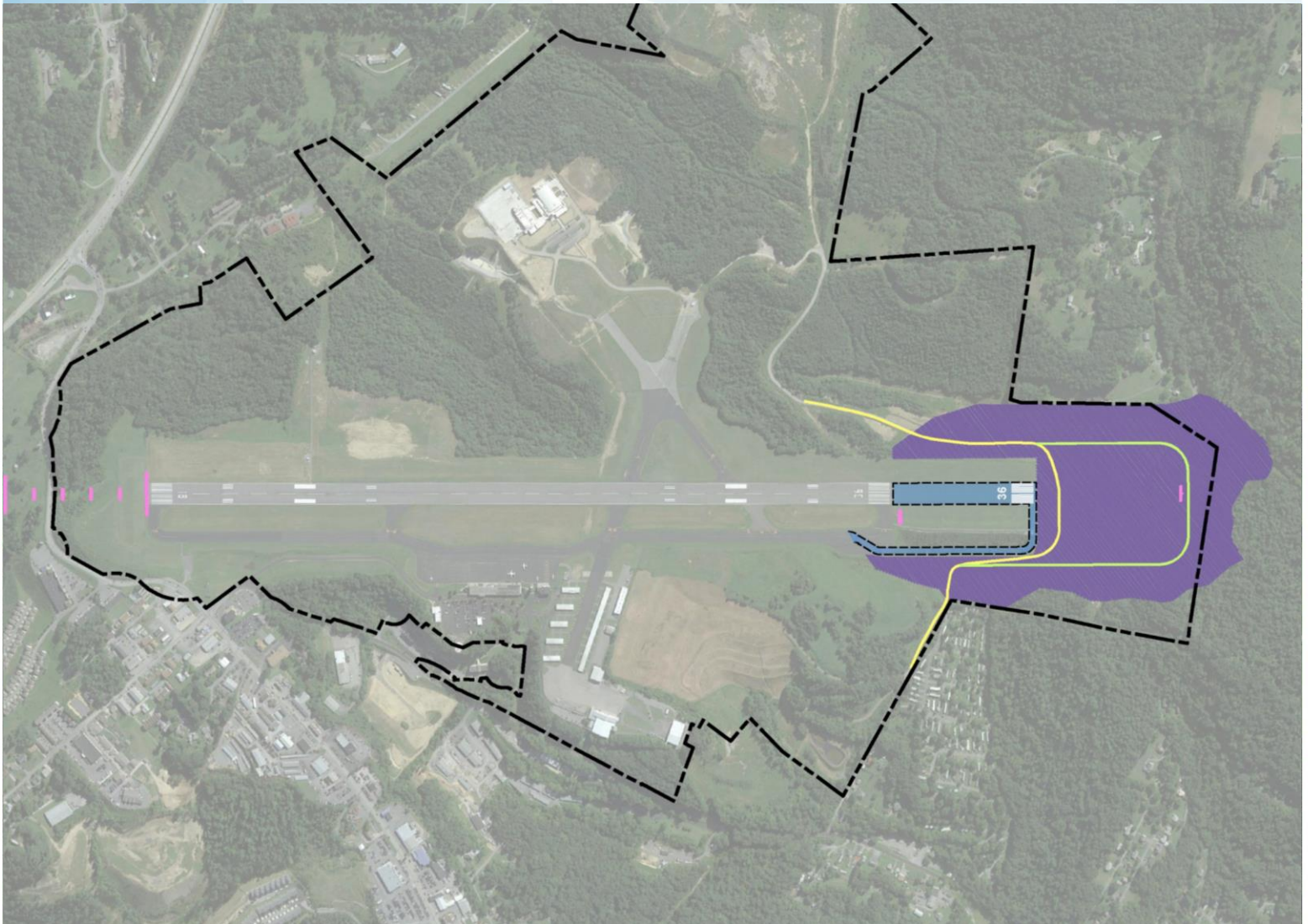
Sincerely,

A handwritten signature in blue ink, reading 'Matthew Di Giulian'.

Matthew Di Giulian
Manager
Beckley Airports Field Office

MORGANTOWN MUNICIPAL AIRPORT

Benefit-Cost Analysis (Runway 18-36 Extension)



Prepared For:
City of Morgantown, West Virginia

Prepared By:
Michael Baker International

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INTERNATIONAL

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Executive Summary

The Morgantown Municipal Airport (MGW) is owned by the City of Morgantown, West Virginia and has a single runway (Runway 18-36) that is currently 5,199 feet long. The Federal Aviation Administration (FAA) concurred with the results of a December 2017 Runway Extension Justification Study (Justification Study) that identified a runway length requirement of 6,200 feet for Runway 18-36. **The City intends to extend Runway 18-36 to a length of 6,200 feet to help prevent further losses in corporate jet activity, commercial charter activity by WVU Athletics and visiting teams, and other business opportunities for the community (refer to Figure ES-1).** The initial cost of the proposed 1,001-foot extension of Runway 18-36 is estimated to be **\$37,583,640** (including professional services). The mountainous terrain of West Virginia causes this cost to be substantially higher than what would be expected at an airport with a more level terrain elsewhere in the United States. Because the runway extension is considered a capacity-enhancing project that would cost greater than \$10 million, the FAA requested the preparation of this Benefit-Cost Analysis (BCA) to determine if the long-term benefits of the project exceed the costs to construct and maintain it. West Virginia University (WVU) provided the funding for most of this BCA effort to show their strong commitment and desire for the runway extension.

The runway at MGW has not been extended since the early 1960s and is 1,551 feet shorter than any other commercial airport in the state, with the next shortest commercial runway being 6,750 feet at the Raleigh County Memorial Airport (BKW). From 2015 to 2017, MGW experienced the most operations of any airport in the state according to tower counts from the FAA's Air Traffic Activity Data System (ATADS) database. The greater Morgantown economy is largely composed of professional and technical service businesses that frequently need to conduct global transport, as opposed to many areas of the state where manufacturing is the key business sector. There is a significant amount of support for the proposed runway extension from federal, state, and local governmental entities, as well as from the many businesses that utilize the airport. The Morgantown area has flourished recently due to its above average concentration of jobs in the higher education and health care sectors. The current runway length at MGW is not capable of accommodating many corporate jets the way their operators desire to utilize them, which results in a general avoidance of MGW or the need to conduct refueling stopovers after departing or diversions when the runway is contaminated. Morgantown is home to WVU, the state's flagship university with enrollment of over 28,000 students. WVU acts as a stabilizing force for the region and is part of the Big 12 Athletic Conference. WVU is located approximately three miles from MGW. The current runway length at MGW is not capable of accommodating charter aircraft for most WVU teams and visiting teams. Therefore, most teams are currently flying into less convenient airports such as Pittsburgh International Airport (PIT) and North Central West Virginia Airport (CKB) and are bussed to and from WVU.

Based on a comprehensive data collection and analyzation effort, this BCA identifies what the potential savings would be to existing and desired airport users if the runway length was extended to 6,200 feet compared to a base case scenario that reflects the existing airport configuration and runway length of 5,199 feet.

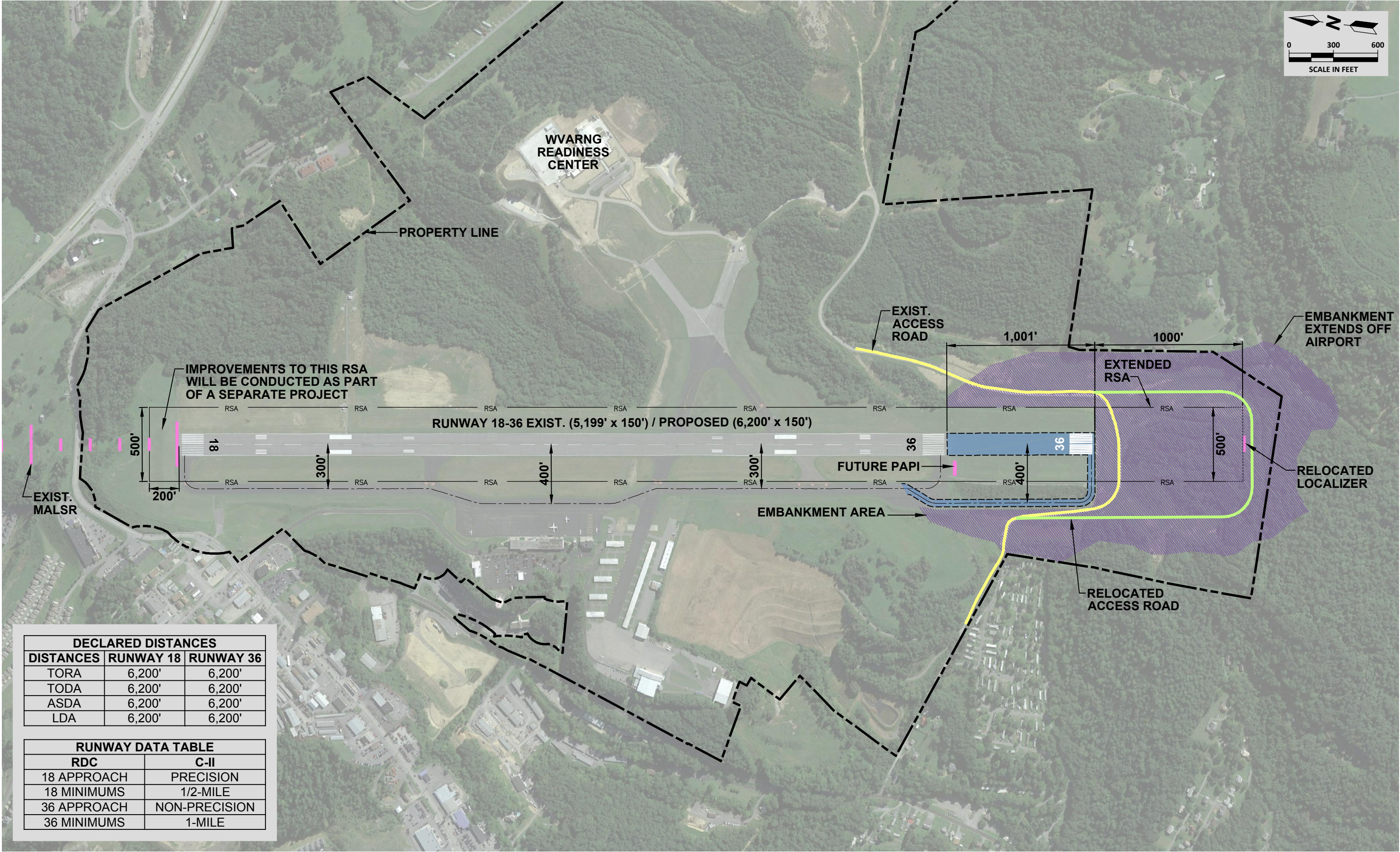


FIGURE ES-1 PROPOSED RUNWAY EXTENSION

The proposed extension includes a 1,001-foot extension to the south end of Runway 18-36 with a parallel taxiway to the new runway end and a 1,000-foot-long Runway Safety Area (RSA) with a standard land platform (Alternative 3 in this BCA). The extension would provide 6,200 feet for all operations in all directions on Runway 18-36 and would therefore satisfy the identified runway length requirement, but users could not accrue the benefits (i.e., cost savings) associated with the extended runway until 2024. The City of Morgantown intends to phase the construction of the runway extension so that some additional useable pavement can be provided sooner rather than later by extending the runway 801 feet south into the existing RSA in the short-term with a 400-foot displaced threshold (Alternative 1 in this BCA). By doing so, existing and desired airport users could begin to accrue partial benefits of the 6,000-foot-long runway with declared distances beginning in 2021. They would only be partial benefits because the short-term extension would not provide 6,200 feet for all operations in all directions like the proposed extension would after fully completed and useable in 2024.

The four quantifiable benefits listed below were identified in this BCA. There are also several hard-to-quantify benefits associated with the proposed runway extension such as the creation of approximately 100 acres of new developable property that will be used as a borrow site for to create the land platform for the extended runway, taxiway, and RSA. The difference between the base case and alternative project costs are referred to as incremental costs and the difference between the base case and alternative savings factors are referred to as the benefits. In this BCA, the cost savings of being able to utilize the extended runway at MGW in a more flexible manner were counted as benefits. For example, there would be less avoidance of MGW and therefore individuals would not have to be transported between a less convenient airport and Morgantown and they would save time. Reduced aircraft operating costs were also counted as a savings/benefit to operators. According to the FAA BCA Guidance, “salvage value is the value, if any, of the project at the end of its expected useful life.” The salvage value was treated as an offset to termination costs in this BCA (i.e., a one-time value at the end of the 20-year evaluation period of the BCA). The variables and methods that were used to calculate dollar value savings and the salvage value were discussed with the FAA prior to the submission of the draft BCA documentation.

1. Uncaptured Corporate Jet Activity
2. Prevented Stopovers and Diversions
3. Uncaptured Commercial Activity
4. Salvage Value

Based on the information described above, four separate BCA evaluations were conducted for the scenarios listed below. **Table ES-1** summarizes the Net Present Values (NPVs) and Benefit-Cost Ratios (BCRs) that were calculated for each scenario. The NPV is the sum of the Present Value (PV) or discounted value of the benefits minus the sum of the PV of the incremental project costs. A BCR of 1.0 or more indicates that the benefits of the project will meet or exceed the costs to construct and maintain it (i.e., the project is worth undertaking).

1. Comparison of Base Case to Alternative 1 (6,000 Feet)
2. Comparison of Base Case to Alternative 2 (6,200 Feet with EMAS Bed)
3. Comparison of Base Case to Alternative 3 (6,200 Feet with Standard RSA)
4. Comparison of Base Case to Alternatives 1 and 3 Combination

Table ES-1 Summary of BCA Evaluations			
Evaluation	Base Case Comparison to	Net Present Value (NPV)	Benefit-Cost Ratio (BCR)
1	Alternative 1	\$3,404,799	1.45
2	Alternative 2	-\$9,781,558	0.78
3	Alternative 3	-\$1,075,341	0.97
4	Alternatives 1 and 3 Combo	\$968,397	1.03
Source: Michael Baker International, Inc., 2018.			

Evaluation 4 produced the greatest long-term value while fulfilling the runway length requirement of 6,200 feet and represents the proposed and preferred runway extension for **MGW**. Therefore, the City of Morgantown intends to construct Alternative 1 in the short-term so that existing and desired users can incur partial cost savings as the proposed runway extension (Alternative 3) is being completed. The City of Morgantown requests that the FAA determine that the benefits of constructing a combination of Alternative 1 and 3 would exceed the costs to construct and maintain the project during the evaluation period.

1.0 Benefit-Cost Analysis (BCA) Objective and Need

The Morgantown Municipal Airport (MGW) is owned by the City of Morgantown, West Virginia and is a commercial service airport that experiences ‘regular use’ by corporate jets, which is defined by the Federal Aviation Administration (FAA) as at least 500 annual operations. The airport’s single runway (Runway 18-36) is currently 5,199 feet long and does not satisfy the length requirements for many existing and desired airport users. Being located near West Virginia University (WVU) and several businesses that rely on air transportation both domestically and internationally, there has been a long-identified need for additional runway length at MGW. The limited runway length has not only resulted in aircraft and passengers travelling to other less convenient airports but has also resulted in businesses selecting sites outside of Morgantown to establish new operations (e.g., Mylan Pharmaceuticals). **The City intends to extend Runway 18-36 to a length of 6,200 feet to help prevent further losses in corporate jet activity, commercial charter activity by WVU Athletics and visiting teams, and other business opportunities for the community.** The FAA classifies MGW as a “Nonhub Primary Commercial Service Airport” in the National Plan of Integrated Airport Systems (NPIAS) and is therefore eligible to receive Airport Improvement Program (AIP) grants that cover up to 90 percent of certain project costs. Because the runway extension is considered a capacity-enhancing project that would cost greater than \$10 million, the FAA requested the preparation of this Benefit-Cost Analysis (BCA) to determine if the long-term benefits of the project exceed the costs to construct and maintain it. WVU provided the funding for most of this BCA effort to show their strong commitment and desire for the runway extension.



The initial construction cost for the proposed 1,001-foot extension of Runway 18-36 is estimated to be **\$31,632,740** (not including professional services). The mountainous terrain of West Virginia causes the construction cost for the runway extension to be substantially higher than what would be expected at an airport with a more level terrain elsewhere in the United States. A significant quantity of fill material is required at MGW to construct the runway extension, taxiway extension, Runway Safety Area (RSA), and sloped embankment, which is estimated to cost **\$23,629,080** and represents **74.70 percent** of the initial construction cost. These factors are mentioned at the beginning of this BCA because the terrain challenges surrounding the airport and the required fill material costs appear to devalue the ‘worthwhileness’ of pursuing the runway extension at MGW compared to if a similar project was undertaken at an airport with a more level terrain elsewhere in the United States. It is requested that the FAA consider these factors in the evaluation of the information presented in this BCA and their subsequent determination. The stated objective, need, and assumptions for this BCA are summarized on the following page.

- **BCA Objective** – The available runway length places operational restrictions on aircraft operations. A runway extension would provide a more flexible operating environment and would result in a cost savings for existing and potential airport users. The BCA should illustrate that the benefits of the proposed runway extension meet or exceed the costs of constructing and maintaining the project while at the same time considering the unique terrain constraints in the area and alternative funding mechanisms that are being pursued by the City of Morgantown to pay what is necessary for the non-FAA share.
- **BCA Need** – BCAs are required for airport capacity projects meeting a dollar threshold of \$10 million or more in FAA AIP discretionary funds. Projects that are undertaken to accommodate larger and more efficient aircraft (e.g., larger corporate and commercial jets) are considered airport capacity projects. The proposed runway extension at MGW exceeds \$10 million and the City of Morgantown expects to fund the projects with a combination of FAA grants and other non-FAA sources.
- **BCA Assumptions** – The following assumptions were considered guiding principles for this BCA and were utilized to quantitatively and qualitatively analyze the benefits of the runway extension.
 1. There is a general avoidance of MGW due to the limited runway length and many individuals are selecting less convenient airports. Therefore, the proposed runway extension would reduce leakage to other airports.
 2. The current runway length does not meet the demands of existing and desired airport users. Therefore, the proposed runway extension would prevent fueling stopovers because aircraft cannot takeoff at their desired payload from MGW to reach their ultimate destination. There would also be reduced diversions associated with landings at MGW because the proposed runway extension would better meet the landing length demands of aircraft.
 3. The proposed runway extension would result in increased opportunities for non-scheduled passenger service for WVU Athletics, visiting teams, and others.
 4. The long-term depreciated value of the newly-created land platform, pavement, and equipment for the proposed runway extension can be counted as an offset to termination costs at the end of the evaluation period (i.e., salvage value).
 5. By moving fill material to create the land platform of the proposed runway extension, there will be newly-created industrial park properties. Although the values of those properties cannot be considered as part of the BCA calculations, those newly-created revenue producing land opportunities are important for the City of Morgantown and Monongalia County and are therefore identified as hard-to-quantify benefits. The FAA can consider hard-to-quantify benefits as part of their evaluation and subsequent determination of a BCA.
 6. Other revenues that would be generated from increased utilization of the airport and subsequent spending in the community cannot be considered as part of the BCA calculations, but they are also recognized as hard-to-quantify benefits.

