ROLLA
NATIONAL AIRPORT MASTER PLAN

Barnard Dunkelberg & Company

TranSystems

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Introduction

Rolla National Airport (VIH), a former US Army airfield located in Rolla/Vichy, Missouri, is an important transportation facility that is an absolute necessity for some and is a "required" convenience for others. It is a vital component of the national airport system, as well as an integral element of the transportation infrastructure that serves Rolla, Vichy, Maries County, Phelps County, and south-central Missouri. The Airport also represents a vital and significant regional economic asset. In addition to the many aviation-related resources, the Airport also provides benefits to local businesses and industry, promotes tourism, as well as encourages additional business development and expansion throughout the cities, surrounding communities, and adjacent counties.

The ever-fluctuating aviation industry influences the facilities and services provided at Rolla National Airport. Many changes have transpired during recent years on a local, regional, and national level that necessitate an evaluation of the Airport's current and future operational characteristics and facilities, as well as providing a plan and program for airport development. This Master Plan will provide a long-term analysis and plan for the Airport as a means for accommodating the anticipated future aviation demand.

The future requirements will be evaluated not only from the standpoint of aviation needs, but also from the relationship of airport facilities to the surrounding land uses and the community as a whole. This planning document will focus on a complete and comprehensive aviation facility, with the overall goal being facilities development that can accommodate future demand that is not significantly constrained by its environs.

This initial *Airport Inventory* chapter will examine three basic elements of the Airport, which are: airport facilities (runways, taxiways, aircraft parking aprons, hangars,

ground access, etc.); the relationship to the surrounding airport/airspace system; and, the airport environs. Subsequent chapters will detail the Airport's forecasts of aviation activity and evaluate the ability of existing airport facilities to safely and efficiently meet the demands of the projected aviation activity. Alternatives will be analyzed that provide necessary facilities to meet the demand, and, the preferred future airport development will be recommended. Further, an implementation schedule will be provided, cost estimates developed, and an overview of potential environmental impacts will be provided.

As illustrated in Figure A1, entitled *AIRPORT LOCATION MAP*, the City of Rolla is located in Phelps County, which is situated in south-central Missouri. Rolla is located approximately 60 miles southeast of Jefferson City, 105 miles southwest of St. Louis, 111 miles northeast of Springfield, and 300 miles northwest of Memphis, Tennessee. Rolla National Airport is located in Maries County, about 11 miles north of the Rolla Central Business District (CBD) and approximately two miles northwest of the Vichy CBD, as shown in Figure A2, entitled *AIRPORT VICINITY MAP*.

Airport Role and Facilities

Rolla National Airport, located on city property outside the existing city limits, is owned and operated by the City of Rolla. The City currently has an established Airport Commission that counsels and advises the City of Rolla on all matters relevant to the control, management, and operation of Rolla National Airport. The responsibility for the development needs of the Airport, and compliance with all federal, state, and local regulations pertaining to the operation of the Airport, lies with the City Council and the Mayor.

The Airport Reference Point (ARP) is located at Latitude 38° 07' 38.7560" N, and Longitude 91° 46' 10.2810" W. The Federal Aviation Administration (FAA) classifies Rolla National Airport as a general aviation airport in the National Plan of Integrated Airport Systems (NPIAS). The Airport has an elevation of 1,148 feet above mean sea level (AMSL) and has property consisting of approximately 1,370 acres.

Currently, Rolla National Airport is operated with two runways (Runways 4/22 and 13/31), a partial parallel taxiway, three connecting taxiways, eight individual hangars, two aircraft apron parking areas, and support facilities. Figure A3, entitled *EXISTING AIRPORT LAYOUT,* provides a graphic presentation of the existing airport facilities.

Airside Facilities

Runway 4/22. Runway 4/22 is 100 feet in width and 5,500 feet in length, with a 213-foot displaced threshold off the Runway 4 end. It is constructed of asphalt and has a gross weight bearing capacity of 75,000 pounds single wheel, 85,000 pounds dual wheel, and 130,000 pounds dual tandem wheel main landing gear configuration. Runway 4/22 has a four-light Visual Approach Slope Indicator (VASI) lighting system, in addition to High Intensity Runway Lights (HIRL) and threshold lights at both runway ends. Runway 22 also has Runway End Identifier Lights (REILs).

Runway 13/31. Runway 13/31 is also 100 feet in width and 5,500 feet in length. It is constructed of asphalt and has a gross weight bearing capacity of 48,000 pounds single wheel, 62,000 pounds dual wheel, and 92,000 pounds dual tandem wheel main landing gear configuration. Runway 13/31 is equipped with Medium Intensity Runway Lights (MIRL) and has threshold lights at both runway ends.

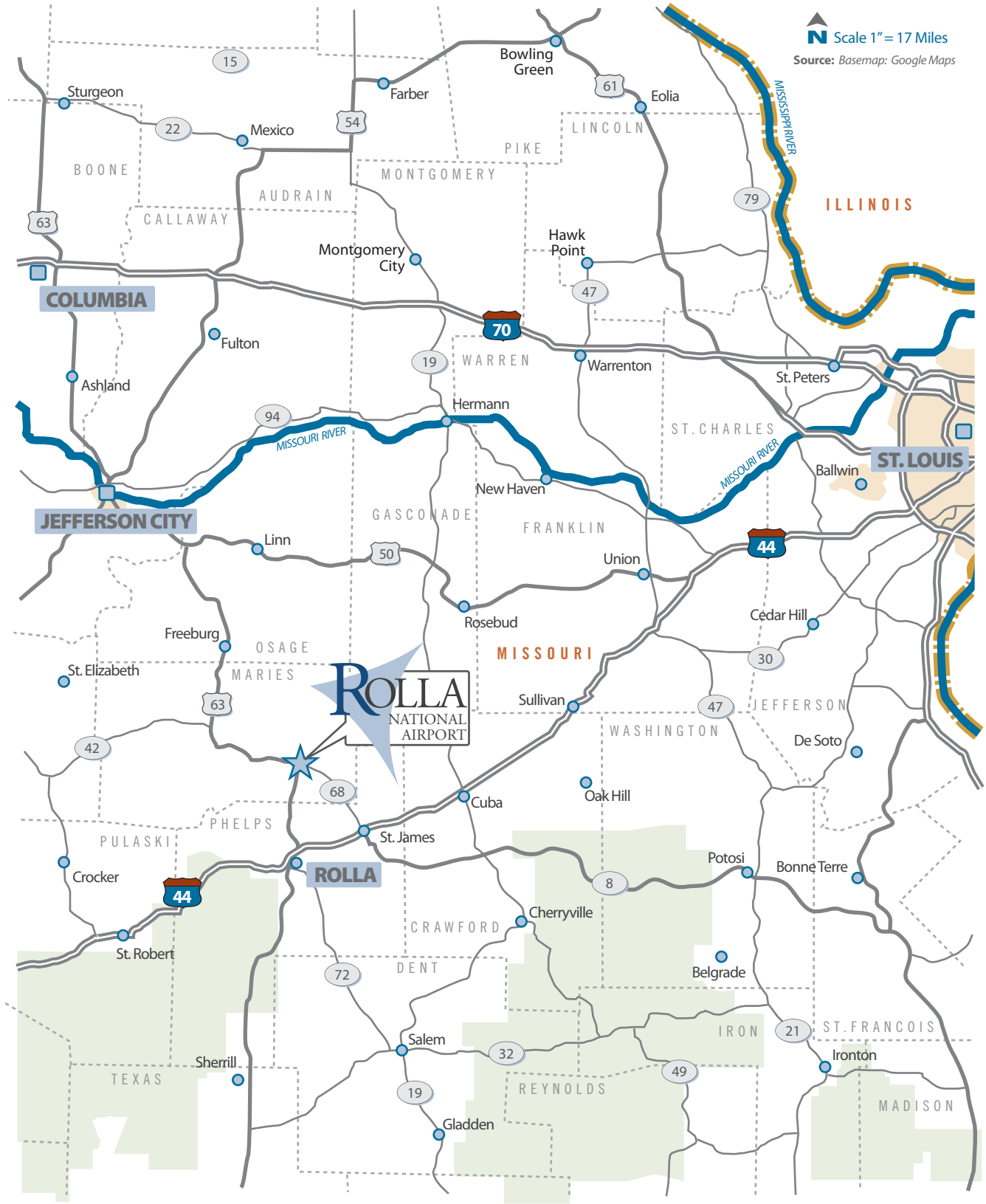


Figure A1 **Airport Location Map**

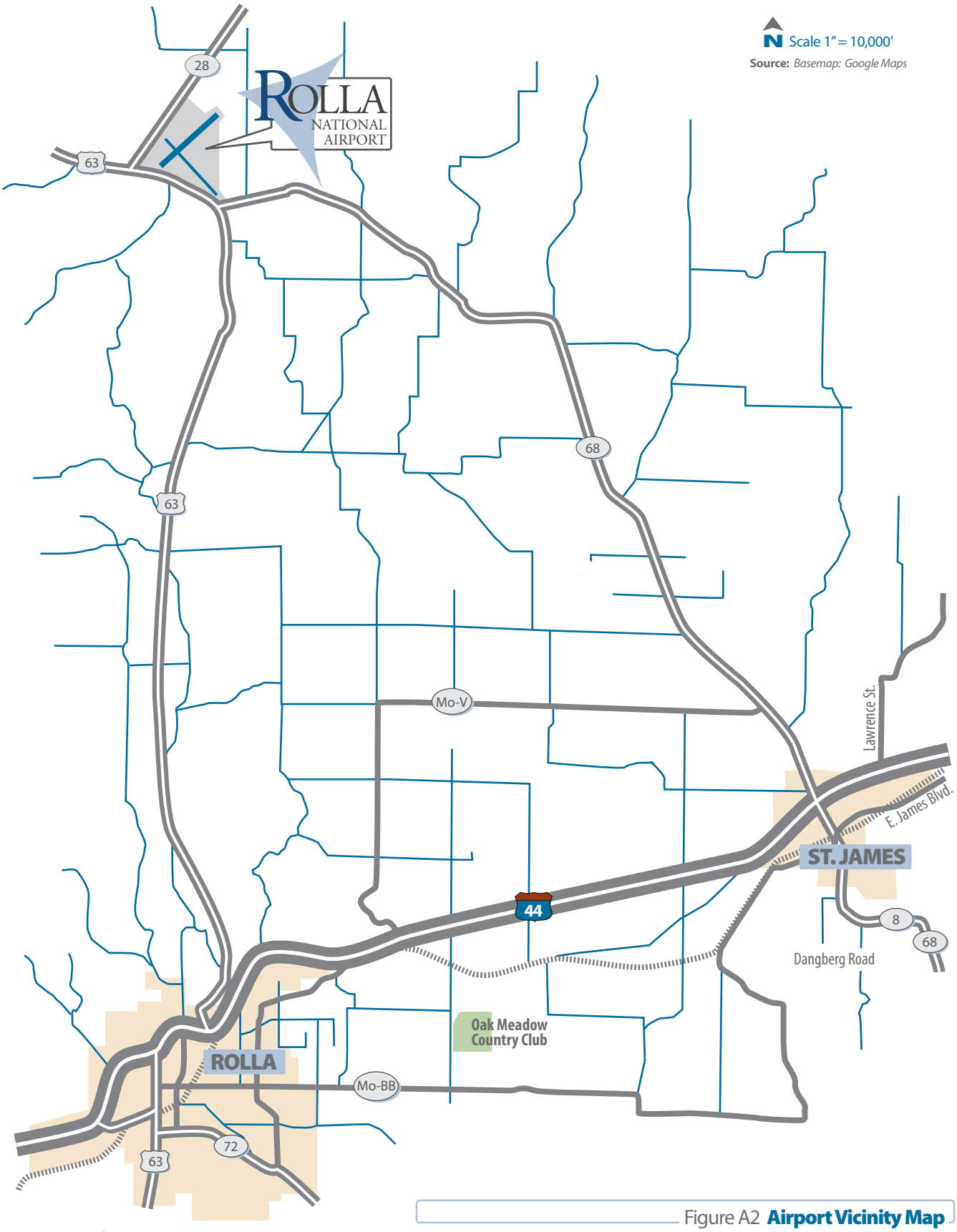
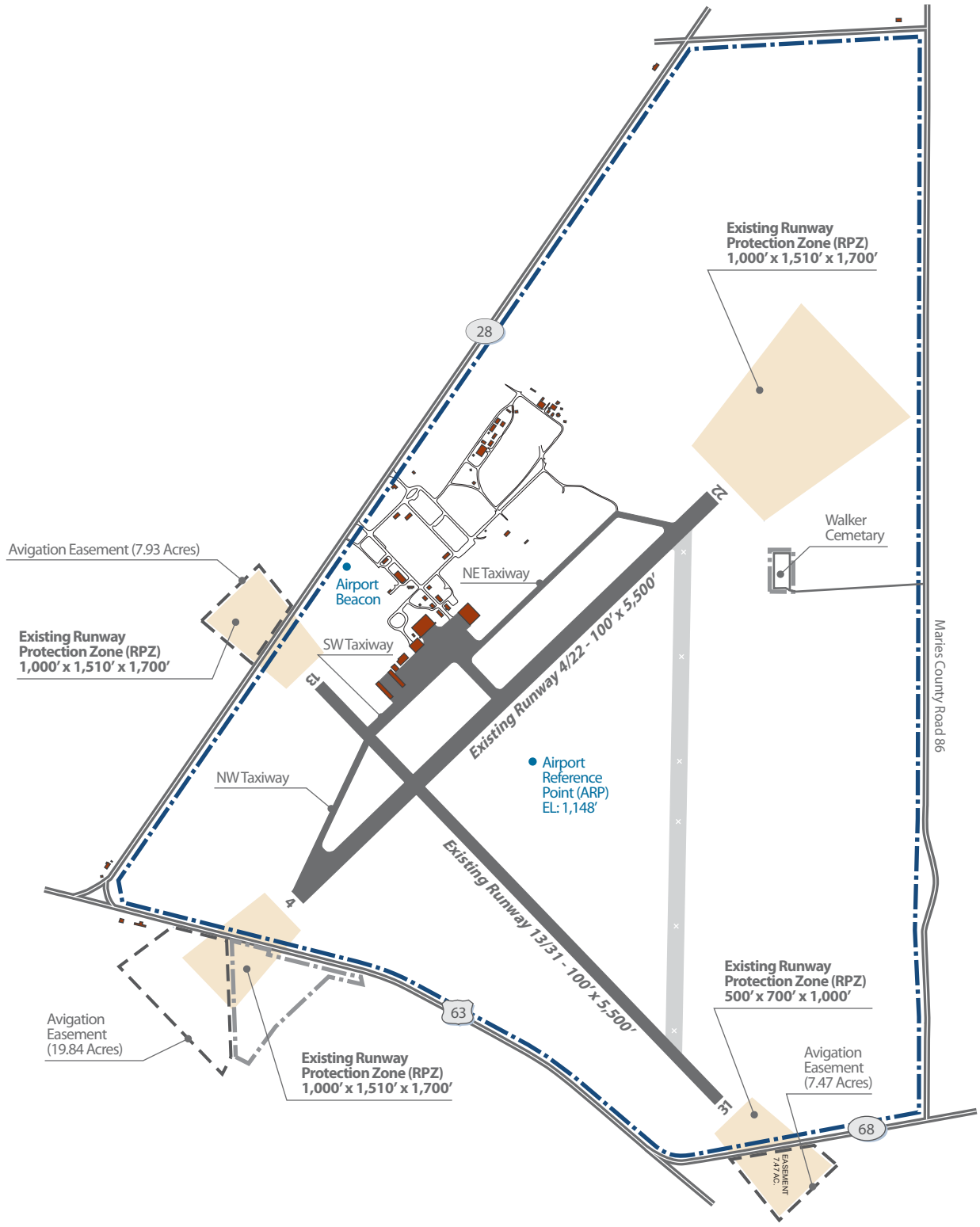


Figure A2 **Airport Vicinity Map**



N Scale 1" = 1,500'

Source: Missouri Engineering Corp. April, 1998

Figure A3 **Existing Airport Layout**

Taxiways. The Northeast Taxiway is a partial parallel taxiway that provides access between Runway 4/22 and both aircraft aprons and hangar area. The Northeast Taxiway is 35 feet wide. The Center Taxiway is a connecting taxiway that is 100 feet wide and connects Runway 4/22 to the main aircraft apron and hangar area. The Southwest Taxiway is also a connecting taxiway that is 100 feet wide and provides access between Runway 13 and the main aircraft apron. Additionally, the Northwest Taxiway is a connecting taxiway that is 50 feet wide and provides access between the main apron and Runway 4.

Landside Facilities

Apron. There is one main aircraft apron at Rolla National Airport. The main apron, which is located to the northeast of the Runway 13 threshold, consists of approximately 116,000 square feet of aircraft parking and movement space.

Currently, there are 26 tie-down positions available on the main aircraft apron.

Hangars and Buildings. There are seven individual hangars (including one 10-unit T-hangar) within the landside development area at Rolla National Airport. The total number of aircraft currently accommodated in these hangars is 37.

Other buildings within the landside development area include a flight center [for the City of Rolla, FAA, and the National Weather Service (NWS)], airport operations/pilots' lounge, two power houses (one unused, one active), visitors' pavilion, #1 pump house (inoperable), #2 pump house, five-bay garage, maintenance shop, former military radar building, and three storage facilities.

Fuel Storage Facilities. Aviation fuel is presently stored in two underground tanks located west of the main apron. Capacity of this facility consists of a 12,000-gallon 100LL AVGAS storage tank and a 15,000-gallon Jet A storage tank. All tanks comply with all federal, state, and local regulations.

Maintenance Facilities. Existing airport maintenance services are located in the maintenance building along the main airport entrance road. Maintenance services are limited to minor airframe and power plant repairs.

Visual Navigational Facilities. Existing visual navigational aids available to pilots at the Airport include a rotating beacon, which is located northwest of the Runway 13 threshold, west of the main aircraft apron. Additionally, a lighted wind cone, the HIRL, MIRL, VASI, and threshold lights mentioned earlier are other visual approach aids found at the Airport.

Automated Surface Observation System (ASOS). The Airport currently maintains an automated service observation system with a frequency of 119.025. This system is designed to provide 24-hour, minute-by-minute observations and performs the basic observing functions necessary to generate an aviation routine weather report and other aviation-related weather information. Information can be transmitted over a discrete very high frequency (VHF) radio frequency or the voice portion of a local navigational aid.

Vehicular Access. US Highway 63, which connects to US Interstate 44 in Rolla just south of the Airport, provides the main access to the Airport. Additionally, State Highway 28 runs northeast of the Airport and State Highway 68 connects to Highway 63 on the southern corner of airport property. Vehicular parking is provided adjacent to the main apron and various individual hangars.

Fencing. The Airport is currently protected by a three-strand barbed wire fence around the perimeter of the property, which is being upgraded to coincide with this Master Plan.

Airspace System/Navigation and Communication Aids

As with all airports, Rolla National Airport functions within the local, regional, and national system of airports and airspace. The following narrative gives a brief description of the Airport's role as an element within these systems.

Air Traffic Service Areas and Aviation Communications

Within the continental United States, there are some 22 geographic areas that are under Air Traffic Control (ATC) jurisdiction. Air traffic controllers in Air Route Traffic Control Centers (ARTCC) provide air traffic services within each area. Rolla National Airport is contained within the Kansas City ARTCC service area, which includes the airspace in portions of Missouri, Kansas, Oklahoma, and Arkansas. The Airport is equipped with an Aeronautical Advisory Station (UNICOM) and Common Traffic Advisory Frequency on frequency 123.0.

Airspace and NAVAIDS Analysis

Navigational aids (NAVAIDS) are instruments providing navigation readings to pilots in appropriately equipped aircraft. The primary navigational aid available for use by pilots in the vicinity of Rolla National Airport is the Vichy VOR/DME (117.70 VIH) located three nautical miles (NM) northwest of the Airport, the Forney VOR (110.0 TBN) located approximately 29 NM southwest of the Airport, the Maples VORTAC

(113.4 MAP), located approximately 32 NM south of the Airport, and the Sunshine VOR/DME (108.4 SHY), located approximately 40 NM west of the Airport. A VORTAC (VHF Omnidirectional Range/Tactical Air Navigation) is a navigational aid providing VOR azimuth, TACAN azimuth, and TACAN distance measuring equipment (DME) at a single site.

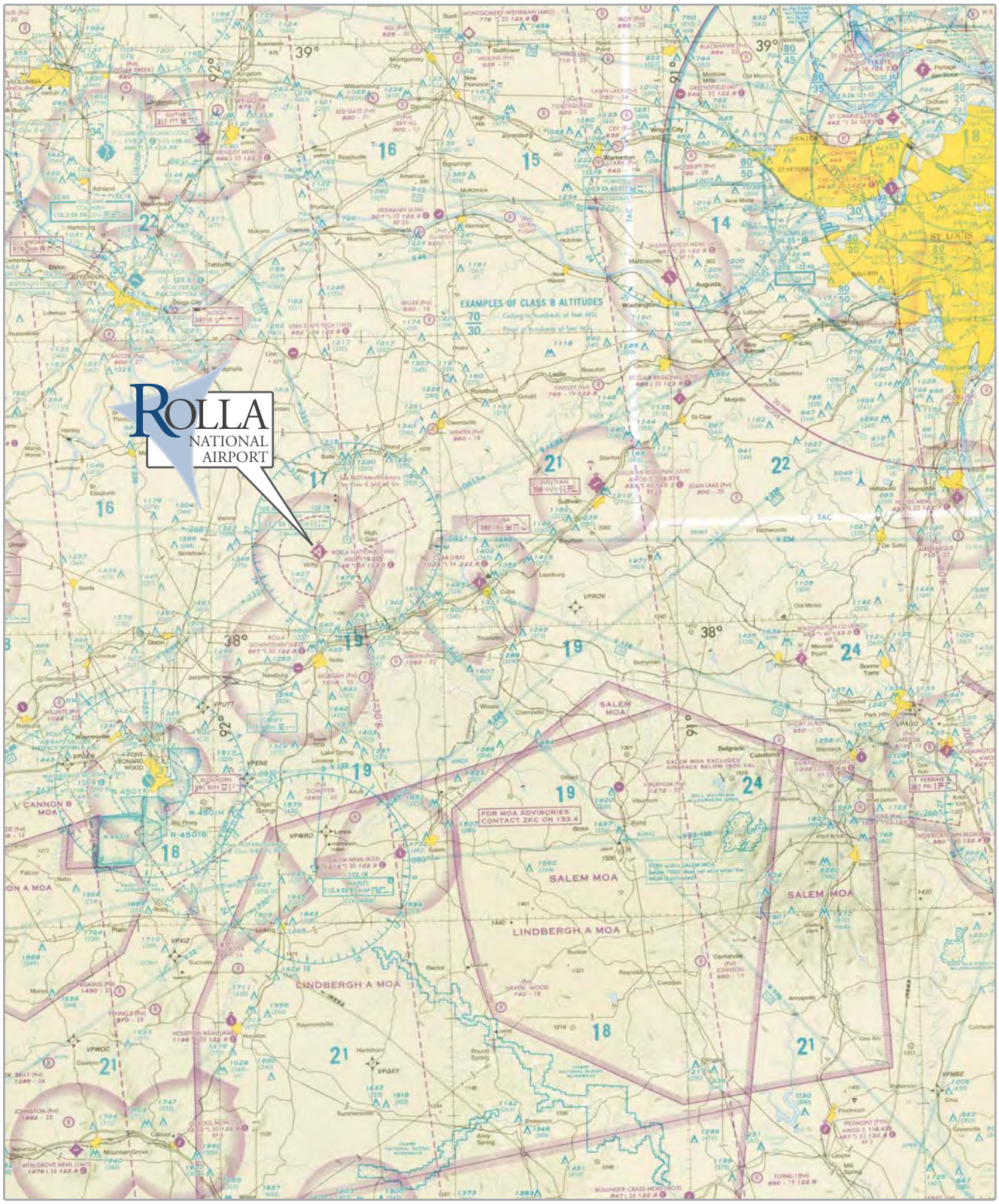
Presently, there are four published instrument approach procedures providing straight-in landing guidance at Rolla National Airport, which are listed in the following table entitled *INSTRUMENT APPROACH PROCEDURES*.

Table A1
INSTRUMENT APPROACH PROCEDURES
Rolla National Airport Master Plan

Type of Approach	Runway Designation (Straight-In)	Ceiling Minimums (AGL)	Visibility Minimums
VOR/DME	4	343'	1 mile
GPS	4	383'	1 mile
VOR/DME RNAV or GPS	22	378'	¾ mile
VOR	22	378'	¾ mile

Source: Jeppesen Airway Manual.

Local controlled airspace surrounding the Airport is designated as Class E with floor established at 700 feet above ground level (AGL). Class E airspace aids in the transition to and from the terminal environment to the en route environment. The following illustration, entitled *AIRSPACE/NAVAIDS SUMMARY*, depicts the Airport, local airspace, and navigational facilities in the vicinity of Rolla National Airport.



Scale 1" = 16 Nautical Miles

Source: *FAA Sectional Raster Aeronautical Charts, East Volume 0607, Kansas City North and South, August 2006.*

Figure A4 **Airspace/NAVAIDS Summary**

Existing Planning Data Inventory

A proper inventory of the existing land uses and zoning patterns surrounding the Airport are important elements in the airport planning process. Land use compatibility with airport development can be insured with a thorough knowledge of what land uses are proposed and what, if any, changes need to be made.

Zoning

Rolla National Airport is located north of Rolla, outside of the city limits. Therefore, the Airport and surrounding property are not zoned, and Maries County has no zoning authority.

Existing Land Use

The existing land uses in the general vicinity of the Airport are presented in the following figure entitled *GENERALIZED EXISTING LAND USE*. The dominant land use within the Airport environs is vacant/undeveloped; however, there are a few scattered rural residences located south, southeast, north, and northeast of the Airport, adjacent to State Highways 28 and 68, County Road 452, and US Highway 63. More urban development occurs further to the south, closer to the Rolla city limits.

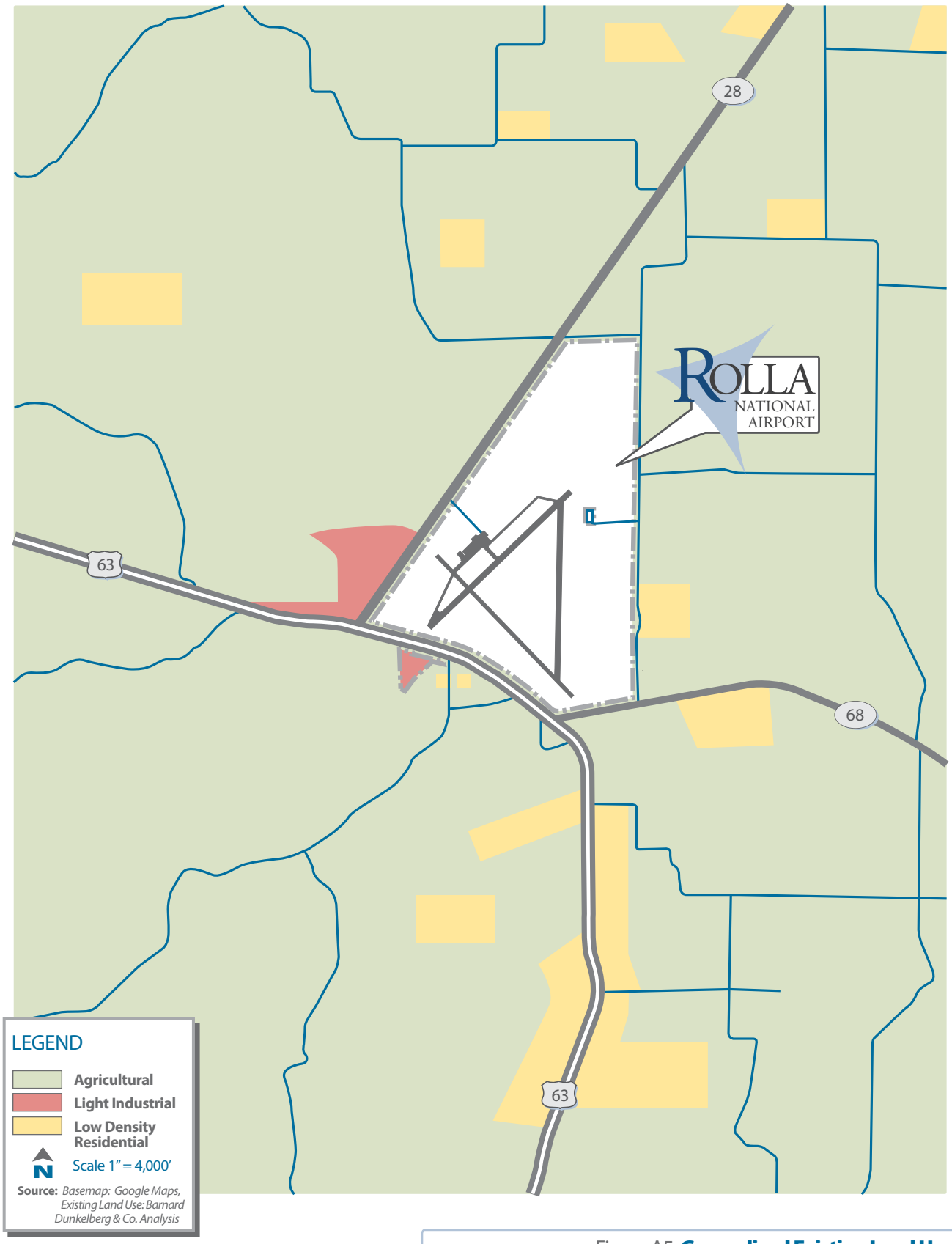


Figure A5 **Generalized Existing Land Use**

Historical and Existing Aviation Activity Summary

A tabulation of aviation activity since 1995 at Rolla National Airport is presented in Table A2, entitled *HISTORICAL AVIATION ACTIVITY, 1995-2005*. This table presents five categories of aircraft operations (an operation is defined as either a take-off or a landing), including: air taxi, itinerant general aviation, local general aviation, military, and total operations.

Table A2
HISTORICAL AVIATION ACTIVITY, 1995-2005
Rolla National Airport Master Plan

Year	Air Taxi	Itinerant General Aviation Operations	Local General Aviation Operations	Military Operations	Total Aircraft Operations
1995[1]	200	6,100	2,674	26	9,000
1996[1]	400	9,800	2,470	30	12,700
1997	250	9,600	6,400	---	16,250
1998	250	9,600	6,400	---	16,250
1999	250	9,600	6,400	---	16,250
2000[1]	400	10,000	2,480	120	13,000
2001	250	9,408	6,272	---	15,930
2002	250	9,408	6,272	---	15,930
2003	250	9,408	6,272	---	15,930
2004[1]	---	10,300	2,554	135	12,989
2005[2]	---	12,800	3,200	800	16,800

Source: Federal Aviation Administration *Terminal Area Forecasts*, 1995-2025.
--- Data not available.
[1] FAA Form 5010-1, *Airport Master Record.*
[2] Rolla National Airport personnel.