2.0 BCA Process

The efforts listed below were conducted as part of the BCA process for MGW and are described in this document in accordance with the FAA's 1999 Airport Benefit-Cost Analysis Guidance (FAA BCA Guidance). This BCA was conducted in phases and included detailed survey efforts, the preparation of a Runway Extension Justification Study (Justification Study), and coordination with all levels of the FAA and many other stakeholders. This document was prepared after the FAA agreed to the assumptions (e.g., forecasts and time-based variables), benefits, alternatives, and economic values presented herein. Many aircraft activity variables for MGW are shown with a base year between May 1, 2016 and April 30, 2017, which represents the most recent one-year period of historical activity data that was available at the time the analysis was initially performed.

- Airport Overview
- West Virginia Airport Trends
- Community Overview and Support
- Justification Study Overview
- Critical Aircraft and Baseline Activity Analysis
- Base Case and Alternatives
- Economic Values and Other BCA Variables
- Quantifiable Benefits
- Hard-to-Quantify Benefits
- Benefit-Cost Analysis and Conclusions

3.0 Airport Overview

Morgantown Municipal Airport opened in November of 1937 and there were regularly-scheduled passenger flights from the beginning. Like many airports in West Virginia, MGW was constructed on the top of a hill (Easton Hill) associated with the Appalachian Mountains. Much of the hill was flattened as part of a Works Progress Administration (WPA) effort to provide room for the airport's airfield and landside facilities. The last known runway expansion project occurred in the early 1960s. Since that time, airfield improvements have mostly consisted of taxiway, RSA, navigational, and routine maintenance projects, as well as the closure of the crosswind runway (Runway 5-23) to provide space for siting the West Virginia National Guard (WVNG) Readiness Center to serve as a gateway and a Reception, Staging, Onward Movement, and Integration Site (RSOI) for Camp Dawson.

"This airport represents the triumph of a dream and a test of the power of unity. For three decades you have worked to make this modern airport come true. Your faith and energy have surmounted every difficulty. The people of Morgantown can look forward to a brighter and a more hopeful life because of this work that you have done. This airport was not the work of any single group. It was built by the cooperation of civic groups and local officials, of city, State, and Nation."

-President Lyndon B. Johnson Remarks at MGW on September 20, 1964

As shown in **Figure 1**, the airfield consists of a single runway (Runway 18-36) that is oriented in a north-south configuration. Runway 18-36 is currently 5,199 feet long, 150 feet wide, and has a precision Instrument Landing System (ILS) approach to the Runway 18 end. The passenger terminal building is located near the center of the runway on the west side, as are all other existing aviation-related facilities at MGW. The WVNG Readiness Center was built on a 35-acre parcel and provides a stationing plan for the WVNG's 249th Army Band and Battery B of the 201st Field Artillery Battalion and a proposed Army Parachute Rigging Facility. It is a gateway to Camp Dawson, which is located approximately 27 miles from MGW near Kingwood, West Virginia, and is used by the U.S. Army, U.S. Special Operations Command, U.S. Marine Corps, U.S. Army Reserve, NATO Forces, and National Guard units from the east coast as a training facility, as well as the Federal Bureau of Investigation (FBI), Bureau of Alcohol, Tobacco, Firearms, and Explosives (ATF), the Department of Energy (DOE), and other federal agencies. The airport serves as part of the training infrastructure for Camp Dawson and recently hosted 10th and 5th Special Forces Groups for training. In addition to the proposed runway extension, plans for the airport include the construction of a taxiway and apron that is capable of supporting Boeing C-17 Globemaster military transport jets to the east of the runway, several new hangar facilities, an expansion of the main apron, and the installation of an Engineered Materials Arresting System (EMAS) bed beyond the north end of Runway 18-36 (i.e., 18 end). MGW supports the flying public with commercial service from Southern Airways Express under the federal Essential Air Service (EAS) program and currently flies to Pittsburgh International Airport (PIT) and Baltimore-Washington International Airport (BWI) using nine-seat Cessna Caravan aircraft. The City has defined an aggressive plan to conduct many of those improvements in the short-term to keep up with the growing local economy and to provide a competitive environment for encouraging business growth within the area.

As the airport owner, the City of Morgantown outlined the vision below for MGW. Many elements of the City's vision are explored in this BCA to illustrate how a runway extension at MGW would be able to benefit various existing airport users as well as to better serve the growing economy and population of the Morgantown area by providing a more flexible airfield environment.

City of Morgantown Vision for Morgantown Municipal Airport

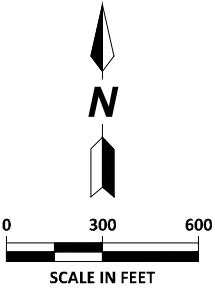
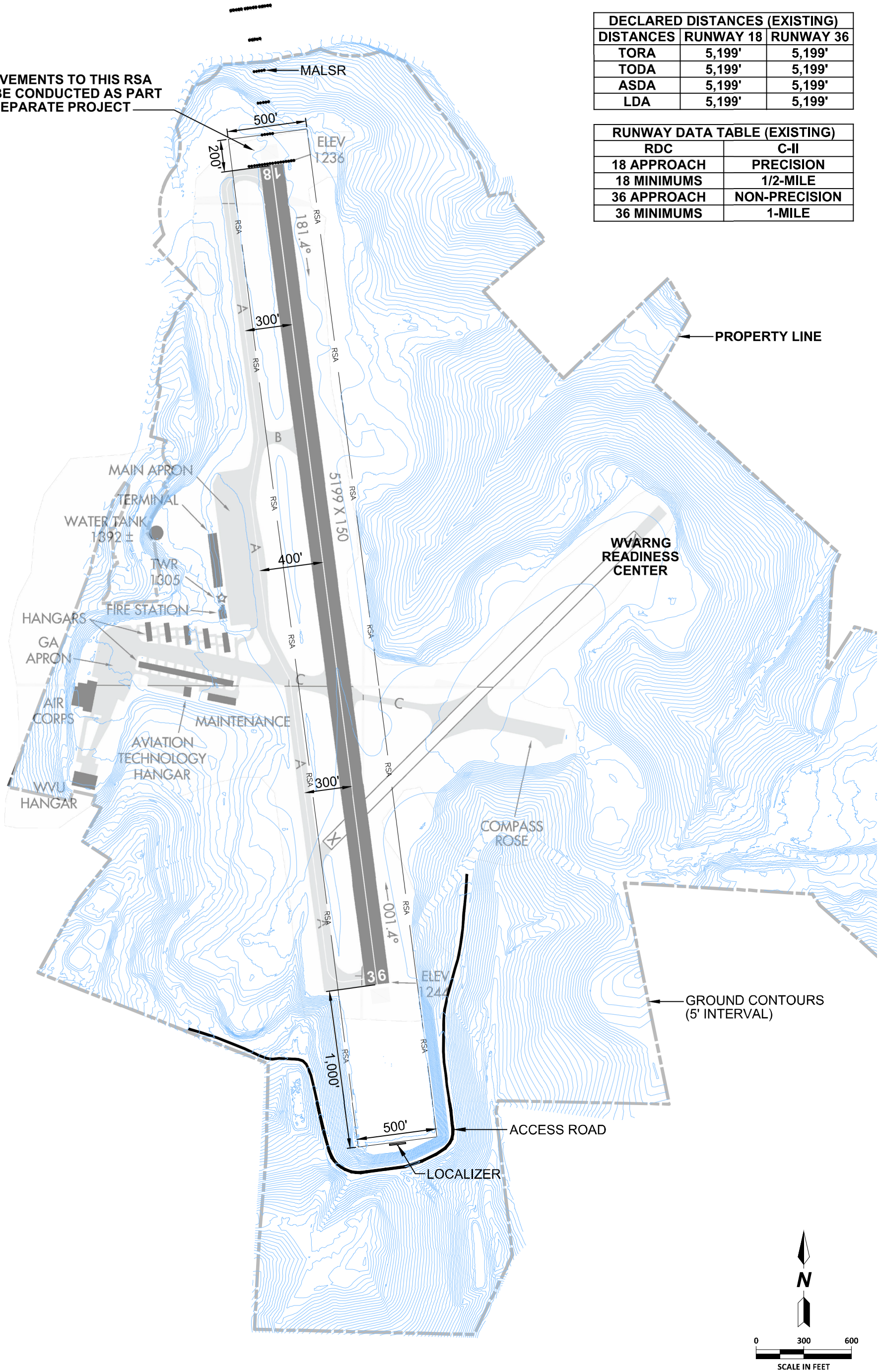
To be able to support the growing needs of one of the few areas of the country with economic growth by focusing on current unmet aviation transportation requirements and leveraging all transportation, holistically to enhance capabilities synergistically for the future. To be prepared for any state or national contingency through aggressive involvement with state, national, and military organizations to provide the needed infrastructure for use in those times of need.

MORGANTOWN MUNICIPAL AIRPORT - WALTER L. BILL HART FIELD

IMPROVEMENTS TO THIS RSA
WILL BE CONDUCTED AS PART
OF A SEPARATE PROJECT

DECLARED DISTANCES (EXISTING)		
DISTANCES	RUNWAY 18	RUNWAY 36
TORA	5,199'	5,199'
TODA	5,199'	5,199'
ASDA	5,199'	5,199'
LDA	5,199'	5,199'

RUNWAY DATA TABLE (EXISTING)	
RDC	C-II
18 APPROACH	PRECISION
18 MINIMUMS	1/2-MILE
36 APPROACH	NON-PRECISION
36 MINIMUMS	1-MILE



4.0 West Virginia Airport Trends

There are seven airports in West Virginia that currently provide commercial airline service including MGW, North Central West Virginia Airport (CKB), Mid-Ohio Valley Regional Airport (PKB), Huntington Tri-State Airport (HTS), Raleigh County Memorial Airport (BKW), Yeager Airport (CRW), and Greenbrier Valley Airport (LWB). The commercial service at five of those airports (including MGW) is subsidized by the U.S. Department of Transportation under the EAS program, while both HTS and CRW have non-subsidized service. **Table 1** provides a comparison of the commercial airports in West Virginia and **Figure 2** illustrates the public use airports in the state. The table shows the number of large commercial jet operations that occurred at each airport from May 1, 2016 through April 30, 2017, which includes everything larger than a regional jet. As shown, the runway length at MGW is 1,551 feet shorter than any other commercial airport in the state, with the next shortest commercial runway being 6,750 feet at BKW. Furthermore, many of the pertinent declared distances calculations at many of the commercial airports are limited for commercial operations, specifically for Accelerate-Stop Distance Available (ASDA) and Landing Distance Available (LDA) which jets must abide to; however, at some airports where ASDA and LDA is restricted, such as HTS and CRW, there are higher numbers of large commercial jet operations. With the high number of corporate jet operations that currently occur at MGW and the various missed opportunities that exist at MGW due to the limited runway length (both for additional corporate and commercial activity), additional runway length is needed to keep up with the growing local travel demands and to provide similar commercial aviation opportunities as other airports in the state. From 2015 to 2017, MGW experienced the most operations of any airport in West Virginia according to tower counts from the FAA Air Traffic Activity Data System (ATADS). A brief history of airfield development at each of the seven commercial service airports is presented in **Table 2**, which was compiled from sources including airport documents, press releases, and newspaper articles. The airfield development review illustrated the following noteworthy items:

- Runway 18-36 at MGW has not been extended since the early 1960s.
- Many of the runways at the other commercial airports were extended prior to the requirements for conducting BCAs (the FAA BCA Guidance was issued in 1999).
- Several extensions have been constructed in recent years to compensate for non-standard RSA, which are considered safety projects and are not subject to the BCA requirements. For example, PKB had non-standard RSA beyond both ends of Runway 3-21, but the terrain drops off sharply beyond the Runway 21 end. The airport opted to construct a small extension of the Runway 3 end and then to displace the Runway 21 end.
- All the airports have terrain challenges that make it difficult to construct airfield expansion projects without significant earthwork costs.
- The airport in the state with the longest runway (8,815 feet) is the Eastern West Virginia Regional Airport/Shepherd Field (MRB), which is classified as a general aviation airport and is located in Martinsburg. MRB is home to the 167th Airlift Wing of the WVNG that flies C-17 Globemaster jets. A runway extension was recently completed at MRB to support C-17 Globemaster jet activity, but the project was funded by the DOD.
- MGW is the closest commercial airport to Camp Dawson.

Table 1 West Virginia Commercial Airport Comparison														
Code	Airport	NM from MGW	County	Airport Elevation	Longest Runway		Runway End 1		Runway End 2		Large Commercial Jet Ops (5/1/2016 to 4/30/2017)	2016 Ops (1/1 to 12/31)	5/1/2016 to 4/30/2017 Ops	Ratio of 2017 Ops to Runway Length
					ID	Length	ASDA	LDA	ASDA	LDA				
MGW	Morgantown Municipal	0.0	Monongalia	1,243.7	18-36	5,199	5,199	5,199	5,199	5,199	0	51,965	52,949	10.18
CKB	North Central West Virginia	25.2	Harrison	1,223.5	3-21	7,800	7,800	7,130	7,130	7,130	396	19,122	18,339	2.35
PKB	Mid-Ohio Valley Regional	72.7	Wood	868.6	3-21	7,240	6,781	6,781	7,241	6,781	13	28,105	31,615	4.37
HTS	Huntington Tri-State	145.0	Wayne	828.3	12-30	7,017	6,516	6,516	7,017	6,510	1,867	11,423	11,623	1.66
BKW	Raleigh County Memorial	124.9	Raleigh	2,503.8	1-19	6,750	6,750	6,750	6,750	6,750	4	No Tower	No Tower	No Tower
CRW	Yeager	109.0	Kanawha	947.2	5-23	6,800	6,300	5,726	6,300	5,800	796	43,467	43,130	6.34
LWB	Greenbrier Valley	109.5	Greenbrier	2,301.4	4-22	7,003	7,003	7,003	7,003	7,003	76	18,046	17,720	2.53

Sources: FAA 5010 database, FAA TFMSC database, FAA ATADS database, and Michael Baker International, Inc., 2017.

Note: The large commercial jet category includes all commercial jet operations conducted by non-commuter aircraft (i.e., every commercial jet operation conducted in aircraft larger than a regional jet).

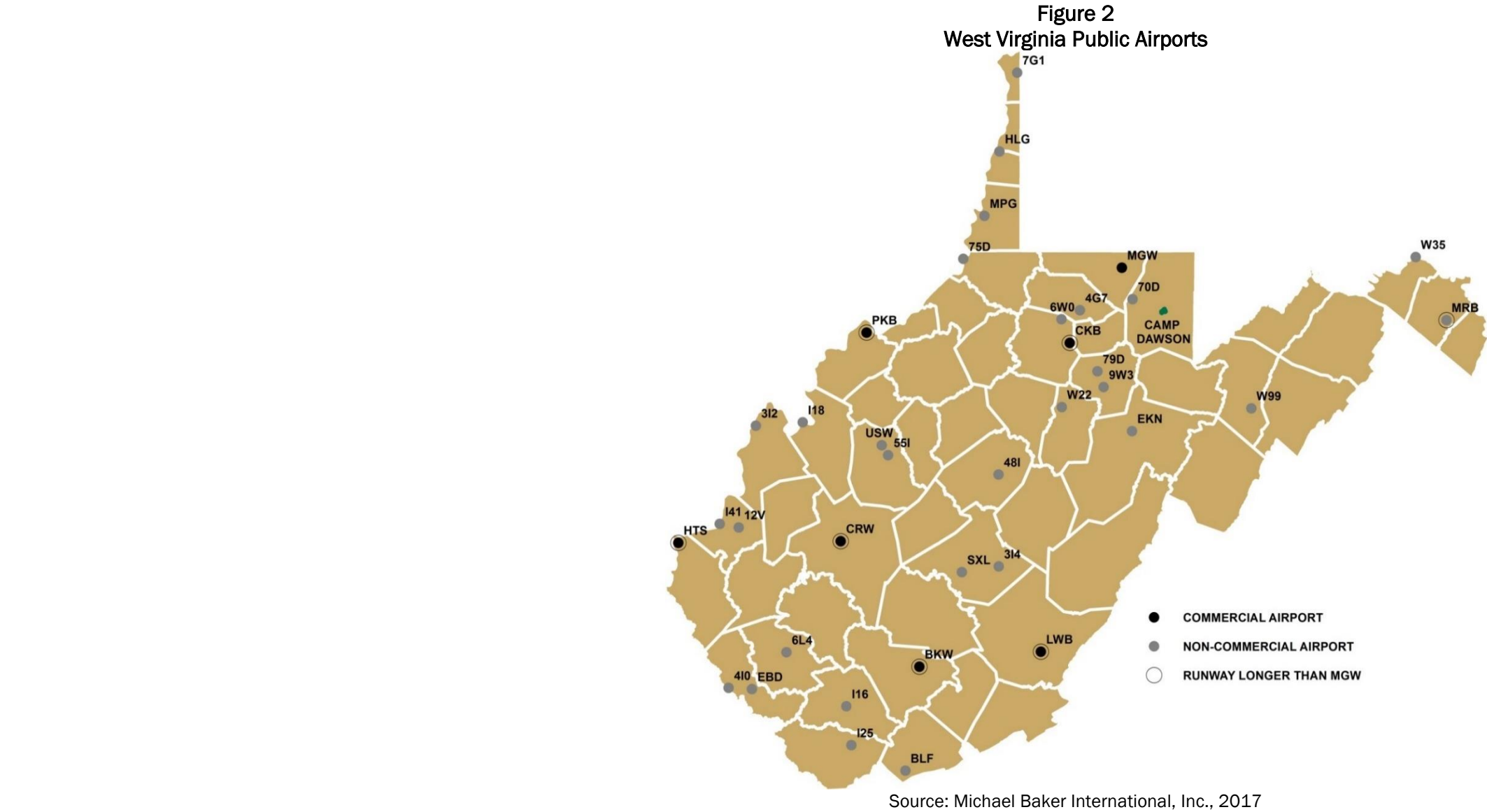


Table 2
West Virginia Commercial Airport Development History

Code	Airport	Longest Runway	Airfield Development History
MGW	Morgantown Municipal	5,199	Besides RSA and taxiway projects, the last runway expansion project was constructed in the early 1960s
CKB	North Central West Virginia	7,800	The runway was extended from 5,200 feet to 7,000 feet in the late 1990s (prior to the requirement for BCAs). Another 800-foot extension was completed in 2012, making Runway 3-21 at CKB the longest commercial runway in the state.
PKB	Mid-Ohio Valley Regional	7,240	A small extension of the main runway (Runway 3-21) was recently constructed in order to compensate for non-standard RSA. The Runway 3 end was extended and the Runway 21 end was displaced as part of the project.
HTS	Huntington Tri-State	7,017	Most of the recent runway extension projects have been constructed for RSA purposes (i.e., extend one end to compensate for RSA deficiencies on another end).
BKW	Raleigh County Memorial	6,750	The main runway (Runway 1-19) was constructed in the late 1970s. The RSA beyond the Runway 19 end was corrected in the early 2000s.
CRW	Yeager	6,800	Most of the recent runway extension projects have been constructed for RSA purposes. An EMAS bed was installed beyond the Runway 5 end and an EMAS was installed. The hillside beyond the EMAS was graded at a slope of 1 foot horizontal for every 1 foot vertical and many sources identify it as the highest reinforced vegetative slope in the country (prior to the landslide).
LWB	Greenbrier Valley	7,003	The RSA beyond the Runway 22 end was recently corrected. It is believed that a 1,000-foot runway extension was constructed in the 1970s, although no information could be found to confirm the actual date.
Sources: Airport websites, newspaper articles, and Michael Baker International, 2014.			

5.0 Community Overview and Support

Monongalia County covers an area of approximately 370 square miles and had a population of more than 105,000 in July 2017 according to the U.S. Census Bureau. The county is approximately 75 miles south of Pittsburgh, Pennsylvania and over half of the country's population is within a five-hundred-mile radius. Interstate 79, a major north-south route, runs through the county and connects with Interstate 68 south of Morgantown and Interstate 70 in Washington, Pennsylvania.

The City of Morgantown is the county seat. The most recently-released U.S. Bureau of Labor Statistics (BLS) unemployment figures (July 2017) for the Morgantown Metropolitan Statistical Area (Morgantown MSA) indicate a 4.0 percent unemployment rate as compared to state and national averages of 5.0 percent and 4.6 percent, respectively. According to the Bureau of Business and Economic Research at WVU, employers in the north-central region of West Virginia have added more than 6,000 jobs since 2010, which translates to growth of around six percent. Growth in the county economy and Per Capita Personal Income (PCPI) has also exceeded state and national averages since 2010. According to the U.S. Bureau of Economic

Analysis (BEA), from 2005 to 2015, the compound annual growth rate was 3.8 percent in the county compared to 3.3 percent in the state and 3.0 percent for the U.S. The BEA released their Prototype Gross Domestic Product (GDP) by County report for 2012-2015 and Monongalia County ranked second in the State of West Virginia with a 2015 GDP of \$6.4 billion. The report also showed a 10.12 percent increase in GDP for Monongalia County from 2012 to 2015.

The Morgantown MSA is regularly distinguished on a variety of national and regional lists, which demonstrates the area's accomplishments in terms of growth, business development, workforce cultivation, and more. The Morgantown MSA has been recognized as:

- “Top 100 Leading Business Location” by Area Development
- “Best Performing” Small Metro by the Milken Institute
- “Best Small Metro for Business and Careers” by Forbes

The Morgantown MSA has flourished recently largely due to its above average concentration in higher education and health care. As previously mentioned, Morgantown is home to WVU, the state's flagship university with enrollment of over 28,000 students. WVU acts as a stabilizing force for the region. In recent years, several large-scale construction and renovation projects at WVU have provided an extra economic boost to the region. During the 2016-2017 school year, WVU achieved a national ranking of fifth in overall athletic performance by CBS Sports. Athletic success and ongoing need for new and improved facilities has directly impacted the surrounding areas. For example, Monongalia County Ballpark opened in 2015 as the home of the WVU Baseball team as well as the West Virginia Black Bears, a minor league affiliate of the Pittsburgh Pirates. In addition, a \$40 million aquatic and track facility will open in 2018-2019 as a community facility that will serve as home for the WVU Track and Swim teams. Currently, WVU does not have adequate facilities for either the Track or Swim teams to host Big 12 Athletic Conference meets but that will soon change. This also was the case before the Monongalia County Ballpark was constructed for the baseball team. By allowing Morgantown to host additional Big 12 events, it creates an even greater need for upgraded airport facilities to allow both teams and fans easier access to the area.

West Virginia United Health System, Inc., d/b/a West Virginia University Health System (WVUHS), the State's largest healthcare provider, is headquartered in Morgantown. WVUHS has completed over \$250 million of new construction in Morgantown since 2015. WVUHS is also planning to recruit 153 doctors in 2017-2018, including 110 new positions. Ruby Memorial Hospital (one of WVUHS's hospitals) is one of only two Level I Trauma Centers in the state, the other being the Charleston Area Medical Center, which means they are certified to treat the most serious trauma/surgical needs.

Monongalia County is home to two major health systems, the other being Mon Health, an integrated healthcare delivery system offering a full range of services. Mon Health Medical Center, the flagship member, is a 189-bed general, acute care hospital in Morgantown. The hospital has been the recipient of many awards and recognitions over the years. Most notably, the hospital was honored with the 2016 Healthgrades Patient Safety Excellence Award and

the 2016 Healthgrades Outstanding Patient Experience Award. Only two percent of all hospitals in the nation receive both awards and Mon Health Medical Center is the only hospital in West Virginia to receive both awards. No other area in West Virginia can claim a comparable health network. With these two major health systems, Morgantown is the essential destination for those seeking care for life threatening illnesses. An upgraded airport would be a welcome addition to both health systems as the airport is occasionally used to transfer patients via air ambulance, which is not uncommon in West Virginia due to the rugged terrain and remoteness of some populations.

Morgantown is also home to the National Institute for Occupational Safety and Health (NIOSH). The Occupational Safety and Health Act of 1970 established NIOSH as a research agency focused on the study of worker safety and health. NIOSH is part of the U.S. Centers for Disease Control and Prevention, in the U.S. Department of Health and Human Services (DHS). The NIOSH facility sits on the original 4.6 acres of land just beside the West Virginia University medical campus. NIOSH/Morgantown has grown to approximately 600 employees from a diverse set of fields including epidemiology, medicine, nursing, industrial hygiene, safety, psychology, chemistry, statistics, economics, and many branches of engineering.

Morgantown is also home to the Department of Energy's National Energy Technology Laboratory (NETL). Discovery, development, and deployment of effective and safe technologies for the recovery of underground energy sources like oil, gas, and the emerging possibilities for gas hydrates in the deep-water of the Gulf of Mexico are at the heart of NETL's mission to conduct research for a prosperous American energy future. It's a mission that has already produced successes but is poised to create even more opportunities. The fracking and ultra-deep drilling technologies that have made current natural gas boom possible were both developed here at NETL.

Other major employers in the area include Mylan Pharmaceuticals and the Monongalia County Board of Education. Mylan got its start in Morgantown in 1961 and has grown into global pharmaceutical company. Mylan is a perfect example of the need to expand the airport facilities as Mylan moved its aviation department to Pittsburgh due to the runway length restrictions at MGW for their Bombardier Global. The Monongalia County School (MCS) system includes several of West Virginia's best public schools. In the NICHE 2019 School Rankings, the MCS receive the distinction of having the number 1 (Morgantown High School) and the number 5 (University High School) rated high schools, the number 2 (Suncrest Middle School) and number 5 (Mountaineer Middle School) rated middle schools, and the number 4 (North Elementary) and number 7 (Suncrest Elementary) rated elementary schools. In addition, the overall school district was rated as the number 2 overall school district in West Virginia. The NICHE rankings are based on rigorous analysis of key statistics and millions of reviews from students and parents using data from the U.S. Department of Education. Ranking factors include state test scores, student-teacher ratio, student diversity, teacher quality, middle school ratings, and the overall quality of the school district.

The NICHE 2018 Best Places to Live ranking provides a comprehensive assessment of the overall livability of an area. The ranking considers several key factors of a location, including the quality of local schools, crime rates, housing trends, employment statistics, and access to

amenities in an attempt to measure the overall quality of an area. Monongalia County had three municipalities (Star City, Morgantown, and Westover) and two boroughs (Cheat Lake and Brookhaven) ranked in the top 15 of approximately 300 locations in the entire State of West Virginia.

In summary, the greater Morgantown economy is largely composed of professional and technical service businesses that frequently need to conduct Global Transport, as opposed to many areas of the state where manufacturing is the key business sector. For all those reasons, there has been a significant amount of support for a runway extension at MGW from federal, state, and local governmental entities, as well as from the many businesses that utilize the airport.

As highlighted in the letter in **Figure 3** from WVU President E. Gordon Gee to the FAA, WVU recognizes the need for additional runway length at MGW to be able to serve the growth of WVU and the local economy, and to have a transportation asset that is more attractive to prospective students, businesses, and visitors. Any additional runway length that can be gained would provide a more flexible environment for WVU, visiting teams, and others to be able to fly commercial airline charters and corporate jet operations in and out of MGW on a more frequent basis. **Table 3** presents a summary of the letters/resolutions that were obtained with select statements and relevant data from each. They illustrate the broad support for the proposed runway extension from city, county, state, institutional, and private businesses.

“West Virginia University confirms our support and joins in the request for the expansion of the runway at the Morgantown Municipal Airport. We have shown this commitment by funding the Benefit Cost Analysis and committing funds to extend the runway to the maximum feasible length. Our goal would be to achieve a runway length befitting a community with a comprehensive flagship university with a comprehensive health sciences system.”

-WVU President E. Gordon Gee Support Letter Dated December 14, 2017

Figure 3
Letter from WVU President to FAA



December 14, 2017

Paul Brake
City Manager
389 Spruce Street
3rd Floor, Room 15
Morgantown, WV 26505

Dear Mr. Brake,

I am writing to strongly support the runway extension project at the Morgantown Municipal Airport. This vital piece of infrastructure is critical to West Virginia University and the economic development of the region.

West Virginia University is one of the premier universities in the country. Our programs draw students and visitors from across the United States and from around the world. Our athletic programs participate in the Big 12 Conference, which has some impact on our transportation needs, in and out of Morgantown. The Morgantown Municipal Airport is one of the restrictive pieces of infrastructure that impedes our continued growth. The current runway length at 5200 feet limits our use of the facility as well as limits the events, businesses, and other economic activity that we can and should attract as a university community.

Expansion of this important infrastructure would help make attending West Virginia University more attractive to prospective students and their parents. It may also encourage more corporations to locate here, especially given our proximity to Washington, D.C. The expansion would allow larger planes and charters to originate and return from Morgantown, saving several hours of travel, whether that is for corporate purposes, business or personal travel, or student-athletes competing in Morgantown.

West Virginia University confirms our support and joins in the request for the expansion of the runway at Morgantown Municipal Airport. We have shown this commitment by funding the Cost Benefit Analysis and committing funds to extend the runway to the maximum feasible length. Our goal would be to achieve a runway length befitting a community with a comprehensive flagship university with a comprehensive health sciences system.

We look forward to meeting with you to share a common vision of how the airport can help all of us meet our objectives and grow the region, as well.

Thank you for your consideration.

Cordially,

A handwritten signature in blue ink, appearing to read 'E. Gordon Gee'.

E. Gordon Gee

PO Box 6201 | Stewart Hall
Morgantown, WV 26506-6201
☎ 304.293.5531 📠 304.293.5883

Equal Opportunity/Affirmative Action Institution

Table 3
Summary of Runway Extension Letters of Support

Letter/Resolution Date	Letter Organization (Signing Individual)	Selected Quote
12/14/2017	West Virginia University (E. Gordon Gee, President)	“West Virginia University confirms our support and joins in the request for the expansion of the runway at the Morgantown Municipal Airport. We have shown this commitment by funding the Benefit Cost Analysis and committing funds to extend the runway to the maximum feasible length. Our goal would be to achieve a runway length befitting a community with a comprehensive flagship university with a comprehensive health sciences system.”
12/14/2017	Monongalia County Development Authority (MCDA) (Pat Martin, President)	“As you are aware, the MCDA has supported this project since inception and has to date committed/expended upwards of \$2,000,000.00 in funds and soft costs to the project in partnership with the City of Morgantown and West Virginia University. These strong funding support partnerships emphasize the critical need for aviation infrastructure improvements at MGW to support the current and long-term growth requirements for businesses and organizations across the entire north center West Virginia region.”
12/13/2017	Morgantown Pilots Association (Richard L. Judy II, President)	“We are acutely aware that there are businesses that would like to do business in the Morgantown area, but due to our runway at the Airport, they are unable to do such because the runway is too short for their aircraft. Our members have been to other airports with longer runways and those airports are much more successful with multiple Fixed Base operators (FBOs), multiple flight schools with larger aircraft, and more Aviation-related businesses. Should the City extend the main runway at the Airport, more businesses will be able to access the Airport and the City.”
12/13/2017	Civil Air Patrol (CAP) Morgantown Composite Squadron (Lt. Col. Richard L. Judy II, Squadron Commander)	“We support the City’s attempt to lengthen the main runway and attract bigger aircraft to utilize the Airport. The Aviation businesses that are anticipated to utilize the Airport will create spectacular opportunities for our Cadets to expand their knowledge in the area of Aerospace Education, which is one of the three main missions of CAP as chartered by Congress. More businesses on the Airport will also afford job opportunities for our Cadets should they wish to pursue a career in the Aerospace field.”
12/12/2017	City of Morgantown (Paul Brake ICMA-CM, CEcD, City Manager)	“The runway extension project at MGW is viewed as necessary for the airport to provide capabilities that are consistent with the growth of the local economy and for attracting and retaining businesses growth opportunities in Morgantown. The limited runway length at MGW has not only resulted in aircraft and passengers travelling to other less convenient airports, but has also resulted in businesses selecting sites outside of Morgantown to establish new operations... In Morgantown, we have long heard the need for an enhanced aviation facility and therefore it is vitally important to the City. With the full support of the Mayor and City Council, Morgantown is prepared to satisfy those needs by extending the runway at MGW.”
12/8/2017	Morgantown Jet Center (Michele Smith, Director of Business Operations)	“The available runway length at MGW currently places operational restrictions on existing and potential airport users. Access is frequently constrained for many corporate aircraft because of the length restrictions for both takeoffs and landings, particularly in the Gulfstream IV call and above where liability insurance no longer allows former customers to land when the runway is wet or contaminated.”
12/6/2017	Monongalia County Commission (Resolution)	“WHEREAS, once completed, the runway extension will provide both the Morgantown Municipal Airport and airport users with sufficient airport infrastructure from an operational standpoint and will offer business aviation travelers a safe and overall more desirable airport facility which will have a significant positive economic impact on the entire region.”
12/5/2017	KeyLogic (Jon K. Hammock, President and CEO)	“With our focus on growth and servicing customers across the U.S., having a full service and capable airport and sufficient runway is critical for our continued success. For many businesses, like KeyLogic, considering whether to remain or expand into a region like Morgantown, a key decision factor is convenient access to the area via air travel – including private, charter, and commercial service.”
Not Dated	Town of Star City (Herman B. Reid, Mayor)	“The Town believes that the planned improvements would benefit the whole region, as the current limited runway length underserves the local economy and causes travelers to utilize other means of transportation. The planned improvements at Morgantown’s Airport are long overdue and the potential growth of our community and surrounding areas is one of the biggest reasons for our support of the project.”
Not Dated	City of Westover (C. David Johnson, Mayor)	“The larger business aircraft, increased safety, and continued economic growth through the extension of the runway will definitely keep more business in our area as well as attracting new business, which is good for everyone.”
8/26/2015	U.S. Senate (U.S. Senator Shelley Moore Capito)	“I am writing to express my support for the proposed runway extension at Morgantown Municipal Airport. As outlined by Morgantown officials, the proposed extension would open additional land around the airport for economic development and would help create jobs and investment in the City and across North Central West Virginia.”

6.0 Justification Study Overview

The FAA concurred with the results of a Justification Study for MGW in early 2018 which demonstrated that a minimum length requirement of 6,200 feet is justified for Runway 18-36. The study presented numerous citations about how the existing 5,199-foot-long runway negatively affects the airport activity, provides a significantly restrictive aviation resource for a broad range of users who want to be able to have the convenience of operating at MGW, and creates past, present, and future challenges for encouraging economic growth opportunities. Morgantown and the greater Monongalia County area is a key center for economic growth for the State of West Virginia, with a significant amount of that growth attributed to investments at WVU's flagship campus. There is a great deal of support for businesses and commercial airline charters to have a more flexible operating environment at MGW and several partners, both organizations and individuals, have come together to express their support, to share their time, and to provide their financial resources to help the runway extension project at MGW come to fruition. In the case of Mylan Pharmaceuticals, the company grew to a point where their larger corporate jets could not effectively be utilized at MGW and their base was shifted to another airport. As part of a survey effort that was conducted for the Justification Study, it was found out that one company recently sold their Learjet because they could no longer effectively utilize it at MGW and another company was interested in purchasing a jet, but their decision to do so is based on the outcome of the runway extension. There is a clear need and desire to move forward with an extension of Runway 18-36 in an expeditious as possible manner.

This Justification Study documented the justification for a runway extension at MGW in three separate ways: 1) by following the procedures as outlines in the FAA AC 150/5325-4B, Runway Length Requirements for Airport Design (Runway Length AC), 2) by identifying critical aircraft and evaluating specific aircraft performance requirements, and 3) by conducting a survey effort of corporate users and soliciting their specific runway length requirements for MGW. All three analyses came to the same basic conclusion that a minimum runway length of 6,200 feet is justified for Runway 18-36. All other commercial airports in the state have runways that are at least 1,551 feet longer than Runway 18-36 at MGW. Although MGW would continue to have the shortest commercial runway in the state by 550 feet with an extension of Runway 18-36 to 6,200 feet, the benefits of such an extension would help to prevent further aviation and economic losses that have occurred and would help to encourage future growth opportunities on a runway length that is justified in accordance with current FAA guidance. The FAA concurred with the Justification Study with the expectation that 6,200 feet would be useable for all operations in all directions on Runway 18-36 (i.e., no declared distances).