Aircraft Operations

At non-towered airports, the actual number of aircraft operations is very difficult to ascertain with any degree of certainty. Often, at airports like Rolla National, the only sources of historical data are the FAA *Terminal Area Forecasts* or the FAA Form 5010-1, *Airport Master Record.* It is important to note that the data included in either of these sources are estimates, due to the time and cost involved in gathering actual data.

Generally, airport personnel or pilots that frequent the Airport will provide the operations estimates to the Missouri Department of Transportation, Aviation Section.

Air Taxi Operations. Generally, any company or individual performing air passenger and/or cargo transportation service on a non-scheduled basis over unspecified routes is conducting air taxi operations. As indicated in the table, there were 2,800 reported air taxi operations at the Airport between 1995 and 2005. For the remainder of this study, air taxi operations, if projected, will be considered as part of the general aviation operations category.

General Aviation Operations. During the historical time frame presented in the table, general aviation operations have remained fairly steady. This is not reflective of typical general aviation activity, which usually has many "peaks and valleys" in the number of aircraft operations. Because general aviation operations are more typically related to regional economic conditions than commercial service or military operations, Rolla National Airport has almost certainly had fluctuations in general aviation operations. In the future, as economic conditions within the region change, fluctuations in the number of general aviation operations at the Airport will continue.

Military Operations. Military operations, as presented in the table, have remained fairly steady. It is anticipated that military operations will maintain this status and, therefore, will not be projected for this planning effort.

Local and Itinerant Operations

Aircraft operations are placed in two categories, local and itinerant. Local operations are generally reflective of flight training operations. The *Air Traffic Control Handbook* defines a local operation as any operation performed by an aircraft operating in the local traffic pattern or within sight of the tower, or aircraft known to be departing or arriving from flight in local practice areas, or aircraft executing practice instrument approaches at the Airport. Itinerant operations are all other aircraft operations and are more often associated with business aircraft. The historic data presented in the table indicates that local operations have accounted for approximately 20% of the total operations.

Existing Operations by Aircraft Type

The current level of aviation activity by aircraft type is summarized in the following table entitled *EXISTING OPERATIONS BY AIRCRAFT TYPE, 2005*. This summary indicates that, of the total 2005 aircraft operations at Rolla National Airport, general aviation aircraft accounted for 95% of the operations. Of the general aviation operations, it is estimated that single engine aircraft performed approximately 30%, multi-engine piston aircraft accounted for 20%, turboprop aircraft performed approximately 25%, business jet aircraft accounted for roughly 10%, and helicopters performed approximately 10% of total operations.

Table A3
EXISTING OPERATIONS BY AIRCRAFT TYPE, 2005
Rolla National Airport Master Plan

Aircraft Type	**Operations**	
General Aviation	*15,200*	*(95%)*
Single Engine	4,800	(30%)
Multi-Engine	3,200	(20%)
Turboprop	4,000	(25%)
Business Jet	1,600	(10%)
Helicopter	1,600	(10%)
Military	*800*	*(5%)*
TOTAL	**16,000**	

Source: Rolla National Airport personnel estimate.

Based Aircraft

Currently, there are 82 aircraft based at Rolla National Airport. Of this total, there are 72 single engine aircraft and ten multi-engine aircraft. A historical summary of based aircraft is provided in the following table entitled *SUMMARY OF BASED AIRCRAFT, 1995-2005*. The data were compiled from FAA records and airport tabulations.

Table A4
SUMMARY OF BASED AIRCRAFT, 1995-2005
Rolla National Airport Master Plan

Year	Single Engine	Multi-Engine	Total
1995[1]	59	6	65
1996[1]	59	6	65
1997	---	---	65
1998	---	---	65
1999	---	---	86
2000[1]	38	9	47
2001	---	---	47
2002	---	---	47
2003	---	---	47
2004[1]	42	9	51
2005[2]	72	10	82

Source: Federal Aviation Administration Terminal Area Forecasts, 1990-2020. Does not differentiate based aircraft into categories.
--- Data not available.
[1] FAA Form 5010-1, *Airport Master Record.*
[2] Rolla National Airport personnel.


ROLLA
NATIONAL AIRPORT MASTER PLAN

Forecasts of Aviation Activity

Introduction

Forecasting is a key element in the master planning process. The forecasts are essential for analyzing existing airport facilities and identifying future needs and requirements for these facilities. Forecasting, by its very nature, is not exact, but it does establish some general parameters for development and, when soundly established, provides a defined rationale for various development activities as demands increase. The amount and kind of aviation activities occurring at an airport are dependent upon many factors, but are usually reflective of the services available to aircraft operators, the meteorological conditions under which the airport operates (daily and seasonally), the businesses located on the airport or within the community the airport serves, and the general economic conditions prevalent within the surrounding area.

Forecasting generally commences by obtaining accurate historical and existing data. Utilizing the present time as an initial point, certain quantifiable facts and trends can be identified, along with many intangible factors, which will impact the aviation activity forecasts. This data has evolved from a comprehensive examination of historical airport records and recent planning documents relative to the Airport (i.e., the *FAA Terminal Area Forecasts, 2005-2025* and the *FAA Aerospace Forecasts Fiscal Years 2006-2017*). These documents were assembled in different years, making the data quite variable and emphasizing the need for establishing a well-defined and well-documented set of base information from which to develop aviation activity forecasts.

Forecast Assumptions and Conditions

Prior to an examination of current and future activity levels at the Airport, there are several conditions and assumptions that should be noted that form the basis, or

foundation, for the development of the forecasts contained here. These variables represent a variety of physical, operational, and socioeconomic considerations and, to varying degrees, relate to and affect aviation activity at Rolla National Airport.

Weather Conditions

With the exception of very few days annually, the Airport is not adversely affected by poor weather conditions. Visual Flight Rules (VFR) meteorological conditions are experienced, on average, approximately 89.4% of the time annually. Therefore, aircraft can operate at the Airport on a regular basis throughout the year, with limited interruption due to weather. The potential negative impact of poor weather conditions on the operational capability of the Airport will be analyzed in the following chapter of this document.

Socioeconomic Conditions

Historically, aviation activity occurring at airports has been directly influenced by regional, state, and national socioeconomic conditions. The most often analyzed conditions are population, employment, and income.

Population. According to US Census Bureau data, the population of Rolla was approximately 14,805 in 1990. By 2000, the population had increased to 16,367. In 1990, the population of Phelps County was 35,248 and Maries County was 7,976. By 2000, Phelps County increased to approximately 39,825 and Maries County increased to 8,903. The City of Rolla Community Development Department projects that the population of Phelps County will increase to 45,497 by the year 2010, which is an increase of 22.5% from 1990 and an annual growth rate of 1.28%. By comparison, the State of Missouri is projected to increase from 5,606,265 (2000 population) to 6,430,173 in 2030, an overall increase of 12.8% and an annual growth rate of 0.46%. The US Census Bureau estimates that the national population will increase from 281,421,906 in 2000 to some 363,584,435 by the year 2030. This is an approximate increase of 22.6% and an annual growth rate of 0.86%.

Employment. Rolla and the surrounding area have a diverse and broad range of employment opportunities, which includes 13 companies with 20 or more employees. According to the US Census Bureau, educational, health, and social services accounted for 32.8% of all nonfarm payroll jobs in 2000, within Phelps County. Trade (13.8%); manufacturing (10.5%); and, arts, entertainment, recreation, accommodation, and food services (8.3%) follow education and health as the leading employment sectors within the County. In 2000, the number of nonfarm payroll jobs was 17,521 in Phelps County and 4,074 in Maries County. Some of the largest major area employers include: Phelps County Regional Medical Center, University

of Missouri – Rolla, Wal-Mart Distribution Center, Rolla Public Schools, Brewer Science, Mid-Continent Mapping, St. John's Clinic, the City of Rolla, Bloomsdale Excavating, Tacony Manufacturing, Royal Canin USA, and CANTEX, Inc.

According to US Census Bureau data, the 2000 unemployment rate was approximately 3.9% for Phelps County and 2.2% for Maries County. This compares to the unemployment rate within the State of Missouri, which was 3.4% in 2000 and increased to 4.7% by 2005. Nationwide, the unemployment rate was 3.7% in 2000, increasing to 5.1% in 2005 (US Department of Labor, Bureau of Labor Statistics).

Income. According to US Census Bureau data, the 2000 per capita personal income for Rolla was approximately $15,916; Phelps County was approximately $16,084; Maries County was approximately $15,662; and, the State of Missouri was $19,936. By 2005, the per capita personal income for Rolla had increased to $18,181, which was an overall increase of 12.5%. Phelps County had increased to $19,325, representing a 16.8% overall increase.[1] The 2005 State of Missouri per capita personal income was approximately $23,026, representing a 13.4% overall increase from 2000.

Community Support

Rolla National Airport benefits from the support of the city and county governments, as well as local industries and citizens. The Airport is recognized as a vital infrastructure asset that contributes to the stability and future expansion of the area's economy. The overall position of the community is one of continued growth and development, with special focus on the impetus that the Airport can provide to attract additional economic and industrial development to the area. Additionally, many smaller communities surrounding Rolla benefit from a quality general aviation airport. These communities provide an economic base that can attract additional aviation activity, as well as industrial/business development to the area.

Rolla National Airport, which is the "front door" for many business and recreational travelers, is located roughly 11 miles north of the Rolla Central Business District (CBD), and two miles northwest of the Vichy CBD. The Airport currently consists of 1,370 acres and offers some vacant property to provide aviation or non-aviation development areas. Currently, the Airport is not constrained by incompatible land uses within the surrounding area.

[1] 2005 data for Maries County is currently unavailable.

Regulatory Climate

For purposes of forecasting in this Master Plan, it is assumed that the regulatory climate regarding the general aviation industry will not change dramatically. Specifically, it is assumed that noise and emissions requirements on business aircraft will remain within the bounds prescribed by current rules and regulations. It is also assumed that the general aviation community will not be subject to new user fees, access to airports and airspace will not be limited, and general aviation airports will not be subject to security restrictions that are currently imposed on air carrier airports.

Negative or Neutral Factors

As a general comment, the Airport has very few negative factors and is in an enviable position, due to its many positive features and conditions. However, there are some broad factors that can have a negative impact on the Airport, and the aviation industry, and these are considered in the planning process. The first issue is the overall condition of the general aviation industry in the United States. Beginning in 1978, many sectors of the general aviation industry have been in a recession, and the Federal Aviation Administration (FAA) has identified several factors that precipitated this downturn, including: economic recessions, fuel crises, termination of the GI Bill, and the repeal of the Investment Tax Credit.

More obvious contributing factors include: the rising expense of owning and operating an aircraft (i.e., costs of insurance, fuel, and maintenance), competition from discount air carriers since airline deregulation, changes in disposable discretionary income, increases in air space restrictions affecting fair-weather flying, reductions in personal leisure time, and shifts in personal preference as to how leisure time is spent. These factors have restricted the single engine light aircraft segment of the industry, in particular.

However, there are a number of bright spots having a positive impact in certain segments of the general aviation industry, including the passage of the General Aviation Revitalization Act (GARA) of 1994. This legislation has caused renewed interest and optimism among US aircraft manufacturers, who are either re-entering the single engine aircraft market after several years' absence, or are increasing future production schedules to meet expected renewed demand. The growth in the amateur-built aircraft market, and the strength of the used aircraft market, indicate that demand for inexpensive personal aircraft is still relatively strong.

The FAA's efforts to aid general aviation revitalization include streamlining the certification process for new entry-level aircraft and implementing measures to

provide regulatory relief and reduce user costs (i.e., reduced rules, improving the delivery of FAA services by decreasing excess layers of management, and the elimination of unneeded programs and processes). Groups such as the Aircraft Owners & Pilots Association (AOPA) are sponsoring programs that aggressively promote the benefits of general aviation and learning to fly.

On a more recent note, since the 9/11 terrorist attacks, Temporary Flight Restrictions (TFRs), and the lingering concerns of some regarding the use of general aviation aircraft in potential future acts of terrorism, have had an added short-term negative impact on the industry. On the positive side for General Aviation (GA), heightened airport security has had a dramatic impact on the "nuisance factor" of commercial air travel; as a result, some travelers have turned to general aviation as a more efficient means of air travel.

An additional factor that has a negative impact on Rolla National Airport is the lack of a low-minimum instrument approach, which inhibits the ability of the more sophisticated general aviation business aircraft from utilizing the Airport during adverse weather conditions, as well as insufficient runway width and length to accommodate a large number of business jets during high temperature days. This issue is an important component that requires attention during the preparation of this Master Plan.

Aviation Activity Forecasts

By using the historical data, and incorporating the previously stated assumptions and conditions, aviation forecasts can be developed. Several forecasting elements are pertinent to this planning effort: general aviation operations, local and itinerant operations, operations by aircraft type, and based aircraft. According to forecasts contained in the FAA *Aerospace Forecasts Fiscal Years 2006-2017*, nationwide general aviation operations are projected to grow at approximately 1.9% annually.

General Aviation Activity Forecast

As discussed earlier, fluctuations within the country's economic cycle historically impact general aviation operations more severely than air carrier operations. However, with more of the general aviation aircraft fleet being used for business purposes now than it was in the past, the economy should have somewhat less of an effect upon overall general aviation activity. Because of the prevailing economic conditions in Rolla and the surrounding area, it is anticipated that itinerant traffic will become an integral part of the aviation activity at the Airport. These factors,

combined with the previously mentioned GARA legislative action, should have a positive impact on general aviation activity.

In developing the aviation activity forecasts, several general aviation forecasts and national trends were reviewed. Included in this assessment, and, as presented in the following table, entitled *GENERAL AVIATION OPERATIONS FORECAST SCENARIOS, 2005-2025*, is a straight line trend projection (TP) based on historical data and three forecast scenarios developed for this Master Plan. As can be noted, the trend projection shows decreasing growth throughout the planning period.

Scenario One. This forecast scenario illustrates an average annual growth rate of 0.78%, which is the percentage utilized for general aviation operations nationally in the FAA *Terminal Area Forecasts*.

Scenario Two. This forecast postulates an average annual growth rate of 1.9% (the selected operations forecast for this Master Plan), which is the percentage utilized for general aviation operations nationally as described in the FAA *Aerospace Forecasts Fiscal Years 2006-2017*.

Scenario Three. This scenario utilizes a 3.3% average annual growth rate, obtained from an operations trend line analysis.

It is anticipated that, with additional facilities (hangars, fuel storage capabilities, etc.) and airside improvements (runway extension), operations could double over the existing level during the 20-year planning period. Additionally, it is also assumed that the ability to accommodate instrument operations at some point will attract individuals who would otherwise use surrounding airports for training and/or storage of aircraft.

Table B1
GENERAL AVIATION OPERATIONS FORECAST SCENARIOS, 2005-2025
Rolla National Airport Master Plan

Year	Scenario One	Scenario Two	Scenario Three
2005[1]	16,000	16,000	16,000
2006	16,125	16,304	16,528
2007	16,251	16,614	17,073
2008	16,377	16,929	17,637
2009	16,505	17,251	18,219
2010	16,634	17,579	18,820
2015	17,293	19,314	22,137
2020	17,978	21,219	26,039
2025	18,690	23,313	30,629

Source: BARNARD DUNKELBERG & COMPANY.
[1] Actual, as estimated by Rolla National Airport personnel.

Military Operations Forecast

There are two primary components in determining military aircraft use at an airport. The first is Department of Defense (DOD) funding, which has fluctuated in recent years, with a general overall decrease. The second is a fueling contract the Airport or Fixed Base Operator (FBO) may have with the DOD or National Guard. Since the Airport does not have a fueling contract, and, in lieu of more definitive sources of information, the existing level of military activity (5%) is adopted for the 20-year planning period.

Local and Itinerant Operations Forecast

Forecasts of operations have also been categorized accordingly into local and itinerant operations. Since Rolla National Airport will continue to transition into a center for business-related general aviation operations, the number of itinerant operations will continue to be the dominant aircraft activity at the Airport. However, with this transition, it is expected that the existing estimate of 20% local operations will remain throughout the end of the planning period. Based on these considerations, forecasts of local and itinerant operations are shown on the following table entitled *SUMMARY OF LOCAL AND ITINERANT OPERATIONS, 2005-2025*.

Table B2
SUMMARY OF LOCAL AND ITINERANT OPERATIONS, 2005-2025
Rolla National Airport Master Plan

Year	Local	Itinerant	Total
2005[1]	3,200	12,800	16,000
2010	3,516	14,063	17,579
2015	3,863	15,451	19,314
2020	4,244	16,975	21,219
2025	4,662	18,651	23,313

Source: BARNARD DUNKELBERG & COMPANY.
Notes: Rounding differences may occur.
[1] Actual, as estimated by Rolla National Airport personnel.

Operations Forecast by Aircraft Type

A further assessment of the forecasts involves the individual and collective use of the Airport by various types of aircraft. Supplementary to an assessment of the local and itinerant use of the Airport, the types of aircraft expected to use the Airport assist in determining the amount and type of facilities needed to meet the aviation demand.

The following table, entitled *SUMMARY OF OPERATIONS FORECAST BY AIRCRAFT TYPE, 2005-2025*, depicts the approximate level of use by aircraft types that are projected to use Rolla National Airport. This table reflects the growing percentage of turbine-powered aircraft anticipated to operate at the Airport, as well as the decreasing percentage of piston-powered aircraft. This is indicative of the type of facility the Airport is expected to become, and the prevailing local economic conditions. It is also in line with overall national trends in general aviation and parallels the FAA expectations and projections characteristic of the general aviation fleet.

Table B3
SUMMARY OF OPERATIONS FORECAST BY AIRCRAFT TYPE, 2005-2025
Rolla National Airport Master Plan

Operations by Type	2005[1]	2010	2015	2020	2025
General Aviation	*15,200*	*16,700*	*18,348*	*20,158*	*22,147*
Single Engine[2]	4,800	5,273	5,794	6,365	6,994
Multi-Engine	3,200	3,516	3,863	4,244	4,662
Turboprop	4,000	4,395	4,828	5,305	5,828
Business Jet	1,600	1,758	2,318	3,183	3,497
Helicopter	1,600	1,758	1,545	1,061	1,166
Military	*800*	*879*	*966*	*1,061*	*1,166*
TOTAL	**16,000**	**17,579**	**19,314**	**21,219**	**23,313**

Source: BARNARD DUNKELBERG & COMPANY.
Notes: Rounding differences may occur.
[1] Actual, as estimated by Rolla National Airport personnel.
[2] Includes single engine piston and turboprop operations.

Based Aircraft Forecasts

The number and type of aircraft anticipated to be based at an airport are vital components in developing a plan for the airport. Depending on the potential market and forecast, the Airport will tailor the plan in response to anticipated demand. Generally, there is a relationship between aviation activity and based aircraft, stated in terms of Operations Per Based Aircraft (OPBA). Sometimes, a trend can be established from historical information of operations and based aircraft. The national trend has been changing, with more aircraft being used for business purposes and less for pleasure flying. The impacts to the OPBA are that business aircraft are usually flown more often than pleasure aircraft.

Historical data (1995-2005) for the Airport indicate that the OPBA has fluctuated from 271 to 195, with an average of 294. With the addition of hangar facilities and an upgrade in airside facilities, it is expected that the number of OPBA will decrease at the Airport, as more aircraft based there are used for business purposes. The OPBA is expected to decrease from 195 in 2005 to 183 by the end of the planning period.

The based aircraft forecasts are presented in the following table entitled *BASED AIRCRAFT FORECAST, 2005-2025*. As can be seen, based aircraft forecasted in this

Master Plan are expected to increase from 82 presently to 128 by 2025, an average annual growth rate of 2.23%.

Table B4
BASED AIRCRAFT FORECAST, 2005-2025
Rolla National Airport Master Plan

Year	Based Aircraft	OPBA
2005[1]	82	195
2010	91	192
2015	102	189
2020	113	186
2025	128	183

Source: BARNARD DUNKELBERG & COMPANY.
OPBA – Operations Per Based Aircraft.
[1] Actual, as estimated by Rolla National Airport personnel.

The mix of based aircraft for incremental periods is shown in the following table entitled *BASED AIRCRAFT FORECAST BY TYPE, 2005-2025*. As with the trend nationally, the percentage of piston-powered aircraft is expected to decrease as a portion of the total based aircraft population at the Airport.

Table B5
BASED AIRCRAFT FORECAST BY TYPE, 2005-2025
Rolla National Airport Master Plan

Aircraft Type	2005[1]	2010	2015	2020	2025
Single Engine (Piston)	33 (40.2%)	37 (40.2%)	38 (38.0%)	43 (38.0%)	46 (35.0%)
Single Engine (Turboprop)	39 (47.6%)	43 (47.6%)	46 (45.0%)	51 (45.0%)	57 (45.0%)
Multi-Engine (Piston)	10 (12.2%)	11 (12.2%)	10 (10.0%)	11 (10.0%)	13 (10.0%)
Multi-Engine (Turboprop)	0 (0.0%)	0 (0.0%)	4 (3.5%)	4 (3.5%)	6 (5.0%)
Business Jet	0 (0.0%)	0 (0.0%)	4 (3.5%)	4 (3.5%)	6 (5.0%)
Helicopter	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)	0 (0.0%)
TOTAL	**82**	**91**	**102**	**113**	**128**

Source: BARNARD DUNKELBERG & COMPANY.
Notes: Rounding differences may occur.
--- Data not available.
[1] Actual, as estimated by Rolla National Airport personnel.

Summary

A summary of the aviation forecasts prepared for this study is presented in the following table entitled *SUMMARY OF AVIATION ACTIVITY FORECASTS, 2005-2025*. This information will be used in the following chapters to analyze the capacity of the Airport and to develop facility requirements. In other words, the aviation activity forecasts are the foundation from which future plans will develop and implementation decisions will be made.

Table B6
SUMMARY OF AVIATION ACTIVITY FORECASTS, 2005-2025
Rolla National Airport Master Plan

Operations	2005[1]	2010	2015	2020	2025
General Aviation	*15,200*	*16,700*	*18,348*	*20,158*	*22,147*
Single Engine[2]	4,800	5,273	5,794	6,365	6,994
Multi-Engine (Piston)	3,200	3,516	3,863	4,244	4,662
Multi-Engine (Turboprop)	4,000	4,395	4,828	5,305	5,828
Business Jet	1,600	1,758	2,318	3,183	3,497
Helicopter	1,600	1,758	1,545	1,061	1,166
Military	*800*	*879*	*966*	*1,061*	*1,166*
TOTAL OPERATIONS	**16,000**	**17,579**	**19,314**	**21,219**	**23,313**
Local Operations	3,200	3,516	3,863	4,244	4,662
Itinerant Operations	12,800	14,063	15,451	16,975	18,651
Based Aircraft By Type					
Single Engine (Piston)	33	37	38	43	46
Single Engine (Turboprop)	39	43	46	51	57
Multi-Engine (Piston)	10	11	10	11	13
Multi-Engine (Turboprop)	0	0	4	4	6
Business Jet	0	0	4	4	6
Helicopter	0	0	0	0	0
TOTAL	**82**	**91**	**102**	**113**	**128**

Sources: BARNARD DUNKELBERG & COMPANY.
Notes: Rounding differences may occur.
[1] Actual, as estimated by Rolla National Airport personnel.
[2] Includes single engine piston and turboprop operations.

ROLLA
NATIONAL AIRPORT MASTER PLAN

C
AIRPORT FACILITY REQUIREMENTS

Airport Facility Requirements

Introduction

To quantify an airport's future facility needs, it is necessary to translate the forecasted aviation activity into specific physical requirements. Therefore, this section addresses the actual types and quantities of facilities and/or the required improvements to existing facilities needed to safely and efficiently accommodate the projected demand that could be placed on the Airport. This chapter consists of two separate analyses: those requirements associated with airside facilities and those dealing with landside facilities.

This analysis uses the forecasts set forth in the preceding chapter for establishing future development of the Airport. This is not intended to dismiss the possibility that, due to the unique circumstances in the Rolla area, either accelerated growth or consistently higher or lower levels of activity may occur. Aviation activity levels should be monitored for consistency with the forecasts. In case of changes, the schedule of development should be adjusted to correspond to the demand for facilities rather than be set to predetermined dates of development. By doing this, over-building or under-building can be avoided.

Knowledge of the types of aircraft currently using, and those aircraft expected to use, Rolla National Airport provides information concerning the Airport Reference Code (ARC). Federal Aviation Administration (FAA) Advisory Circular 150/5300-13, *Airport Design*, provides guidelines for this determination. The ARC is based on the "Design Aircraft" that is judged the most critical aircraft using, or projected to use, the Airport. The ARC relates aircraft operational and physical characteristics to design criteria that are applied to various airport components. Under this methodology, safety margins are provided in the physical design of airport facilities.

There are two components in determining the appropriate ARC for an airport. The first component, depicted by a capital letter, is the Aircraft Approach Category and

relates to aircraft approach speed. The second component, depicted by a Roman numeral, is the Airplane Design Group (ADG) and relates to airplane wingspan.

Additionally, FAA criteria indicate that at least 500 annual operations by an aircraft or group of aircraft are required to include the Airport in the representative ARC. The following table provides some of the more common aircraft included in the different ARC categories.

Table C1
REPRESENTATIVE AIRCRAFT OF VARIOUS AIRPORT REFERENCE CODES
Rolla National Airport Master Plan

ARC	Common Aircraft
	Aircraft Weighing Less Than 12,500 Pounds
A-I	Beech Baron 55, Beech Bonanza, Cessna 172
B-I	Beech King Air 100, Cessna 421, Piper Navajo, Swearingen Metroliner, Cessna Citation I
B-II	Beech Super King Air 200, Cessna 441
	Aircraft Weighing More Than 12,500 Pounds
B-I	Falcon 10, Mitsubishi MU-300, Learjet 28/29
B-II	Beech 1900, Jetstream 31, Falcon 20/50/200/900, Cessna Citation II/III/IV/V, Saab 340
C-I	Learjet 24/25/55, IAI 1124 Westwind, Hawker 125-700
C-II	Gulfstream G-III, Canadair 601, Hawker 800
C-III	A-320, B-727, B-737, DC-9, MD-80
C-IV	A-310, B-757, B-767, L-1011, DC-10-10
D-I	Learjet 35/36
D-II	Gulfstream G-II/G-IV
D-IV	DC-10-30, DC-10-40, MD-11
D-V	B-747, B-777

Source: FAA Advisory Circular 150/5300-13, *Airport Design.*

Currently, there are a moderate number of itinerant multi-engine turboprop operations that occur at the Airport, including Beech King Airs (ARC B-I and B-II).

However, the vast majority of aircraft operations are conducted by piston and turbine-powered, single engine small aircraft (i.e., aircraft with max take-off weights less than 12,500 pounds) in ARC A-I or B-I. According to the existing Airport Layout Plan (ALP), Rolla National Airport is currently designated ARC B-II, a future designation of B-II, and a post planning consideration of an ultimate C-II designation. The appropriate designations will be evaluated in a later section of this chapter.

Airside Facility Requirements

This section presents the analysis of requirements for airside facilities necessary to meet the anticipated aviation demand at Rolla National Airport. For those components determined to be deficient, the type and size of the facility required to meet future demand are identified. Airside facilities examined include the runway, taxiways, runway protection zones, thresholds, and navigational aids.

Wind Coverage

Climatological conditions specific to the location of an airport not only influence the layout of the airfield, but also affect the use of the runway system. Surface wind conditions have a direct effect on the operation of an airport; runways not oriented to take the fullest advantage of prevailing winds will restrict the capacity of the Airport to varying degrees. When landing and taking off, aircraft are able to operate properly on a runway as long as the wind component perpendicular to the direction of travel (defined as a crosswind) is not excessive.

Ceiling and Visibility. FAA Advisory Circular 150/5060-5, *Airport Capacity and Delay*, describes three categories of ceiling and visibility minimums for use in both capacity and delay calculations. Visual Flight Rules (VFR) conditions occur whenever the cloud ceiling is at least 1,000 feet above ground level and the visibility is at least three statute miles. Instrument Flight Rules (IFR) conditions occur when the reported cloud ceiling is at least 500 feet, but less than 1,000 feet, and/or visibility is at least one statute mile, but less than three statute miles. Poor Visibility and Ceiling (PVC) conditions exist whenever the cloud ceiling is less than 500 feet and/or the visibility is less than one statute mile.

Meteorological data from the National Climatic Data Center has been used to tabulate information at Rolla National Airport in more specific terms:

- VFR conditions - Ceiling equal to or greater than 1,000 feet above ground level and visibility is equal to or greater than three statute miles. These conditions occur at the Airport approximately 89.4% of the time annually.

- VFR minimums to existing Runway 22 approach minimums (VOR Approach) - Ceiling less than 1,000 feet and/or visibility less than three statute miles, but ceiling equal to or greater than 400 feet and visibility equal to or greater than ¾-mile. These conditions occur at the Airport approximately 6.0% of the time annually.

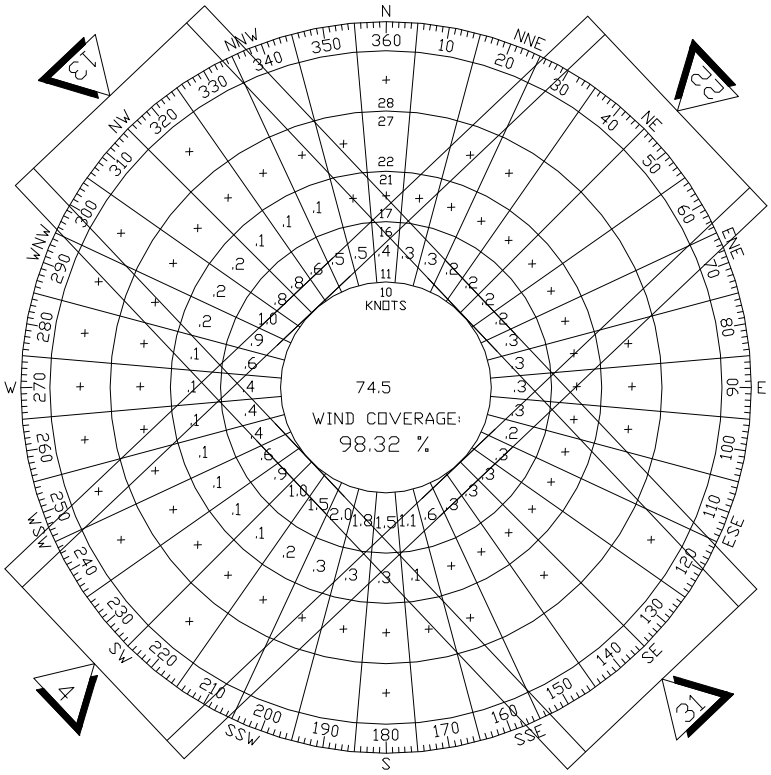
- Category I ILS minimums - Ceiling less than 1,000 feet and/or visibility less than three statute miles, but ceiling equal to or greater than 200 feet and/or visibility equal or greater than ½-statute mile. These conditions occur at the Airport approximately 8.9% of the time annually.

Wind Coverage. To determine wind velocity and direction at VIH, wind data to construct the all weather wind rose was obtained for the period January 1, 1996 – December 31, 2005 from observations taken at the Airport (from data gathered by the National Oceanic and Atmospheric Administration, National Climatic Data Center). The appropriate maximum crosswind component is dependent upon the Airport Reference Code for the type of aircraft that use the Airport on a regular basis. As previously identified, the current ARC for Runway 4/22 (the primary runway) is ARC B-II. The current ARC for Runway 13/31 is B-I.

According to FAA AC 150/5300-13, for ARC-A-I and B-I airports, a crosswind component of 10.5 knots is considered maximum. For ARC A-II and B-II airports, a crosswind component of 13 knots is considered maximum. For ARC A-III, B-III, and C-I through D-III airports, a crosswind component of 16 knots is considered maximum. Finally, for ARC A-IV through D-VI airports, a crosswind component of 20 knots is considered maximum.

In consideration of the Airport's ARC B-II classification, these standards specify that a maximum crosswind of 13 knots be considered in the analysis. In addition, it is known that the Airport will also continue to serve small single and twin-engine aircraft for which the 10.5-knot crosswind component is considered maximum; therefore, two crosswind components are important to be analyzed for the Airport (the 10.5-knot and the 13-knot). The following illustration, entitled *ALL WEATHER WIND ROSE*, illustrates the all weather wind coverage provided at Rolla National Airport.

Figure C1
ALL WEATHER WIND ROSE
Rolla National Airport Master Plan



Source: National Oceanic and Atmospheric Administration, National Climatic Data Center. Station 72445, Vichy/Rolla, Missouri. Period of Record: 1996 – 2005.

Table C2
ALL WEATHER WIND COVERAGE SUMMARY
Rolla National Airport Master Plan

Runway Designation	10.5-Knot Crosswind Component	13-Knot Crosswind Component
Runway 4	57.85%	60.67%
Runway 22	76.50%	80.89%
Runway 4/22	89.13%	94.42%
Runway 13	69.29%	74.02%
Runway 31	66.72%	69.80%
Runway 13/31	88.23%	93.36%
All Combined Runways	98.32%	99.58%

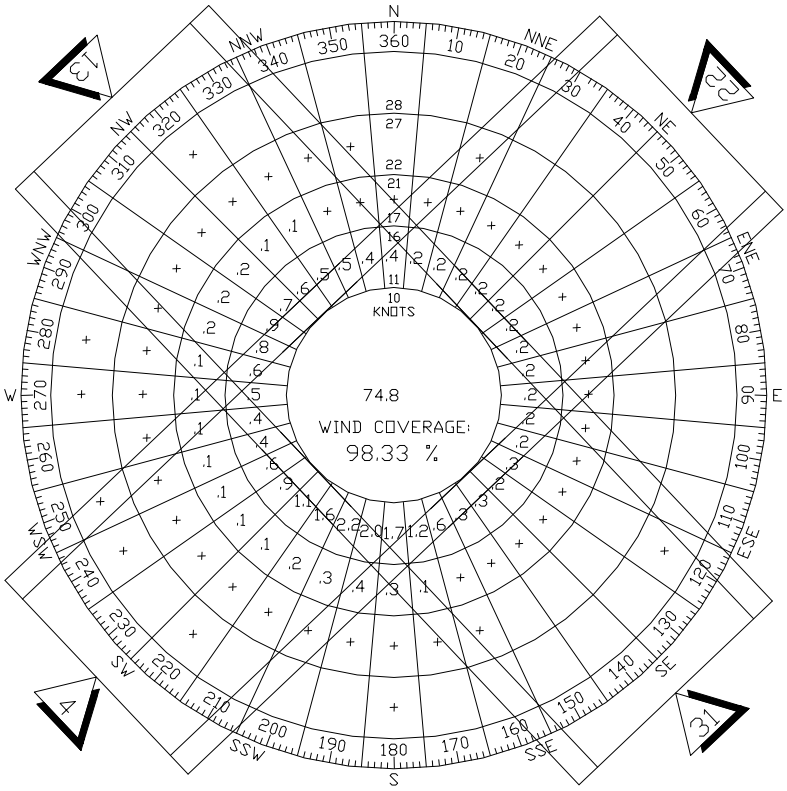
Sources: Wind analysis tabulation provided by BARNARD DUNKELBERG & COMPANY, utilizing FAA Airport Design Software supplied with AC 150/5300-13, *Airport Design*.

Data obtained from the National Oceanic and Atmospheric Administration,
National Climatic Data Center, Station 72445, Vichy/Rolla, Missouri.
Period of Record: 1996 – 2005.

The desirable wind coverage for an airport is 95%. This means that the runway should be oriented so that the maximum crosswind component does not exceed more than five percent of the time. Together, the two runways provide 98.32% wind coverage for the 10.5-knot crosswind component and 99.58% wind coverage for the 13-knot crosswind component. This analysis indicates that the existing runway configuration provides adequate wind coverage for the 10.5-knot and 13-knot crosswind components.

In an effort to analyze the need for and placement of improved instrument approaches, an Instrument Flight Rules (IFR) wind rose has been constructed and is presented in the following figure entitled *IFR WIND ROSE*. Again, wind data from Rolla National Airport have been used in the construction of the IFR wind rose.

Figure C2
IFR[1] WIND ROSE
Rolla National Airport Master Plan



Source: National Oceanic and Atmospheric Administration, National Climatic Data Center.
Station 72445, Vichy/Rolla, Missouri. Period of Record: 1996 – 2005.

The following table, entitled *IFR WIND COVERAGE SUMMARY*, quantifies the wind coverage offered by runways during IFR meteorological conditions.

Table C3
IFR WIND COVERAGE SUMMARY
Rolla National Airport Master Plan

Runway Designation	Wind Coverage Provided Under IFR Conditions[1] 5-Knot Tailwind to Maximum Headwind 10.5-Knot	13-Knot
Runway 4	55.95%	58.48%
Runway 22	78.71%	83.08%
Runway 4/22	89.59%	94.71%
Runway 13	70.24%	75.15%
Runway 31	66.01%	69.09%
Runway 13/31	87.95%	93.79%
Combined Runways	98.33%	99.59%

Sources: Wind analysis tabulation provided by BARNARD DUNKELBERG & COMPANY utilizing FAA Airport Design Software supplied with AC 150/5300-13, *Airport Design*.

Data obtained from the National Oceanic and Atmospheric Administration,
National Climatic Data Center, Station 72445, Vichy/Rolla, Missouri.
Period of Record: 1996 – 2005.

[1] Ceiling of less than 1,000 feet, but equal to or greater than 200 feet and/or visibility less than three miles.

Conclusion. This analysis shows that Runway 4/22 does not provide adequate wind coverage during all weather conditions. From the IFR wind coverage examination, it can be determined that, if a single existing runway is considered, Runway 22 provides the best wind coverage and should have the highest priority when an improved visibility minimum instrument approach is contemplated. However, examination will be given to the possibility of improving the approaches to both runway ends in the next chapter.

Dimensional Criteria

The FAA Advisory Circular 150/5300-13, *Airport Design*, recommends standard widths, minimum clearances, and other dimensional criteria for runways, taxiways, safety areas, aircraft parking areas, and other physical airport facilities. Dimensions are recommended with respect to the Airport Reference Code and the lowest designated or planned approach visibility minimums.

Existing dimensional standards associated with Rolla National Airport are contained in Table C4 entitled *RUNWAY 4/22 DIMENSIONAL STANDARDS, IN FEET* and Table C5, *RUNWAY 13/31 DIMENSIONAL STANDARDS, IN FEET*. Design standards for both runways are shown to provide information on the differing requirements dependent on applying either ARC B-I, B-II, or C-II.

Table C4
RUNWAY 4/22 DIMENSIONAL STANDARDS, IN FEET
Rolla National Airport Master Plan

Item	Existing Dimension	ARC B-II with ≥ ¾ Mile Visibility Minimums	ARC B-II with < ¾ Mile Visibility Minimums	ARC C-II
Runway:				
Width	100	75	100	100
Safety Area Width	150	150	300	500
Safety Area Length (beyond pavement end)				
Runway 4	300	300	600	1,000
Runway 22	300	300	600	1,000
Object Free Area Width	500	500	800	800
Object Free Area Length (beyond pavement end)				
Runway 4	300	300	600	1,000
Runway 22	300	300	600	1,000
Obstacle Free Zone Width	400	400	400	400
Obstacle Free Zone Length (beyond pavement end)				
Runway 4	200	200	200	200
Runway 22	200	200	200	200
Taxiway:				
Width	N.D.	35	35	35
Safety Area Width	N.D.	79	79	79
Object Free Area Width	N.D.	131	131	131
Runway Centerline to:				
Holding Position Markings[1]	N.D.	200	250[2]	250[2]
Parallel Taxiway Centerline	524	240	300	400
Aircraft Parking Area	700	250	400	500

Sources: FAA Advisory Circular 150/5300-13, *Airport Design*.
[1] FAA Advisory Circular 150/5340-1H, *Standards for Airport Markings*.
[2] For precision/GPS precision runways.
Notes:
N.D. – Not designated in current planning information.
Current runway dimensions are based on visibility minimums greater than or equal to ¾-mile. Design separation criteria, changes significantly for minimums less than ¾-mile.

Table C5
RUNWAY 13/31 DIMENSIONAL STANDARDS, IN FEET
Rolla National Airport Master Plan

Item	Existing Dimension	ARC B-I	ARC B-II
Runway:			
Width	100	60	75
Safety Area Width	120	120	150
Safety Area Length (beyond pavement end)			
Runway 13	240	240	300
Runway 31	240	240	300
Object Free Area Width	400	400	500
Object Free Area Length (beyond pavement end)			
Runway 13	240	240	300
Runway 31	240	240	300
Obstacle Free Zone Width	400	400	400
Obstacle Free Zone Length (beyond pavement end)			
Runway 4	200	200	200
Runway 22	200	200	200
Taxiway:			
Width	N.D.	25	35
Safety Area Width	N.D.	49	79
Object Free Area Width	N.D.	89	131
Runway Centerline to:			
Holding Position Markings[1]	N.D.	200	200
Parallel Taxiway Centerline	N.A.	225	240
Aircraft Parking Area	600	200	250

Sources: FAA Advisory Circular 150/5300-13, *Airport Design*.
[1] FAA Advisory Circular 150/5340-1H, *Standards for Airport Markings*.

Notes:
N.D. – Not designated in current planning information.
N.A. – Not applicable.
Dimensions are based on visual approach minimums only. Design separation criteria changes significantly for minimums not lower-than one mile.

Conclusion. In consideration of the existing and forecast aircraft operational fleet and the existing physical layout of the Airport, ARC B-II is the appropriate existing designation for the Airport (ARC B-II is used for the primary runway, Runway 4/22,

and ARC B-I is used for the secondary runway, Runway 13/31). Should the Airport have the demand and the necessary amount of annual aircraft operations in the future, an upgrade to ARC C-II for Runway 4/22 for the ultimate (post planning period) runway configuration should be protected for. Although critical aircraft operations may fall short of the required 500 annual operations, it is not unusual, but it is anticipated in order to provide sufficient traffic to warrant the ultimate C-II upgrade.

Runway Pavement Strength

Runway 4/22 can currently support aircraft with a gross weight of 75,000 pounds single wheel, 85,000 pounds dual wheel, and 130,000 pounds dual tandem wheel main landing gear configurations. Runway 13/31 can currently support aircraft with a gross weight of 48,000 pounds single wheel, 62,000 pounds dual wheel, and 92,000 pounds dual tandem wheel main landing gear configurations. Existing planning information indicates that this runway strength is adequate throughout the planning period.

Conclusion. The existing pavement strength is considered adequate to accommodate the forecast aircraft fleet for the duration of the planning period. Additionally, pavement maintenance and rehabilitation will be required throughout the course of the planning period.

Runway Line-of-Sight

According to runway line-of-sight standards, any two points located five feet above the runway centerline must be mutually visible for the entire length of the runway. If the runway has a full-length parallel taxiway, the visibility requirement is reduced to a distance of one-half the runway length. Rolla National Airport complies with the runway line-of-sight standards for the entire length of the runway.

Conclusion. Since the line-of-sight standards are met for both existing runways, no additional analysis is required. These standards will need to be revisited with any proposed improvements to the runway system.

Runway Length

Generally, runway length requirements for design purposes at an airport like Rolla National Airport are premised upon the category of aircraft using the Airport. The categories are small aircraft under 12,500 pounds maximum take-off weight and large aircraft under 60,000 pounds maximum take-off weight.

Runway length requirements are generally derived from the computer based FAA Airport Design Software supplied in conjunction with Advisory Circular (AC) 150/5300-13, *Airport Design*. Using this software, three values are entered into the computer, including the airport elevation of 1,148 feet Above Mean Sea Level (AMSL), the Mean Normal Maximum Temperature (NMT) of 88° Fahrenheit, and the maximum difference in runway elevation at the centerline of 27.9 feet (Runway 4/22). This data generates the general recommendations for runway length requirements at Rolla National Airport, which are provided in the following table entitled *RUNWAY LENGTH REQUIREMENTS*.

Table C6
RUNWAY LENGTH REQUIREMENTS
Rolla National Airport Master Plan

Aircraft Category	**Runway Take-off Length (Feet)**	
	Wet	**Dry**
Aircraft Less Than 12,500 Pounds With Less Than 10 Seats		
75% of Small Aircraft Fleet	2,880	2,880
95% of Small Aircraft Fleet	3,420	3,420
100% of Small Aircraft Fleet	4,040	4,040
Aircraft Less Than 12,500 lbs. With 10 or More Seats	4,450	4,450
Aircraft Greater Than 12,500 Pounds But Less Than 60,000 Pounds		
75% of fleet at 60% useful load	5,500	5,110
75% of fleet at 90% useful load	7,000	6,940
100% of fleet at 60% useful load	5,950	5,950
100% of fleet at 90% useful load	8,880	8,880
Aircraft of More than 60,000 Pounds	5,420	5,420

Source: FAA Advisory Circular 150/5300-13, *Airport Design*.
Lengths based on 1,148' AMSL, 88° F NMT and a maximum difference in runway centerline elevation of 27.9' for Runway 4/22.

As shown in the table, there are nine different runway lengths listed. The first four rows in the table pertain to those general aviation aircraft having a maximum certificated take-off weight of 12,500 pounds or less. The next four rows concern the runway length requirements of the general aviation aircraft fleet weighing more than 12,500 pounds, but less than 60,000 pounds. Each of the runway lengths given for large aircraft under 60,000 pounds maximum certificated take-off weight provides a runway sufficient to satisfy the operational requirements of a certain percentage of the aircraft fleet at a certain percentage of the useful load. Useful load is defined as the difference between the maximum take-off weight and the operating weight empty. In other words, it is the load that can be carried by the aircraft composed of passengers, fuel, and cargo. Generally, the following aircraft comprise 75% of the general aviation aircraft fleet between 12,500 and 60,000 pounds: Learjets, Sabreliners, Citations, Challengers, Falcons, Hawkers, and Westwinds.

The last row of the preceding table consists of runway lengths specific to certain large aircraft weighing more than 60,000 pounds. It should be mentioned that the runway lengths assume aircraft operating at maximum take-off weight (i.e., 100% useful load). Runway lengths are normally based on aircraft operating at 60% useful load, which is usually 70% to 80% of that required for 100% useful load.

It should be noted that, when analyzing the generalized runway length requirements given in the above table, the actual length necessary for a runway is a function of elevation, temperature, and aircraft stage length. As temperatures change on a daily basis, the runway length requirements change accordingly (i.e., the cooler the temperature, the shorter the runway necessary). Therefore, if a runway is designed to accommodate a certain aircraft under all conditions, it can also accommodate a larger aircraft (or one that requires a longer runway) when temperatures are cooler or when a shorter stage length is required. However, the amount of time such operations can safely occur is limited.

The data presented in the table above indicate that Runway 4/22, with a length of 5,500 feet, can accommodate 75% of the aircraft fleet weighing more than 12,500 pounds and less than 60,000 pounds at 60% useful load during wet conditions, and can accommodate many large aircraft weighing more than 60,000 pounds during wet or dry conditions. A minimum runway extension of approximately 1,440 feet is required to accommodate 75% of the large aircraft fleet weighing 60,000 pounds or less at 90% useful load (during dry conditions) and a runway extension of approximately 450 feet is required to accommodate 100% of this same aircraft fleet at 60% useful load.

When considering business jet aircraft likely to operate at Rolla National Airport (i.e., Cessna Citation V, VII, EXCEL, and Learjet 35), the length of Runway 4/22 is

adequate to handle these aircraft; therefore, a runway extension is not strongly indicated based upon the future air traffic forecasts for the Airport.

Conclusion. In consideration of the category of aircraft that regularly operate, or are expected to regularly operate during the forecast period at the Airport, under most conditions, an examination of extending the main runway would not be considered.

Taxiways

Taxiways are constructed primarily to enable the movement of aircraft between the various functional areas on the Airport and the runway system. Some taxiways are necessary simply to provide access between aircraft parking aprons and runways; whereas, other taxiways become necessary to provide more efficient and safer use of the airfield.

The taxiway system configuration at Rolla National Airport is considered inadequate and improvements are needed. The provision of a parallel taxiway would eliminate the dangerous practice of back-taxiing on the runway and increase the capacity of the airfield system. Additionally, providing exit taxiways at appropriate locations will further improve safety, increase capacity, and enhance instrument operations.

Conclusion. An improved taxiway system that reduces runway occupancy times, eliminates back-taxiing on runways, and improves safety conditions will be a major component of this study. Therefore, the provision of a parallel taxiway, and adequate exit taxiways, is recommended. The guidelines contained in FAA AC 150/5300-13 will be followed to ensure that exit taxiways are provided at the appropriate locations.

Runway Protection Zones (RPZs)

The function of the Runway Protection Zone (RPZ) is to enhance the protection of people and property on the ground beyond the end of runways. This is achieved through airport control of the RPZ areas. The RPZ is trapezoidal in shape, centered about the extended runway centerline, and begins 200 feet beyond the end of the area usable for take-off or landing. The RPZ dimensions are functions of the type of aircraft and approach visibility minimums associated with each runway end.

As noted earlier, the Airport is not currently served with a precision instrument approach to the Airport. The following table, entitled *RUNWAY PROTECTION ZONE DIMENSIONS, IN FEET*, lists the existing RPZ dimensions in addition to the requirements for improved approach capabilities. The existing RPZs for Runways 4, 13, and 31 extend beyond airport property.

Table C7
RUNWAY PROTECTION ZONE DIMENSIONS, IN FEET
Rolla National Airport Master Plan

Item	Width at Runway End	Length	Width at Outer End
Existing RPZ Dimensions:			
Runway 4	500	1,000	700
Runway 22	1,000	1,700	1,510
Runway 13	500	1,000	700
Runway 31	500	1,000	700
Required RPZ Dimensions for Various Visibility Minimums:			
Visual and not lower than one mile, Small Aircraft Exclusively	250	1,000	450
Visual and not lower than one mile, Approach Categories A & B	500	1,000	700
Visual and not lower than one mile, Approach Categories C & D	500	1,700	1,010
Not lower than ¾ -mile, all aircraft	1,000	1,700	1,510
Lower than ¾ -mile, all aircraft	1,000	2,500	1,750

Source: FAA Advisory Circular 150/5300-13, *Airport Design*.

Conclusion. Based on the existing and projected aircraft fleet, the possibility of upgrading ARCs, and the likely potential for improved visibility minimum approaches, the existing RPZs appear deficient for the duration of the planning period. Various options for acquiring future control of those portions of the RPZs that extend beyond airport property will be examined in later sections of this study.

Threshold Siting

Guidelines contained in FAA AC 150/5300-13 provide criteria for the proper siting of runway thresholds regarding obstacle clearance. Like the RPZ criteria, the threshold siting criteria are based on the type of aircraft and approach visibility minimums associated with each runway end. Based on the existing criteria applicable to each runway end (i.e., straight in for Runway 4/22 and visual approaches), the existing surfaces to the Runway 4 and 22 ends do *not* provide adequate clearance. The approach end of Runway 4 has two threshold siting surface penetrations (trees), with the tallest tree penetrating the surface by 5.9 feet, as well as a third tree located just

under the siting surface. The approach end of Runway 22 has one tree penetrating the threshold siting surface by nearly 21 feet and a guide post penetrating by approximately 22 feet. Additionally, the Runway 22 approach end also has terrain penetrations associated with the scheduled lighting or maintenance projects that are scheduled for immediate removal. There are no threshold siting surface penetrations to either Runway 13 or Runway 31. These considerations will be a focus of discussion in the following chapter.

Conclusion. Based on this analysis, the threshold siting surfaces for Runways 4 and 22 do not have adequate obstruction clearance. Steps to rectify these deficiencies will be examined and improvements will be recommended in following chapters of this document. The requirements will be re-examined in conjunction with any future improvements or changes to the airfield or approach visibility minimums.

Instrumentation and Lighting

Airport navigational aids, including instrument approaches and associated equipment, airport lighting, and weather/airspace services, were detailed in the *Airport Inventory* chapter of this document. The Airport is currently equipped with a Global Positioning System (GPS) overlay instrument approach to Runway 4, and a Very High Frequency Omni Directional Range (VOR) instrument approach to Runways 4 and 22. Runway 13/31 currently does not have any instrument approach capabilities. Runway 4/22 has a four-light Visual Approach Slope Indicator (VASI) lighting system in addition to High Intensity Runway Lights (HIRL) and threshold lights at both runway ends. Because Rolla National Airport was a former military airbase, Runway 4/22 was originally 150 feet wide. Nonstandard HIRLs[1] were installed to remedy the 25 feet of abandoned pavement on each side of the runway. Runway 13/31 is equipped with Medium Intensity Runway Lights (MIRL) and has threshold lights at both runway ends. Runway 22 also has Runway End Identifier Lights (REILs).

The potential for providing improved instrument approaches at airports throughout the country at a reduced cost is increased with the continued development of GPS technology. In fact, GPS approaches are expected to be the FAA's standard approach technology in the future. Based on the availability of GPS approaches, the Airport should evaluate methods to accommodate improved instrument approach capabilities in consideration of the physical and airspace environments.

Appendix 16 of FAA AC 150/5300-13, *Airport Design*, recommends, but does not require, the installation of an approach lighting system, such as: Medium Intensity

[1] The nonstandard HIRLs were replaced with standard HIRLs in 2008.

Approach Lighting System with Runway Alignment Indicator Lights (MALSR), a Medium Intensity Approach Lighting System with Sequenced Flashers (MALSF), or an Omnidirectional Approach Lighting System (ODALS) for runways with instrument approaches of not-lower-than one mile visibility minimums. Currently, there is an existing ODALS installed off the Runway 22 end. Enhancing instrument approach capabilities by implementing a Category I Instrument Landing System (ILS) approach to Runway 22 would require the installation of a 2,400-foot MALSR.

Conclusion. Because of the expected increased use of sophisticated business and corporate aircraft at Rolla National Airport, and to increase safety and operational use of the Airport during adverse weather conditions, the ability to implement improved instrument approaches should be considered. For increased safety purposes, Runway End Identifier Lights (REILS) and Precision Approach Path Indicator (PAPI) lights should be programmed for installation at both runway ends for Runway 4/22 and Runway 13/31.

Landside Facility Requirements

Landside facilities are those facilities that support the airside facilities, but are not actually part of the aircraft operating surfaces. These consist of such facilities as aprons, storage hangars, Fixed Base Operators (FBOs), fuel storage facilities, access roads, and terminal buildings. Following an analysis of these existing facilities, current deficiencies can be noted in terms of accommodating both existing and future needs.

Aircraft Storage

Aircraft at Rolla National Airport are currently stored in eight individual hangars. Currently, there are 82 aircraft based at the Airport. During the 20-year planning period, the number of based aircraft is forecast to increase to 128, indicating that an increase in storage facilities to accommodate approximately 46 new aircraft will be required. It is assumed that future storage spaces will reflect the characteristics of current storage patterns.

Based Aircraft Apron. Aircraft tiedowns are provided for those aircraft that do not require, or do not desire to pay the cost for, hangar storage. Space calculations for these areas are based on 360 square yards of apron for each aircraft to be tied down. This amount of space allows for aircraft parking and circulation between the rows of parked aircraft. Trends indicate that, as more aircraft are based at an airport, hangar storage capacity is surpassed before additional hangar spaces are supplied.

Itinerant Aircraft Apron. In addition to the needs of the based aircraft tiedown areas, transient aircraft also require apron parking areas at Rolla National Airport. This storage is provided in the form of transient aircraft tiedown space. In calculating the area requirements for these tiedowns, an area of 400 square yards per aircraft is used. There are a couple of reasons this area is larger than the area required for based aircraft. First, the users of the transient tiedown spaces will not be as familiar with the layout and circulation patterns as based aircraft and additional maneuvering room is essential. Secondly, whereas typically smaller, single engine based aircraft use tiedowns as storage, all types of transient aircraft use tiedowns, making it necessary to provide additional space for the larger aircraft. The development plan for the Airport will designate adequate areas for apron development to satisfy this demand.

Hangars. As stated previously, it is assumed that future storage patterns will reflect the existing characteristics. With that assumption, it is anticipated that additional hangar spaces will be required during the course of the planning period.

Conclusion. The accompanying table, entitled *GENERAL AVIATION STORAGE REQUIREMENTS, 2005-2025*, depicts the type of storage facilities and the number of units or acres needed for that facility in order to meet the forecast demand for each development phase. The actual type of hangar storage facility to accommodate based aircraft has been identified as corporate and T-hangar. It is recognized that large maintenance/FBO hangars will accommodate some of the aircraft storage demand; although, the actual number, size, and location of these large hangars will depend on user needs and financial feasibility. Therefore, the quantities of these types of hangars have not been projected; however, potential development sites will be identified in the *Airport Plans* chapter of this document.

Table C8
GENERAL AVIATION STORAGE REQUIREMENTS, 2005-2025
Rolla National Airport Master Plan

Facility	2005[1]	2010	2015	2020	2025
Itinerant Apron (acres)	---	1.8	1.9	2.1	2.3
Based Aircraft Apron (acres)	---	0.3	0.3	0.4	0.4
Total Apron (acres)	1.8	2.1	2.2	2.5	2.7
Hangar Spaces (no./acres)	79/15.9	87/17.5	98/19.7	108/21.7	123/22.1

Sources: BARNARD DUNKELBERG & COMPANY and TransSystems projections based on FAA AC 150/5300-13 *Airport Design.*
--- Data not available.
[1]Actual. Apron at Rolla National Airport not designated for either itinerant or based aircraft.

Vehicular Access and Parking

Access roadways, auto parking requirements, and the accompanying land requirements are not included in the analysis presented in the previous table because the amount of land necessary for these facilities will be a function of the location of other facilities, as well as the most effective routing of roadways.

Support Facilities Requirements

In addition to the aircraft storage facilities described above, there are several support facilities that have quantifiable requirements and are vital to the efficient and safe operation of the Airport.

Fuel Storage Facility. Aviation fuel is presently stored in two underground tanks located west of the main apron. Capacity of this facility consists of a 12,000-gallon 100LL AVGAS storage tank and a 15,000-gallon Jet A storage tank. The fuel storage capacity at the Airport is considered adequate for the existing demand. However, demand for fuel storage capacity will increase over time as operations and based aircraft increase. Thus, in the near-term, the most likely significant fuel demand will be Jet A, as more and more turbine powered aircraft begin to use the Airport on a regular basis. It is anticipated that the current facilities are adequate to meet the fueling demand throughout the forecast period[2].

[2] The demand for additional jet fuel storage could potentially be accelerated by the needs of Baron Aviation.

Summary

Although many of the existing airport facilities are adequate to serve through the end of the 20-year planning period, others will need improvement to accommodate the existing and future aviation demand, and to provide a safe and efficient aircraft operating environment. The facility requirements detailed in this chapter will be used to evaluate the Airport and provide the basis for the Master Plan recommendations. The following list summarizes the important development issues facing the Airport:

- Improved taxiway system.
- Examination of improved instrument approach capabilities.
- Provision of general aviation hangar development areas.
- Provision of landside development areas.
- Examination of rectifying the deficient threshold siting surface requirements.

ROLLA
NATIONAL AIRPORT MASTER PLAN

D
AIRPORT DEVELOPMENT PLAN & PROGRAM

Airport Development Plan and Program

Introduction

This chapter provides a description of the various factors and influences that will form the basis for the ultimate development plan and program for Rolla National Airport. Its purpose is to present the development plan in terms of both its concept and reasoning. In concert with the status of the Airport, some basic assumptions and goals have been established that are intended to direct future airport development. The aviation activity forecasts and the various considerations on which the forecasts have been based support these assumptions and goals. The assumptions also focus on continued airport development, in response to community needs and economic growth stimulation.

Assumption One. This assumption focuses on the need to accommodate and attract private and business aviation activity. The importance of Rolla National Airport to the local and regional business community is to be emphasized.

Assumption Two. The second assumption states that the Airport should be designed to the proper dimensional standards to accommodate the forecasted aircraft fleet. As described in previous chapters, the projected aircraft activity levels indicate that the appropriate existing Airport Reference Code (ARC) for Rolla National Airport is B-II. However, as previously mentioned in the *Airport Facility Requirements* chapter, the ultimate (post planning period) configuration and ARC designation is C-II.

Assumption Three. This assumption relates to the need for the Airport to accommodate aircraft operations with greater reliability. This indicates that the runway system should be supplied with adequate runway length and approach guidance facilities to accommodate the expected increase in business/corporate aircraft.

Assumption Four. This assumption relates to the requirement that the Airport is to be developed to complement and enhance on-airport and off-airport regional economic development activities.

Assumption Five. The fifth assumption centers on the relationship of the Airport facility to the environment and off-airport land uses. The Airport should develop in such a fashion that is compatible and complementary to the surrounding land uses, and strive to minimize the adverse impacts on the natural environment to the extent possible.

In conjunction with the above assumptions, several development goals have been established for purposes of directing this plan and its content, and establishing continuity for future airport development. These goals account for several considerations relating to both short-term and long-term needs of the Airport, including safety, efficiency, noise, capital improvements, land use compatibility, financial conditions, public interest and investment, and community awareness. While all are project oriented, some obviously represent more tangible activities than do others. However, all are deemed important and appropriate to the future of the Airport.