7.0 Critical Aircraft and Baseline Activity Analysis

The FAA recently released AC 150/5000-17, Critical Aircraft and Regular Use Determination, which indicates that “the critical aircraft is the most demanding aircraft type, or grouping of aircraft with similar characteristics, that make regular use of the airport. Regular use is 500 annual operations, including both itinerant and local operations but excluding touch-and-go operations. An operation is either a takeoff or landing.” At MGW, jets are the aircraft type that meets the critical aircraft and regular use definitions. As shown below, there were 2,009 jet operations at MGW between May 1, 2016 and April 30, 2017, which suggests that corporate jets with Maximum Takeoff Weights (MTOWs) greater than 12,500 pounds but less than 60,000 pounds represent the critical aircraft for MGW.

Update: According to the FAA's TFMSC database, MGW experienced 2,153 jet operations from May 1, 2017 to April 30, 2018, which represents a 7.17% increase over the prior year.

- Military Jets – **20 Operations**
- Commercial Jets and Corporate Jets Greater Than 60,000 Pounds – **47 Operations**
- Very Light Jets (VLJs) 12,500 Pounds or Less – **47 Operations**
- Corporate Jets Greater Than 12,500 Pounds but Less Than 60,000 Pounds – **1,921 Operations**
- Total – **2,009 Operations**

In the Runway Length AC, that category of critical aircraft (MTOW greater than 12,500 pounds but less than 60,000 pounds) is further divided into two separate categories referred to as ‘75 percent of the fleet’ and ‘100 percent of the fleet.’ The ‘100 percent of the fleet’ category includes more demanding corporate jets and therefore produces greater runway length recommendations. The FAA identifies specific aircraft that fall into each category within the Runway Length AC. During the one-year period shown in **Table 4**, there were 1,610 operations by aircraft in the ‘75 percent of the fleet’ category and 311 operations by aircraft in the ‘100 percent of the fleet’ category. Therefore, aircraft in the ‘75 percent of fleet category’ currently meet the FAA’s definition of the critical aircraft for the evaluations of corporate aircraft activity in this BCA. **Figure 4** provides an illustration of the flight origins and destinations for 2013 jet activity at MGW. The top portion of the graphic illustrates the airports that aircraft departed from prior to landing at MGW and the bottom portion of the graphic illustrates the airports that aircraft departed to after conducting a takeoff from MGW, which may not be the ultimate destination for the passengers on the aircraft. The graphic appears to illustrate the range restrictions for aircraft departing from MGW compared to those arriving at MGW.

Table 4
MGW Jet Activity Summary (May 2016 to April 2017)

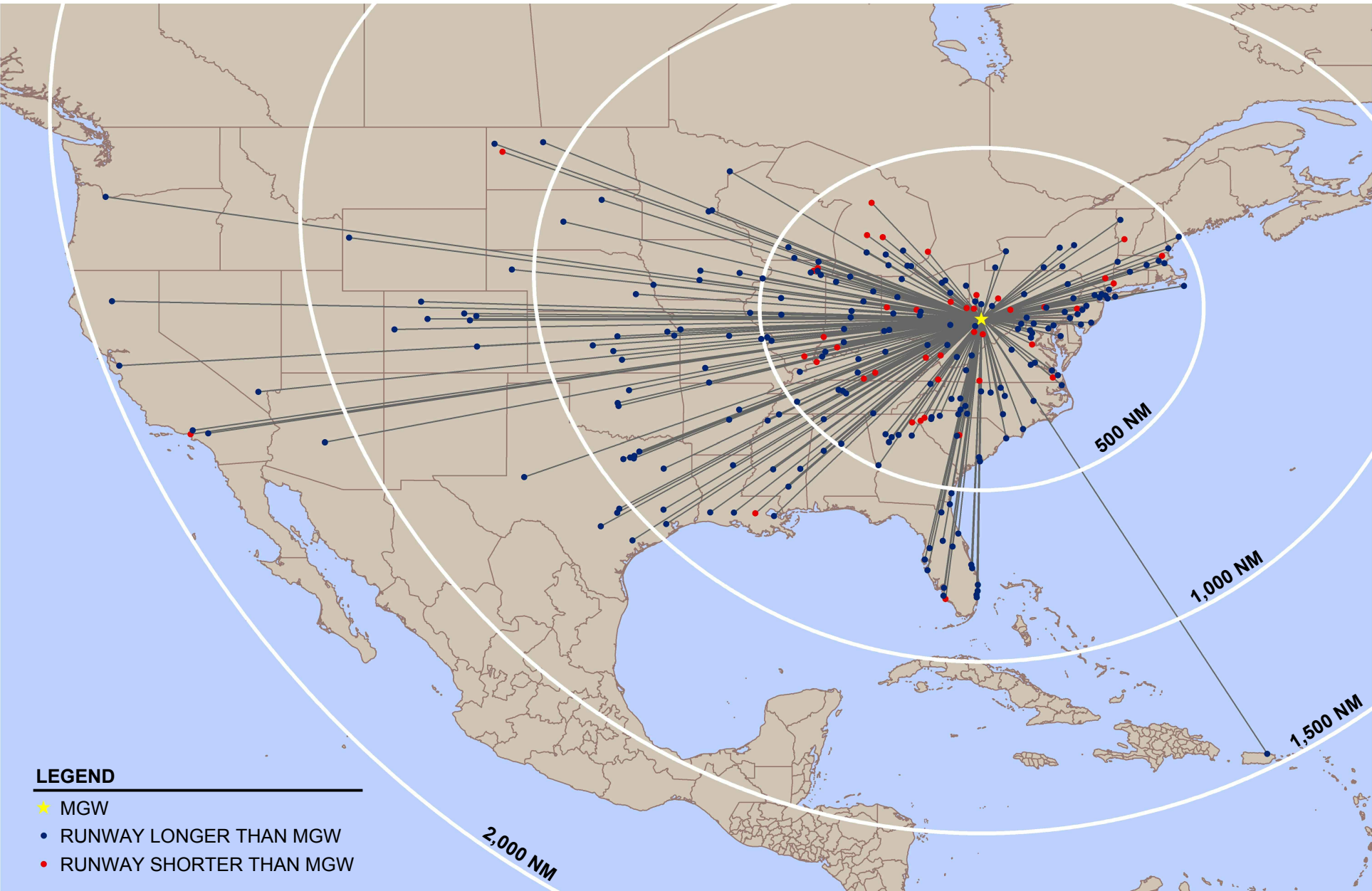
Aircraft		LAHSO Group (See Note)	Operations
Code	Model		
75% of Fleet (Less Demanding Group of Corporate Jets)			
C551	Cessna Citation II/SP	5	2
C501	Cessna I/SP	6	10
C680	Cessna Citation Sovereign	6	24
C68A	Cessna Citation Latitude	6	2
E55P	Embraer Phenom 300	6	134
J328	Fairchild Dornier 328 Jet	6	6
LJ45	Bombardier Learjet 45	6	16
C25A	Cessna Citation CJ2	7	23
C25B	Cessna Citation CJ3	7	285
C25C	Cessna Citation CJ4	7	14
C525	Cessna CitationJet/CJ1	7	118
C550	Cessna Citation II/Bravo	7	117
C56X	Cessna Excel/XLS	7	135
CL30	Bombardier (Canadair) Challenger 300	7	13
CL35	Bombardier Challenger 300	7	7
FA20	Dassault Falcon/Mystère 20	7	2
LJ31	Bombardier Learjet 31/A/B	7	28
LJ75	Learjet 75	7	2
MU30	Mitsubishi MU300/ Diamond I	7	2
WW24	IAI 1124 Westwind	7	8
BE40	Raytheon/Beech Beechjet 400/T-1	8	66
C560	Cessna Citation V/Ultra/Encore	8	446
C650	Cessna III/VI/VII	8	14
F900	Dassault Falcon 900	8	16
FA50	Dassault Falcon/Mystère 50	8	13
LJ35	Bombardier Learjet 35/36	9	50
PRM1	Raytheon Premier 1/390 Premier 1	7(A)	57
75% of Fleet Totals			1,610
100% of Fleet (More Demanding Group of Corporate Jets)			
GALX	IAI 1126 Galaxy/Gulfstream G200	5	2
ASTR	IAI Astra 1125	7	150
G280	Gulfstream G280	7	2
H25B	BAe HS 125/700-800/Hawker 800	7	79
H25C	BAe/Raytheon HS 125-1000/Hawker 1000	7	2
HA4T	Hawker 4000	7	8
CL60	Bombardier Challenger 600/601/604	8	14
F2TH	Dassault Falcon 2000	8	12
LJ55	Bombardier Learjet 55	8	2
C750	Cessna Citation X	9	14
LJ60	Bombardier Learjet 60	10	26
100% of Fleet Totals			311

Sources: FAA TFMSC database and Michael Baker International, Inc., 2017.

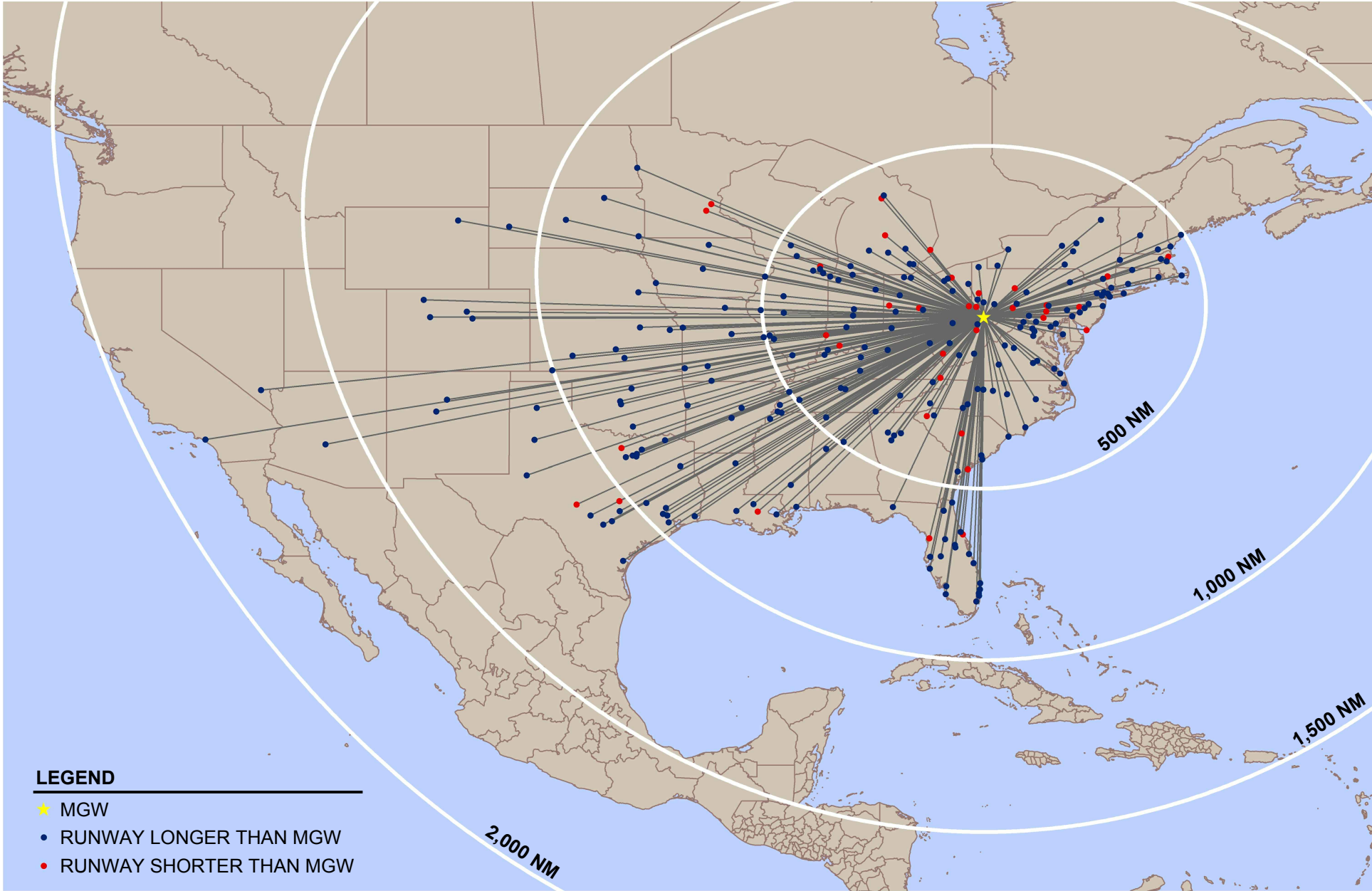
Note: This represents the Land and Hold Short Operations (LAHSO) group for each aircraft from FAA Order JO 7360.1C, Aircraft Type Designators, and was used as part of the Justification Study to categorize aircraft.

MORGANTOWN MUNICIPAL AIRPORT - WALTER L. BILL HART FIELD

ORIGINS OF JETS ARRIVING AT MGW (2013 OPERATIONS)



DESTINATIONS OF JETS DEPARTING FROM MGW (2013 OPERATIONS)

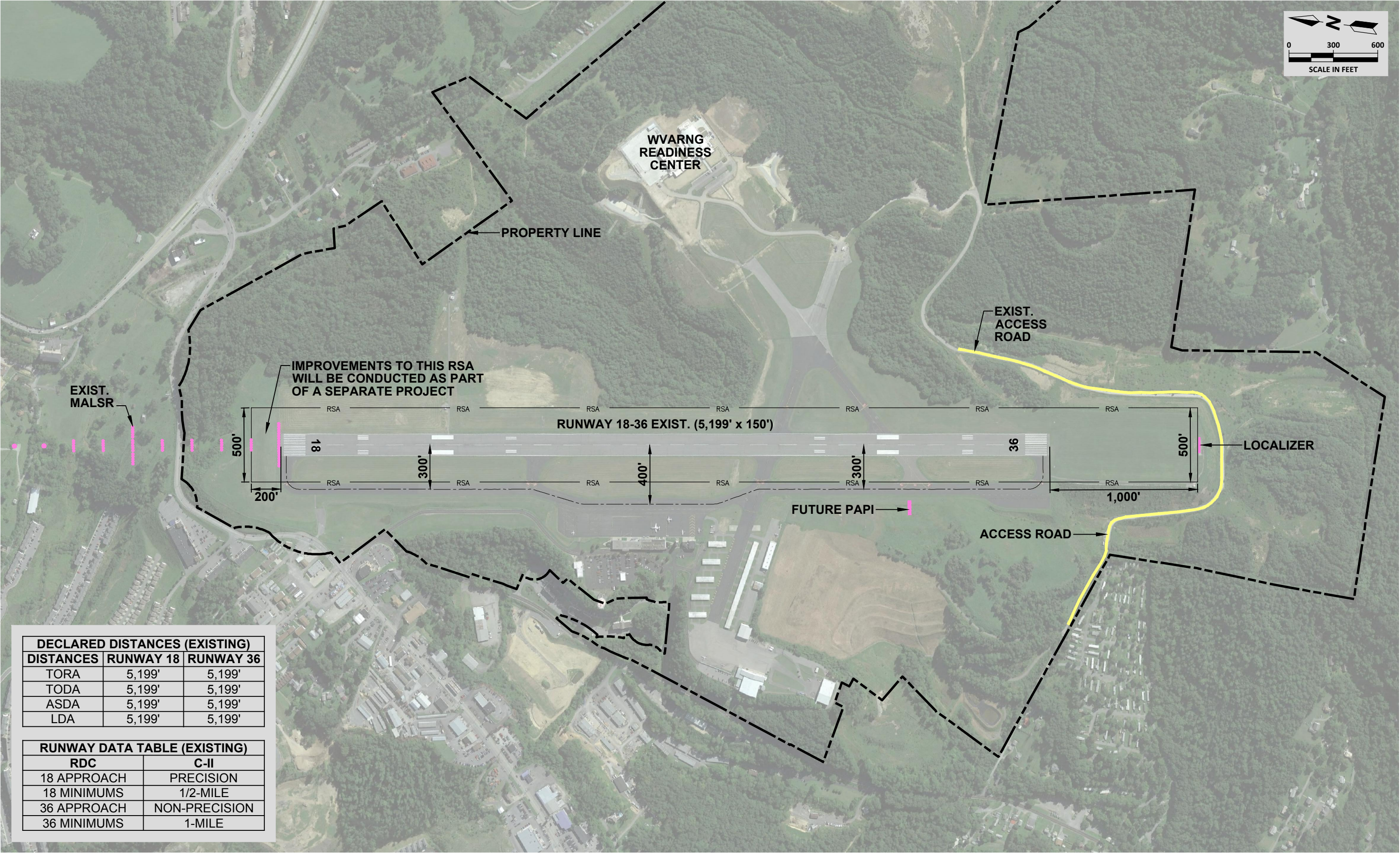


8.0 Base Case and Alternatives

According to the FAA BCA Guidance, “The benefits and costs of one or more initiative designed to accomplish specified objectives must be measured against a reference point, also called the base case. Ideally, the reference point should be the optimal course of action compatible with the specified project objectives that would be pursued in the absence of a major initiative. However, in most instances, the base case will not fully meet the objectives specified for the project.” Through discussions with the FAA, the base case for this BCA represents existing conditions as shown in **Figure 5**. Therefore, this base case was assigned a \$0 cost for the comparisons to the three alternatives in this BCA. As mentioned, the Justification Study identified a runway length requirement of 6,200 feet for all operations in all directions on Runway 18-36 (i.e., no declared distances). This BCA only evaluates extensions of Runway 18-36 to the south (i.e., 36 end) and does address RSA improvements the north end (i.e., 18 end) to provide a standard 1,000-foot RSA. Although minor improvements to the RSA to the north will soon be constructed, full improvement of that RSA will be constructed as part of a separate project if practicable to do so. The FAA has allowed the BCA to be conducted assuming that the declared distances calculations shown on the base case and alternative graphics will be implemented.

8.1 Alternative 1 (6,000 Feet)

As shown in **Figure 6**, Alternative 1 represents the simplest alternative that could be constructed at MGW without the need to construct embankment or to require significant fill material. Alternative 1 extends Runway 18-36 to the south by 801 feet and incorporates a 400-foot displaced threshold, which provides a total runway length of 6,000 feet. The ASDA for Runway 36 takeoffs would increase from 5,199 feet to 6,000 feet with this extension and the LDA for Runway 36 landings would increase from 5,199 feet to 5,600 feet. Those are the two critical declared distance calculations that jet operators must adhere to. Rather than constructing a parallel taxiway to the new runway end, which would be a major undertaking, this alternative incorporates a turnaround at the runway end. Although the FAA indicates that turnarounds at runway ends could conflict with some of the imaginary surfaces surrounding runways, this minimal impact alternative would allow for the extension to be utilized in the shortest amount of time. The extension under Alternative 1 could be available for use in 2021 and would therefore allow existing and desired airport users to accrue the benefits (i.e., cost savings) associated with a longer runway sooner rather than later.