- Provide effective direction for the future development of Rolla National Airport through the preparation of a rational and feasible plan and program.
- Accommodate the aviation forecasts in a safe and efficient manner by providing the necessary airport facilities and services.
- Identify the best uses for landside development areas so facilities can be readily constructed when demand is realized (construction is to be driven by actual demand, not forecast demand or a timeline).
- Encourage and protect the public and private investment of land and facilities.
- Enhance the self-sustaining capability of the Airport and ensure the financial feasibility of airport development.
- Plan and develop the Airport to be compatible with the surrounding land uses and minimize the environmental impacts.
- Plan and develop the Airport to be capable of accommodating the future needs and requirements of the City of Rolla, Phelps and Maries Counties, and the surrounding region.

Airside Development Concepts, Alternatives, and Recommendations

Introduction

Because all other functions relate to, and revolve around, the basic runway layout, runway system development alternatives must first be carefully examined and evaluated. Specific considerations include runway length, approach criteria, dimensional standards, and the provision that the demonstrated and expected uses, facilities, and activities can be accommodated through the planning period. The primary objective of the alternatives analysis is to examine the options that will result in an improved aircraft operating environment.

Runway/Taxiway System

As stated in the introductory assumptions, the main and crosswind runways with lengths of 5,500 feet and widths of 100 feet are adequate to accommodate the existing and forecast aircraft fleet[1]. Changes in regards to the runway/taxiway system layout will be analyzed, including the ultimate ARC C-II configuration for Runway 4/22.

Instrument Approach Capabilities. Because, in the following years, Global Positioning System (GPS) technology is expected to offer the potential for relatively low cost instrument approach capabilities, the ramifications and requirements of providing approaches to Rolla National Airport are critical.

Design Standards. Maintaining current standards and planning for the appropriate future design standards are high priorities in the alternatives analysis process. Currently, Runway 4/22 meets ARC B-II standards and Runway 13/31 meets ARC B-I standards. Based on the wind analysis discussed in the *Airport Facility Requirements* chapter, Runway 4/22 provides 89.13% wind coverage for a 10.5-knot crosswind component, which is well below the 95% desirable wind coverage for ARC B-II aircraft; however, with the combined coverage of both the primary and the crosswind runways, the 10.5-knot crosswind component coverage is 98.32%.

Additionally, the pavement strengths for Runway 4/22 (75,000 pounds single wheel, 85,000 pounds dual wheel, and 130,000 pounds dual tandem wheel main landing gear configuration) and Runway 13/31 (48,000 pounds single wheel, 62,000 pounds dual wheel, and 92,000 pounds dual tandem wheel main landing gear configuration) are adequate to handle ARC B-II aircraft.

[1] Runway 4 is currently displaced by 213 feet.

Resolving any design standard deficiencies, maintaining current standards, and planning for the appropriate future design standards are high priorities in the alternatives analysis process.

Alternative One

This alternative involves retaining the existing runway lengths of 5,500 feet for both Runway 4/22 and Runway 13/31. In addition, a full-length parallel taxiway will be programmed for the north side of the crosswind runway, and taxiway extensions to both thresholds of Runway 4/22. This alternative, illustrated in the following figure entitled *ALTERNATIVE ONE*, recommends maintaining an instrument approach of not-lower-than ¾-mile visibility minimums to Runway 22 and an instrument approach of not-lower-than one mile visibility minimums to Runway 4.

Main Runway System. By retaining the existing runway length of 5,500 feet, this alternative will accommodate 75% at 60% useful load of aircraft greater than 12,500 pounds but less than 60,000 pounds, in addition to most large business aircraft. Alternative One also provides for removing the nonstandard taxiway at the Runway 4 end and constructing a partial parallel taxiway to the Runway 4 threshold. This partial parallel taxiway will be 35 feet wide, as required by FAA planning standards for Airplane Design Group (ADG) II, and will be located 650 feet west of the runway centerline to connect with the existing Southwest Taxiway. Additionally, Alternative One provides for the extension of the existing partial parallel taxiway (Northeast Taxiway) to the Runway 22 threshold. This taxiway will be 35 feet wide, located 525 feet west of the runway centerline.

Crosswind Runway System. By retaining the existing runway length of 5,500 feet, this alternative will accommodate 75% at 60% useful load of aircraft greater than 12,500 pounds but less than 60,000 pounds, in addition to most large business aircraft. Alternative One also provides for the construction of a full-length parallel taxiway located north of Runway 13/31. This taxiway would be located 225 feet north of the runway and will be 25 feet wide, as required by FAA planning standards for ARC B-I runways.

Approaches. This alternative implements a visibility minimum of not-lower-than one mile approach to Runway 4, a visibility minimum of not-lower-than ¾-mile non-precision instrument approach to Runway 22, and visual approaches to both ends of Runway 13/31. Appendix 16 of FAA AC 150/5300-13, *Airport Design*, recommends, but does not require, the installation of an approach lighting system, such as Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR), a Medium Intensity Approach Lighting System with Sequenced Flashers (MALSF), or an Omnidirectional Approach Lighting System (ODALS) for runways

with instrument approaches of not-lower-than one mile visibility minimums. Currently, there is an existing ODALS installed off the Runway 22 end.

Alternative One recommends maintaining the existing ODALS or installing an MALSF to Runway 22, which includes the installation of Runway End Identifier Lights (REILs). Except for Runway 22, the Runway Protection Zones (RPZs) associated with these approaches extend onto undeveloped land northwest, southwest, and southeast of the Airport. The Airport should have ownership interest in the RPZs to the extent required to control land use and height of objects. The ownership can be in fee simple or easement.

Design Standards. There currently are no safety deficiencies associated with this alternative, as both the Runway Safety Area (RSA) and the Runway Object Free Area (ROFA) are contained within airport property.

FAR Part 77, Objects Affecting Airspace. Surveying of the Federal Aviation Regulation (FAR) *Part 77* imaginary surfaces, which was conducted as part of the associated obstruction survey for this Master Plan, indicates that a road (U.S. Highway 63) and five trees penetrate the *Part 77* surface off the Runway 4 approach end. Additionally, a guide post, high terrain[2], and two trees off the Runway 22 approach end penetrate the *Part 77* surface. The *Part 77* surface to the approach end of Runway 13 is penetrated by a road (Missouri State Route 28) and a tree, and the *Part 77* surface to the approach end of Runway 31 is also penetrated by a road (Missouri State Route 68). All of these obstructions will be analyzed further, and appropriate action will be recommended, in consideration of future programmed instrument approach capabilities. The potential obstructions may well require removal before improved instrument capabilities are implemented.

Threshold Siting. Guidelines contained in FAA AC 150/5300-13 provide criteria for the proper siting of runway thresholds regarding obstacle clearance. Like the RPZ criteria, the threshold siting criteria are based on the type of aircraft and approach visibility minimums associated with each runway end. Based on the existing criteria applicable to each runway end (i.e., straight in for Runway 4/22 and visual approaches), the existing surfaces to the Runways 4 and 22 ends do *not* provide adequate clearance. The approach end of Runway 4 has two threshold siting surface penetrations (trees), with the tallest tree penetrating the surface by 5.9 feet, as well as a third tree located just under the siting surface. The approach end of Runway 22 has one tree penetrating the threshold siting surface by nearly 21 feet and a guide post penetrating by approximately 22 feet. Additionally, the Runway 22 approach

[2] The high terrain located off the Runway 22 threshold is a result of a storage pile created for a cut-and-fill project. The storage pile will be removed in conjunction with the Runway 4/22 relighting project.

end also has terrain penetrations associated with current lighting or maintenance projects that are scheduled for immediate removal. There are no threshold siting surface penetrations to either Runway 13 or Runway 31. The potential obstructions may well require removal before instrument capabilities are implemented or improved.

Property Acquisition. Approximately 35 acres of property acquisition are suggested for obtaining ownership of land located within the RPZs for Runways 4, 13, and 31 for land use control purposes. If owning the land in fee simple within the RPZs is unachievable, at a minimum, the Airport should continue maintaining the existing easements and obtain additional easements as necessary that provide the ability to control height of objects, right of overflight, and land use.

Development Costs. Major cost items and approximate values associated with this alternative include:

- Acquisition of approximately 35 acres of land in fee simple or easement.
- Construction of a full-length parallel taxiway, 25 feet wide.
- Construction of partial parallel taxiways, 35 feet wide.
- Removal or relocation of obstructions hindering navigation and penetrating future *Part 77* and threshold surface siting approach surfaces, including vegetation.

Conclusion. Alternative One provides for meeting FAA design standards for the existing and future types of aircraft that regularly operate and are anticipated to operate at the Airport.

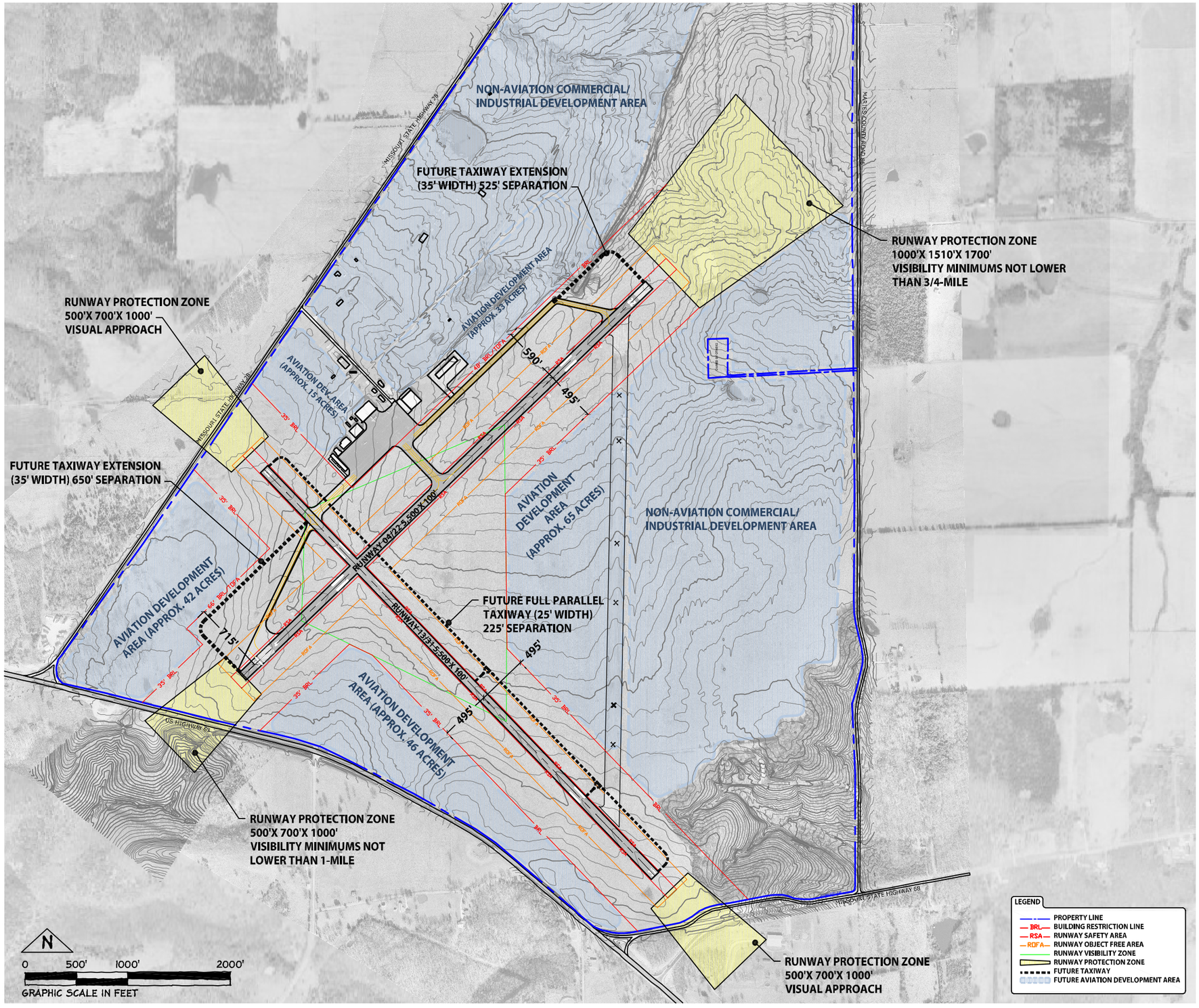


Figure D1 Alternative One

ROLLA
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Barnard Dunkelberg & Company

TULSA
1616 East 15th Street
Tulsa, Oklahoma 74120
918.585.8844

DENVER
1743 Wazee Street, Suite 400
Denver, Colorado 80202
303.825.8844

Alternative Two

Alternative Two involves retaining the existing runway lengths of 5,500 feet for both Runway 4/22 and Runway 13/31. In addition, a full-length parallel taxiway will be programmed for the west side of the main runway, as well as a full-length parallel taxiway for the south side of the crosswind runway. This alternative, illustrated in the following figure entitled *ALTERNATIVE TWO*, recommends maintaining an instrument approach of not-lower-than one mile visibility minimums to Runway 4 and a Category I instrument approach with visibility minimums of lower-than ½-mile to Runway 22.

Main Runway System. By retaining the existing runway length of 5,500 feet, this alternative will accommodate 75% at 60% useful load of aircraft greater than 12,500 pounds but less than 60,000 pounds, in addition to most large business aircraft. This alternative provides for extending the Runway 22 threshold 690 feet to the north, and shifting the Runway 4 threshold 477 feet from the existing displaced threshold end (currently displaced 213 feet) to meet the increase in the Runway Object Free Area (ROFA) width for ARC C-II runway design standard minimums, as well as retain the full existing runway length of 5,500 feet. Alternative Two also provides for removing the nonstandard taxiways at the thresholds for Runways 4 and 22, removing the unused 690 feet of pavement behind the relocated Runway 4 end, and constructing a full-length parallel taxiway to the west of Runway 4/22. This parallel taxiway will be located 400 feet west of the runway centerline and will be 35 feet wide, as required by FAA planning standards for ARC C-II airports with runway approach visibility minimums lower-than ¾-mile.

As noted in previous chapters, the Runway Safety Area and the Runway Object Free Area on the southern end of this runway are impacted to some degree by the U.S. Highway 63. It is recommended that this non-standard condition be remedied through the use of declared distances. FAA Airport Design Advisory Circular 150/5300-13, *Airport Design*, describes the use of declared distances for applications such as *"existing constrained airports where it is impracticable to provide the runway safety area (RSA), the runway object free area (ROFA) or the runway protection zone (RPZ) in accordance with the design standards"* for airport geometry and runway design.

The Advisory Circular further states, *"by treating the airplane's runway performance distances independently, provides an alternative airport design methodology by declaring distances to satisfy the airplane's takeoff run, takeoff distance, accelerate-stop distance, and landing distance requirements. The declared distances are takeoff run available (TORA), takeoff distance available (TODA), accelerate-stop distance available (ASDA), and landing distance available (LDA)."*

The effect of using declared distances to resolve the non-standard conditions on the south end of Runway 4/22 is minimized because the threshold is already displaced to allow for proper approach clearance over objects. However, implementing a Category I Instrument Landing System (ILS) with visibility minimums of lower-than ½-mile, the ROFA to Runway 4 is impacted by U.S. Highway 63. Shifting the Runway 4 threshold 477 feet to the north (from the existing displaced threshold), and extending Runway 22 by 690 feet to the north would remedy this deficiency, as well as retain the existing 5,500 feet of existing useable runway length[3] for Runway 4's ASDA and LDA. The Missouri Department of Transportation (MoDOT) Aviation Section does not recommend using declared distances if the runway has been justified for ARC C-II.

The following table, entitled *ALTERNATIVE TWO – RUNWAY 4/22 DECLARED DISTANCES*, summarizes the existing and proposed future declared distance runway lengths for the various runway use considerations. The numbers that will change in the future with the use of declared distances are highlighted with a **bold font**. The future configuration for Runway 4/22 is illustrated at the end of this section in Figure D1, which is entitled *RECOMMENDED AIRSIDE DEVELOPMENT PLAN*. As can be noted in the review of the table and the illustration, the physical and operational changes attributable to the use of declared distances are minimal.

Table D1
ALTERNATIVE TWO – RUNWAY 4/22 DECLARED DISTANCES, IN FEET
Rolla National Airport Master Plan

	Existing Runway		Future Runway*	
	4	22	4	22
Displaced Threshold (Approach End)	213	0	0	0
Takeoff Run Available (TORA)	5,500	5,500	5,500	5,500
Takeoff Distance Available (TODA)	5,500	5,500	5,500	5,500
Accelerate-Stop Distance Available (ASDA)	5,500	5,500	5,500	5,500
Landing Distance Available (LDA)	**5,287**	5,500	5,500	5,500

Source: BARNARD DUNKELBERG & COMPANY.
* This includes 690 feet of removed pavement behind the proposed Runway 4 relocation.

Crosswind Runway System. By retaining the existing runway length of 5,500 feet, this alternative will accommodate 75% at 60% useful load of aircraft greater than 12,500 pounds but less than 60,000 pounds, in addition to most large business

[3] This includes 690 feet of removed pavement behind the proposed Runway 4 relocation.

aircraft. Alternative Two also provides for the construction of a full-length parallel taxiway located south of Runway 13/31. This taxiway will be located 225 feet south of the runway and will be 25 feet wide, as required by FAA planning standards for ARC B-I runways with visual approach visibility minimums. An additional partial parallel taxiway is also programmed, extending west from Runway 4/22's parallel taxiway to the Runway 13 threshold. This partial parallel taxiway will be located 225 feet north of Runway 13/31 and will be 25 feet wide.

Approaches. This alternative implements a visibility minimum of not-lower-than one mile approach to Runway 4, a visibility minimum of lower-than ½-mile precision instrument approach to Runway 22, and visual approaches to both ends of Runway 13/31. Appendix 16 of FAA AC 150/5300-13 recommends, but does not require, the installation of an approach lighting system, such as an MALSR, an MALSF, or an ODALS for runways with instrument approaches of not-lower-than one mile visibility minimums. Currently, there is an existing ODALS installed off the Runway 22 end. Enhancing instrument approach capabilities by implementing a conventional Category I ILS approach to Runway 22 would require the installation of a 2,400-foot MALSR[4].

Alternative Two recommends the installation of an MALSR to Runway 22, which also includes the installation of REILs. The RPZs associated with these approaches will extend into undeveloped land northwest, northeast, southwest, and southeast of the Airport. The Airport should have ownership interest in the RPZs to the extent required to control land use and height of objects. The ownership can be in fee simple or easement.

Design Standards. If this alternative is implemented, safety deficiencies associated with the ROFA to Runway 4 are not contained within the Airport's existing property. However, correction of this deficiency would be met with the extension of Runway 22 by 690 feet to the north, and the shifting of Runway 4 an additional 477 feet to the north from the existing displaced threshold end. A total of 690 feet will be displaced until the displaced threshold pavement is ultimately removed.

FAR Part 77, Objects Affecting Airspace. Surveying of the Federal Aviation Regulation (FAR) *Part 77* imaginary surfaces, which was conducted as part of the associated obstruction survey for this Master Plan, indicates that a road (U.S. Highway 63) and five trees penetrate the *Part 77* surface off the Runway 4 approach end. Additionally, a guide post, high terrain, and two trees off the Runway 22 approach end penetrate the *Part 77* surface. The *Part 77* surface to the approach end of Runway 13 is penetrated by a road (Missouri State Route 28) and a tree, and the

[4] It is unknown if approach lighting systems will be required for GPS-driven "LPV" procedures to Category I minimums.

Part 77 surface to the approach end of Runway 31 is also penetrated by a road (Missouri State Route 68). All of these obstructions will be analyzed further, and appropriate action will be recommended, in consideration of future programmed instrument approach capabilities. The potential obstructions will be removed before improved instrument capabilities are implemented.

Threshold Siting. Guidelines contained in FAA AC 150/5300-13 provide criteria for the proper siting of runway thresholds regarding obstacle clearance. Like the RPZ criteria, the threshold siting criteria are based on the type of aircraft and approach visibility minimums associated with each runway end. Based on the existing criteria applicable to each runway end (i.e., straight in for Runway 4/22 and visual approaches), the existing surfaces to the Runways 4 and 22 ends do *not* provide adequate clearance. The approach end of Runway 4 has two threshold siting surface penetrations (trees), with the tallest tree penetrating the surface by 5.9 feet, as well as a third tree located just under the siting surface. The approach end of Runway 22 has one tree penetrating the threshold siting surface by nearly 21 feet and a guide post penetrating by approximately 22 feet. Additionally, the Runway 22 approach end also has terrain penetrations associated with the scheduled lighting or maintenance projects that is scheduled for immediate removal. There are no threshold siting surface penetrations to either Runway 13 or Runway 31.

Property Acquisition. Approximately 54 acres of property acquisition are suggested for obtaining ownership of land located within the RPZs for Runways 4/22 and 13/31 for land use control purposes. If owning the land in fee simple within the RPZs is unachievable, at a minimum, the Airport should continue maintaining the existing easements and obtain additional easements as necessary that provide the ability to control height of objects, right of overflight, and land use.

Development Costs. Major cost items and approximate values associated with this alternative include:

- Acquisition of approximately 54 acres of land in fee simple or easement.
- Extend Runway 22 by 690 feet to the north.
- Removal of 690 feet of pavement behind relocated Runway 4 threshold.
- Construction of a full-length parallel taxiway, 35 feet wide.
- Construction of full-length parallel taxiway, 25 feet wide.
- Removal or relocation of obstructions hindering navigation and penetrating future *Part 77* and threshold surface siting approach surfaces, including vegetation.

Conclusion. Alternative Two provides for meeting FAA design standards for the existing and future types of aircraft that regularly operate and are anticipated to operate at the Airport.

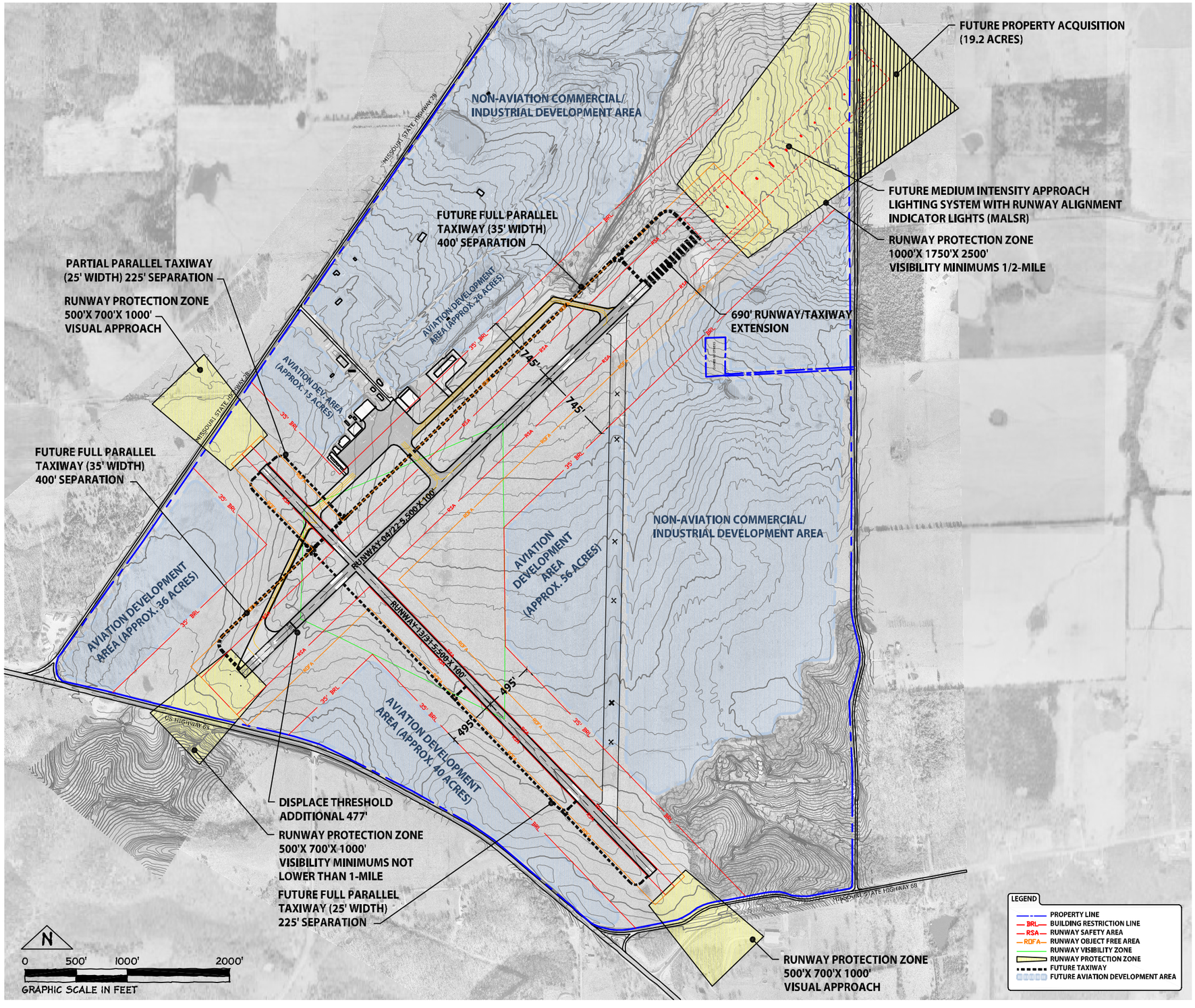

Figure D2 Alternative Two

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Alternative Three

Alternative Three involves retaining the existing runway lengths of 5,500 feet for both Runway 4/22 and Runway 13/31. In addition, a full-length parallel taxiway will be programmed for the west side of the main runway, as well as a full-length parallel taxiway for the south side of the crosswind runway. This alternative, illustrated in the following figure entitled *ALTERNATIVE THREE*, recommends maintaining an instrument approach of not-lower-than one mile visibility minimums to Runway 4 and an instrument approach of not-lower-than ¾-mile visibility minimums to Runway 22.

Main Runway System. By retaining the existing runway length of 5,500 feet, this alternative will accommodate 75% at 60% useful load of aircraft greater than 12,500 pounds but less than 60,000 pounds, in addition to most large business aircraft. Alternative Three also provides for removing the nonstandard taxiways at the thresholds for Runways 4 and 22, and constructing a full-length parallel taxiway to the west of Runway 4/22. This parallel taxiway will be located 400 feet west of the runway centerline and will be 35 feet wide, as required by FAA planning standards for ARC B-II airports.

Crosswind Runway System. By retaining the existing runway length of 5,500 feet, this alternative will accommodate 75% at 60% useful load of aircraft greater than 12,500 pounds but less than 60,000 pounds, in addition to most large business aircraft. Alternative Three also provides for the construction of a full-length parallel taxiway located south of Runway 13/31. This taxiway will be located 225 feet south of the runway and will be 25 feet wide, as required by FAA planning standards for ARC B-I runways with visual runway visibility minimums. An additional partial parallel taxiway is also programmed, extending west from Runway 4/22's parallel taxiway to the Runway 13 threshold. This partial parallel taxiway will be located 225 feet north of Runway 13/31 and will be 25 feet wide. In the long-term, it is recommended that the width of Runway 13/31 be reduced from 100 feet to 75 feet. The disadvantage of reducing the overall runway width would be a loss of runway flexibility; however, the advantages would be the reductions in operational and maintenance expenses that offset the runway flexibility.

Approaches. This alternative implements a visibility minimum of not-lower-than one mile approach to Runway 4, a visibility minimum of not-lower-than ¾-mile non-precision instrument approach to Runway 22, and visual approaches to both ends of Runway 13/31. Appendix 16 of FAA AC 150/5300-13 recommends, but does not require, the installation of an approach lighting system, such as an MALSR, an MALSF, or an ODALS for runways with instrument approaches of not-lower-than one mile

visibility minimums. Currently, there is an existing ODALS installed off the Runway 22 end.

Alternative Three recommends maintaining the existing ODALS or installing MALSF to Runway 22, which includes the installation of REILs. The RPZs associated with these approaches will extend into undeveloped land northwest, northeast, southwest, and southeast of the Airport. The Airport should have ownership interest in the RPZs to the extent required to control land use and height of objects. The ownership can be in fee simple or easement.

Design Standards. There are currently no safety deficiencies associated with this alternative, as both the RSA and the ROFA are contained within airport property.

FAR Part 77, Objects Affecting Airspace. Surveying of the Federal Aviation Regulation (FAR) *Part 77* imaginary surfaces, which was conducted as part of the associated obstruction survey for this Master Plan, indicates that a road (U.S. Highway 63) and five trees penetrate the *Part 77* surface off the Runway 4 approach end. Additionally, a guide post, high terrain, and two trees off the Runway 22 approach end penetrate the *Part 77* surface. The *Part 77* surface to the approach end of Runway 13 is penetrated by a road (Missouri State Route 28) and a tree, and the *Part 77* surface to the approach end of Runway 31 is also penetrated by a road (Missouri State Route 68). All of these obstructions will be analyzed further, and appropriate action will be recommended, in consideration of future programmed instrument approach capabilities. The potential obstructions will be removed before instrument capabilities are implemented.

Threshold Siting. Guidelines contained in FAA AC 150/5300-13 provide criteria for the proper siting of runway thresholds regarding obstacle clearance. Like the RPZ criteria, the threshold siting criteria are based on the type of aircraft and approach visibility minimums associated with each runway end. Based on the existing criteria applicable to each runway end (i.e., straight in for Runway 4/22 and visual approaches), the existing surfaces to the Runways 4 and 22 ends do *not* provide adequate clearance. The approach end of Runway 4 has two threshold siting surface penetrations (trees), with the tallest tree penetrating the surface by 5.9 feet, as well as a third tree located just under the siting surface. The approach end of Runway 22 has one tree penetrating the threshold siting surface by nearly 21 feet and a guide post penetrating by approximately 22 feet. Additionally, the Runway 22 approach end also has terrain penetrations associated with the scheduled lighting or maintenance projects that is scheduled for immediate removal. There are no threshold siting surface penetrations to either Runway 13 or Runway 31.

Property Acquisition. Approximately 35 acres of property acquisition are suggested for obtaining ownership of land located within the RPZs for Runways 4, 13, and 31 for land use control purposes. If owning the land in fee simple within the RPZs is unachievable, at a minimum, the Airport should continue maintaining the existing easements and obtain additional easements as necessary that provide the ability to control height of objects, right of overflight, and land use.

Development Costs. Major cost items and approximate values associated with this alternative include:

- Acquisition of approximately 35 acres of land in fee simple or easement.
- Construction of a full-length parallel taxiway, 35 feet wide.
- Construction of full-length parallel taxiway, 25 feet wide.
- Construction of a partial parallel taxiway, 25 feet wide.
- Removal or relocation of obstructions hindering navigation and penetrating future *Part 77* and threshold surface siting approach surfaces, including vegetation.

Conclusion. Alternative Three provides for meeting FAA design standards for the existing and future types of aircraft that regularly operate and are anticipated to operate at the Airport.