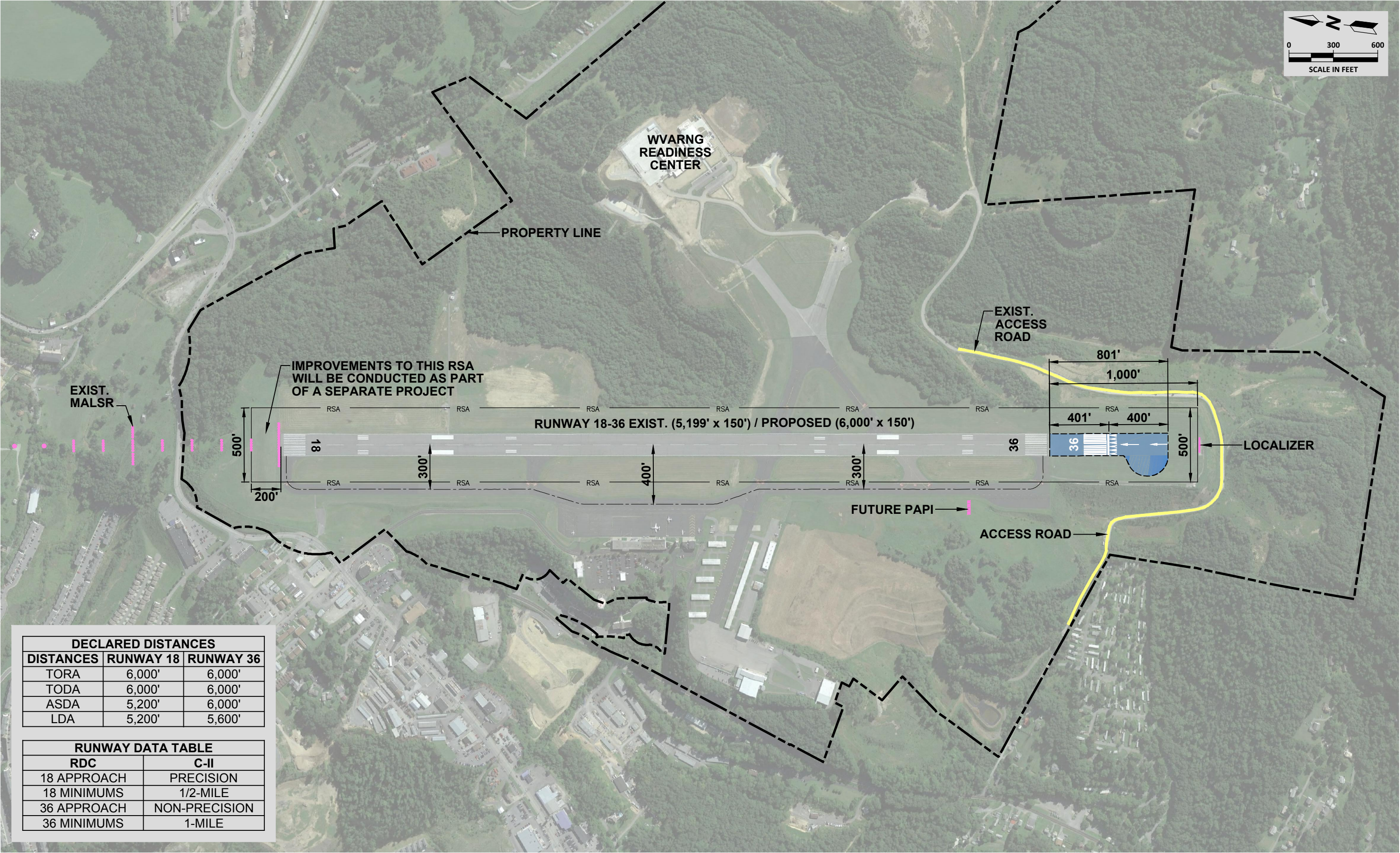


Table 5 illustrates the evaluation period and projects costs associated with Alternative 1. The FAA BCA Guidance indicates that “the evaluation period is the number of years over which the benefits and costs of an investment should be considered.” Construction of Alternative 1 would be expected to take two years/phases (2019 and 2020) and the extension would be useable in 2021. As recommended by the FAA for major airport infrastructure projects, the 20-year benefit stream represents the economic life “over which the asset itself can be expected to meet the requirements for which it was acquired in a cost-effective manner.” Although the physical life of pavement projects may be greater than 20 years, maintenance costs tend to increase as the pavement ages and replacement may be more cost-effective than annual maintenance. Therefore, the accrual of benefits and initial Operations and Maintenance (O&M) costs for Alternative 1 would begin in 2021 and end in 2040. Since Alternative 1 does not fully satisfy the identified runway length requirement for MGW, it was mainly considered as an interim project that could be phased into a larger runway extension project like those describe in Alternatives 2 and 3.

The cost items in shown in red were not evaluated as part of this BCA. They are provided to illustrate the same overall numbers in various documents that are being developed for the proposed runway extension. Specifically, the north end RSA construction is a safety related project that does not need to be evaluated as part of a BCA. The coal removal is under the area where the industrial park will be constructed and where the fill material will be obtained from for the proposed runway extension. The costs associated with the coal removal will be absorbed by a mining company.

Table 5
Alternative 1 Evaluation Period and Project Costs

Evaluation Period and Project Costs					
Year	Investment Year	Discount Year	Benefit Year	Action	Cost
2019	1	0		Construction (Phase 1)	\$2,588,440
2020	2	1		Construction (Phase 2)	\$2,588,440
2021	3	2	1	Benefits/O&M Costs Begin	\$260,751
2022-2039	4-21	3-20	2-19	Benefits/O&M Costs Continue	\$260,751
2040	22	21	20	Benefits/O&M Costs End	\$260,751
				Total Project Costs	\$10,391,912
Detailed Cost Breakdown					
Item		Year		Cost	
North End RSA Construction		2019		\$525,600	
Embankment Construction		N/A		\$0	
EMAS Construction		N/A		\$0	
Runway Construction		2019-2020		\$4,226,880	
Taxiway Construction		N/A		\$0	
Environmental Mitigation		N/A		\$0	
Property Acquisition		N/A		\$0	
Coal Removal		N/A		\$0	
Professional Services		Ongoing		\$950,000	
Total Initial Costs				\$5,702,480	
Remove North End RSA Construction & Coal Removal				\$525,600	
Revised Initial Costs				\$5,176,880	
Years of Construction				2	
Revised Initial Costs Average Per Year				\$2,588,440	
20-Year Maintenance Costs				\$5,215,032	
20-Year Maintenance Costs Average Per Year				\$260,752	
Revised Initial Costs + 20-Year Maintenance Costs				\$10,391,912	
Source: Michael Baker International, Inc., 2018.					
Note: The average costs per year for construction and maintenance were spread throughout the evaluation period.					

8.2 Alternative 2 (6,200 Feet and EMAS)

As shown in **Figure 7**, Alternative 2 includes a 1,001-foot extension to the south end of Runway 18-36 with a parallel taxiway to the new runway end and a 600-foot-long RSA with an Engineered Materials Arresting System (EMAS) bed. An EMAS bed consists of concrete blocks that crush to stop aircraft during an aborted takeoff or a long landing (i.e., overruns). They are typically constructed at airports with a significant amount of large jet activity and where it is not practicable to construct the land platform for a standard 1,000-foot-long RSA beyond the runway end. Alternative 2 would provide 6,200 feet for all operations in all directions on Runway 18-36 and would therefore satisfy the identified runway length requirement; however, it would take five years of construction (2019 to 2023) before the extended portion could be utilized by aircraft. That is a very long construction duration and it would mean that existing and desired airport users could not accrue the benefits (i.e., cost savings) associated with a longer runway until 2024. As shown in **Table 6**, the evaluation period for Alternative 2 would extend out until 2043 and the largest cost items would be the embankment construction, initial EMAS cost, and long-term EMAS maintenance costs, which makes this the most expensive alternative of the three presented in this BCA. EMAS costs were determined in accordance with FAA Order 5200.9, Financial Feasibility and Equivalency of RSA Improvements and EMAS.

The cost items in shown in red were not evaluated as part of this BCA. They are provided to illustrate the same overall numbers in various documents that are being developed for the proposed runway extension. Specifically, the north end RSA construction is a safety related project that does not need to be evaluated as part of a BCA. The coal removal is under the area where the industrial park will be constructed and where the fill material will be obtained from for the proposed runway extension. The costs associated with the coal removal will be absorbed by a mining company.



FIGURE 7 ALTERNATIVE 2

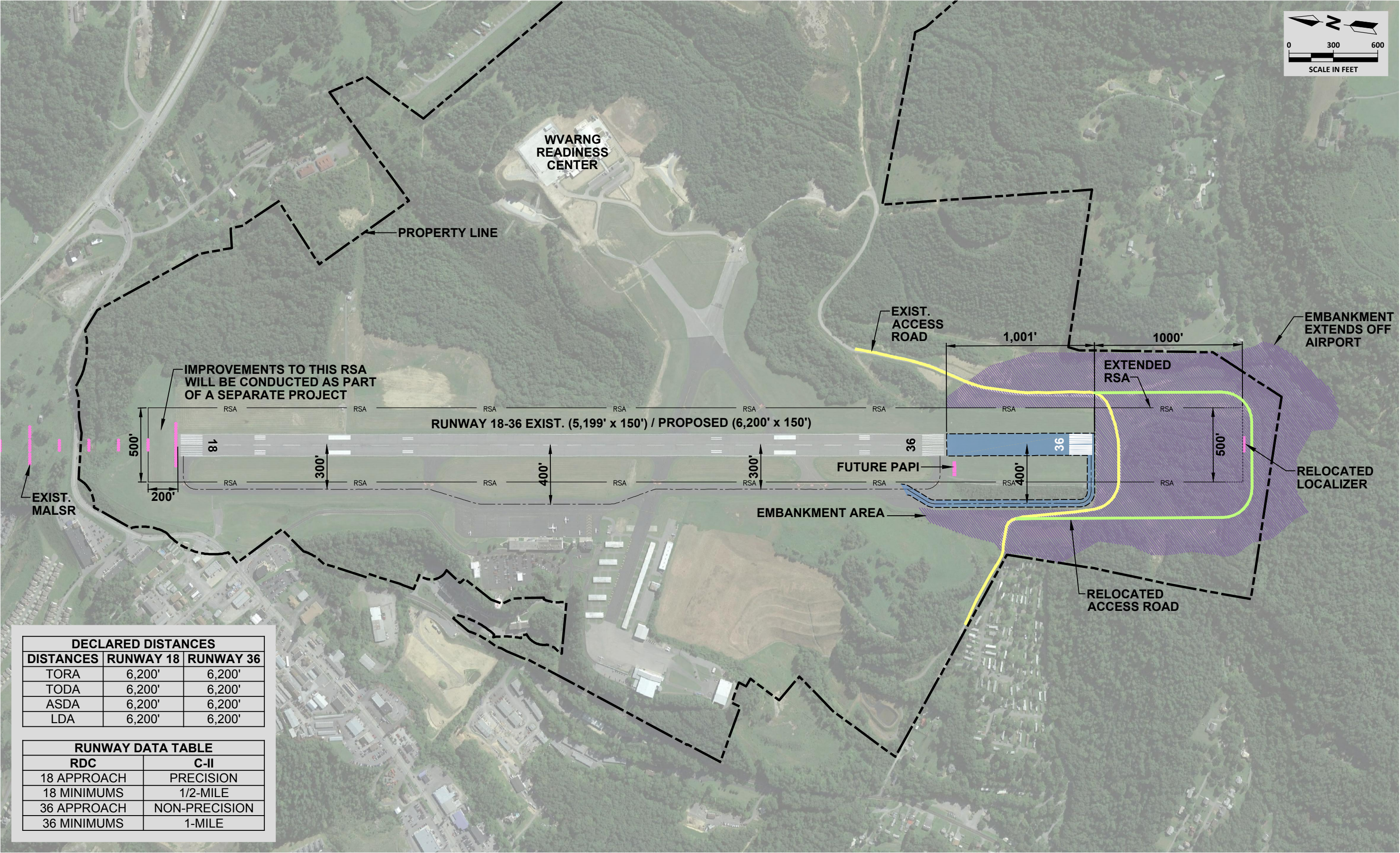
Table 6
Alternative 2 Evaluation Period and Project Costs

Evaluation Period and Project Costs					
Year	Investment Year	Discount Year	Benefit Year	Action	Cost
2019	1	0		Construction (Phase 1)	\$7,452,932
2020	2	1		Construction (Phase 2)	\$7,452,932
2021	3	2		Construction (Phase 3)	\$7,452,932
2022	4	3		Construction (Phase 4)	\$7,452,932
2023	5	4		Construction (Phase 5)	\$7,452,932
2024	6	5	1	Benefits/O&M Costs Begin	\$1,563,432
2025	7-24	6-23	2-19	Benefits/O&M Costs Continue	\$1,563,432
2043	25	24	20	Benefits/O&M Costs End	\$1,563,432
				Total Project Costs	\$68,533,312
Detailed Cost Breakdown					
Item		Year		Cost	
North End RSA Construction		2019		\$525,600	
Embankment Construction		2019 to 2021		\$15,016,350	
EMAS Construction		2022		\$9,243,750	
Runway Construction		2022		\$3,501,480	
Taxiway Construction		2023		\$2,502,180	
Environmental Mitigation		Ongoing		\$550,000	
Property Acquisition		Ongoing		\$500,000	
Coal Removal		Ongoing		\$13,242,000	
Professional Services		Ongoing		\$5,950,900	
Total Initial Costs				\$51,032,260	
Remove North End RSA Construction & Coal Removal				\$13,767,600	
Revised Initial Costs				\$37,264,660	
Years of Construction				5	
Revised Initial Costs Average Per Year				\$7,452,932	
20-Year Maintenance Costs				\$31,268,652	
20-Year Maintenance Costs Average Per Year				\$1,563,433	
Revised Initial Costs + 20-Year Maintenance Costs				\$68,533,312	
Source: Michael Baker International, Inc., 2018.					
Note: The average costs per year for construction and maintenance were spread throughout the evaluation period.					

8.3 Alternative 3 (6,200 Feet and Standard RSA)

As shown in **Figure 8**, Alternative 3 includes a 1,001-foot extension to the south end of Runway 18-36 with a parallel taxiway to the new runway end and a 1,000-foot-long RSA with a standard land platform. Alternative 3 would provide 6,200 feet for all operations in all directions on Runway 18-36 and would therefore satisfy the identified runway length requirement; however, it would take five years of construction (2019 to 2023) before the extended portion could be utilized by aircraft. That is a very long construction duration and it would mean that existing and desired airport users could not accrue the benefits (i.e., cost savings) associated with a longer runway until 2024. As shown in **Table 7**, the evaluation period for Alternative 3 would extend out until 2043 and the largest cost item would be the embankment construction, but even though the land platform is longer than the one in Alternative 2, Alternative 3 does not include the excessive costs of maintaining the EMAS during the evaluation period. Alternative 3 is considered the proposed action for this BCA and the preferred method of extending Runway 18-36 by the City of Morgantown. As described later in this BCA, the City would prefer to phase the runway extension in such a way that the extension in Alternative 1 can be constructed and utilized earlier, but the full build-out would consist of Alternative 3.

The cost items in shown in red were not evaluated as part of this BCA. They are provided to illustrate the same overall numbers in various documents that are being developed for the proposed runway extension. Specifically, the north end RSA construction is a safety related project that does not need to be evaluated as part of a BCA. The coal removal is under the area where the industrial park will be constructed and where the fill material will be obtained from for the proposed runway extension. The costs associated with the coal removal will be absorbed by a mining company.



DECLARED DISTANCES		
DISTANCES	RUNWAY 18	RUNWAY 36
TORA	6,200'	6,200'
TODA	6,200'	6,200'
ASDA	6,200'	6,200'
LDA	6,200'	6,200'

RUNWAY DATA TABLE	
RDC	C-II
18 APPROACH	PRECISION
18 MINIMUMS	1/2-MILE
36 APPROACH	NON-PRECISION
36 MINIMUMS	1-MILE

FIGURE 8 ALTERNATIVE 3

Table 7
Alternative 3 Evaluation Period and Project Costs

Evaluation Period and Project Costs					
Year	Investment Year	Discount Year	Benefit Year	Action	Cost
2019	1	0		Construction (Phase 1)	\$7,516,728
2020	2	1		Construction (Phase 2)	\$7,516,728
2021	3	2		Construction (Phase 3)	\$7,516,728
2022	4	3		Construction (Phase 4)	\$7,516,728
2023	5	4		Construction (Phase 5)	\$7,516,728
2024	6	5	1	Benefits/O&M Costs Begin	\$434,492
2025	7-24	6-23	2-19	Benefits/O&M Costs Continue	\$434,492
2043	25	24	20	Benefits/O&M Costs End	\$434,492
				Total Project Costs	\$46,273,470
Detailed Cost Breakdown					
Item		Year		Cost	
North End RSA Construction		2019		\$525,600	
Embankment Construction		2019 to 2021		\$23,629,080	
EMAS Construction		N/A		\$0	
Runway Construction		2022		\$3,501,480	
Taxiway Construction		2023		\$2,502,180	
Environmental Mitigation		Ongoing		\$1,000,000	
Property Acquisition		Ongoing		\$1,000,000	
Coal Removal		Ongoing		\$13,242,000	
Professional Services		Ongoing		\$5,950,900	
Total Initial Costs				\$51,351,240	
Remove North End RSA Construction & Coal Removal				\$13,767,600	
Revised Initial Costs				\$37,583,640	
Years of Construction				5	
Revised Initial Costs Average Per Year				\$7,516,728	
20-Year Maintenance Costs				\$8,689,830	
20-Year Maintenance Costs Average Per Year				\$434,492	
Revised Initial Costs + 20-Year Maintenance Costs				\$46,273,470	
Source: Michael Baker International, Inc., 2018.					
Note: The average costs per year for construction and maintenance were spread throughout the evaluation period.					