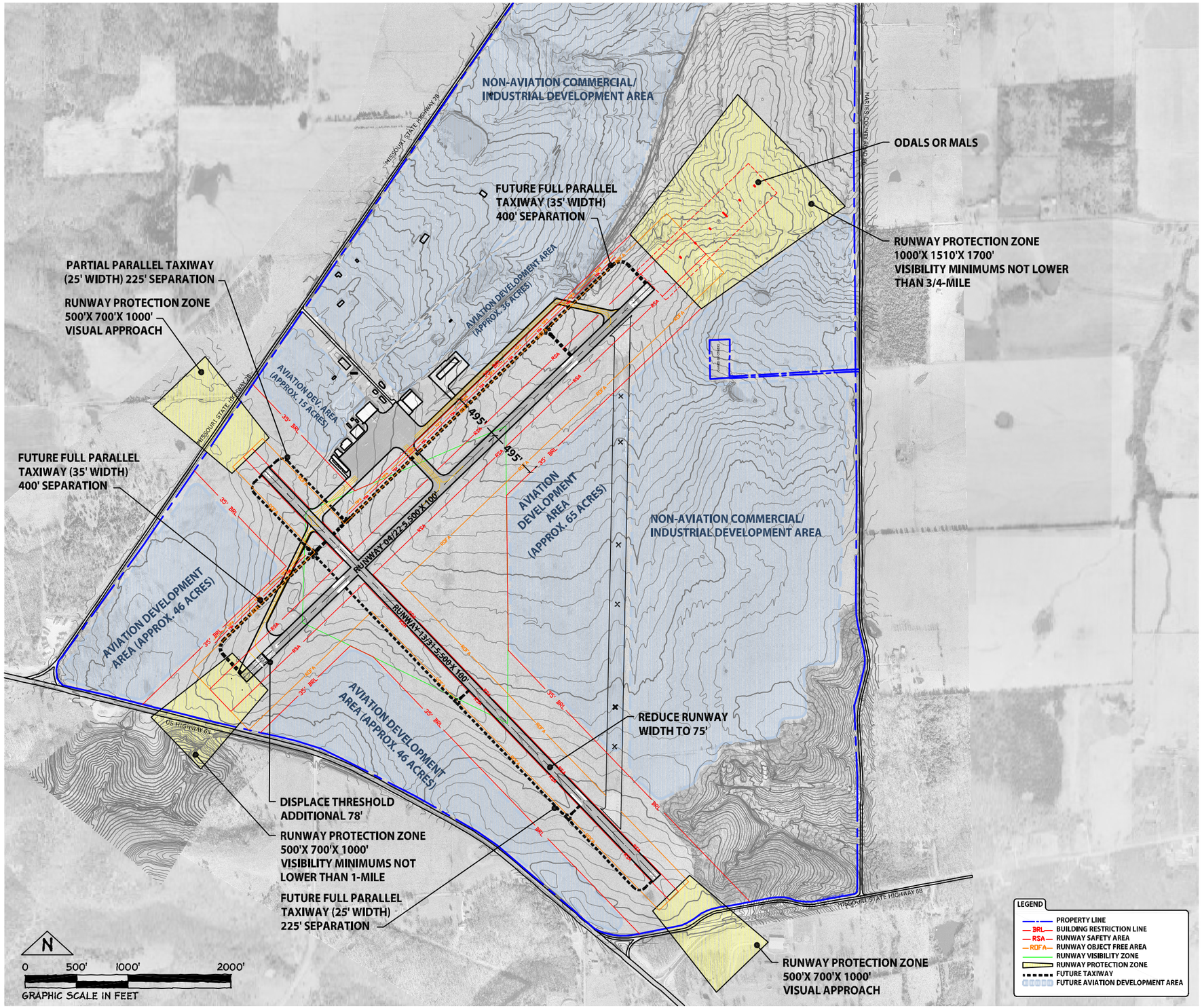

Figure D3 Alternative Three

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Airside Recommendations

Following a careful assessment of the alternatives and discussions with Airport stakeholders and City of Rolla officials, it has been determined that the long-term development plan for the Airport is represented in a phased combination of Alternative Two and Alternative Three.

Phase One (1-5 Years):

- Construct taxiway connectors, 35 feet wide, to the existing partial parallel taxiway on the west side of Runway 4/22.
- Construct a partial parallel taxiway, north of Runway 13 (separated 225 feet from the runway centerline), 25 feet wide.
- Install an MALSF or ODALS to the approach end of Runway 22.

Phase Two (6-10 Years):

- Construct a full-length parallel taxiway 225 feet south of the Runway 13/31 centerline, 25 feet wide.

Phase Three (11-20 Years):

- Construct a full-length parallel taxiway on the west side of Runway 4/22 (separated 400 feet from the runway centerline), 35 feet wide.
- Reducing the width of Runway 13/31 from 100 feet to 75 feet.
- Relighting Runway 13/31.

Post Planning Period:

- Land acquisition of approximately 19 acres for Runway 22 RPZ.
- Extend Runway 22 by 690 feet to the north.
- Shift the Runway 4 threshold additional 477 feet north from the existing Runway 4 displaced threshold end (for a total displacement of 690 feet).
- Extend the full-length parallel taxiway 690 feet north on the west side of Runway 4/22 (separated 400 feet from the runway centerline, 35 feet wide).
- Remove 690 feet of unused pavement behind the relocated Runway 4 threshold.
- Install an MALSR to the approach end of Runway 22.
- Implement a Category I ILS approach to Runway 22.

Landside Development Concepts, Alternatives, and Recommendations

Introduction

Following the consideration of the framework of the Airport's ultimate airside development, alternatives involving other airport facilities can now be analyzed. The overall objective here is the provision of facilities that are conveniently located and accessible to the community, and that can accommodate the specific requirements of airport users. Every effort has been made to formulate a focus on future airport development, with the realization that the existing hangar development area will be utilized as long as practical.

Landside facilities consist of aircraft parking aprons, hangar development areas, support facility development, and airport access. With respect to the forecast activity levels and resultant facility requirements identification, the Airport's potential facility deficiencies relate primarily to aircraft storage facilities (i.e., individual executive hangars and larger corporate hangars) and aircraft apron space. Additionally, undeveloped parcels of airport property will be evaluated with respect to aviation and aviation-related development capability.

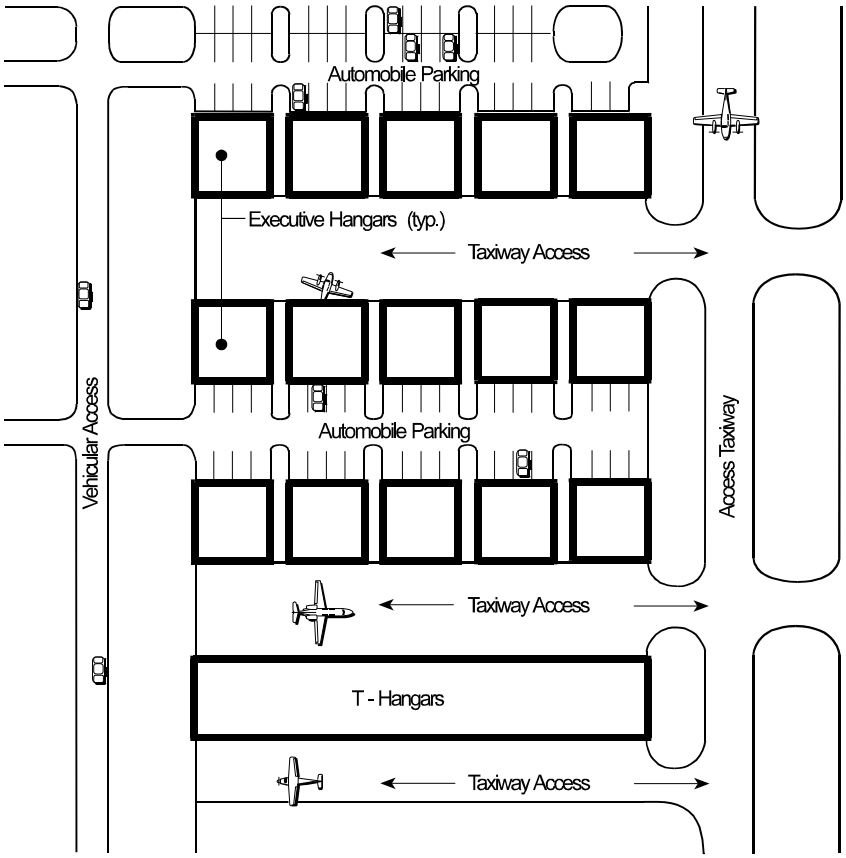
Development Considerations

According to the general aviation forecasts, it is projected that Rolla National Airport will attract additional based aircraft throughout the planning period. The resulting facility requirements determined that the Airport will require additional aircraft parking apron and storage facilities (i.e., T-hangars and executive/corporate hangars) to accommodate both based and itinerant aircraft.

Aircraft Storage Facilities. The future development of T-hangars, executive/corporate hangars, and maintenance/FBO hangars at Rolla National Airport will be demand driven. Therefore, the number, size, and location of these hangars will vary depending upon the demand for the particular type. Because of existing infrastructure and on-airport land availability, three areas have been considered for additional aircraft storage and maintenance facilities. This will limit the additional expenses (i.e., land acquisition, utilities, taxiway access, and roadway access) incurred when a new area is developed. The Airport should consider several important guidelines when making hangar placement decisions, which are detailed in the following narrative and depicted in the following illustration entitled *TYPICAL GENERAL AVIATION HANGAR LAYOUT*.

- T-hangars should be nested and developed with taxiway access to both sides of the hangar. Controlled vehicular access should be provided to the taxiway/apron area near the T-hangars. Additionally, public vehicular parking should be provided near the T-hangars to accommodate both users and visitors.
- Conventional hangars (FBO, maintenance, corporate, etc.) should be supplied with taxiway access, vehicular access, and adjacent vehicular parking. This is most efficiently accomplished when a row of hangars is developed and supplied with taxiway access on one side and vehicular access and parking on the other side.
- It is most efficient to "double load" both the taxilane access and the automobile access routes with hangars. In other words, the access taxilanes are lined with hangars on both sides and the vehicular roadways/parking areas are lined with hangars on both sides.

Figure D4
TYPICAL GENERAL AVIATION HANGAR LAYOUT
Rolla National Airport Master Plan



Source: BARNARD DUNKELBERG & COMPANY.

Aviation Support Facilities. The Airport contains a large amount of undeveloped property offering great potential for the development of aviation compatible facilities located within the existing property line. While the demand for aviation-use facilities may never occur in quantities that will outstrip available area, there is always the potential and demand for non-aviation use to be generated as well. In either case, non-aviation uses that are compatible with the Airport should also be considered.

Many non-aviation businesses find it beneficial to be located on, or near, an airport, particularly those that use aircraft to transport their personnel or products. The medical industry, which has the need for rapid shipment of supplies or personnel

during all types of weather conditions, is a classic example of the benefits air transportation can offer businesses. The development of airport property for non-aviation uses should be explored and encouraged. The overall objective is to provide a unified development scheme of aviation compatible facilities that support the Airport and fulfill the goals of the City of Rolla.

Landside Development Recommendations

As illustrated in the previous figures of this chapter, landside development areas are analyzed at Rolla National Airport. There are eight total landside development areas on the Airport. Additionally, the planning period forecasts indicate that approximately 22.1 acres may be required to accommodate the anticipated future aviation storage facilities. Each landside development area and their available acreage are associated with the runway/taxiway configuration presented in the *Conceptual Development Plan*.

Development Area One. Development Area One is located along the west side of the future Runway 4/22 parallel taxiway, north and west of the existing T-hangar area, and contains approximately 26 acres of future aviation developable land. Convenient taxiway access is provided by the Runway 4/22 parallel taxiway; however, connecting taxilanes would be required for convenient airside access.

Development Area Two. Development Area Two is located directly west of Aviation Development Area One, extending on airport property to Missouri Highway 28 and bordered to the south by the airport entrance road. This area contains approximately 13.2 acres and is recommended to be reserved for aviation related use or aviation support facilities development.

Development Area Three. Development Area Three is the small area located in between the airport entrance road and the Runway 13 threshold. This area contains approximately 15 acres of land that is recommended to be reserved for future aviation development.

Development Area Four. Development Area Four is located to the south of the Runway 13 threshold, in between the junction of Missouri State Highway 28 and U.S. Highway 63, and west of the Runway 4 threshold. This area contains approximately 36 acres of developable land. However, due to the close proximity to Missouri State Highway 28 and U.S. Highway 63, approximately ten acres could be reserved for non-aviation commercial/industrial use and the remaining 26 acres near the Runway 13 threshold could be reserved for aviation-related use. Convenient landside access is provided to this area by both highways, as well as convenient airside access provided by the future parallel taxiways to Runways 4/22 and 13/31.

Development Area Five. Development Area Five is located east of the Runway 4 threshold and south of Runway 13/31, along the north side of U.S. Highway 63, and contains approximately 40 acres. This area is recommended to be reserved for future aviation-related development. Convenient airside access would be provided by the future Runway 13/31 parallel taxiway.

Development Area Six. Development Area Six is located east of the intersection of both runways, west of the closed runway. This area contains approximately 56 acres and is also recommended to be reserved for future aviation development. However, should the closed runway continue to not be maintained for taxilane purposes, there is no direct, convenient airside access from this area.

Development Area Seven. Development Area Seven is located directly east of the closed runway. This area contains approximately 202 acres and should be reserved for long-term non-aviation commercial/industrial development. Convenient vehicular access is provided by Maries County Road 86; however, the construction of an additional access road may be required.

Development Area Eight. Development Area Eight is the large area extending north to Maries County Road 87, west and northwest of the Runway 22 threshold. This area contains approximately 207 acres and is recommended to be reserved for long-term non-aviation commercial/industrial development. Convenient landside access is provided via Missouri State Highway 28 and Maries County Road 87.

Summary

In consideration of existing compatible land uses where the Airport is not wholly encroached upon, it is appropriate at this point, from a land use planning perspective, to protect for airport development prior to incompatible land uses becoming present. Following discussions with Airport and City of Rolla personnel, proposed development recommendations for Rolla National Airport were made that are intended to present a long-term development plan for the Airport that will accommodate the aviation demand in a comprehensive fashion.

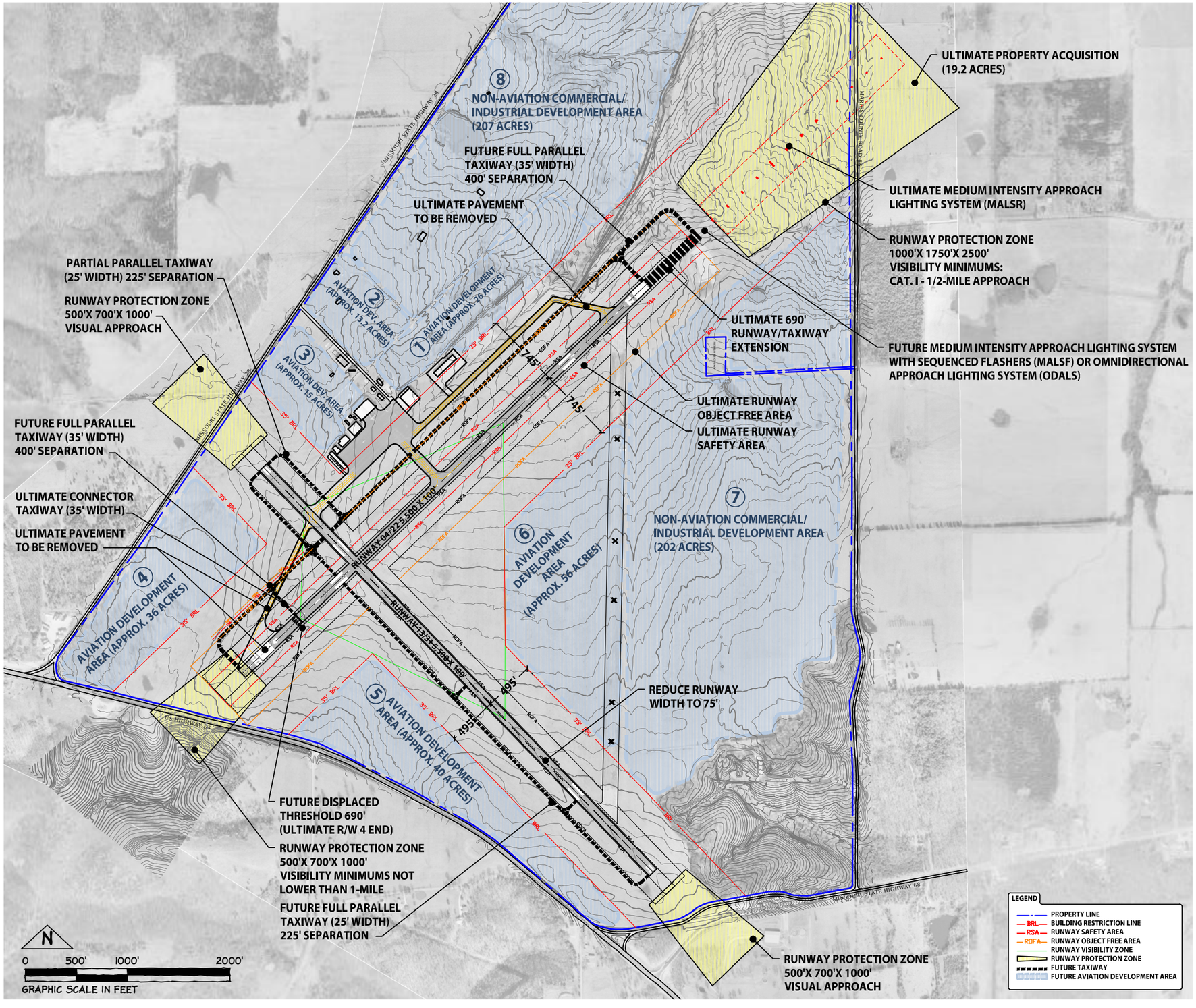


Figure D5 Conceptual Development Plan

ROLLA NATIONAL AIRPORT MASTER PLAN

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F AIRPORT PLANS

Airport Plans

Introduction

The ultimate development plan and program for Rolla National Airport have evolved from various factors, influences, and considerations. Among these are existing and future aviation demand, aircraft operational characteristics, facility requirements, and environmental considerations. Additionally, the general direction or thrust of future airport development, as expressed by airport staff, city staff, airport users, and other interested parties, served as a basis for the airport planning process.

Because previous chapters have established and quantified the future development needs of Rolla National Airport, the resulting elements of the recommended Conceptual Development Plan are categorically reviewed and detailed here in a narrative and graphic format. A brief written description of the individual elements represented in the set of *Airport Plans* is accompanied by a graphic description presented in the form of the *Airport Layout Drawing*, the *Airport Airspace Drawings*, the *Inner Portion of the Approach Surface Drawings*, the *Terminal Area Plan,* the *Airport Land Use Plan*, and the *Airport Property Map*.

Airport Layout Drawing

The Airport Layout Drawing is a graphic depiction of ultimate airport facilities, representing the unified, long-range development scheme required to enable the Airport to accommodate the forecast future demand. However, it is recognized that future demand for facilities cannot be accurately predicted, particularly during the latter stages of the 20-year planning period. Therefore, development flexibility is provided in the plan and emphasis is placed on the initial five-year planning period, where the projections are more definable and the magnitude of program accomplishments are more pronounced. Furthermore, carefully guided development, during the initial years of the planning period, is essential to the proper expansion of the facility and the continued enhancement of aviation development.

The drawing provides detailed information on airport and runway design criteria that is necessary to define relationships with applicable standards. The following illustration, entitled *AIRPORT LAYOUT DRAWING*, and the following paragraphs describe the major components of the future airport development plan presented in the *Airport Layout Drawing*.

Runway System

Runway. As explained in the preceding chapter, Runway 4/22 is recommended to maintain its existing length of 5,500 feet until the long-term, where Runway 22 will be extended 690 feet to the north. Runway 4 will be shifted 477 feet from the existing displaced threshold and the remaining 690 feet of unused pavement behind the relocated Runway 4 end will be removed. The total runway length will remain at 5,500 feet. Runway 13/31 is recommended to maintain its existing runway length of 5,500 feet, and the runway width will be reduced to 75 feet. Both runway lengths will provide a runway sufficient to accommodate 75% of the general aviation aircraft fleet weighing less than 60,000 pounds at 60% useful load on a regular basis, in addition to most large aircraft.

Approaches. Runway 4 is programmed to maintain a not-lower-than one mile visibility minimum instrument approach. Runway 22 is programmed for an implementation of a Category I ILS precision instrument approach. Both runway ends for Runway 13/31 will remain visual approaches only.

Lighting. Runway 22 currently has Runway End Identifier Lights (REILs); however, it is recommended that runway threshold lights be installed at both runway ends for Runway 4/22. Additionally, installing a Medium Intensity Approach Lighting System with Sequenced Flashers (MALSF) or an Omnidirectional Approach Lighting System (ODALS) to Runway 22 is recommended for the short-term. Ultimately, installing a Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) to Runway 22 is recommended for the long-term.

Design Standards. There are no existing deficiencies associated with the Runway Safety Area (RSA) and the Runway Object Free Area (ROFA) for Runways 4/22 and 13/31. In the post planning period, after extending Runway 22, removing 690 feet from the Runway 4 threshold will be required to rectify potential ROFA deficiencies for the ultimate runway design standard upgrade to C-II for Runway 4/22.

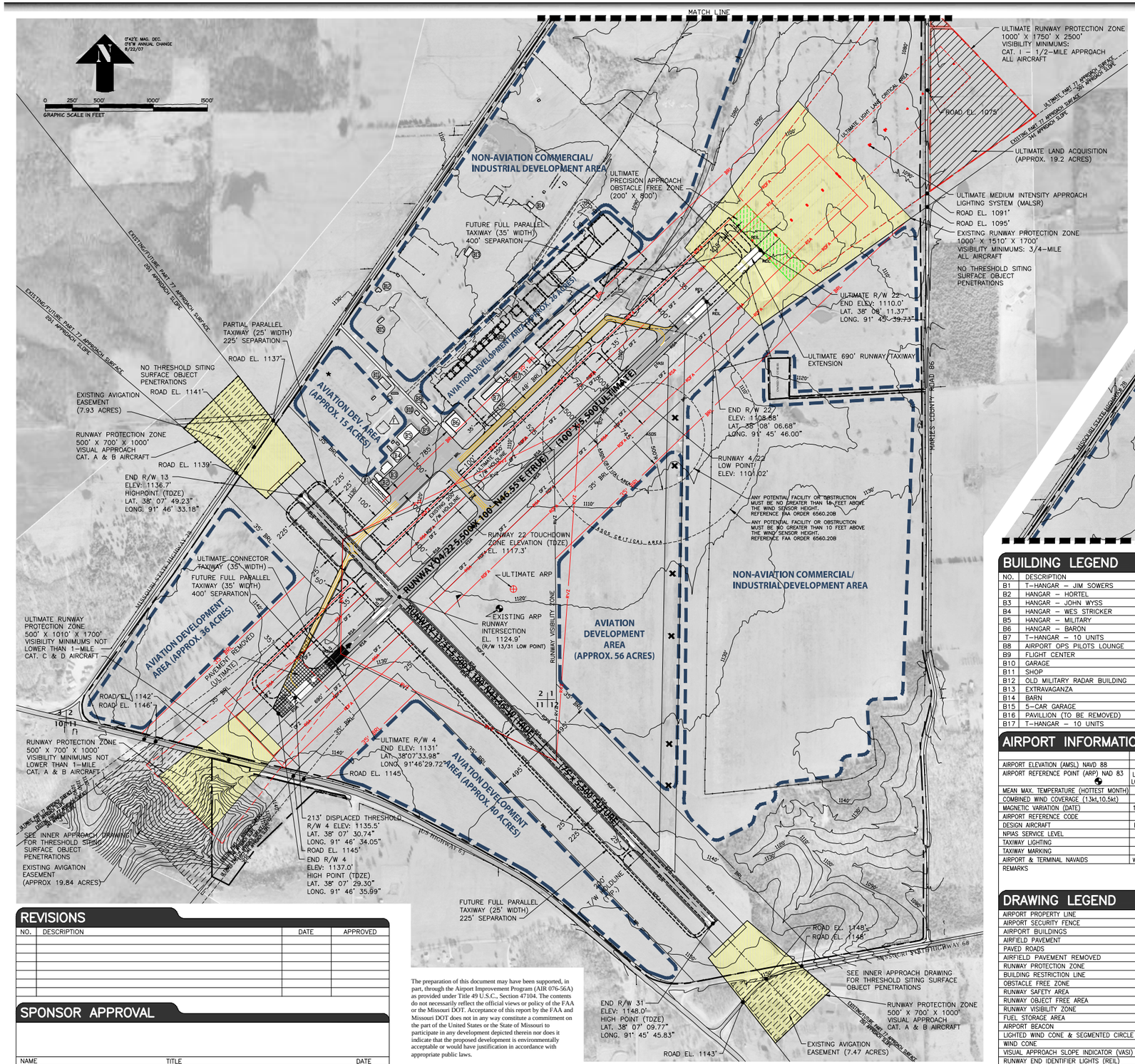
Property Acquisition. Approximately 54 acres of property acquisition are suggested for obtaining ownership of land located within the RPZs for Runways 4/22 and 13/31 for land use control purposes (includes approximately 19 acres for the ultimate Runway 22 RPZ). If owning the land within the RPZs is unachievable, at a

minimum, the Airport should continue maintaining the existing easements that provide the ability to control height of objects and land use.

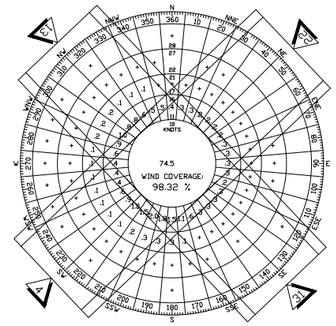
Taxiway System

The primary taxiway improvements are the construction of a 35-foot wide full-length parallel taxiway located 400 feet west of the centerline to Runway 4/22 and addition of connector taxiways. In conjunction with the ultimate 690-foot runway extension, the parallel taxiway is recommended for extension as well. However, when Runway 4 is shifted 477 feet from the existing displaced threshold, the parallel taxiway will also be shifted to the north by the equal distance. The remaining 690 feet of the parallel taxiway's unused pavement will be removed in conjunction with the 690-foot pavement removal of the Runway 4 threshold, for a total ultimate taxiway length of 5,500 feet. Additionally, a full-length parallel taxiway located 225 feet south of the centerline to Runway 13/31 (25 feet wide), and a partial parallel taxiway separated 225 feet north of the Runway 13/31 centerline (also 25 feet wide), are programmed for construction. The existing nonstandard taxiways located at the Runways 4 and 22 thresholds are programmed for removal.

In the interest of safety and efficiency, all taxiways should be equipped with Medium Intensity Taxiway Lighting (MITL), signs, and markings that clearly define the location and limits of each taxiway, and should provide proper guidance to pilots who are unfamiliar with the Airport. Aircraft holding position markings and signs should be provided at every taxiway that intersects the runway.



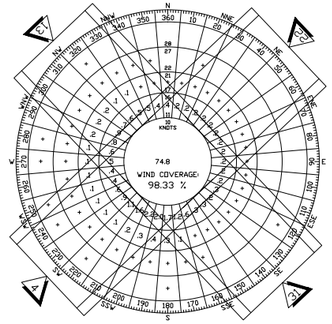
ALL WEATHER WINDROSE



Runway Designation	10.5-Knot Crosswind Component	13-Knot Crosswind Component
Runway 4	57.89%	66.67%
Runway 22	76.50%	80.89%
Runway 4/22	89.13%	94.42%
Runway 13	69.29%	74.02%
Runway 31	66.72%	69.80%
Runway 13/31	88.23%	93.39%
All Combined Runways	98.32%	99.58%

Source: Wind analysis tabulation provided by BARNARD DUNKELBERG & COMPANY utilizing FAA Airport Design Software (applied with AC 150/5300-13, Airport Design. Data obtained from the National Oceanic and Atmospheric Administration, National Climatic Data Center, Station 72449, Vichy/Rolla, Missouri. Period of Record: 1996 - 2005.

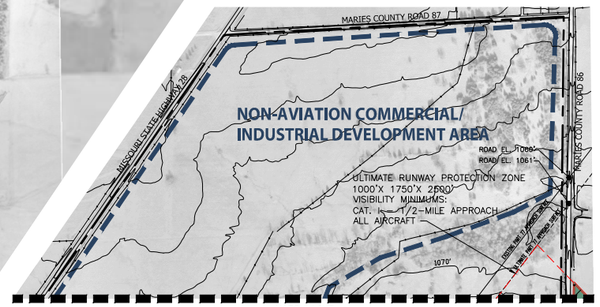
IFR WEATHER WINDROSE



Runway Designation	Wind Coverage Provided Under IFR Conditions[1] 5-Knot Tailwind to Maximum Headwind 10.5-Knot	13-Knot
Runway 4	55.95%	58.48%
Runway 22	78.71%	83.08%
Runway 4/22	89.99%	94.71%
Runway 13	70.04%	75.15%
Runway 31	66.81%	69.09%
Runway 13/31	87.95%	93.79%
Combined Runways	98.33%	99.58%

Source: Wind analysis tabulation provided by BARNARD DUNKELBERG & COMPANY utilizing FAA Airport Design Software (applied with AC 150/5300-13, Airport Design. Data obtained from the National Oceanic and Atmospheric Administration, National Climatic Data Center, Station 72449, Vichy/Rolla, Missouri. Period of Record: 1996 - 2005.

[1] Ceiling of not less than 1,000 feet but equal to or greater than 250 feet and/or visibility less than 3 statute miles.



BUILDING LEGEND

NO.	DESCRIPTION	
B1	T-HANGAR - JIM SOWERS	.
B2	HANGAR - HORTEL	.
B3	HANGAR - JOHN WYSS	.
B4	HANGAR - WES STRICKER	.
B5	HANGAR - MILITARY	.
B6	HANGAR - BARON	.
B7	T-HANGAR - 10 UNITS	.
B8	AIRPORT OPS PILOTS LOUNGE	.
B9	FLIGHT CENTER	.
B10	GARAGE	.
B11	SHOP	.
B12	OLD MILITARY RADAR BUILDING	.
B13	EXTRAVAGANZA	
B14	BARN	
B15	5-CAR GARAGE	
B16	PAVILLION (TO BE REMOVED)	
B17	T-HANGAR - 10 UNITS	

AIRPORT INFORMATION

	EXISTING	FUTURE	ULTIMATE
AIRPORT ELEVATION (AMSL) NAVD 88	1148.0'	SAME	SAME
AIRPORT REFERENCE POINT (ARP) NAD 83	LAT. 38°07'38.76"N LON. 91°46'10.28"W	SAME SAME	LAT. 38°07'40.53"N LON. 91°46'08.63"W
MEAN MAX. TEMPERATURE (HOTTEST MONTH)	88°F (JULY)	SAME	SAME
COMBINED WIND COVERAGE (13kt,10.5kt)	95.58%, 98.32%	SAME	SAME
MAGNETIC VARIATION (DATE)	12°47'E (JUNE '06)	SAME	SAME
AIRPORT REFERENCE CODE	B-II	SAME	C-II
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HAWKER 800XP
NPIAS SERVICE LEVEL	GA	SAME	SAME
TAXIWAY LIGHTING	MITL	SAME	SAME
TAXIWAY MARKING	C/L, HOLDLINES	SAME	SAME
AIRPORT & TERMINAL NAVAIDS	VOR/DME,BEACON,RNW(GPS)	SAME	LPV,BEACON,RNW(GPS)
REMARKS			

DRAWING LEGEND

	EXISTING	FUTURE/ULTIMATE
AIRPORT PROPERTY LINE		
AIRPORT SECURITY FENCE	X	XX
AIRPORT BUILDINGS		
AIRFIELD PAVEMENT		
PAVED ROADS		
AIRFIELD PAVEMENT REMOVED		
RUNWAY PROTECTION ZONE		
BUILDING RESTRICTION LINE	BRL	BRL
OBSTACLE FREE ZONE	OFZ	
RUNWAY SAFETY AREA	RSA	RSA
RUNWAY OBJECT FREE AREA	ROFA	ROFA
RUNWAY VISIBILITY ZONE	RVZ	RVZ
FUEL STORAGE AREA		
AIRPORT BEACON		
LIGHTED WIND CONE & SEGMENTED CIRCLE		
WIND CONE		
VISUAL APPROACH SLOPE INDICATOR (VASI)		
RUNWAY END IDENTIFIER LIGHTS (REIL)		
AIRPORT REFERENCE POINT (ARP)		

RUNWAY INFORMATION

	RUNWAY 4/22			RUNWAY 13/31	
	EXISTING	FUTURE	ULTIMATE	EXISTING	FUTURE
APPROACH VISIBILITY MINIMUMS	1-MILE/3/4-MILE	SAME	1-MILE/1/2-MILE	VISUAL/VISUAL	SAME
FAR PART 77 APPROACH SLOPE	34:1/34:1	SAME	34:1/50:1	20:1/20:1	SAME
RUNWAY WIDTH X LENGTH	100' X 5500'	SAME	100' x 5500'	100' x 5500'	75' x 5500'
RUNWAY PAVEMENT TYPE	ASPHALT	SAME	SAME	ASPHALT	SAME
TAXIWAY PAVEMENT TYPE	ASPHALT	SAME	SAME	ASPHALT	SAME
PAVEMENT STRENGTH (IN 1000 LBS.)	75S,85D,130DT	SAME	SAME	48S,62D,92DT	SAME
RUNWAY LIGHTING	MIRL, NON-STD HIRL	SAME	SAME	MIRL	SAME
RUNWAY MARKING	NP/NP	SAME	NP/PREC	VISUAL/VISUAL	SAME
EFFECTIVE RUNWAY GRADIENT	0.5 %	SAME	SAME	0.2 %	SAME
MAXIMUM GRADE WITHIN RUNWAY LENGTH %	0.7 %	SAME	SAME	0.9 %	SAME
RUNWAY LINE-OF-SIGHT	CRITERIA MET	SAME	SAME	CRITERIA MET	SAME
PERCENT WIND COVERAGE (13kt, 10.5kt)	87.5, 91.4	SAME	SAME	89.5, 94.1	SAME
VISUAL APPROACH AIDS	VASI/VASI, REILS	SAME	SAME	NONE	SAME
INSTRUMENT APPROACH AIDS	VOR/DME, RNAV(GPS)	SAME	LPV/RNAV(GPS)	NONE	SAME
AIRPORT REFERENCE CODE	B-II	SAME	C-II	B-I	SAME
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HAWKER 800XP	KING AIR B-200	SAME
RUNWAY SAFETY AREA (RSA) WIDTH	150'	SAME	500'	120'	SAME
RSA LENGTH BEYOND STOP END	300'/300'	SAME	1000'/1000'	240'/240'	SAME
RUNWAY OBJECT FREE AREA (ROFA) WIDTH	500'	SAME	800'	400'	SAME
OFA LENGTH BEYOND STOP END	300'/300'	SAME	1000'/1000'	240'/240'	SAME
OBSTACLE FREE ZONE (OFZ) WIDTH *	400'	SAME	SAME	400'	SAME
OFZ LENGTH BEYOND STOP END *	200'/200'	SAME	SAME	200'/200'	SAME
RUNWAY CENTERLINE TO TAXIWAY HOLD LINE	200'	SAME	250'	200'	SAME
TAXIWAY WIDTH	35'	SAME	35'	N/A	25'
TOUCHDOWN ZONE ELEVATION	1137.0'/1117.3'	SAME	SAME	1136.7'/1148.0'	SAME
DISPLACED THRESHOLD	213'/NONE	SAME	NONE	NONE	SAME

* No OFZ object penetrations

NOTES

1. THIS DRAWING REFLECTS PLANNING STANDARDS SPECIFIC TO THIS AIRPORT AND IS NOT A PRODUCT OF DETAILED ENGINEERING DESIGN ANALYSIS. IT IS NOT INTENDED TO BE USED FOR CONSTRUCTION DOCUMENTATION OR NAVIGATION.
2. RUNWAY COORDINATES ARE NAD83. RUNWAY END ELEVATIONS ARE NAVD88.
3. NO MODIFICATION TO STANDARDS.

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

SPONSOR APPROVAL

NAME TITLE DATE

The preparation of this document may have been supported, in part, through the Airport Improvement Program (AIR 076-56A) as provided under Title 49 U.S.C., Section 47104. The contents do not necessarily reflect the official views or policy of the FAA or the Missouri DOT. Acceptance of this report by the FAA and Missouri DOT does not in any way constitute a commitment on the part of the United States or the State of Missouri to participate in any development depicted therein nor does it indicate that the proposed development is environmentally acceptable or would have justification in accordance with appropriate public laws.

ROLLA NATIONAL AIRPORT
Rolla, Missouri

AIRPORT LAYOUT DRAWING

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DATE
JUNE 2009

SCALE
1" = 500'

SHEET NO.
1 OF 12

Figure E1 **Airport Layout Drawing**

Landside Development Area

As illustrated on the *AIRPORT LAYOUT DRAWING*, various development areas for landside facilities are also allocated. It is recognized that the development of these areas will be demand driven and, where appropriate, options have been provided for the type of facilities that are likely to develop in a certain area. The Airport has a large amount of undeveloped property available to meet both short-term and long-term aviation demands.

As previously mentioned in the *Airport Development Plan and Program* chapter, the recommended landside development plan provides for eight separate landside aviation development areas, with a total of 595.2 acres available for aviation and non-aviation development.

Development Area One. Development Area One is located along the west side of the future 4/22 parallel taxiway, north and west of the existing T-hangar area, and contains approximately 26 acres of future aviation developable land. Convenient taxiway access is provided by the Runway 4/22 parallel taxiway; however, connecting taxilanes would be required for convenient airside access.

Development Area Two. Development Area Two is located directly southwest of Aviation Development Area One, extending on airport property to Missouri Highway 28 and bordered to the south by the airport entrance road. This area contains approximately 13.2 acres and is recommended to be reserved for aviation-related use or aviation support facilities development.

Development Area Three. Development Area Three is the small area located in between the airport entrance road and the Runway 13 threshold. This area contains approximately 15 acres of land that is recommended to be reserved for future aviation development.

Development Area Four. Development Area Four is located to the south of the Runway 13 threshold, in between the junction of Missouri State Highway 28 and U.S. Highway 63, and west of the Runway 4 threshold. This area contains approximately 36 acres of developable land. However, due to the close proximity to Missouri State Highway 28 and U.S. Highway 63, approximately ten acres could be reserved for non-aviation commercial/industrial use and the remaining 26 acres near the Runway 13 threshold could be reserved for aviation-related use. Convenient landside access is provided to this area by both highways, as well as convenient airside access provided by the future parallel taxiways to Runways 4/22 and 13/31.

Development Area Five. Development Area Five is located east of the Runway 4 threshold and south of Runway 13/31, along the north side of U.S. Highway 63, and contains approximately 40 acres. This area is recommended to be reserved for future aviation-related development. Convenient airside access would be provided by the future Runway 13/31 parallel taxiway.

Development Area Six. Development Area Six is located east of the intersection of both runways, west of the closed runway. This area contains approximately 56 acres and is also recommended to be reserved for future aviation development. However, should the closed runway continue to not be maintained for taxilane purposes, there is no direct, convenient airside access from this area.

Development Area Seven. Development Area Seven is located directly east of the closed runway. This area contains approximately 202 acres and should be reserved for long-term non-aviation commercial/industrial development. Convenient vehicular access is provided by Maries County Road 86; however, the construction of an additional access road may be required.

Development Area Eight. Development Area Eight is the large area extending north to Maries County Road 87, northwest of the Runway 22 threshold. This area contains approximately 207 acres and is recommended to be reserved for long-term non-aviation commercial/industrial development. Convenient landside access is provided via Missouri State Highway 28 and Maries County Road 87.

Airport Airspace Drawing

In order to protect airspace and approaches from hazards that could affect the safe and efficient operation of aircraft, federal criteria contained in Federal Aviation Regulations (FAR) Part 77*, Objects Affecting Navigable Airspace*, have been established to provide guidance in controlling the height of objects in close proximity to airports. FAR Part 77 criteria specify a set of imaginary surfaces that, when penetrated by an object (structure, tree, or terrain), designate the object as being an obstruction. The *AIRPORT AIRSPACE DRAWING*, illustrated in the following figure, is based on FAR Part 77 criteria and provides plan and profile views of the imaginary surfaces as they relate to Rolla National Airport. The drawing is based on the ultimate runway length, the ultimate planned approaches to each runway end, and the ultimate airport elevation. Therefore, Runway 4/22 is based on larger-than-utility (i.e., aircraft weighing in excess of 12,500 pounds, gross weight) runway criteria with precision instrument approaches having visibility minimums lower-than ¾-mile. Runway 13/31 is also based on larger-than-utility runway criteria with visual approaches.

Based on these criteria, a brief description of each imaginary surface, and the appropriate dimensions and slopes, are described in the following narrative.

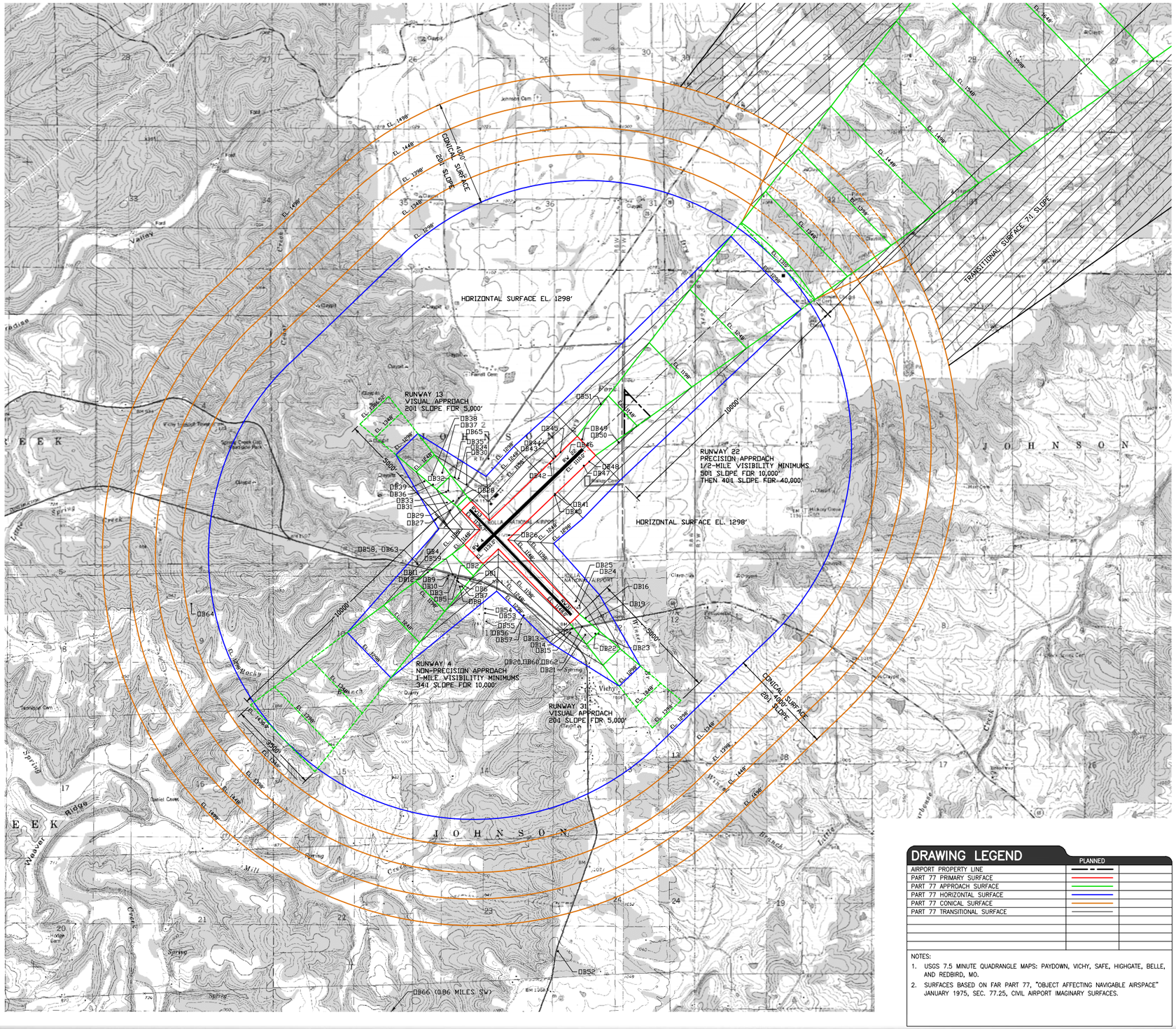
The primary surface, a surface longitudinally centered on the runway, is 1,000 feet in width and extends 200 feet beyond each runway end. The elevation of any point on the primary surface is the same as the elevation on the nearest point on the runway centerline. Transitional surfaces extend upward and outward at right angles to the runway centerline, and the runway centerline extended, at the edges of the primary surface with a slope of seven to one. The horizontal surface is a horizontal plane established at 150 feet above the airport elevation. Swinging arcs with radii of 10,000 feet from the center of each end of the primary surface, and connecting the arcs by lines tangent to these arcs, establish the perimeter of the horizontal surface.

At the periphery of the horizontal surface, the conical surface extends outward and upward at a slope of 20 to one for a horizontal distance of 4,000 feet. Finally, approach surfaces are longitudinally centered on the extended runway centerlines, extending outward and upward from each end of the primary surface. The inner edge is 1,000 feet in width (the same width as the primary surface), and expands uniformly to a width of 3,500 feet at the outer edge for runways with not-lower-than one-mile visibility minimums. The approach surfaces extend for a horizontal distance of 10,000 feet at a slope of 34 to one for these runways.

Inner Portion of the Approach Surface Drawings

To provide a more detailed view of the inner portions of the FAR Part 77 imaginary approach surfaces, detailed drawings have been prepared. These drawings illustrate the inner portion of the approach surfaces associated with each runway end. The *INNER PORTION OF THE APPROACH SURFACE DRAWINGS* that follow provide large-scale drawings with both plan and profile delineation. They are intended to facilitate identification of roadways, utility lines, railroads, structures, and other possible obstructions that may lie within the confines of, or near, the approach surfaces.

As with the *AIRPORT AIRSPACE DRAWING*, the *INNER PORTION OF THE APPROACH SURFACE DRAWINGS* are based upon the ultimate planned runway configuration and length, the ultimate planned approaches to each runway end, and the ultimate runway end elevation. Again, Runway 4/22 is based on larger-than-utility runway criteria with precision instrument approaches with visibility minimums lower-than ¾-mile and Runway 13/31 is based on larger-than-utility runway criteria with visual approaches.



PART 77 OBSTRUCTIONS

#	DESCRIPTION	LATITUDE LONGITUDE	AMSL/AGL*	PENETRATION	PART 77 SURFACE	DISPOSITION
OB1	ROAD (N)	38°07'33.32"N 91°46'33.32"W	1160'/15'	7.5'	RW4 APP	
OB2	TREE	38°07'23.64"N 91°46'39.26"W	1181'/41'*	20.6'	RW4 APP	
OB3	TREE	38°07'24.20"N 91°46'40.39"W	1181'/41'*	19.8'	RW4 APP	
OB4	ROAD (N)	38°07'25.14"N 91°46'41.55"W	1157'/15'	-5.8'	RW4 APP	
OB5	TREE	38°07'22.88"N 91°46'39.53"W	1179'/39'*	16.5'	RW4 APP	
OB6	TREE	38°07'22.38"N 91°46'38.93"W	1182'/42'*	19.5'	RW4 APP	
OB7	TREE	38°07'20.71"N 91°46'37.17"W	1182'/42'*	18.3'	RW4 APP	
OB8	TREE	38°07'20.64"N 91°46'38.21"W	1187'/87'*	22.2'	RW4 APP	
OB9	TREE	38°07'24.79"N 91°46'43.50"W	1175'/38'*	9.7'	RW4 APP	
OB10	TREE	38°07'23.73"N 91°46'44.10"W	1179'/41'*	20.5'	RW4 APP	
OB11	ROAD (N)	38°07'27.17"N 91°46'51.33"W	1161'/15'	-13.2	RW4 APP	
OB12	PP	38°07'26.07"N 91°46'53.23"W	1176'/36'*	-16.8'	TRANSITIONAL	
OB13	ROAD (N)	38°07'04.19"N 91°45'47.85"W	1166'/15'	-21.9'	TRANSITIONAL	
OB14	SIGN	38°07'04.64"N 91°45'45.39"W	1166'/16'*	-1.3'	TRANSITIONAL	
OB15	TREE	38°07'03.14"N 91°45'46.29"W	1208'/63'*	16.8'	TRANSITIONAL	
OB16	TREE	38°07'08.60"N 91°45'38.94"W	1208'/66'*	39.6'	TRANSITIONAL	
OB17	REMOVED					
OB18	REMOVED					
OB19	TREE	38°07'07.11"N 91°45'37.27"W	1197'/55'*	22.5	RW31 APP	
OB20	ROAD (N)	38°07'05.33"N 91°45'40.68"W	1156'/15'	-17.1'	RW31 APP	
OB21	TREE	38°07'02.26"N 91°45'39.22"W	1183'/43'*	-0.7'	RW31 APP	
OB22	TREE	38°07'02.72"N 91°45'34.45"W	1181'/41'*	-14.2'	RW31 APP	
OB23	TREE	38°07'02.65"N 91°45'33.02"W	1182'/42'*	-17.3'	RW31 APP	
OB24	TREE	38°07'13.22"N 91°45'41.93"W	1189'/47'*	10.9'	TRANSITIONAL	
OB25	TREE	38°07'14.87"N 91°45'43.44"W	1186'/47'*	5.2'	TRANSITIONAL	
OB26	OL ON WSK	38°07'39.69"N 91°46'14.84"W	1148'/23'*	21.0'	PRIMARY	
OB27	ROAD (N)	38°07'49.12"N 91°46'42.43"W	1158'/15'	-31.5'	TRANSITIONAL	
OB28	ROAD (N)	38°07'53.60"N 91°46'38.44"W	1156'/15'	-1.0'	RW13 APP	
OB29	TREE	38°07'52.61"N 91°46'41.03"W	1162'/21'*	1.5'	RW13 APP	
OB30	TREE	38°07'58.79"N 91°46'34.60"W	1158'/23'*	-46.5'	TRANSITIONAL	
OB31	TREE	38°07'51.99"N 91°46'44.01"W	1162'/40'*	-22.9'	TRANSITIONAL	
OB32	TREE	38°07'56.43"N 91°46'43.40"W	1170'/29'*	-11.0'	RW13 APP	
OB33	TREE	38°07'55.99"N 91°46'44.33"W	1166'/25'*	-15.9'	RW13 APP	
OB34	TREE	38°08'00.96"N 91°46'38.41"W	1178'/40'*	-29.5'	TRANSITIONAL	
OB35	TREE	38°08'01.36"N 91°46'40.25"W	1178'/39'*	-23.0'	TRANSITIONAL	
OB36	POLE	38°07'58.73"N 91°46'50.49"W	1163'/28'*	-45.9'	RW13 APP	
OB37	POLE	38°08'03.13"N 91°46'46.13"W	1162'/32'*	-51.1'	RW13 APP	
OB38	TREE	38°08'02.42"N 91°45'50.90"W	1181'/61'*	-42.5'	RW13 APP	
OB39	TREE	38°07'59.97"N 91°46'54.61"W	1181'/59'*	-54.1'	TRANSITIONAL	
OB40	ROD ON TOWER	38°07'54.37"N 91°45'53.07"W	1139'/29'*	38.0'	PRIMARY	
OB41	ROD ON TOWER	38°07'54.87"N 91°45'53.03"W	1122'/12'*	21.0'	PRIMARY	
OB42	TREE	38°08'06.10"N 91°45'55.09"W	1131'/31'*	23.0'	PRIMARY	
OB43	TREE	38°08'07.99"N 91°45'53.70"W	1134'/36'*	25.0'	PRIMARY	
OB44	POLE	38°08'08.86"N 91°45'52.59"W	1120'/22'*	11.0'	PRIMARY	
OB45	TREE	38°08'10.41"N 91°45'50.23"W	1129'/29'*	20.0'	PRIMARY	
OB46	TREE	38°08'10.47"N 91°45'46.08"W	1133'/28'*	24.0'	PRIMARY	
OB47	GP	38°08'05.33"N 91°45'39.31"W	1136'/21'*	27.0'	PRIMARY	
OB48	POST	38°08'06.85"N 91°45'36.66"W	1126'/11'*	19.9'	RW22 APP	
OB49	TREE	38°08'15.23"N 91°45'39.93"W	1134'/34'*	12.0'	RW22 APP	
OB50	TREE	38°08'13.98"N 91°45'22.71"W	1150'/50'*	6.1'	TRANSITIONAL	
OB51	TREE	38°08'28.21"N 91°45'31.01"W	1138'/36'*	-6.3'	TRANSITIONAL	
OB52	1996-ACE-416-OE WATER TANK	38°05'04.65"N 91°45'53.57"W	1290'/170'	NONE	NONE	
OB53	2003-ACE-652-OE MOBILE HOME	38°07'10.70"N 91°45'27.00"W	1181'/25'	-117'	HORIZONTAL	
OB54	2003-ACE-653-OE BUILDING	38°07'12.30"N 91°46'27.00"W	1186'/25'	-112'	HORIZONTAL	
OB55	2003-ACE-732-OE BUILDING	38°07'07.53"N 91°46'25.88"W	1151'/18'	-147'	HORIZONTAL	
OB56	2003-ACE-733-OE BUILDING	38°07'09.73"N 91°46'08.18"W	1151'/18'	-139'	TRANSITIONAL	
OB57	2003-ACE-888-OE BUILDING	38°07'06.53"N 91°46'09.48"W	1191'/16'	-107'	HORIZONTAL	
OB58	2003-ACE-1564-OE HIGHWAY	38°07'29.21"N 91°46'58.09"W	1153'/15'	-5'	TRANSITIONAL	
OB59	2003-ACE-1565-OE HIGHWAY	38°07'25.33"N 91°46'41.28"W	1157'/15'	-11'	RW4 APP	
OB60	2003-ACE-1566-OE HIGHWAY	38°07'05.33"N 91°45'40.68"W	1163'/15'	-5'	RW31 APP	
OB61	REMOVED					
OB62	2006-ACE-236-OE HIGHWAY	38°07'05.33"N 91°45'40.68"W	1163'/15'	-5'	RW31 APP	
OB63	2006-ACE-237-OE HIGHWAY	38°07'29.21"N 91°46'58.09"W	1168'/15'	-90'	TRANSITIONAL	
OB64	2006-ACE-1123-OE TOWER	38°07'15.00"N 91°48'45.00"W	1223'/264'	-115'	CONICAL	
OB65	DOF# 29-001199 TOWER	38°08'08.00"N 91°46'25.00"W	1241'/111'	-57'	HORIZONTAL	
OB66	2004-ACE-63-OE TOWER	38°04'00.76"N 91°47'32.68"W	1427'/370'	NONE	NONE	

(N) 15 FEET ADDED TO ELEVATION TO DETERMINE PART 77 CLEARANCE OR PENETRATION.
SOURCES: 405 OBSTRUCTION SURVEY "TYPE D" BY TRANSYSTEMS CORPORATION, SEPT. 2006.
ARCHIVE SEARCH OF OE/AAA CASES, 1988 – PRESENT.
FAA/AVN DIGITAL OBSTACLE FILE 5/31/09.
AGL* – ELEVATIONS ESTIMATED FROM USGS QUADRANGLE MAP.

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

7.42°E. MAG. DEC.
0.6°W ANNUAL CHANGE
8/22/07

0 1000' 2000' 4000' 6000'
GRAPHIC SCALE IN FEET

DRAWING LEGEND

	PLANNED
AIRPORT PROPERTY LINE	
PART 77 PRIMARY SURFACE	
PART 77 APPROACH SURFACE	
PART 77 HORIZONTAL SURFACE	
PART 77 CONICAL SURFACE	
PART 77 TRANSITIONAL SURFACE	

NOTES:
1. USGS 7.5 MINUTE QUADRANGLE MAPS: PAYDOWN, VICHY, SAFE, HIGHGATE, BELLE, AND REDBIRD, MO.
2. SURFACES BASED ON FAR PART 77, "OBJECT AFFECTING NAVIGABLE AIRSPACE" JANUARY 1975, SEC. 77.25, CIVIL AIRPORT IMAGINARY SURFACES.

ROLLA NATIONAL AIRPORT
Rolla, Missouri

AIRPORT AIRSPACE DRAWING
CONICAL SURFACE PLAN VIEW

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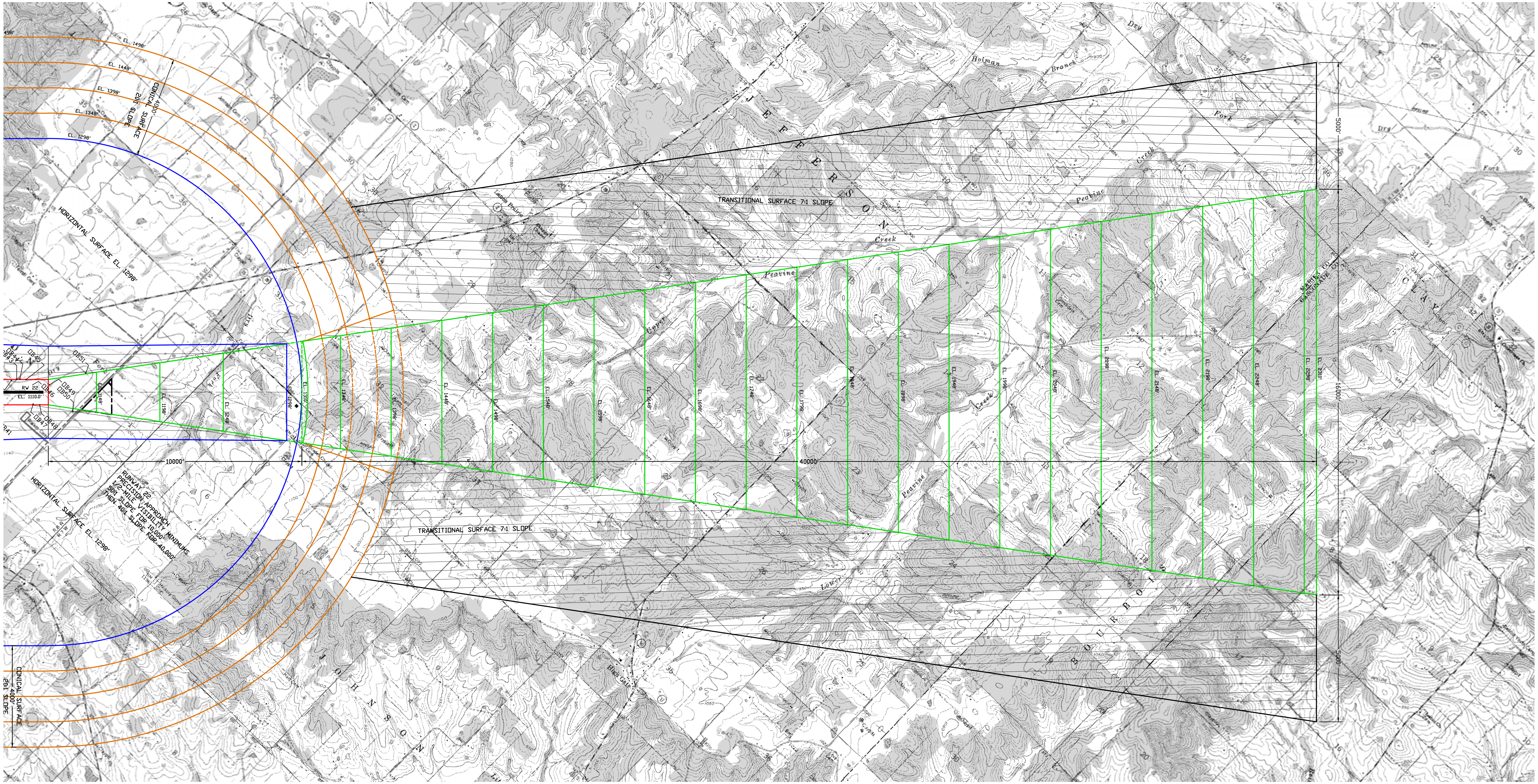
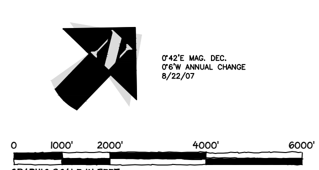
DATE
JUNE 2009

SCALE
1" = 2000'

SHEET NO.
2 OF 12

Figure E2 **Airport Airspace Drawing - Plan View**





REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

PART 77 OBSTRUCTIONS

#	DESCRIPTION	LATITUDE LONGITUDE	AMSL/AGL*	PENETRATION	PART 77 SURFACE	DISPOSITION
OB43	TREE	38°08'07.99"N 91°45'53.70"W	1134'/36'*	25.0'	PRIMARY	
OB44	POLE	38°08'08.86"N 91°45'52.59"W	1120'/22'*	11.0'	PRIMARY	
OB45	TREE	38°08'10.41"N 91°45'50.23"W	1129'/29'*	20.0'	PRIMARY	
OB46	TREE	38°08'10.47"N 91°45'46.08"W	1133'/28'*	24.0'	PRIMARY	
OB47	GP	38°08'05.33"N 91°45'39.31"W	1136'/21'*	27.0'	PRIMARY	
OB48	POST	38°08'06.85"N 91°45'36.66"W	1126'/11'*	19.9'	RW22 APP	
OB49	TREE	38°08'15.23"N 91°45'39.93"W	1134'/34'*	12.0'	RW22 APP	
OB50	TREE	38°08'13.98"N 91°45'22.71"W	1150'/50'*	6.1'	TRANSITIONAL	
OB51	TREE	38°08'28.21"N 91°45'31.01"W	1138'/36'*	−6.3'	TRANSITIONAL	

SOURCES: 405 OBSTRUCTION SURVEY "TYPE D" BY TRANSYSTEMS CORPORATION, SEPT. 2006.
ARCHIVE SEARCH OF OE/AAA CASES, 1988 – PRESENT.
FAA/AVN DIGITAL OBSTACLE FILE 5/31/09.
AGL* – ELEVATIONS ESTIMATED FROM USGS QUADRANGLE MAP.