9.0 Economic Values and Other BCA Variables

Prior to the calculation of benefits, it was necessary to determine economic values and other variables and to have the FAA review and confirm their use in the BCA. The economic values shown in **Table 8** were obtained from the report Economic Values for FAA Investment and Regulatory Decisions, a Guide (Economic Values Guide), which was updated in September 2016. The Economic Values Guide provides a wide range of values that may be utilized in a BCA including the value of passenger time, aircraft operating costs, and aircraft seat utilization averages. The values were developed by a review of historical data and must be utilized when no other airport-specific data is available that can justify the use of a different value. The only value used in this BCA not from the Economic Values Guide was the average seats occupied for general aviation turbojets weighing between 12,500 and 65,000 pounds. In 2015, a survey was conducted for this BCA using surveymonkey.com. Three jet-exclusive operators responded with average passenger loads as part of that survey and the result was 6.0 passengers. Since none of the calculations in the remaining portions of this BCA account for crew costs (i.e., only passengers), the Variable Operating Costs (Including Crew) from the Economic Values Guide (Column 4 of Table 4-10) were utilized to calculate benefits as instructed by the note at the bottom of that table. The adjusted values for aircraft operating costs were calculated based on instructions from the FAA and considering the Price Index for Gross Domestic Product (PI for GDP) Personal Consumption Expenditures from the U.S. BEA. The adjustment factor was calculated using the formula below.

$$(P_c/P_b) = \text{Adjustment for Aircraft Operating Cost}$$

Where:

P_c and P_b are the PI GDPs in the current year and base year.

Therefore:

$$P_c \text{ of } 102.551 \text{ (Q4 of 2013)} / P_b \text{ of } 110.629 \text{ (Q3 of 2018)} = 1.08 \text{ Adjustment}$$

Other variables that were incorporated into the BCA are shown in **Table 9** and include taxi time comparisons between MGW, CKB, and PIT, utilization factors for when aircraft are avoiding MGW and are instead utilizing CKB and PIT, drive times, and forecast growth rates. The other variables were reviewed by the FAA for use in this BCA.

Table 8
Economic Values

Item	Source	Value
Value of Time		
Business Air Travel	2016 Economic Values Guide	\$63.20
Average Seats Occupied		
Average Seats Occupied (GA Turbojet 12,500 to 65,000)	2016 Economic Values Guide	3.8
Average Seats Occupied (GA Turbojet 12,500 to 65,000)	2015 BCA Survey	6.0
Charter Hourly Operating Costs		
Hourly Operating Cost (GA Turbojet 12,500 to 65,000)	2016 Economic Values Guide	\$3,652
Hourly Operating Cost (GA Turbojet 12,500 to 65,000)	Adjusted Value	\$3,940
Hourly Operating Cost (GA Turbojet 65,000+)	2016 Economic Values Guide	\$6,719
Hourly Operating Cost (GA Turbojet 12,500 to 65,000)	Adjusted Value	\$7,248

Table 9
Other BCA Variables

Item	Source	Value
Taxi Time Comparisons		
CKB Taxi Time	Compared to PIT	0.00 Hours
MGW Taxi Time	Compared to PIT	0.00 Hours
PIT Taxi Time	FAA ASPM Database Average of Taxi-In/Out Times (Through June 2018)	0.18 Hours
Utilization for General Aviation Avoidance		
CKB Uncaptured Jet Activity Utilization	FAA TFMSC Database Share of GA Jet Activity (Through June 2018)	9.96%
PIT Uncaptured Jet Activity Utilization	FAA TFMSC Database Share of GA Jet Activity (Through June 2018)	90.04%
Drive Time to/from MGW		
CKB to MGW Travel Time	Google Maps	0.67 Hours
PIT to MGW Travel Time	Google Maps	1.50 Hours
Length of a Stopover or Diversion		
Stopover/Diversion Time	Estimated from 2015 BCA Survey (Most Indicated Higher Values for Diversions)	1.00 Hour
Utilization for Commercial Charter Avoidance		
CKB Uncaptured Commercial Activity Utilization	BTS Form 41 Share of Unscheduled Commercial Activity (Through May 2018)	5.06%
PIT Uncaptured Commercial Activity Utilization	BTS Form 41 Share of Unscheduled Commercial Activity (Through May 2018)	94.94%
Forecast Rates and Average Commercial Charter Passengers		
GA Operations Forecast Growth Rate	Justification Study & FAA Aerospace Forecast FY 2017-2037 (Turbojet Hours Flown)	3.80%
Commercial Operations Forecast Growth Rate	FAA 2017 Terminal Area Forecast (TAF) Air Taxi Growth Rate for MGW	1.27%
Commercial Operations Passengers	Estimated from WVU Athletics Survey	50

10.0 Quantifiable Benefits

There are costs associated with designing, constructing, and maintaining the different scenarios (base case and alternatives) and there are costs associated with the limitations associated with the existing 5,199-foot runway length at MGW that are incurred by existing and potential airport users. The difference between the base case and alternative project costs are referred to as the incremental costs. The difference between the base case and alternative savings factors are referred to as the benefits. A BCA should ideally demonstrate that the conveniences associated with a selected alternative, combined with the costs to construct and maintain the selected alternative, will result in a cost savings compared to the inconveniences associated with the base case. The benefit calculations for this BCA are described in this section for the following items:

1. Uncaptured Corporate Jet Activity
2. Prevented Stopovers and Diversions
3. Uncaptured Commercial Activity
4. Salvage Value

10.1 Uncaptured Corporate Jet Activity

Based on the results of the Corporate User Survey in the Justification Study (refer to **Table 10**), it was found that numerous individuals are simply avoiding MGW because of the takeoff and landing length limitations associated with the current length of Runway 18-36. Even though MGW is closer to their intended destination, they are opting to utilize a less than convenient airport with greater runway length. This means they currently must incur more operating costs for their aircraft and more passenger time driving between a less than convenient airport and their intended destination in the Morgantown area. Therefore, if the runway were extended at MGW, they would save on aircraft operating costs and passenger time. The savings or benefits for the uncaptured corporate jet activity were calculated and are summarized in **Table 11** for the maximum evaluation period of the three alternatives. The benefits were calculated by multiplying operational factors by the economic values and other BCA variables described earlier in the previous section. The FAA requested that the low forecast of uncaptured jet operations from the Corporate User Survey be utilized in this BCA.

Table 10 Summary of Corporate User Survey							
Survey ID	User Type	Preferred Runway Length at MGW?	Aircraft Considerations at Preferred Runway Length?	Annual Operations (Jet Only)			Other Notes
				Existing 5,199 Feet?	Proposed Increase at 6,200 Feet (Low)?	Proposed Increase at 6,200 Feet (High)?	
01	Air Charter Service	6,200 Feet	30 Passenger Air Charter	0	8	10	
02	Air Charter Service	6,200 Feet	Hawker 400XP, Hawker 800XP	18	28	28	
03	State Aviation Division	5,200 Feet	Cessna 208, King Air 350	0	0	0	
04	Air Charter Service	6,200 Feet	Could Transition to Light Jet	0	30	30	
05	Private Business	6,000 Feet (Minimum)	Premier 1	48	14	14	Sold Learjet due to Inadequate Runway Length at MGW
06	Private Business	6,200 Feet	Astra 1125	0	77	80	
07	Private Business	6,200 to 6,500 Fleet	Plans to Purchase Light Jet in 12 to 24 Months	0	38	50	Runway Length is Influencing Business Decisions
08	Private Business		N/A	0	0	0	
09	Air Charter Service	6,200 Feet	Citation 560XL	6	0	0	
10	Air Charter Service		Various Citation Jets	10	0	0	
11	Private Business	Up to 10,000 Feet	King Air 100	0	0	0	
12	Private Business		King Air	0	0	0	
13	Private Business	6,000 Feet	Hawker 900	15	2	4	
14	Private Business		Citation 560XL	10	0	0	
15	Air Charter Service	6,000 Feet	Astra 1125	175	10	10	Various Missed Opportunities
16	Private Business		King Air 90, King Air 200	0	0	0	
17	Private Business	6,200 Feet	Hawker 4000, King Air 300	4	16	16	
18	Aircraft Sales	6,200 Feet for Others	Citation 525B (CJ3)	4	0	0	
19	Air Charter Service	Answered Based on 6,200 Feet	Multiple Corporate Jets (All Sizes)	588	29	59	Would Increase Safety and Charters
20	Private Business	6,000 Feet to 6,500 Feet	Citation 560XL, Challenger 601	5	6	7	Difficult to Operate Challenger
21	Athletic Organization		Challenger 604	3	0	0	
22	Private Business		Cirrus, King Air, Citation X	5	0	0	
23	Private Business		Baron 58, Cirrus SR22	0	0	0	
24	Private Business	Answered Based on 6,200 Feet	Challenger 604, Global 7000	6	24	24	Difficult to Fly Direct Flights
25	Private Business	Answered Based on 6,200 Feet	Gulfstream G200	6	9	9	Would Allow More Frequent Visits
Jet Activity Data (Existing and Proposed Runway Lengths) (Base Year + 0)				903	291 Increase	341 Increase	
Annual Jet Operations For 6,000 Feet or Greater				875	291	341	
Annual Jet Operations For 6,200 Feet or Greater				631	265	313	
Adjustment Based on Critical Aircraft Sample Size of 47.01% (Base Year + 0)					620	726	
Forecast (Base Year + 1)					643	753	
Forecast (Base Year + 2)					668	782	
Forecast (Base Year + 3)					693	812	
Forecast (Base Year + 4)					719	843	
Forecast (Base Year + 5)					747	875	
AAGR (Year 0 to Year 5)					3.80%	3.80%	
Source: Interpolation of survey responses by Michael Baker International, Inc., 2017. Note: Survey responses marked in blue were either intentionally zeroed out or had no quantitative value for this analysis.							

Table 11 Benefits of Uncaptured Corporates Jet Activity												
Item			% Lost to PIT	% Lost to CKB	Passengers x Time x Hourly Cost of Time	Time x Hourly Operating Cost	Passengers x Time x Hourly Cost of Time	N/A	N/A	Passengers x Time x Hourly Cost of Time		
Multiplication Factor for Operations			90.04%	9.96%	\$69.68	\$723.98	\$568.80	N/A	N/A	\$252.80		
Year	Investment Year	Forecast Year	Uncaptured Operations			PIT Time (Costs Incurred)			CKB Time (Costs Incurred)			Total (Costs Incurred)
			Total	PIT	CKB	Passenger Taxi Time	Aircraft Taxi Time	Passenger Drive Time	Passenger Taxi Time	Aircraft Taxi Time	Passenger Drive Time	
2018			620	558	56	\$38,899	\$404,170	\$317,541			\$14,053	\$774,662.70
2019	1	1	644	579	58	\$40,377	\$419,529	\$329,608			\$14,587	\$804,099.89
2020	2	2	668	601	60	\$41,911	\$435,471	\$342,133			\$15,141	\$834,655.68
2021	3	3	693	624	62	\$43,504	\$452,018	\$355,134			\$15,716	\$866,372.60
2022	4	4	720	648	65	\$45,157	\$469,195	\$368,629			\$16,313	\$899,294.76
2023	5	5	747	673	67	\$46,873	\$487,025	\$382,637			\$16,933	\$933,467.96
2024	6	6	775	698	70	\$48,654	\$505,532	\$397,177			\$17,577	\$968,939.74
2025	7	7	805	725	72	\$50,503	\$524,742	\$412,270			\$18,245	\$1,005,759.45
2026	8	8	836	752	75	\$52,422	\$544,682	\$427,936			\$18,938	\$1,043,978.31
2027	9	9	867	781	78	\$54,414	\$565,380	\$444,198			\$19,658	\$1,083,649.48
2028	10	10	900	811	81	\$56,482	\$586,864	\$461,077			\$20,405	\$1,124,828.17
2029	11	11	934	841	84	\$58,628	\$609,165	\$478,598			\$21,180	\$1,167,571.64
2030	12	12	970	873	87	\$60,856	\$632,313	\$496,785			\$21,985	\$1,211,939.36
2031	13	13	1,007	907	90	\$63,169	\$656,341	\$515,663			\$22,820	\$1,257,993.05
2032	14	14	1,045	941	94	\$65,569	\$681,282	\$535,258			\$23,687	\$1,305,796.79
2033	15	15	1,085	977	97	\$68,061	\$707,171	\$555,598			\$24,588	\$1,355,417.07
2034	16	16	1,126	1,014	101	\$70,647	\$734,044	\$576,710			\$25,522	\$1,406,922.92
2035	17	17	1,169	1,052	105	\$73,332	\$761,937	\$598,625			\$26,492	\$1,460,385.99
2036	18	18	1,213	1,092	109	\$76,118	\$790,891	\$621,373			\$27,498	\$1,515,880.65
2037	19	19	1,259	1,134	113	\$79,011	\$820,945	\$644,985			\$28,543	\$1,573,484.12
2038	20	20	1,307	1,177	117	\$82,013	\$852,141	\$669,495			\$29,628	\$1,633,276.52
2039	21	21	1,357	1,222	122	\$85,130	\$884,522	\$694,936			\$30,754	\$1,695,341.02
2040	22	22	1,408	1,268	126	\$88,365	\$918,134	\$721,343			\$31,923	\$1,759,763.98
2041	23	23	1,462	1,316	131	\$91,722	\$953,023	\$748,754			\$33,136	\$1,826,635.01
2042	24	24	1,517	1,366	136	\$95,208	\$989,238	\$777,207			\$34,395	\$1,896,047.14
2043	25	25	1,575	1,418	141	\$98,826	\$1,026,829	\$806,741			\$35,702	\$1,968,096.94
Preliminary Totals (Costs Incurred by Operators 2018-2043)						\$1,675,850	\$17,412,581	\$13,680,412	N/A	N/A	\$605,417	\$33,374,261
AAGR 2018-2043			3.80%	3.80%	3.80%	3.80%	3.80%	3.80%	N/A	N/A	3.80%	3.80%
Source: Michael Baker International, Inc., 2018. Note: Costs incurred are the current costs that operators must incur because of current runway length limitations at MGW and equal the savings (benefits) that operators would realize after the runway is extended.												

10.2 Prevented Stopovers/Diversions

The existing runway length does not allow jet operators to always fulfill their desired missions in and out of MGW. In many instances, the operator must restrict payload or conduct a stopover at another airport for additional fuel before proceeding to their ultimate destination. Those stopovers add additional operational costs for the airplane as well as create additional time waiting at another airport for the passengers. It is anticipated that each stopover creates an hour of additional operating costs for the aircraft and an hour of “waiting time” for the passengers. Diversions upon landing at MGW can also occur because the runway does not currently provide many of the length requirements primarily during wet or contaminated conditions. Similar hour factors were assumed to be incurred when diversions are necessary. Because the stopovers and diversions are known to occur at BVI, their consequences must be factored into the BCA calculations. A survey effort was conducted for this BCA in 2015 that received 25 responses, of which only 10 provided useable quantitative data. Of those 10, only six provided responses regarding stopovers and diversions, which equated to 44 annual stopovers and 36 annual diversions. The number of operations in the Corporate User Survey (Table 11) was adjusted based on a sample size calculation. Specifically, the respondents of the Corporate User Survey indicated that they conducted 47.01 percent of current jet operations at MGW. Because the same percentage would be much lower for the survey that was conducted for this BCA in 2015, it was determined that some degree of adjustment should be warranted. Like the Corporate User Survey, the number of annual stopovers and diversions was adjusted based on the same 47.01 percent to calculate the benefits shown in **Table 12** for the maximum evaluation period of the three alternatives, which results in 94 annual stopovers and 77 annual diversions in the base year.

Table 12 Benefits of Prevented Stopovers/Diversions														
Item					% to PIT	% to CKB	Passengers x Time x Hourly Cost of Time	Time x Hourly Operating Cost	Passengers x Time x Hourly Cost of Time	Passengers x Time x Hourly Cost of Time	Time x Hourly Operating Cost	Passengers x Time x Hourly Cost of Time		
Multiplication Factor for Operations					90.04%	9.96%	\$448.88	\$4,663.98	N/A	\$379.20	\$3,940.00	N/A		
Year	Investment Year	Forecast Year	Stopovers	Diversions	44 Stopovers + 36 Diversions			PIT Time (Costs Incurred)			CKB Time (Costs Incurred)			Total (Costs Incurred)
					Total	PIT	CKB	Passenger Taxi Time	Aircraft Taxi Time	Passenger Drive Time	Passenger Taxi Time	Aircraft Taxi Time	Passenger Drive Time	
2018			94	77	170	153	17	\$68,782	\$714,669		\$6,425	\$66,763		\$856,639.39
2019	1	1	97	79	177	159	18	\$71,396	\$741,826		\$6,670	\$69,300		\$889,191.69
2020	2	2	101	83	183	165	18	\$74,109	\$770,016		\$6,923	\$71,933		\$922,980.97
2021	3	3	105	86	190	171	19	\$76,925	\$799,276		\$7,186	\$74,667		\$958,054.25
2022	4	4	109	89	198	178	20	\$79,848	\$829,649		\$7,459	\$77,504		\$994,460.31
2023	5	5	113	92	205	185	20	\$82,883	\$861,175		\$7,743	\$80,449		\$1,032,249.80
2024	6	6	117	96	213	192	21	\$86,032	\$893,900		\$8,037	\$83,506		\$1,071,475.29
2025	7	7	122	99	221	199	22	\$89,301	\$927,868		\$8,342	\$86,679		\$1,112,191.35
2026	8	8	126	103	229	207	23	\$92,695	\$963,127		\$8,659	\$89,973		\$1,154,454.63
2027	9	9	131	107	238	214	24	\$96,217	\$999,726		\$8,988	\$93,392		\$1,198,323.90
2028	10	10	136	111	247	222	25	\$99,874	\$1,037,716		\$9,330	\$96,941		\$1,243,860.21
2029	11	11	141	115	256	231	26	\$103,669	\$1,077,149		\$9,684	\$100,625		\$1,291,126.90
2030	12	12	146	120	266	240	27	\$107,608	\$1,118,081		\$10,053	\$104,449		\$1,340,189.72
2031	13	13	152	124	276	249	28	\$111,697	\$1,160,568		\$10,435	\$108,418		\$1,391,116.93
2032	14	14	158	129	287	258	29	\$115,942	\$1,204,669		\$10,831	\$112,537		\$1,443,979.37
2033	15	15	164	134	298	268	30	\$120,348	\$1,250,447		\$11,243	\$116,814		\$1,498,850.59
2034	16	16	170	139	309	278	31	\$124,921	\$1,297,964		\$11,670	\$121,253		\$1,555,806.91
2035	17	17	176	144	321	289	32	\$129,668	\$1,347,286		\$12,113	\$125,860		\$1,614,927.57
2036	18	18	183	150	333	300	33	\$134,595	\$1,398,483		\$12,574	\$130,643		\$1,676,294.82
2037	19	19	190	156	346	311	34	\$139,710	\$1,451,625		\$13,051	\$135,608		\$1,739,994.02
2038	20	20	197	161	359	323	36	\$145,019	\$1,506,787		\$13,547	\$140,761		\$1,806,113.80
2039	21	21	205	168	372	335	37	\$150,529	\$1,564,045		\$14,062	\$146,110		\$1,874,746.12
2040	22	22	213	174	387	348	38	\$156,250	\$1,623,479		\$14,596	\$151,662		\$1,945,986.47
2041	23	23	221	181	401	361	40	\$162,187	\$1,685,171		\$15,151	\$157,425		\$2,019,933.96
2042	24	24	229	187	417	375	41	\$168,350	\$1,749,207		\$15,727	\$163,407		\$2,096,691.45
2043	25	25	238	195	432	389	43	\$174,747	\$1,815,677		\$16,325	\$169,616		\$2,176,365.73
Preliminary Totals (Costs Incurred by Operators 2018-2043)								\$2,963,302	\$30,789,586	N/A	\$276,825	\$2,876,293	N/A	\$36,906,006
AAGR 2018-2043					3.80%	3.80%	3.80%	3.80%	3.80%	N/A	3.80%	3.80%	N/A	3.80%
Source: Michael Baker International, Inc., 2018. Note: Costs incurred are the current costs that operators must incur because of current runway length limitations at MGW and equal the savings (benefits) that operators would realize after the runway is extended.														

10.3 Uncaptured Commercial Activity

A WVU Athletics survey was conducted for the Justification Study to determine what the commercial charter possibilities



would be for MGW following an extension of Runway 18-36 to 6,200 feet. The survey was conducted via email from the Deputy Athletic Director of WVU to her counterparts at the other universities in the Big 12 Athletic Conference. As shown in **Table 13**, there are 10 universities in the Big 12, the nearest of which is located over 600 miles away in Ames, Iowa and the farthest of which is located over 1,100 miles away in Lubbock, Texas. All the Big 12



universities are supported by airports with runways at least 1,801 feet longer than Runway 18-36 at MGW. As expressed in the letter from WVU President E. Gordon Gee in Figure 3, WVU has long expressed a desire to extend the runway at MGW to not only to provide a nearby facility for commercial athletic charters, but also to support the growing institution and local economy.

While some of the smaller athletic teams occasionally travel in and out of MGW on commercial airline charters, such as volleyball, baseball, soccer, and some basketball, WVU would like the convenience of having a nearby airport where they could fly larger teams in and out of, both for WVU's athletes and fans as well as those for visiting teams. By being able to provide the convenience of utilizing MGW which is less than a three-mile drive from WVU, it would reduce the travel time and expenses associated with having to be transported from a less convenient airport. These are a few of the reasons why WVU is very supportive of the proposed runway extension and has committed funds towards the implementation of the project. **Table 14** presents a summary of the results of the WVU Athletics survey. For the purposes of this analysis, only information related to future activity by non-football charters was included in the table. The savings or benefits for the uncaptured commercial activity were calculated and are summarized in **Table 15** for the maximum evaluation period of the three alternatives. The FAA requested that the low forecast of uncaptured commercial activity from the WVU Athletics survey be utilized in this BCA.

Table 13
Big 12 Athletic Conference

University	Location	Team	Nearest Commercial Airport	Code	Longest Runway	NM from MGW
West Virginia University	Morgantown, West Virginia	Mountaineers	Morgantown Municipal	MGW	5,199	0
Iowa State University	Ames, Iowa	Cyclones	Des Moines International	DSM	9,003	636
University of Kansas	Lawrence, Kansas	Jayhawks	Forbes Field	FOE	12,803	731
Kansas State University	Manhattan, Kansas	Wildcats	Manhattan Regional	MHK	7,000	776
Oklahoma State University	Stillwater, Oklahoma	Cowboys	Stillwater Regional	SWO	7,401	838
University of Oklahoma	Norman, Oklahoma	Sooners	Will Rogers World	OKC	9,802	878
Texas Christian University	Fort Worth, Texas	Horned Frogs	Dallas/Fort Worth International	DFW	13,401	920
Baylor University	Waco, Texas	Bears	Waco Regional	ACT	7,107	970
University of Texas at Austin	Austin, Texas	Longhorns	Austin-Bergstrom International	AUS	12,248	1,038
Texas Tech University	Lubbock, Texas	Red Raiders	Lubbock International	LBB	11,500	1,110

Source: Michael Baker International, 2017.

Table 14
Summary of WVU Athletics Survey

Survey ID	University	Respondent	Aircraft Utilized	Use of MGW at 6,200 Feet?		
				Teams (Non-Football)?	Operations (Low)?	Operations (High)?
KZ-01	Iowa State	Charter	Dornier 328, Saab 2000, Embraer 135	W/M BBall, VBall, Soccer, Softball	10	18
KZ-02	Kansas State	University	Embraer 145	W/M BBall	4	4
KZ-03	Kansas	University	Boeing 737-300/400, CRJ 2000, Saab 2000	W/M BBall, Football, VBall	6	6
KZ-04	OK State	University	RJ (50 Seat)	W/M BBall, Baseball	4	4
KZ-05	Texas Christian	University	RJ (50 Seat), Other (30 Seat)	W/M BBall, VBall, Soccer, TBD	12	12
KZ-06	Texas Tech	University	Embraer 145, Saab 2000	W/M BBall, Track, VBall	10	10
KZ-07	U of Texas	University	Embraer 175, Saab 2000	W BBall	2	2
KZ-08	West Virginia	University	Varies, Embraer 175, Embraer 145	W/M BBall, Soccer	71	71
No ID	Baylor		No Response			
No ID	U of OK		No Response			
Anticipated Athletic Charters with 6,200 Foot Long Runway (Based on Actual Response)					119	127

Source: Interpolation of survey responses by Michael Baker International, Inc., 2017.

Table 15 Benefits of Uncaptured Commercial Activity												
Item			% Lost to PIT	% Lost to CKB	Passengers x Time x Hourly Cost of Time	Time x Hourly Operating Cost	Passengers x Time x Hourly Cost of Time	N/A	N/A	Passengers x Time x Hourly Cost of Time		
Multiplication Factor for Operations			94.94%	5.06%	\$580.65	\$1,331.82	\$4,740.00	N/A	N/A	\$2,106.67		
Year	Investment Year	Forecast Year	Uncaptured Operations			PIT Time (Costs Incurred)			CKB Time (Costs Incurred)			Total (Costs Incurred)
			Total	PIT	CKB	Passenger Taxi Time	Aircraft Taxi Time	Passenger Drive Time	Passenger Taxi Time	Aircraft Taxi Time	Passenger Drive Time	
2018			119	113	6	\$65,602	\$150,470	\$535,528			\$12,681	\$764,281
2019	1	1	124	117	6	\$68,095	\$156,188	\$555,878			\$13,163	\$793,323
2020	2	2	128	122	6	\$70,683	\$162,123	\$577,001			\$13,663	\$823,470
2021	3	3	133	126	7	\$73,369	\$168,283	\$598,927			\$14,182	\$854,761
2022	4	4	138	131	7	\$76,157	\$174,678	\$621,686			\$14,721	\$887,242
2023	5	5	143	136	7	\$79,051	\$181,316	\$645,310			\$15,281	\$920,958
2024	6	6	149	141	8	\$82,054	\$188,206	\$669,832			\$15,861	\$955,954
2025	7	7	154	147	8	\$85,173	\$195,358	\$695,286			\$16,464	\$992,280
2026	8	8	160	152	8	\$88,409	\$202,781	\$721,707			\$17,090	\$1,029,987
2027	9	9	166	158	8	\$91,769	\$210,487	\$749,132			\$17,739	\$1,069,126
2028	10	10	173	164	9	\$95,256	\$218,486	\$777,599			\$18,413	\$1,109,753
2029	11	11	179	170	9	\$98,876	\$226,788	\$807,147			\$19,113	\$1,151,924
2030	12	12	186	177	9	\$102,633	\$235,406	\$837,819			\$19,839	\$1,195,697
2031	13	13	193	183	10	\$106,533	\$244,351	\$869,656			\$20,593	\$1,241,133
2032	14	14	201	190	10	\$110,581	\$253,637	\$902,703			\$21,376	\$1,288,296
2033	15	15	208	198	11	\$114,783	\$263,275	\$937,006			\$22,188	\$1,337,252
2034	16	16	216	205	11	\$119,145	\$273,279	\$972,612			\$23,031	\$1,388,067
2035	17	17	224	213	11	\$123,672	\$283,664	\$1,009,571			\$23,906	\$1,440,814
2036	18	18	233	221	12	\$128,372	\$294,443	\$1,047,935			\$24,815	\$1,495,565
2037	19	19	242	229	12	\$133,250	\$305,632	\$1,087,756			\$25,758	\$1,552,396
2038	20	20	251	238	13	\$138,314	\$317,246	\$1,129,091			\$26,736	\$1,611,387
2039	21	21	260	247	13	\$143,570	\$329,301	\$1,171,997			\$27,752	\$1,672,620
2040	22	22	270	257	14	\$149,025	\$341,815	\$1,216,532			\$28,807	\$1,736,179
2041	23	23	281	266	14	\$154,688	\$354,804	\$1,262,761			\$29,902	\$1,802,154
2042	24	24	291	277	15	\$160,566	\$368,286	\$1,310,746			\$31,038	\$1,870,636
2043	25	25	302	287	15	\$166,668	\$382,281	\$1,360,554			\$32,217	\$1,941,720
Preliminary Totals (Costs Incurred by Operators 2018-2043)						\$2,826,292	\$6,482,584	\$23,071,771	N/A	N/A	\$546,328	\$32,926,975
AAGR 2018-2043			3.80%	3.80%	3.80%	3.80%	3.80%	3.80%	N/A	N/A	3.80%	3.80%
Source: Michael Baker International, Inc., 2018. Note: Costs incurred are the current costs that operators must incur because of current runway length limitations at MGW and equal the savings (benefits) that operators would realize after the runway is extended.												

10.4 Salvage Value

According to the FAA BCA Guidance, “salvage value is the value, if any, of the project at the end of its expected life. Note that it is treated in this guidance as an offset to termination costs, but also could be treated as a benefit of the project.” There are various methods of calculating salvage value and incorporating the value into BCA calculations. However, it is frequently calculated based on an annual depreciation rate of three percent for the newly-constructed land, pavement, and other equipment (straight line depreciation at three percent per year). For MGW, the initial depreciation value (year 1 of the asset) was calculated based on adding up the items shown in **Table 16**, which includes improvements to land, newly-created land and fill material, new pavements, and new aboveground and underground equipment. Those actions are likely to have some value 20 years after the runway extension is completed and therefore their costs were incorporated into this BCA. As shown in **Table 17**, a 20-year salvage value was then calculated and is treated as an offset to termination costs in this BCA.

Table 16 Salvage Value Calculation	
Embankment Estimate	Included in Calculation
CLEARING AND GRUBBING	Yes
UNCLASSIFIED EXCAVATION	Yes
BORROW EXCAVATION	Yes
AIRFIELD OPERATIONS AREA FENCING	Yes
MOBILIZATION (INCLUDED IN BELOW ESTIMATES)	x
60" CONCRETE PIPE	Yes
60" CONCRETE PIPE (WOLFE RUN)	x
EMAS	Yes
AIRPORT ACCESS ROAD RELOCATION	x
WOLFE RUN ROAD RELOCATION	x
Runway Estimate	Included in Calculation
SUBBASE, 10" DEPTH (RUNWAY)	Yes
CRUSHED AGGREGATE BASE COURSE, 8" DEPTH (RUNWAY)	Yes
BITUMINOUS SURFACE COURSE, 4" DEPTH (RUNWAY)	Yes
BITUMINOUS BASE COURSE, 5" DEPTH (RUNWAY)	Yes
MARKING WITH GLASS BEADS	x
MARKING WITHOUT GLASS BEADS	x
MARKING REMOVAL	x
SAW-CUT GROOVING	x
6-INCH PERFORATED UNDERDRAIN PIPE (RUNWAY)	Yes
UNDERDRAIN CLEANOUTS (RUNWAY)	Yes
AIRFIELD LIGHTING CABLE (RUNWAY)	Yes
COUNTERPOISE IN SEPARATE TRENCH (RUNWAY)	Yes
2-INCH CONDUIT IN TURF (RUNWAY)	Yes
4 WAY 2 INCH DUCTBANK (RUNWAY)	Yes
ELECTRICAL HANDHOLE (RUNWAY)	Yes
RUNWAY EDGE LIGHTS	Yes
THRESHOLD LIGHTS	Yes
VASI REMOVAL - RUNWAY 36	x
PAPI INSTALLATION - RUNWAY 36	Yes
REIL - RUNWAY 36	Yes
LOCALIZER RELOCATION	x
MOBILIZATION	x
Taxiway Estimate	Included in Calculation
SUBBASE, 10" DEPTH (TAXIWAY)	Yes

Table 16
Salvage Value Calculation

Embankment Estimate	Included in Calculation
CRUSHED AGGREGATE BASE COURSE, 8" DEPTH (TAXIWAY)	Yes
BITUMINOUS SURFACE COURSE, 4" DEPTH (TAXIWAY)	Yes
BITUMINOUS BASE COURSE, 5" DEPTH (TAXIWAY)	Yes
MARKING WITH GLASS BEADS	x
MARKING WITHOUT GLASS BEADS	x
MARKING REMOVAL	x
6-INCH PERFORATED UNDERDRAIN PIPE (TAXIWAY)	Yes
UNDERDRAIN CLEANOUTS (TAXIWAY)	Yes
AIRFIELD LIGHTING CABLE (TAXIWAY)	Yes
COUNTERPOISE IN SEPARATE TRENCH (TAXIWAY)	Yes
2-INCH CONDUIT IN TURF(TAXIWAY)	Yes
4 WAY 2 INCH DUCTBANK (TAXIWAY)	Yes
ELECTRICAL HANDHOLE (TAXIWAY)	Yes
TAXIWAY EDGE LIGHTS	Yes
TAXIWAY GUIDANCE SIGN	Yes
MOBILIZATION	x

Table 17
20-Year Salvage Value

Item	Alternative 1	Alternative 2	Alternative 3
Total Initial Costs	\$5,702,480	\$51,032,260	\$51,351,240
Initial Depreciation Value	\$2,357,280	\$28,335,960	\$27,047,460
% of Total	41.34%	55.53%	52.67%
Salvage Value (20-Year)	\$1,281,876	\$15,408,935	\$14,708,256
Source: Michael Baker International, Inc., 2018.			

11.0 Hard-to-Quantify Benefits

There are also several hard-to-quantify benefits associated with implementing a runway extension at MGW that must also be recognized. These are benefits that would be induced by undertaking a runway extension and that may also be just as important as the quantifiable benefits, but it is difficult to assign a value to their worth specifically to users of the aviation system. For example, they may include new economic development opportunities that would be created by the proposed action that would result in new jobs and businesses coming to the area. Some of the hard-to-quantify benefits associated with undertaking a runway extension at MGW are summarized below.

To construct the proposed runway extension, a significant amount of fill material will have to be moved to the construction site. The plan currently involves leveling off a nearby property that was recently released to the Monongalia County Development Authority (MCDA) so that it is suitable for industrial park development. The project will create approximately 100 acres of industrial park properties with nearby access to U.S. Interstate 68 and Cheat Road. Such an endeavor may not have been as financially feasible without the need to extend Runway 18-36 and to move fill material a short distance. The MCDA will arrange for the sale, leasing, and/or development of the newly-created industrial properties, which will have the potential to attract several businesses, jobs, and new development to the local area. In exchange for the industrial park properties, the MCDA gave the City several acres of property that may be used for future aviation development. Such a property exchange may have not been possible if a runway extension was not going to occur. This provides the City with additional opportunities to expand the landside development envelope of the airport and to respond to the growing economy of the Morgantown area.

"I am writing to express my support for the proposed runway extension at Morgantown Municipal Airport. As outlined by Morgantown officials, the proposed extension would open additional land around the airport for economic development and would help create jobs and investment in the city and across North Central West Virginia."

*-U.S. Senator Shelley Moore Capito
(Letter to FAA dated August 26, 2015)*

As mentioned, the airport is located close to federal facilities such as the Department of Energy's National Energy Technology Library, the Center for Disease Control and Prevention's NIOSH, and Camp Dawson. Therefore, a runway extension would help to improve aviation access to those critical federal facilities, particularly during times of emergency. A runway extension would also aid in the City's plan to construct a taxiway and apron that is capable of supporting Boeing C-17 Globemaster military transport jets.

12.0 Benefit-Cost Analysis and Conclusions

Within this section of the BCA, the alternatives are compared to the base case to determine whether a runway extension at MGW is a worthwhile undertaking from a return-on-investment standpoint. To conduct this analysis, the incremental project costs and the benefits previously calculated must be discounted to their Present Value (PV). A description of discounting from the FAA Benefit-Cost Analysis Guidance is provided below. To determine the PV, a discount rate of seven percent was applied to all incremental project costs and benefits after the initial investment year. This means that the expensive upfront costs of the proposed action (Alternative 3) are discounted far less than the benefits that will be realized after project completion (i.e., the first benefit year is the sixth investment year). There are a few different ways to determine if a project is worth undertaking. The Net Present Value (NPV) and Benefit-Cost Ratio (BCR) methods are used herein to illustrate the justification for an extension of Runway 18-36 feet at MGW. The NPV method is simply the sum of the PV of benefits minus the sum of the PV of incremental project costs. A positive NPV means that the investment is warranted. The BCR is the same formula, except the factors are divided. A BCR of 1.0 or greater indicates that the benefits of the project will meet or exceed the costs to construct and maintain it (i.e., the project is worth undertaking).

Description of Discounting

“Discounting requires the division of an annual discount rate into future benefits and costs. The annual discount rate (also known as the marginal rate of return on capital) represents the prevailing level of capital productivity that can be achieved at any particular time by investing resources, i.e., the opportunity cost. Because FAA recommends the use of constant dollar cash streams, the discount rate should be net of inflation. This net-of-inflation rate is called the real discount rate. [...] The real discount rate relevant to all airport projects to be funded with Federal funds is 7 percent.”

Four separate BCA evaluations were conducted for the four scenarios listed below. A summary of the NPVs and BCRs that were calculated for each scenario is shown in **Table 18** and the analyses are presented in **Tables 19** through **22**.

1. Comparison of Base Case to Alternative 1 (6,000 Feet)
2. Comparison of Base Case to Alternative 2 (6,200 Feet with EMAS)
3. Comparison of Base Case to Alternative 3 (6,200 Feet with Standard RSA)
4. Comparison of Base Case to Alternatives 1 and 3 Combination

Table 18
Summary of BCA Evaluations

Evaluation	Base Case Comparison to	Net Present Value (NPV)	Benefit-Cost Ratio (BCR)
1	Alternative 1	\$3,404,799	1.45
2	Alternative 2	-\$9,781,558	0.78
3	Alternative 3	-\$1,075,341	0.97
4	Alternatives 1 and 3 Combo	\$968,397	1.03

Source: Michael Baker International, Inc., 2018.