DRAWING LEGEND

	PLANNED	
AIRPORT PROPERTY LINE	▬ ▬ ▬	
PART 77 PRIMARY SURFACE	red line	
PART 77 APPROACH SURFACE	green line	
PART 77 HORIZONTAL SURFACE	blue line	
PART 77 CONICAL SURFACE	orange line	
PART 77 TRANSITIONAL SURFACE	grey line	

NOTES:
1. USGS 7.5 MINUTE QUADRANGLE MAPS: PAYDOWN, VICHY, SAFE, HIGHGATE, BELLE, AND REDBIRD, MO.
2. SURFACES BASED ON FAR PART 77, "OBJECT AFFECTING NAVIGABLE AIRSPACE" JANUARY 1975, SEC. 77.25, CIVIL AIRPORT IMAGINARY SURFACES.

ROLLA NATIONAL AIRPORT
Rolla, Missouri

AIRPORT AIRSPACE DRAWING
RUNWAY 22 EXTENDED APPROACH

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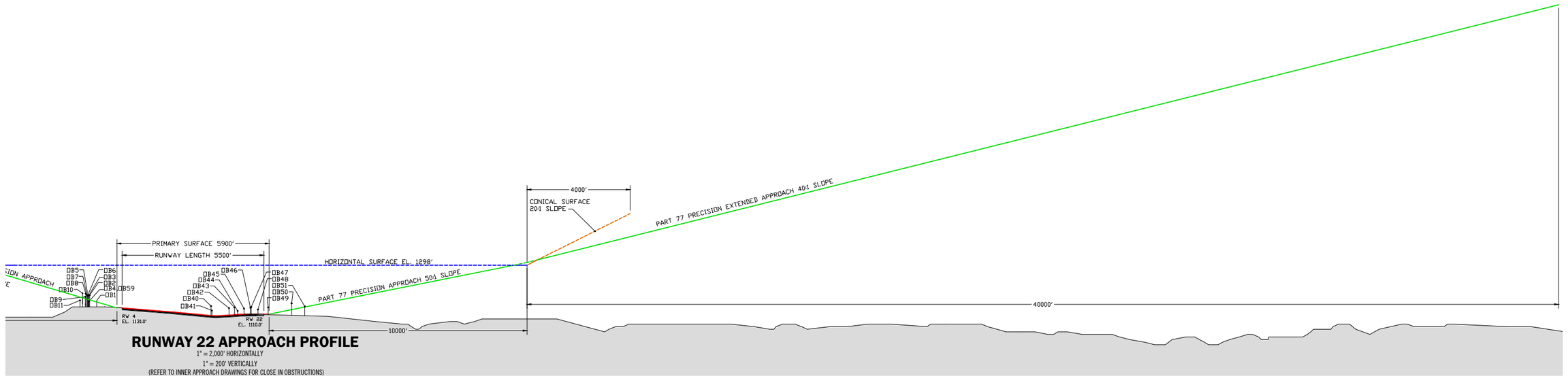
DATE
JUNE 2009

SCALE
1" = 2000'

SHEET NO.
3 OF 12

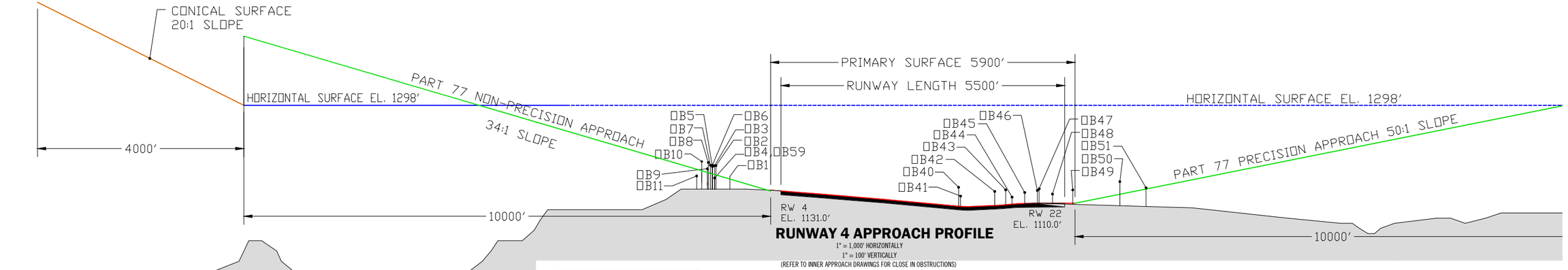
Figure E3 **Airport Airspace Drawing - Extended Approach Plan**



RUNWAY 22 APPROACH PROFILE

1" = 2,000' HORIZONTALLY
1" = 200' VERTICALLY
(REFER TO INNER APPROACH DRAWINGS FOR CLOSE IN OBSTRUCTIONS)

0 1000′ 2000′ 4000′ 6000′
GRAPHIC SCALE IN FEET



RUNWAY 4 APPROACH PROFILE

1" = 1,000' HORIZONTALLY
1" = 100' VERTICALLY
(REFER TO INNER APPROACH DRAWINGS FOR CLOSE IN OBSTRUCTIONS)

0 500′ 1000′ 2000′ 3000′
GRAPHIC SCALE IN FEET

PART 77 OBSTRUCTIONS

#	DESCRIPTION	LATITUDE LONGITUDE	AMSL/AGL*	PENETRATION	PART 77 SURFACE	DISPOSITION
0B1	ROAD (N)	38°07'23.32"N 91°46'33.32"W	1160'/15'	7.5'	RW4 APP	
0B2	TREE	38°07'23.64"N 91°46'39.26"W	1181'/41'*	20.6'	RW4 APP	
0B3	TREE	38°07'24.20"N 91°46'40.39"W	1181'/41'*	19.8'	RW4 APP	
0B4	ROAD (N)	38°07'25.14"N 91°46'41.55"W	1157'/15'	-5.8'	RW4 APP	
0B5	TREE	38°07'22.88"N 91°46'39.53"W	1179'/39'*	16.5'	RW4 APP	
0B6	TREE	38°07'22.38"N 91°46'38.93"W	1182'/42'*	19.5'	RW4 APP	
0B7	TREE	38°07'20.71"N 91°46'37.17"W	1182'/42'*	18.3'	RW4 APP	
0B8	TREE	38°07'20.64"N 91°46'38.21"W	1187'/87'*	22.2'	RW4 APP	
0B9	TREE	38°07'24.79"N 91°46'43.50"W	1175'/38'*	9.7'	RW4 APP	
0B10	TREE	38°07'23.73"N 91°46'44.10"W	1179'/41'*	20.5'	RW4 APP	
0B11	ROAD (N)	38°07'27.17"N 91°46'51.33"W	1161'/15'	-13.2	RW4 APP	
0B40	ROD ON TOWER	38°07'54.37"N 91°45'53.07"W	1139'/29'*	38.0'	PRIMARY	
0B41	ROD ON TOWER	38°07'54.87"N 91°45'53.03"W	1122'/12'*	21.0'	PRIMARY	
0B42	TREE	38°08'06.10"N 91°45'55.09"W	1131'/31'*	23.0'	PRIMARY	
0B43	TREE	38°08'07.99"N 91°45'53.70"W	1134'/36'*	25.0'	PRIMARY	
0B44	POLE	38°08'08.86"N 91°45'52.59"W	1120'/22'*	11.0'	PRIMARY	
0B45	TREE	38°08'10.41"N 91°45'50.23"W	1129'/29'*	20.0'	PRIMARY	
0B46	TREE	38°08'10.47"N 91°45'46.08"W	1133'/28'*	24.0'	PRIMARY	
0B47	GP	38°08'05.33"N 91°45'39.31"W	1136'/21'*	27.0'	PRIMARY	
0B48	POST	38°08'06.85"N 91°45'36.66"W	1126'/11'*	19.9'	RW22 APP	
0B49	TREE	38°08'15.23"N 91°45'39.93"W	1134'/34'*	12.0'	RW22 APP	
0B50	TREE	38°08'13.98"N 91°45'22.71"W	1150'/50'*	6.1'	TRANSITIONAL	
0B51	TREE	38°08'28.21"N 91°45'31.01"W	1138'/36'*	-6.3'	TRANSITIONAL	
0B59	2003-ACE-1565-OE HIGHWAY	38°07'25.33"N 91°46'41.28"W	1157'/15'	-11'	RW4 APP	

(N) 15 FEET ADDED TO ELEVATION TO DETERMINE PART 77 CLEARANCE OR PENETRATION.
SOURCES: 405 OBSTRUCTION SURVEY "TYPE D" BY TRANSYSTEMS CORPORATION, SEPT. 2006.
ARCHIVE SEARCH OF OE/AAA CASES, 1988 – PRESENT.
FAA/AVN DIGITAL OBSTACLE FILE 5/31/09.
AGL* – ELEVATIONS ESTIMATED FROM USGS QUADRANGLE MAP.

DRAWING LEGEND

	PLANNED
AIRPORT PROPERTY LINE	
PART 77 PRIMARY SURFACE	
PART 77 APPROACH SURFACE	
PART 77 HORIZONTAL SURFACE	
PART 77 CONICAL SURFACE	
PART 77 TRANSITIONAL SURFACE	

NOTES:
1. USGS 7.5 MINUTE QUADRANGLE MAPS: PAYDOWN, VICHY, SAFE, HIGHGATE, BELLE, AND REDBIRD, MO.
2. SURFACES BASED ON FAR PART 77, "OBJECT AFFECTING NAVIGABLE AIRSPACE" JANUARY 1975, SEC. 77.25, CIVIL AIRPORT IMAGINARY SURFACES.

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

ROLLA NATIONAL AIRPORT
Rolla, Missouri

AIRPORT AIRSPACE DRAWING
RUNWAY 4/22 APPROACH PROFILES

Barnard Dunkelberg & Company
TULSA
1616 East 15th Street
Tulsa, Oklahoma 74120
918.585.8844
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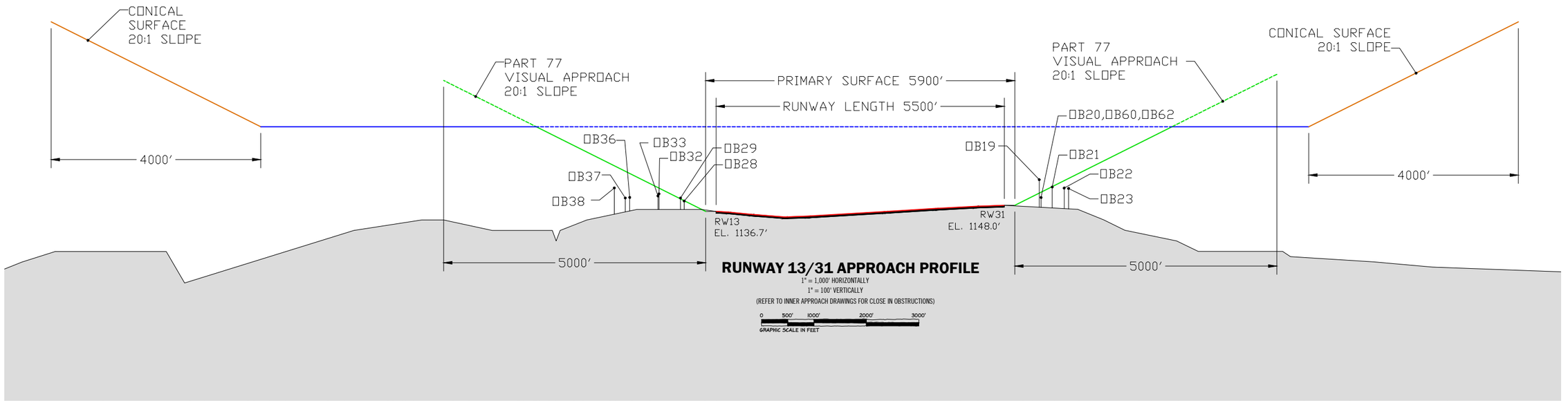
1743 Wazee Street, Suite 400
Denver, Colorado 80202
303.825.8844

DATE
JUNE 2009

SCALE
AS NOTED

SHEET NO.
4 OF 12

Figure E4 **Airport Airspace Drawing - Runway 4/22 Approach Profiles**



PART 77 OBSTRUCTIONS

#	DESCRIPTION	LATITUDE LONGITUDE	AMSL/AGL*	PENETRATION	PART 77 SURFACE	DISPOSITION
0817	REMOVED					
0818	REMOVED					
0819	TREE	38°07'07.11"N 91°45'37.27"W	1197'/56'*	22.5	RW31 APP	
0820	ROAD (N)	38°07'05.33"N 91°45'40.68"W	1156'/15'	–17.1'	RW31 APP	
0821	TREE	38°07'02.26"N 91°45'39.22"W	1183'/43'*	–0.7'	RW31 APP	
0822	TREE	38°07'02.72"N 91°45'34.45"W	1181'/41'*	–14.2'	RW31 APP	
0823	TREE	38°07'02.65"N 91°45'33.02"W	1182'/42'*	–17.3'	RW31 APP	
0828	ROAD (N)	38°07'53.60"N 91°46'38.44"W	1156'/15'	–1.0'	RW13 APP	
0829	TREE	38°07'52.61"N 91°46'41.03"W	1162'/21'*	1.5'	RW13 APP	
0832	TREE	38°07'56.43"N 91°46'43.40"W	1170'/29'*	–11.0'	RW13 APP	
0833	TREE	38°07'55.99"N 91°46'44.33"W	1166'/25'*	–15.9'	RW13 APP	
0836	POLE	38°07'58.73"N 91°46'50.49"W	1163'/28'*	–45.9'	RW13 APP	
0837	POLE	38°08'03.13"N 91°46'46.13"W	1162'/32'*	–51.1'	RW13 APP	
0838	TREE	38°08'02.42"N 91°46'50.90"W	1181'/61'*	–42.5'	RW13 APP	
0839	TREE	38°07'59.97"N 91°46'54.61"W	1181'/59'*	–54.1'	TRANSITIONAL	
0860	2003-ACE-1566-OE HIGHWAY	38°07'05.33"N 91°45'40.68"W	1163'/15'	–5'	RW31 APP	
0861	REMOVED					
0862	2006-ACE-236-OE HIGHWAY	38°07'05.33"N 91°45'40.68"W	1163'/15'	–5'	RW31 APP	

(N) 15 FEET ADDED TO ELEVATION TO DETERMINE PART 77 CLEARANCE OR PENETRATION.
SOURCES: 405 OBSTRUCTION SURVEY "TYPE D" BY TRANSYSTEMS CORPORATION, SEPT. 2006.
ARCHIVE SEARCH OF OE/AAA CASES, 1988 – PRESENT.
FAA/AVN DIGITAL OBSTACLE FILE 5/31/09.
AGL* – ELEVATIONS ESTIMATED FROM USGS QUADRANGLE MAP.

DRAWING LEGEND

	PLANNED
AIRPORT PROPERTY LINE	
PART 77 PRIMARY SURFACE	
PART 77 APPROACH SURFACE	
PART 77 HORIZONTAL SURFACE	
PART 77 CONICAL SURFACE	
PART 77 TRANSITIONAL SURFACE	

NOTES:
1. USGS 7.5 MINUTE QUADRANGLE MAPS: PAYDOWN, VICHY, SAFE, HIGHGATE, BELLE, AND REDBIRD, MO.
2. SURFACES BASED ON FAR PART 77, "OBJECT AFFECTING NAVIGABLE AIRSPACE" JANUARY 1975, SEC. 77.25, CIVIL AIRPORT IMAGINARY SURFACES.

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

ROLLA NATIONAL AIRPORT
Rolla, Missouri

AIRPORT AIRSPACE DRAWING
RUNWAY 13/31 APPROACH PROFILES

Barnard Dunkelberg & Company
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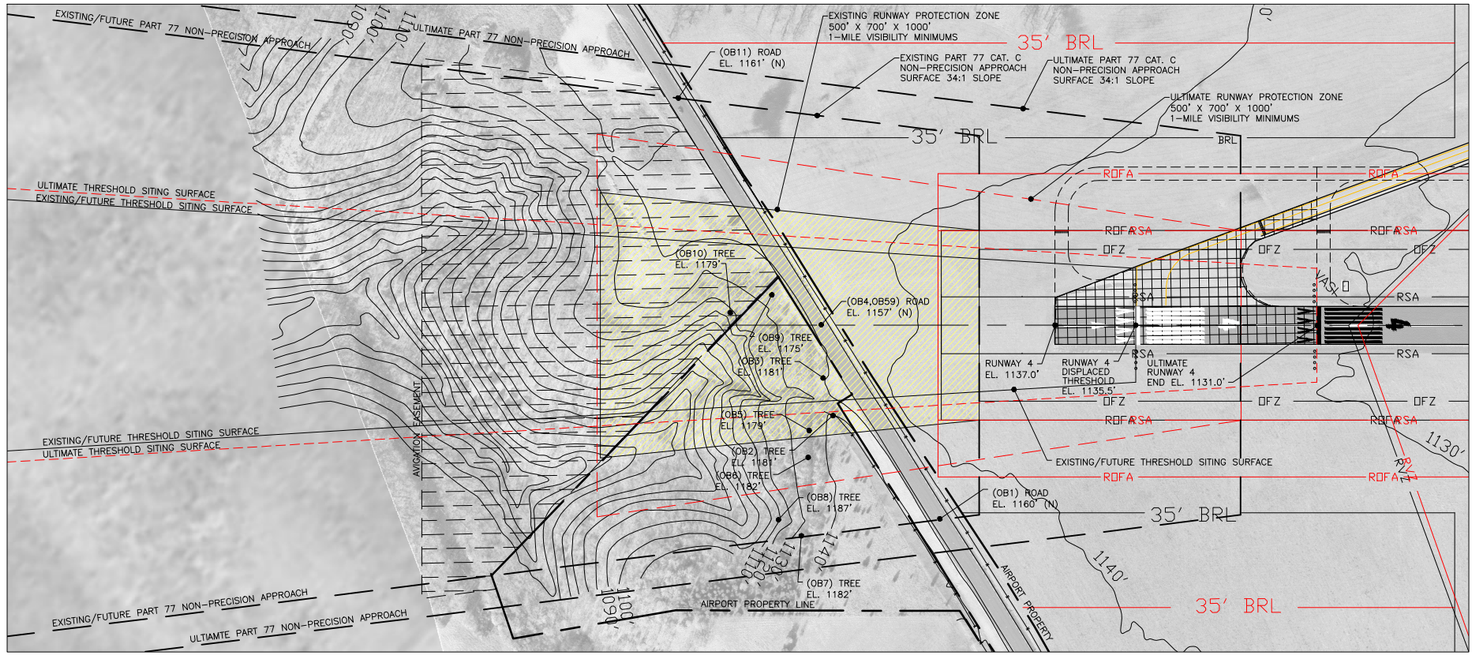
Tulsa, Oklahoma 74120
918.585.8844
DENVER
1743 Wazee Street, Suite 400
Denver, Colorado 80202
303.825.8844

DATE
JUNE 2009

SCALE
AS NOTED

SHEET NO.
5 OF 12

Figure E5 **Airport Airspace Drawing - Runway 13/31 Approach Profiles**



RUNWAY 4 - PLAN

1" = 200'

RUNWAY 4 - PROFILE

1" = 200' HORIZONTALLY
1" = 200' VERTICALLY

ULTIMATE THRESHOLD SITING PENETRATIONS

#	DESCRIPTION	ELEV.	PENETRATION	TSS	DISPOSITION
OB2	TREE	1181'	7.7'	RW4 TYPE 7	REMOVE
OB3	TREE	1181'	6.9'	RW4 TYPE 7	REMOVE
OB5	TREE	1179'	3.1'	RW4 TYPE 7	REMOVE

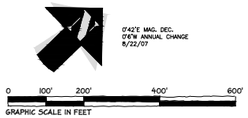
EXISTING THRESHOLD SITING PENETRATIONS

#	DESCRIPTION	ELEV.	PENETRATION	TSS	DISPOSITION
OB2	TREE	1181'	19.6'	RW4 TYPE 7	REMOVE
OB3	TREE	1181'	18.8'	RW4 TYPE 7	REMOVE
OB5	TREE	1179'	15.0'	RW4 TYPE 7	REMOVE
OB9	TREE	1175'	8.7'	RW4 TYPE 7	REMOVE
OB10	TREE	1179'	8.0'	RW4 TYPE 7	REMOVE

PART 77 OBSTRUCTIONS

#	DESCRIPTION	LATITUDE LONGITUDE	AMSL/AGL*	PENETRATION	PART 77 SURFACE	DISPOSITION
OB1	ROAD (N)	38°07'23.32"N 91°46'33.32"W	1160'/15'	7.5'	RW4 APP	
OB2	TREE	38°07'23.64"N 91°46'39.26"W	1181'/41'*	20.6'	RW4 APP	
OB3	TREE	38°07'24.20"N 91°46'40.39"W	1181'/41'*	19.8'	RW4 APP	
OB4	ROAD (N)	38°07'25.14"N 91°46'41.55"W	1157'/15'	-5.8'	RW4 APP	
OB5	TREE	38°07'22.88"N 91°46'39.53"W	1179'/39'*	16.5'	RW4 APP	
OB6	TREE	38°07'22.38"N 91°46'38.93"W	1182'/42'*	19.5'	RW4 APP	
OB7	TREE	38°07'20.71"N 91°46'37.17"W	1182'/42'*	18.3'	RW4 APP	
OB8	TREE	38°07'20.64"N 91°46'38.21"W	1187'/87'*	22.2'	RW4 APP	
OB9	TREE	38°07'24.79"N 91°46'43.50"W	1175'/38'*	9.7'	RW4 APP	
OB10	TREE	38°07'23.73"N 91°46'44.10"W	1179'/41'*	20.5'	RW4 APP	
OB11	ROAD (N)	38°07'27.17"N 91°46'51.33"W	1161'/15'	-13.2	RW4 APP	
OB59	2003-ACE-1565-OE HIGHWAY	38°07'25.33"N 91°46'41.28"W	1157'/15'	-11'	RW4 APP	

(N) 15 FEET ADDED TO ELEVATION TO DETERMINE PART 77 CLEARANCE OR PENETRATION.
SOURCES: 405 OBSTRUCTION SURVEY "TYPE D" BY TRANSYSTEMS CORPORATION, SEPT. 2006.
ARCHIVE SEARCH OF OE/AAA CASES, 1988 - PRESENT.
FAA/AVN DIGITAL OBSTACLE FILE 5/31/09
AGL* - ELEVATIONS ESTIMATED FROM USGS QUADRANGLE MAP.



AIRPORT INFORMATION

	EXISTING	FUTURE	ULTIMATE
AIRPORT ELEVATION (AMSL) NAVD 88	1148.0'	SAME	SAME
AIRPORT REFERENCE POINT (ARP) NAD 83	LAT. 38°07'38.76"N LON. 91°46'10.28"W	SAME SAME	LAT. 38°07'40.53"N LON. 91°46'08.63"W
MEAN MAX. TEMPERATURE (HOTTEST MONTH)	88°F (JULY)	SAME	SAME
COMBINED WIND COVERAGE (13kt,10.5kt)	95.58%, 98.32%	SAME	SAME
MAGNETIC VARIATION (DATE)	1°47'E (JUNE '06)	SAME	SAME
AIRPORT REFERENCE CODE	B-II	SAME	C-II
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HAWKER 800XP
NPIAS SERVICE LEVEL	GA	SAME	SAME
TAXIWAY LIGHTING	MITL	SAME	SAME
TAXIWAY MARKING	C/L, HOLDLINES	SAME	SAME
AIRPORT & TERMINAL NAVAIDS	VOR/DME,BEACON,RNAV(GPS)	SAME	LPV,BEACON,RNAV(GPS)

REMARKS

DRAWING LEGEND

	EXISTING	FUTURE/ULTIMATE
AIRPORT PROPERTY LINE		
AIRPORT SECURITY FENCE	X	XX
AIRPORT BUILDINGS		
AIRFIELD PAVEMENT		
PAVED ROADS		
AIRFIELD PAVEMENT REMOVED		
RUNWAY PROTECTION ZONE		
BUILDING RESTRICTION LINE	BRL	BRL
OBSTACLE FREE ZONE	OFZ	
RUNWAY SAFETY AREA	RSA	RSA
RUNWAY OBJECT FREE AREA	ROFA	ROFA
FUEL STORAGE AREA		
AIRPORT BEACON		
LIGHTED WIND CONE & SEGMENTED CIRCLE		
WIND CONE		
VISUAL APPROACH SLOPE INDICATOR (VASI)		
RUNWAY END IDENTIFIER LIGHTS (REIL)		
AIRPORT REFERENCE POINT (ARP)		

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

RUNWAY INFORMATION

	RUNWAY 4/22			RUNWAY 13/31	
	EXISTING	FUTURE	ULTIMATE	EXISTING	FUTURE
APPROACH VISIBILITY MINIMUMS	1-MILE/3/4-MILE	SAME	1-MILE/1/2-MILE	VISUAL/VISUAL	SAME
FAR PART 77 APPROACH SLOPE	20:1/34:1	SAME	20:1/50:1	20:1/20:1	SAME
RUNWAY WIDTH X LENGTH	100' X 5500'	SAME	100' x 5500'	100' x 5500'	75' x 5500'
RUNWAY PAVEMENT TYPE	ASPHALT	SAME	SAME	ASPHALT	SAME
TAXIWAY PAVEMENT TYPE	ASPHALT	SAME	SAME	ASPHALT	SAME
PAVEMENT STRENGTH (IN 1000 LBS.)	75S,85D,130DT	SAME	SAME	485,620,92DT	SAME
RUNWAY LIGHTING	MIRL, NON-STD HIRL	SAME	SAME	MIRL	SAME
RUNWAY MARKING	NP/NP	SAME	NP/PREC	VISUAL/VISUAL	SAME
EFFECTIVE RUNWAY GRADIENT	0.5 %	SAME	SAME	0.2 %	SAME
MAXIMUM GRADE WITHIN RUNWAY LENGTH %	0.7 %	SAME	SAME	0.9 %	SAME
RUNWAY LINE-OF-SIGHT	CRITERIA MET	SAME	SAME	CRITERIA MET	SAME
PERCENT WIND COVERAGE (13kt, 10.5kt)	87.5, 91.4	SAME	SAME	89.5, 94.1	SAME
VISUAL APPROACH AIDS	VASI/VASI, REILS	SAME	SAME	NONE	SAME
INSTRUMENT APPROACH AIDS	VOR/DME, RNAV(GPS)	SAME	LPV/RNAV(GPS)	NONE	SAME
AIRPORT REFERENCE CODE	B-II	SAME	C-II	B-I	SAME
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HAWKER 800XP	KING AIR B-200	SAME
RUNWAY SAFETY AREA (RSA) WIDTH	150'	SAME	500'	120'	SAME
RSA LENGTH BEYOND STOP END	300'/300'	SAME	1000'/1000'	240'/240'	SAME
RUNWAY OBJECT FREE AREA (ROFA) WIDTH	500'	SAME	800'	400'	SAME
OFA LENGTH BEYOND STOP END	300'/300'	SAME	1000'/1000'	240'/240'	SAME
OBSTACLE FREE ZONE (OFZ) WIDTH *	400'	SAME	SAME	400'	SAME
OFZ LENGTH BEYOND STOP END *	200'/200'	SAME	SAME	200'/200'	SAME
RUNWAY CENTERLINE TO TAXIWAY HOLD LINE	200'	SAME	250'	200'	SAME
TAXIWAY WIDTH	35'	SAME	35'	N/A	25'
TOUCHDOWN ZONE ELEVATION	1137.0'/1117.3'	SAME	SAME	1136.7'/1148.0'	SAME

* No OFZ object penetrations

ROLLA NATIONAL AIRPORT

Rolla, Missouri

INNER PORTION OF THE APPROACH SURFACE RUNWAY 4 - PLAN & PROFILE

Barnard Dunkelberg & Company

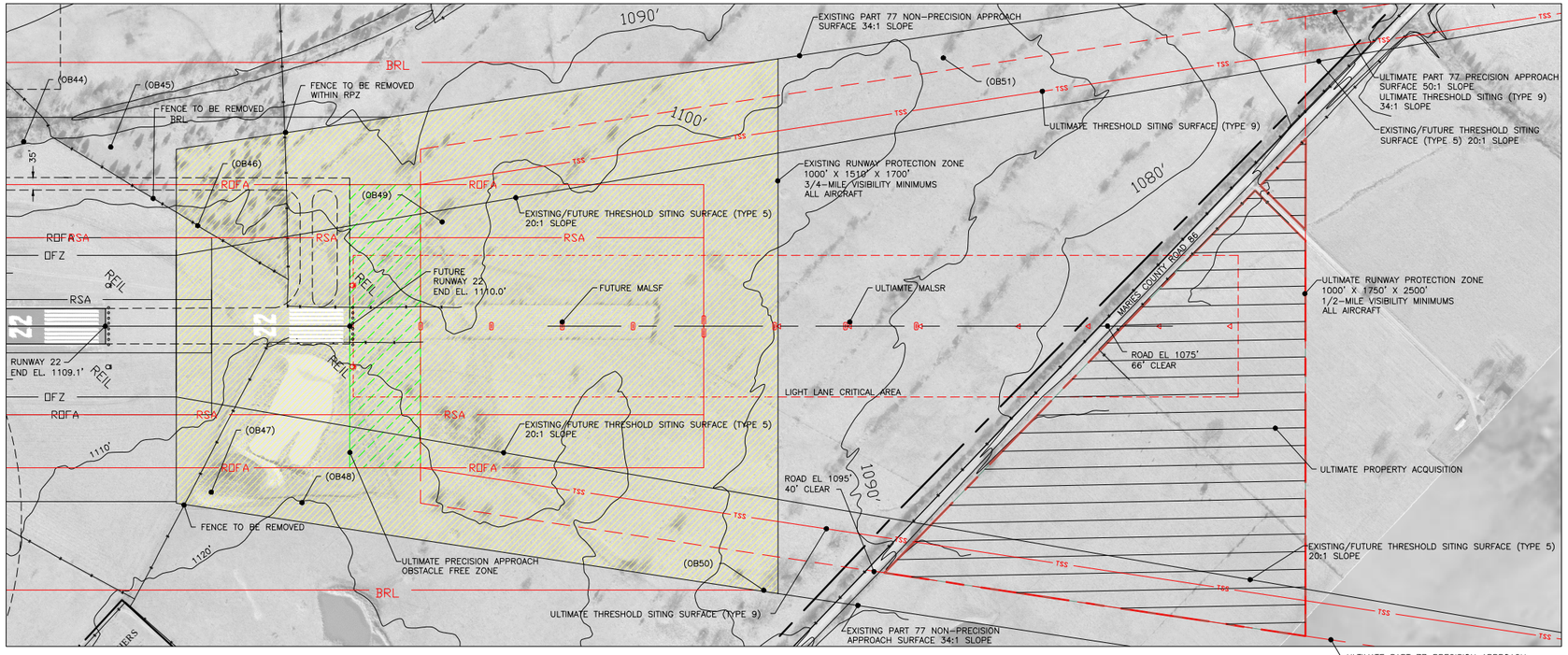
TULSA
1616 East 15th Street
Tulsa, Oklahoma 74120
918.585.8844