Evaluation 1 includes a comparison of the Base Case to Alternative 1, which is an extension of Runway 18-36 to 6,000 feet and incorporates a displaced threshold and declared distances. Because this alternative does not fully provide the runway length requirement of 6,200 feet for all operations in all directions, the previously identified benefits (except for the salvage value) were only counted at 30.00 percent of their total value. This was calculated based the percentage of length provided for takeoffs and landings on Runway 36 compared to the runway length requirement of 6,200 feet. Alternative 1 yielded the highest NPV and BCR even after the benefits were reduced to 30.00 percent of their total value. Because the project costs are lower under Alternative 1 and there is no need for significant earthwork, the runway becomes useable sooner and therefore benefits can begin sooner and are less discounted than they are under Evaluations 2 and 3. **Alternative 1 also helps to illustrate what type of BCR would be expected at an airport elsewhere in the county with flatter terrain and similar activity as MGW, but if the benefits of Alternative 1 were not reduced to 30.00 percent of their total value, the NPV would be \$28,335,160 and the BCR would be 4.73.** Those figures illustrate how the terrain of an airport and the associated costs for construction can make an airport look less worthwhile for AIP funding from a BCA perspective.

As can be seen in Evaluation 2, Alternative 2 is no longer being considered because the costs to construct and maintain the EMAS over the course of the evaluation period exceed the costs to construct standard RSA under Alternative 3 (Evaluation 3). **Evaluation 4, which consists of a combination of Alternatives 1 and 3, produces the greatest long-term value while fulfilling the runway length requirement of 6,200 feet and represents the proposed and preferred runway extension for MGW.** It is recommended that Alternative 1 be implemented as part of a Phase 1 construction project so that the operational benefits of having a 6,000-foot-long runway can be realized sooner rather than later (in 2021), although the specific project details would be determined during the design phase regarding the displaced threshold length and declared distances. As Alternative 1 is being constructed, the earthwork can continue for Alternative 4 and the ultimate 6,200-foot-long runway can be available for all operations in all directions starting in 2024. With a positive NPV and BCR, the City of Morgantown intends to pursue the combination of Alternatives 1 and 3 as shown in Evaluation 4 of this BCA.

The City of Morgantown requests that the FAA determine that the benefits of constructing a combination of Alternatives 1 and 3 (Evaluation 4) would exceed the costs to construct and maintain the project during the evaluation period. Evaluation 4 produced an NPV of \$968,397 and a BCR of 1.03. This represents the proposed and preferred runway extension for MGW and would fulfill the Runway 18-36 length requirement of 6,200 feet by 2024 that is fully useable for all operations in all directions. Some partial benefits would begin to be accrued in 2021 with a partial extension of Runway 18-36 that incorporates a displaced threshold and declared distances.

Table 19
1) Base Case to Alternative 1 Analysis (6,000 Feet)

Year	Investment Year	Forecast Year	Discount Year	Benefit Year	Benefits (Savings)						Project Costs	
					Benefit 1	Benefit 2	Benefit 3	Benefit 4	Total	Discounted	Total	Discounted
2018												
2019	1	1	0								\$2,588,440	\$2,588,440
2020	2	2	1								\$2,588,440	\$2,419,103
2021	3	3	2	1	\$259,912	\$287,416	\$256,428		\$803,756	\$702,032	\$260,752	\$227,751
2022	4	4	3	2	\$269,788	\$298,338	\$266,173		\$834,299	\$681,037	\$260,752	\$212,851
2023	5	5	4	3	\$280,040	\$309,675	\$276,287		\$866,003	\$660,669	\$260,752	\$198,926
2024	6	6	5	4	\$290,682	\$321,443	\$286,786		\$898,911	\$640,911	\$260,752	\$185,912
2025	7	7	6	5	\$301,728	\$333,657	\$297,684		\$933,069	\$621,743	\$260,752	\$173,750
2026	8	8	7	6	\$313,193	\$346,336	\$308,996		\$968,526	\$603,149	\$260,752	\$162,383
2027	9	9	8	7	\$325,095	\$359,497	\$320,738		\$1,005,330	\$585,111	\$260,752	\$151,760
2028	10	10	9	8	\$337,448	\$373,158	\$332,926		\$1,043,532	\$567,613	\$260,752	\$141,832
2029	11	11	10	9	\$350,271	\$387,338	\$345,577		\$1,083,187	\$550,637	\$260,752	\$132,553
2030	12	12	11	10	\$363,582	\$402,057	\$358,709		\$1,124,348	\$534,170	\$260,752	\$123,881
2031	13	13	12	11	\$377,398	\$417,335	\$372,340		\$1,167,073	\$518,194	\$260,752	\$115,777
2032	14	14	13	12	\$391,739	\$433,194	\$386,489		\$1,211,422	\$502,697	\$260,752	\$108,203
2033	15	15	14	13	\$406,625	\$449,655	\$401,175		\$1,257,456	\$487,663	\$260,752	\$101,124
2034	16	16	15	14	\$422,077	\$466,742	\$416,420		\$1,305,239	\$473,079	\$260,752	\$94,508
2035	17	17	16	15	\$438,116	\$484,478	\$432,244		\$1,354,838	\$458,931	\$260,752	\$88,326
2036	18	18	17	16	\$454,764	\$502,888	\$448,669		\$1,406,322	\$445,206	\$260,752	\$82,547
2037	19	19	18	17	\$472,045	\$521,998	\$465,719		\$1,459,762	\$431,891	\$260,752	\$77,147
2038	20	20	19	18	\$489,983	\$541,834	\$483,416		\$1,515,233	\$418,975	\$260,752	\$72,100
2039	21	21	20	19	\$508,602	\$562,424	\$501,786		\$1,572,812	\$406,445	\$260,752	\$67,383
2040	22	22	21	20	\$527,929	\$583,796	\$520,854	\$1,281,876	\$2,914,454	\$703,879	\$260,752	\$62,975
Totals					\$7,581,019	\$8,383,261	\$7,479,417	\$1,281,876	\$24,725,573	\$10,994,030	\$10,391,912	\$7,589,231
										Net Present Value (NPV)		\$3,404,799
										Benefit-Cost Ratio (BCR)		1.45

Source: Michael Baker International, Inc., 2018.

Table 20												
2) Base Case to Alternative 2 (6,200 Feet with EMAS)												
Year	Investment Year	Forecast Year	Discount Year	Benefit Year	Benefits (Savings)						Project Costs	
					Benefit 1	Benefit 2	Benefit 3	Benefit 4	Total	Discounted	Total	Discounted
2018												
2019	1	1	0								\$7,452,932	\$7,452,932
2020	2	2	1								\$7,452,932	\$6,965,357
2021	3	3	2								\$7,452,932	\$6,509,679
2022	4	4	3								\$7,452,932	\$6,083,813
2023	5	5	4								\$7,452,932	\$5,685,806
2024	6	6	5		\$968,940	\$1,071,475	\$955,954		\$2,996,369	\$2,136,370	\$1,563,433	\$1,114,706
2025	7	7	6		\$1,005,759	\$1,112,191	\$992,280		\$3,110,231	\$2,072,478	\$1,563,433	\$1,041,781
2026	8	8	7		\$1,043,978	\$1,154,455	\$1,029,987		\$3,228,420	\$2,010,498	\$1,563,433	\$973,627
2027	9	9	8		\$1,083,649	\$1,198,324	\$1,069,126		\$3,351,100	\$1,950,371	\$1,563,433	\$909,932
2028	10	10	9		\$1,124,828	\$1,243,860	\$1,109,753		\$3,478,441	\$1,892,042	\$1,563,433	\$850,404
2029	11	11	10		\$1,167,572	\$1,291,127	\$1,151,924		\$3,610,622	\$1,835,457	\$1,563,433	\$794,770
2030	12	12	11		\$1,211,939	\$1,340,190	\$1,195,697		\$3,747,826	\$1,780,565	\$1,563,433	\$742,776
2031	13	13	12		\$1,257,993	\$1,391,117	\$1,241,133		\$3,890,243	\$1,727,315	\$1,563,433	\$694,183
2032	14	14	13		\$1,305,797	\$1,443,979	\$1,288,296		\$4,038,073	\$1,675,657	\$1,563,433	\$648,769
2033	15	15	14		\$1,355,417	\$1,498,851	\$1,337,252		\$4,191,519	\$1,625,543	\$1,563,433	\$606,326
2034	16	16	15		\$1,406,923	\$1,555,807	\$1,388,067		\$4,350,797	\$1,576,929	\$1,563,433	\$566,660
2035	17	17	16		\$1,460,386	\$1,614,928	\$1,440,814		\$4,516,127	\$1,529,769	\$1,563,433	\$529,589
2036	18	18	17		\$1,515,881	\$1,676,295	\$1,495,565		\$4,687,740	\$1,484,018	\$1,563,433	\$494,943
2037	19	19	18		\$1,573,484	\$1,739,994	\$1,552,396		\$4,865,874	\$1,439,637	\$1,563,433	\$462,563
2038	20	20	19		\$1,633,277	\$1,806,114	\$1,611,387		\$5,050,777	\$1,396,582	\$1,563,433	\$432,302
2039	21	21	20		\$1,695,341	\$1,874,746	\$1,672,620		\$5,242,707	\$1,354,815	\$1,563,433	\$404,021
2040	22	22	21		\$1,759,764	\$1,945,986	\$1,736,179		\$5,441,930	\$1,314,297	\$1,563,433	\$377,589
2041	23	23	22		\$1,826,635	\$2,019,934	\$1,802,154		\$5,648,723	\$1,274,991	\$1,563,433	\$352,887
2042	24	24	23		\$1,896,047	\$2,096,691	\$1,870,636		\$5,863,375	\$1,236,861	\$1,563,433	\$329,801
2043	25	25	24		\$1,968,097	\$2,176,366	\$1,941,720	\$15,408,935	\$21,495,118	\$4,237,690	\$1,563,433	\$308,225
Totals					\$28,261,707	\$31,252,430	\$27,882,941	\$15,408,935	\$102,806,012	\$35,551,883	\$68,533,312	\$45,333,441
										Net Present Value (NPV)		\$-9,781,558
										Benefit-Cost Ratio (BCR)		0.78
Source: Michael Baker International, Inc., 2018.												

Table 21
3) Base Case to Alternative 3 (6,200 Feet with Standard RSA)

Year	Investment Year	Forecast Year	Discount Year	Benefit Year	Benefits (Savings)						Project Costs	
					Benefit 1	Benefit 2	Benefit 3	Benefit 4	Total	Discounted	Total	Discounted
2018												
2019	1	1	0								\$7,516,728	\$7,516,728
2020	2	2	1								\$7,516,728	\$7,024,979
2021	3	3	2								\$7,516,728	\$6,565,401
2022	4	4	3								\$7,516,728	\$6,135,889
2023	5	5	4								\$7,516,728	\$5,734,476
2024	6	6	5	1	\$968,940	\$1,071,475	\$955,954		\$2,996,369	\$2,136,370	\$434,492	\$309,786
2025	7	7	6	2	\$1,005,759	\$1,112,191	\$992,280		\$3,110,231	\$2,072,478	\$434,492	\$289,520
2026	8	8	7	3	\$1,043,978	\$1,154,455	\$1,029,987		\$3,228,420	\$2,010,498	\$434,492	\$270,579
2027	9	9	8	4	\$1,083,649	\$1,198,324	\$1,069,126		\$3,351,100	\$1,950,371	\$434,492	\$252,878
2028	10	10	9	5	\$1,124,828	\$1,243,860	\$1,109,753		\$3,478,441	\$1,892,042	\$434,492	\$236,335
2029	11	11	10	6	\$1,167,572	\$1,291,127	\$1,151,924		\$3,610,622	\$1,835,457	\$434,492	\$220,873
2030	12	12	11	7	\$1,211,939	\$1,340,190	\$1,195,697		\$3,747,826	\$1,780,565	\$434,492	\$206,424
2031	13	13	12	8	\$1,257,993	\$1,391,117	\$1,241,133		\$3,890,243	\$1,727,315	\$434,492	\$192,919
2032	14	14	13	9	\$1,305,797	\$1,443,979	\$1,288,296		\$4,038,073	\$1,675,657	\$434,492	\$180,299
2033	15	15	14	10	\$1,355,417	\$1,498,851	\$1,337,252		\$4,191,519	\$1,625,543	\$434,492	\$168,503
2034	16	16	15	11	\$1,406,923	\$1,555,807	\$1,388,067		\$4,350,797	\$1,576,929	\$434,492	\$157,480
2035	17	17	16	12	\$1,460,386	\$1,614,928	\$1,440,814		\$4,516,127	\$1,529,769	\$434,492	\$147,177
2036	18	18	17	13	\$1,515,881	\$1,676,295	\$1,495,565		\$4,687,740	\$1,484,018	\$434,492	\$137,549
2037	19	19	18	14	\$1,573,484	\$1,739,994	\$1,552,396		\$4,865,874	\$1,439,637	\$434,492	\$128,550
2038	20	20	19	15	\$1,633,277	\$1,806,114	\$1,611,387		\$5,050,777	\$1,396,582	\$434,492	\$120,141
2039	21	21	20	16	\$1,695,341	\$1,874,746	\$1,672,620		\$5,242,707	\$1,354,815	\$434,492	\$112,281
2040	22	22	21	17	\$1,759,764	\$1,945,986	\$1,736,179		\$5,441,930	\$1,314,297	\$434,492	\$104,935
2041	23	23	22	18	\$1,826,635	\$2,019,934	\$1,802,154		\$5,648,723	\$1,274,991	\$434,492	\$98,070
2042	24	24	23	19	\$1,896,047	\$2,096,691	\$1,870,636		\$5,863,375	\$1,236,861	\$434,492	\$91,655
2043	25	25	24	20	\$1,968,097	\$2,176,366	\$1,941,720	\$14,708,256	\$20,794,439	\$4,099,553	\$434,492	\$85,659
Totals					\$28,261,707	\$31,252,430	\$27,882,941	\$14,708,256	\$102,105,333	\$35,413,747	\$46,273,470	\$36,489,087
										Net Present Value (NPV)		-\$1,075,341
										Benefit-Cost Ratio (BCR)		0.97

Source: Michael Baker International, Inc., 2018.

Table 22
4) Base Case to Alternatives 1 and 3 Combination

Year	Investment Year	Forecast Year	Discount Year	Benefit Year	Benefits (Savings)						Project Costs	
					Benefit 1	Benefit 2	Benefit 3	Benefit 4	Total	Discounted	Total	Discounted
2018												
2019	1	1	0								\$7,516,728	\$7,516,728
2020	2	2	1								\$7,516,728	\$7,024,979
2021	3	3	2	Varies	\$259,912	\$287,416	\$256,428		\$803,756	\$702,032	\$7,516,728	\$6,565,401
2022	4	4	3	Varies	\$269,788	\$298,338	\$266,173		\$834,299	\$681,037	\$7,516,728	\$6,135,889
2023	5	5	4	Varies	\$280,040	\$309,675	\$276,287		\$866,003	\$660,669	\$7,516,728	\$5,734,476
2024	6	6	5	Varies	\$968,940	\$1,071,475	\$955,954		\$2,996,369	\$2,136,370	\$434,492	\$309,786
2025	7	7	6	Varies	\$1,005,759	\$1,112,191	\$992,280		\$3,110,231	\$2,072,478	\$434,492	\$289,520
2026	8	8	7	Varies	\$1,043,978	\$1,154,455	\$1,029,987		\$3,228,420	\$2,010,498	\$434,492	\$270,579
2027	9	9	8	Varies	\$1,083,649	\$1,198,324	\$1,069,126		\$3,351,100	\$1,950,371	\$434,492	\$252,878
2028	10	10	9	Varies	\$1,124,828	\$1,243,860	\$1,109,753		\$3,478,441	\$1,892,042	\$434,492	\$236,335
2029	11	11	10	Varies	\$1,167,572	\$1,291,127	\$1,151,924		\$3,610,622	\$1,835,457	\$434,492	\$220,873
2030	12	12	11	Varies	\$1,211,939	\$1,340,190	\$1,195,697		\$3,747,826	\$1,780,565	\$434,492	\$206,424
2031	13	13	12	Varies	\$1,257,993	\$1,391,117	\$1,241,133		\$3,890,243	\$1,727,315	\$434,492	\$192,919
2032	14	14	13	Varies	\$1,305,797	\$1,443,979	\$1,288,296		\$4,038,073	\$1,675,657	\$434,492	\$180,299
2033	15	15	14	Varies	\$1,355,417	\$1,498,851	\$1,337,252		\$4,191,519	\$1,625,543	\$434,492	\$168,503
2034	16	16	15	Varies	\$1,406,923	\$1,555,807	\$1,388,067		\$4,350,797	\$1,576,929	\$434,492	\$157,480
2035	17	17	16	Varies	\$1,460,386	\$1,614,928	\$1,440,814		\$4,516,127	\$1,529,769	\$434,492	\$147,177
2036	18	18	17	Varies	\$1,515,881	\$1,676,295	\$1,495,565		\$4,687,740	\$1,484,018	\$434,492	\$137,549
2037	19	19	18	Varies	\$1,573,484	\$1,739,994	\$1,552,396		\$4,865,874	\$1,439,637	\$434,492	\$128,550
2038	20	20	19	Varies	\$1,633,277	\$1,806,114	\$1,611,387		\$5,050,777	\$1,396,582	\$434,492	\$120,141
2039	21	21	20	Varies	\$1,695,341	\$1,874,746	\$1,672,620		\$5,242,707	\$1,354,815	\$434,492	\$112,281
2040	22	22	21	Varies	\$1,759,764	\$1,945,986	\$1,736,179		\$5,441,930	\$1,314,297	\$434,492	\$104,935
2041	23	23	22	Varies	\$1,826,635	\$2,019,934	\$1,802,154		\$5,648,723	\$1,274,991	\$434,492	\$98,070
2042	24	24	23	Varies	\$1,896,047	\$2,096,691	\$1,870,636		\$5,863,375	\$1,236,861	\$434,492	\$91,655
2043	25	25	24	Varies	\$1,968,097	\$2,176,366	\$1,941,720	\$14,708,256	\$20,794,439	\$4,099,553	\$434,492	\$85,659
Totals					\$29,071,448	\$32,147,859	\$28,681,829	\$14,708,256	\$104,609,392	\$37,457,485	\$46,273,470	\$36,489,087
										Net Present Value (NPV)		\$968,397
										Benefit-Cost Ratio (BCR)		1.03

Source: Michael Baker International, Inc., 2018.