DENVER
1743 Wazee Street, Suite 400
Denver, Colorado 80202
303.825.8844

DATE
JUNE 2009

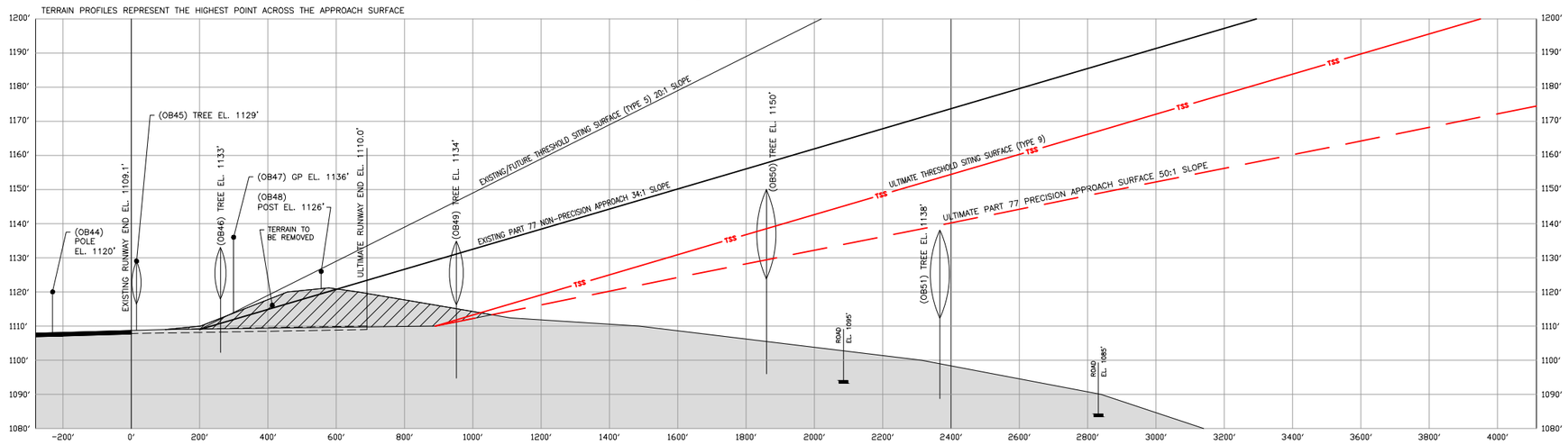
SCALE
1" = 200'

SHEET NO.
6 OF 12



RUNWAY 22 - PLAN

1" = 200'



RUNWAY 22 - PROFILE

1" = 200' HORIZONTALLY
1" = 200' VERTICALLY

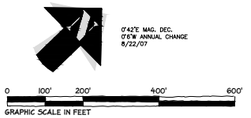
ULTIMATE THRESHOLD SITING PENETRATIONS

#	DESCRIPTION	ELEV.	PENETRATION	TSS	DISPOSITION
OB49	TREE	1134'	22.8'	RW22 TYPE 5	REMOVE

PART 77 OBSTRUCTIONS

#	DESCRIPTION	LATITUDE LONGITUDE	AMSL/AGL*	PENETRATION	PART 77 SURFACE	DISPOSITION
OB44	POLE	38°08'08.86"N 91°45'52.59"W	1120'/22'*	11.0'	PRIMARY	
OB45	TREE	38°08'10.41"N 91°45'50.23"W	1129'/29'*	20.0'	PRIMARY	
OB46	TREE	38°08'10.47"N 91°45'46.08"W	1133'/28'*	24.0'	PRIMARY	
OB47	GP	38°08'05.33"N 91°45'39.31"W	1136'/21'*	27.0'	PRIMARY	
OB48	POST	38°08'06.85"N 91°45'36.66"W	1126'/11'*	19.9'	RW22 APP	
OB49	TREE	38°08'15.23"N 91°45'39.93"W	1134'/34'*	12.0'	RW22 APP	
OB50	TREE	38°08'13.98"N 91°45'22.71"W	1150'/50'*	6.1'	TRANSITIONAL	
OB51	TREE	38°08'28.21"N 91°45'31.01"W	1138'/36'*	-6.3'	TRANSITIONAL	

(N) 15 FEET ADDED TO ELEVATION TO DETERMINE PART 77 CLEARANCE OR PENETRATION.
SOURCES: 405 OBSTRUCTION SURVEY "TYPE D" BY TRANSYSTEMS CORPORATION, SEPT. 2006.
ARCHIVE SEARCH OF OE/AAA CASES, 1988 – PRESENT.
FAA/AVN DIGITAL OBSTACLE FILE 5/31/09.
AGL* – ELEVATIONS ESTIMATED FROM USGS QUADRANGLE MAP.



AIRPORT INFORMATION

	EXISTING	FUTURE	ULTIMATE
AIRPORT ELEVATION (AMSL) NAVD 88	1148.0'	SAME	SAME
AIRPORT REFERENCE POINT (ARP) NAD 83	LAT. 38°07'38.76"N LON. 91°46'10.28"W	SAME SAME	LAT. 38°07'40.53"N LON. 91°46'08.63"W
MEAN MAX. TEMPERATURE (HOTTEST MONTH)	88°F (JULY)	SAME	SAME
COMBINED WIND COVERAGE (13kt,10.5kt)	95.58%, 98.32%	SAME	SAME
MAGNETIC VARIATION (DATE)	12°47'E (JUNE '06)	SAME	SAME
AIRPORT REFERENCE CODE	B-II	SAME	C-II
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HAWKER 800XP
NPIAS SERVICE LEVEL	GA	SAME	SAME
TAXIWAY LIGHTING	MITL	SAME	SAME
TAXIWAY MARKING	C/L, HOLDLINES	SAME	SAME
AIRPORT & TERMINAL NAVAIDS	VOR/DME,BEACON,RNAV(GPS)	SAME	LPV,BEACON,RNAV(GPS)
REMARKS			

DRAWING LEGEND

	EXISTING	FUTURE/ULTIMATE
AIRPORT PROPERTY LINE		
AIRPORT SECURITY FENCE	X	XX
AIRPORT BUILDINGS		
AIRFIELD PAVEMENT		
PAVED ROADS		
AIRFIELD PAVEMENT REMOVED		
RUNWAY PROTECTION ZONE		
BUILDING RESTRICTION LINE	BRL	BRL
OBSTACLE FREE ZONE	OFZ	
RUNWAY SAFETY AREA	RSA	RSA
RUNWAY OBJECT FREE AREA	ROFA	ROFA
FUEL STORAGE AREA		
AIRPORT BEACON		
LIGHTED WIND CONE & SEGMENTED CIRCLE		
WIND CONE		
VISUAL APPROACH SLOPE INDICATOR (VASI)		
RUNWAY END IDENTIFIER LIGHTS (REIL)		
AIRPORT REFERENCE POINT (ARP)		

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

RUNWAY INFORMATION

	RUNWAY 4/22			RUNWAY 13/31	
	EXISTING	FUTURE	ULTIMATE	EXISTING	FUTURE
APPROACH VISIBILITY MINIMUMS	1-MILE/3/4-MILE	SAME	1-MILE/1/2-MILE	VISUAL/VISUAL	SAME
FAR PART 77 APPROACH SLOPE	20:1/34:1	SAME	20:1/50:1	20:1/20:1	SAME
RUNWAY WIDTH X LENGTH	100' X 5500'	SAME	100' x 5500'	100' x 5500'	75' x 5500'
RUNWAY PAVEMENT TYPE	ASPHALT	SAME	SAME	ASPHALT	SAME
TAXIWAY PAVEMENT TYPE	ASPHALT	SAME	SAME	ASPHALT	SAME
PAVEMENT STRENGTH (IN 1000 LBS.)	755,850,130DT	SAME	SAME	485,62D,92DT	SAME
RUNWAY LIGHTING	MIRL, NON-STD HIRL	SAME	MIRL		SAME
RUNWAY MARKING	NP/NP	SAME	NP/PREC	VISUAL/VISUAL	SAME
EFFECTIVE RUNWAY GRADIENT	0.5 %	SAME	SAME	0.2 %	SAME
MAXIMUM GRADE WITHIN RUNWAY LENGTH %	0.7 %	SAME	SAME	0.9 %	SAME
RUNWAY LINE-OF-SIGHT	CRITERIA MET	SAME	SAME	CRITERIA MET	SAME
PERCENT WIND COVERAGE (13kt, 10.5kt)	87.5, 91.4	SAME	SAME	89.5, 94.1	SAME
VISUAL APPROACH AIDS	VASI/VASI, REILS	SAME	SAME	NONE	SAME
INSTRUMENT APPROACH AIDS	VOR/DME, RNAV(GPS)	SAME	LPV/RNAV(GPS)	NONE	SAME
AIRPORT REFERENCE CODE	B-II	SAME	C-II	B-I	SAME
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HAWKER 800XP	KING AIR B-200	SAME
RUNWAY SAFETY AREA (RSA) WIDTH	150'	SAME	500'	120'	SAME
RSA LENGTH BEYOND STOP END	300'/300'	SAME	1000'/1000'	240'/240'	SAME
RUNWAY OBJECT FREE AREA (ROFA) WIDTH	500'	SAME	800'	400'	SAME
OFA LENGTH BEYOND STOP END	300'/300'	SAME	1000'/1000'	240'/240'	SAME
OBSTACLE FREE ZONE (OFZ) WIDTH *	400'	SAME	SAME	400'	SAME
OFZ LENGTH BEYOND STOP END *	200'/200'	SAME	SAME	200'/200'	SAME
RUNWAY CENTERLINE TO TAXIWAY HOLD LINE	200'	SAME	250'	200'	SAME
TAXIWAY WIDTH	35'	SAME	35'	N/A	25'
TOUCHDOWN ZONE ELEVATION	1137.0'/1117.3'	SAME	SAME	1136.7'/1148.0'	SAME

* No OFZ object penetrations

ROLLA NATIONAL AIRPORT

Rolla, Missouri

INNER PORTION OF THE APPROACH SURFACE RUNWAY 22 - PLAN & PROFILE

Barnard Dunkelberg & Company

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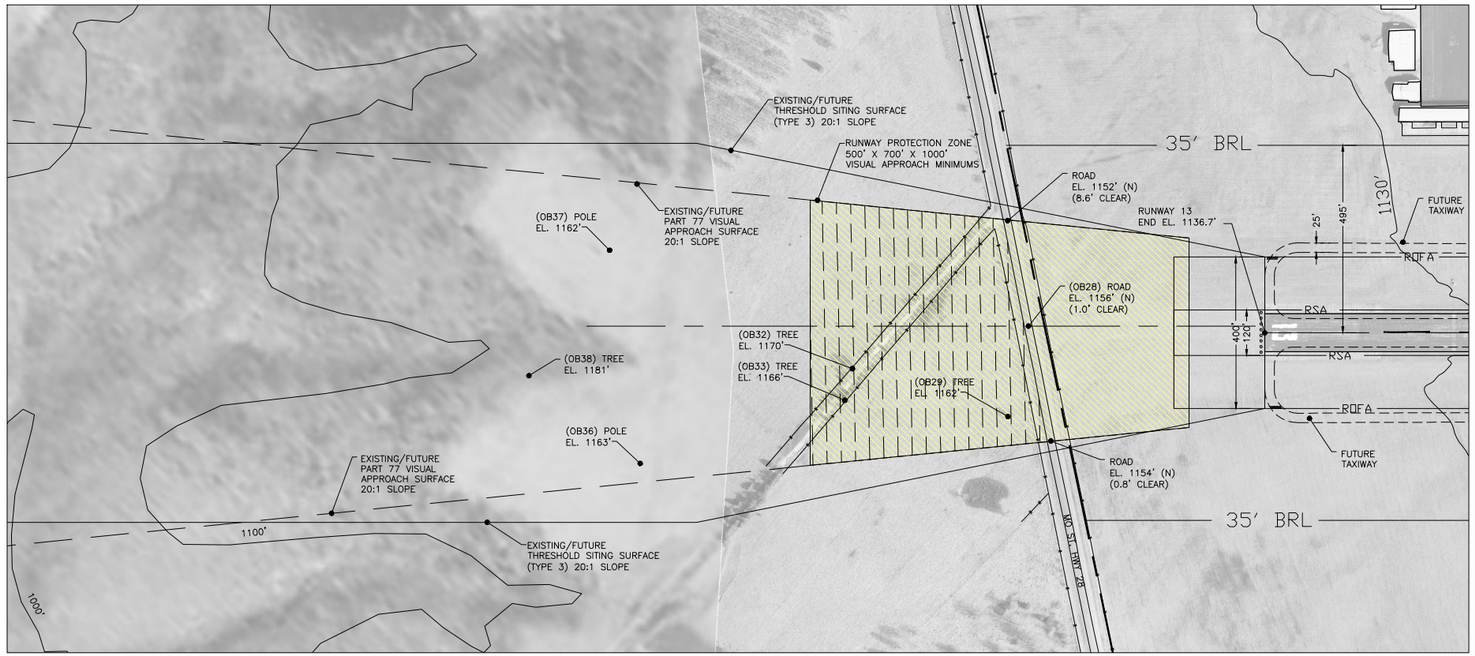
DATE
JUNE 2009

SCALE
1" = 200'

SHEET NO.
7 OF 12



RUNWAY 13 - PLAN

1" = 200'

RUNWAY 13 - PROFILE

1" = 200' HORIZONTALLY
1" = 200' VERTICALLY

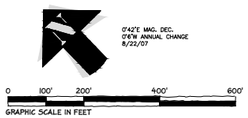
THRESHOLD SITING PENETRATIONS

#	DESCRIPTION	ELEV.	PENETRATION	TSS	DISPOSITION
	NONE				

PART 77 OBSTRUCTIONS

#	DESCRIPTION	LATITUDE LONGITUDE	AMSL/AGL*	PENETRATION	PART 77 SURFACE	DISPOSITION
OB28	ROAD (N)	38°07'53.60"N 91°46'38.44"W	1156'/15'	-1.0'	RW13 APP	
OB29	TREE	38°07'52.61"N 91°46'41.03"W	1162'/21'*	1.5'	RW13 APP	
OB32	TREE	38°07'56.43"N 91°46'43.40"W	1170'/29'*	-11.0'	RW13 APP	
OB33	TREE	38°07'55.99"N 91°46'44.33"W	1166'/25'*	-15.9'	RW13 APP	
OB36	POLE	38°07'58.73"N 91°46'50.49"W	1163'/28'*	-45.9'	RW13 APP	
OB37	POLE	38°08'03.13"N 91°46'46.13"W	1162'/32'*	-51.1'	RW13 APP	
OB38	TREE	38°08'02.42"N 91°46'50.90"W	1181'/61'*	-42.5'	RW13 APP	

(N) 15 FEET ADDED TO ELEVATION TO DETERMINE PART 77 CLEARANCE OR PENETRATION.
SOURCES: 405 OBSTRUCTION SURVEY "TYPE D" BY TRANSYSTEMS CORPORATION, SEPT. 2006.
ARCHIVE SEARCH OF OE/AAA CASES, 1958 – PRESENT.
FAA/AVN DIGITAL OBSTACLE FILE 5/31/09.
AGL* – ELEVATIONS ESTIMATED FROM USGS QUADRANGLE MAP.



AIRPORT INFORMATION

	EXISTING	FUTURE	ULTIMATE
AIRPORT ELEVATION (AMSL) NAVD 88	1148.0'	SAME	SAME
AIRPORT REFERENCE POINT (ARP) NAD 83	LAT. 38°07'38.76"N LON. 91°46'10.28"W	SAME SAME	LAT. 38°07'40.53"N LON. 91°46'08.63"W
MEAN MAX. TEMPERATURE (HOTTEST MONTH)	88°F (JULY)	SAME	SAME
COMBINED WIND COVERAGE (13kt,10.5kt)	95.58%, 98.32%	SAME	SAME
MAGNETIC VARIATION (DATE)	12°47'E (JUNE '06)	SAME	SAME
AIRPORT REFERENCE CODE	B-II	SAME	C-II
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HAWKER 800XP
NPIAS SERVICE LEVEL	GA	SAME	SAME
TAXIWAY LIGHTING	MITL	SAME	SAME
TAXIWAY MARKING	C/L, HOLDLINES	SAME	SAME
AIRPORT & TERMINAL NAVAIDS	VOR/DME,BEACON,RNW(GPS)	SAME	LPV,BEACON,RNW(GPS)
REMARKS			

DRAWING LEGEND

	EXISTING	FUTURE/ULTIMATE
AIRPORT PROPERTY LINE		
AIRPORT SECURITY FENCE	X	XX
AIRPORT BUILDINGS		
AIRFIELD PAVEMENT		
PAVED ROADS		
AIRFIELD PAVEMENT REMOVED		
RUNWAY PROTECTION ZONE		
BUILDING RESTRICTION LINE	BRL	BRL
OBSTACLE FREE ZONE	OFZ	
RUNWAY SAFETY AREA	RSA	RSA
RUNWAY OBJECT FREE AREA	ROFA	ROFA
FUEL STORAGE AREA		
AIRPORT BEACON		
LIGHTED WIND CONE & SEGMENTED CIRCLE		
WIND CONE		
VISUAL APPROACH SLOPE INDICATOR (VASI)		
RUNWAY END IDENTIFIER LIGHTS (REIL)		
AIRPORT REFERENCE POINT (ARP)		

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

RUNWAY INFORMATION

	RUNWAY 4/22			RUNWAY 13/31	
	EXISTING	FUTURE	ULTIMATE	EXISTING	FUTURE
APPROACH VISIBILITY MINIMUMS	1-MILE/3/4-MILE	SAME	1-MILE/1/2-MILE	VISUAL/VISUAL	SAME
FAR PART 77 APPROACH SLOPE	20:1/34:1	SAME	20:1/50:1	20:1/20:1	SAME
RUNWAY WIDTH X LENGTH	100' X 5500'	SAME	100' x 5500'	100' x 5500'	75' x 5500'
RUNWAY PAVEMENT TYPE	ASPHALT	SAME	SAME	ASPHALT	SAME
TAXIWAY PAVEMENT TYPE	ASPHALT	SAME	SAME	ASPHALT	SAME
PAVEMENT STRENGTH (IN 1000 LBS.)	75S,85D,130DT	SAME	SAME	485,620,92DT	SAME
RUNWAY LIGHTING	MIRL, NON-STD HIRL	SAME	SAME	MIRL	SAME
RUNWAY MARKING	NP/NP	SAME	NP/PREC	VISUAL/VISUAL	SAME
EFFECTIVE RUNWAY GRADIENT	0.5 %	SAME	SAME	0.2 %	SAME
MAXIMUM GRADE WITHIN RUNWAY LENGTH %	0.7 %	SAME	SAME	0.9 %	SAME
RUNWAY LINE-OF-SIGHT	CRITERIA MET	SAME	SAME	CRITERIA MET	SAME
PERCENT WIND COVERAGE (13kt, 10.5kt)	87.5, 91.4	SAME	SAME	89.5, 94.1	SAME
VISUAL APPROACH AIDS	VASI/VASI, REILS	SAME	SAME	NONE	SAME
INSTRUMENT APPROACH AIDS	VOR/DME, RNAV(GPS)	SAME	LPV/RNAV(GPS)	NONE	SAME
AIRPORT REFERENCE CODE	B-II	SAME		B-I	SAME
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HAWKER 800XP	KING AIR B-200	SAME
RUNWAY SAFETY AREA (RSA) WIDTH	150'	SAME	500'	120'	SAME
RSA LENGTH BEYOND STOP END	300'/300'	SAME	1000'/1000'	240'/240'	SAME
RUNWAY OBJECT FREE AREA (ROFA) WIDTH	500'	SAME	800'	400'	SAME
OFA LENGTH BEYOND STOP END	300'/300'	SAME	1000'/1000'	240'/240'	SAME
OBSTACLE FREE ZONE (OFZ) WIDTH *	400'	SAME	SAME	400'	SAME
OFZ LENGTH BEYOND STOP END *	200'/200'	SAME	SAME	200'/200'	SAME
RUNWAY CENTERLINE TO TAXIWAY HOLD LINE	200'	SAME	250'	200'	SAME
TAXIWAY WIDTH	35'	SAME	35'	N/A	25'
TOUCHDOWN ZONE ELEVATION	1137.0'/1117.3'	SAME	SAME	1136.7'/1148.0'	SAME

* No OFZ object penetrations

ROLLA NATIONAL AIRPORT

Rolla, Missouri

INNER PORTION OF THE APPROACH SURFACE RUNWAY 13 - PLAN & PROFILE

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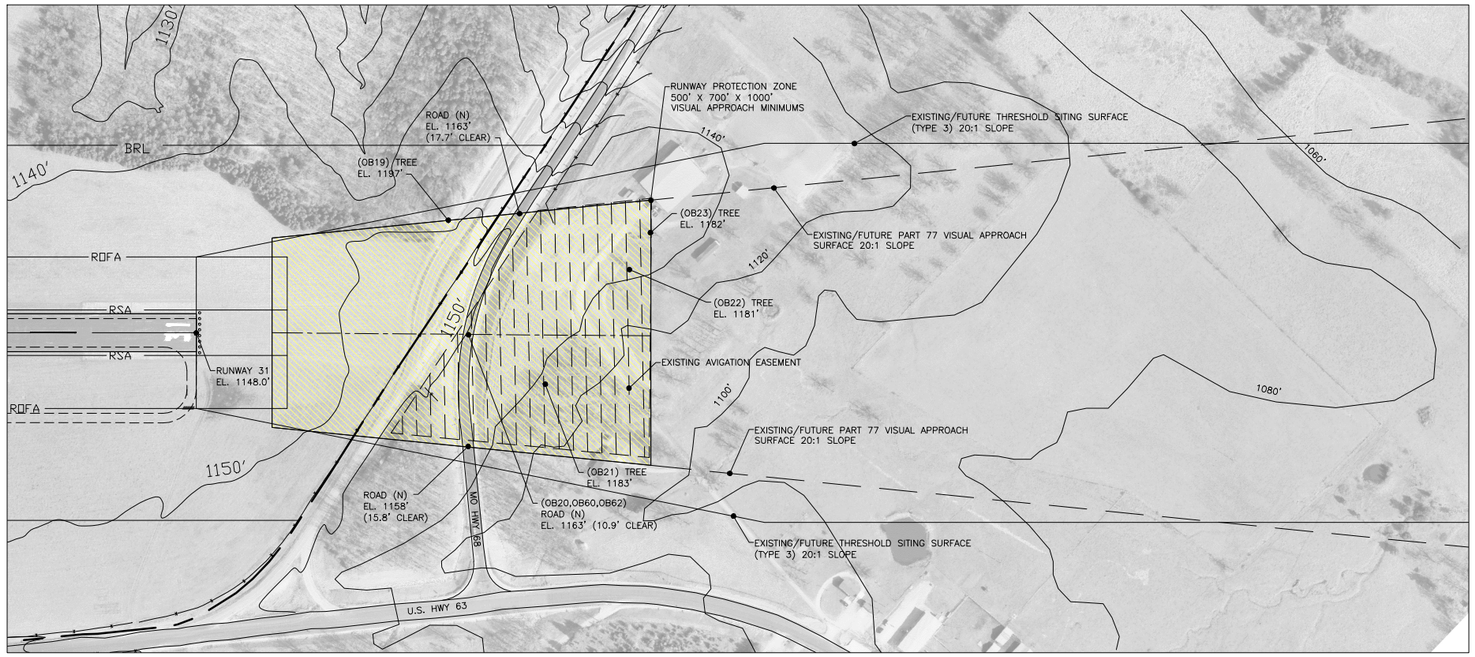
DATE
JUNE 2009

SCALE
1" = 200'

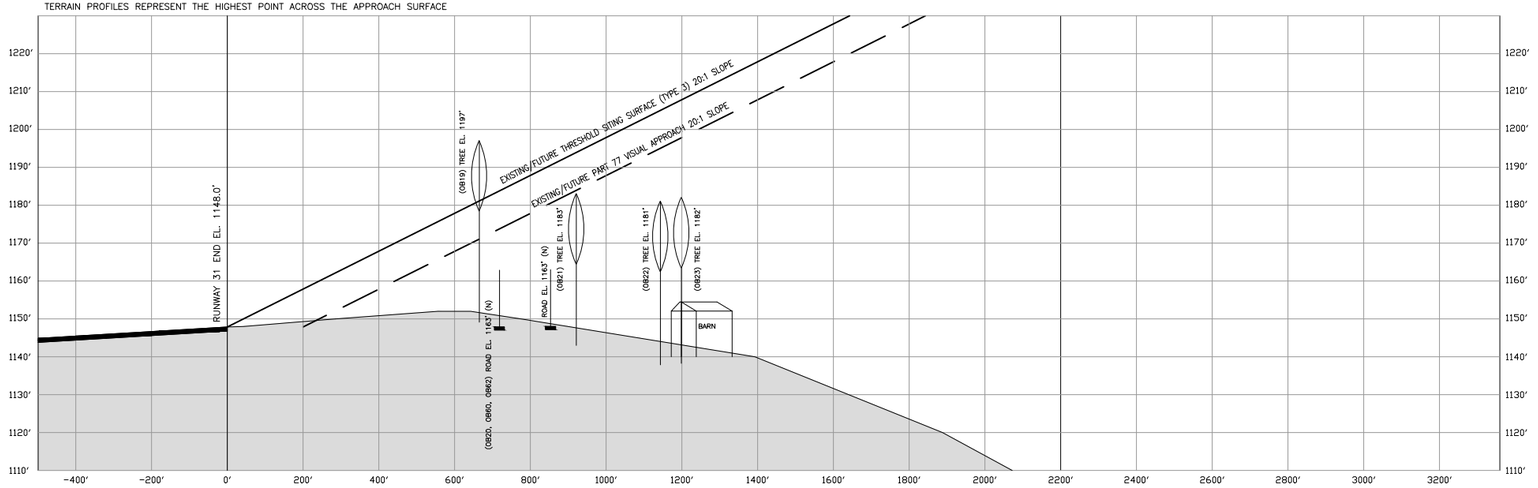
SHEET NO.
8 OF 12



RUNWAY 31 - PLAN

1" = 200'

TERRAIN PROFILES REPRESENT THE HIGHEST POINT ACROSS THE APPROACH SURFACE



RUNWAY 31 - PROFILE

1" = 200' HORIZONTALLY
1" = 200' VERTICALLY

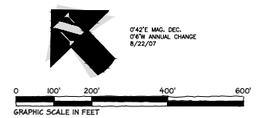
THRESHOLD SITING PENETRATIONS

#	DESCRIPTION	ELEV.	PENETRATION	TSS	DISPOSITION
OB19	TREE	1197'	15.6	RW31 TYPE 3	REMOVE

PART 77 OBSTRUCTIONS

#	DESCRIPTION	LATITUDE LONGITUDE	AMSL/AGL*	PENETRATION	PART 77 SURFACE	DISPOSITION
OB17	REMOVED					
OB18	REMOVED					
OB19	TREE	38°07'07.11"N 91°45'37.27"W	1197'/55'*	22.5	RW31 APP	
OB20	ROAD (N)	38°07'05.33"N 91°45'40.68"W	1156'/15'	-17.1'	RW31 APP	
OB21	TREE	38°07'02.26"N 91°45'39.22"W	1183'/43'*	-0.7'	RW31 APP	
OB22	TREE	38°07'02.72"N 91°45'34.45"W	1181'/41'*	-14.2'	RW31 APP	
OB23	TREE	38°07'02.65"N 91°45'33.02"W	1182'/42'*	-17.3'	RW31 APP	
OB60	2003-ACE-1566-OE HIGHWAY	38°07'05.33"N 91°45'40.68"W	1163'/15'	-5'	RW31 APP	
OB61	REMOVED					
OB62	2006-ACE-236-OE HIGHWAY	38°07'05.33"N 91°45'40.68"W	1163'/15'	-5'	RW31 APP	

(N) 15 FEET ADDED TO ELEVATION TO DETERMINE PART 77 CLEARANCE OR PENETRATION.
SOURCES: 405 OBSTRUCTION SURVEY "TYPE D" BY TRANSYSTEMS CORPORATION, SEPT. 2006.
ARCHIVE SEARCH OF OE/AAA CASES, 1988 – PRESENT.
FAA/AVN DIGITAL OBSTACLE FILE 5/31/09.
AGL* – ELEVATIONS ESTIMATED FROM USGS QUADRANGLE MAP.



AIRPORT INFORMATION

	EXISTING	FUTURE	ULTIMATE
AIRPORT ELEVATION (AMSL) NAVD 88	1148.0'	SAME	SAME
AIRPORT REFERENCE POINT (ARP) NAD 83	LAT. 38°07'38.76"N LON. 91°46'10.26"W	SAME SAME	LAT. 38°07'40.53"N LON. 91°46'08.63"W
MEAN MAX. TEMPERATURE (HOTTEST MONTH)	88°F (JULY)	SAME	SAME
COMBINED WIND COVERAGE, (13kt,10.5kt)	95.58%, 98.32%	SAME	SAME
MAGNETIC VARIATION (DATE)	12°47'E (JUNE '06)	SAME	SAME
AIRPORT REFERENCE CODE	B-II	SAME	C-II
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HAWKER 800XP
NPIAS SERVICE LEVEL	GA	SAME	SAME
TAXIWAY LIGHTING	MITL	SAME	SAME
TAXIWAY MARKING	C/L, HOLDLINES	SAME	SAME
AIRPORT & TERMINAL NAVAIDS	VOR/DME,BEACON,RNW(GPS)	SAME	LPV,BEACON,RNW(GPS)
REMARKS			

DRAWING LEGEND

	EXISTING	FUTURE/ULTIMATE
AIRPORT PROPERTY LINE		
AIRPORT SECURITY FENCE	X	XX
AIRPORT BUILDINGS		
AIRFIELD PAVEMENT		
PAVED ROADS		
AIRFIELD PAVEMENT REMOVED		
RUNWAY PROTECTION ZONE		
BUILDING RESTRICTION LINE	BRL	BRL
OBSTACLE FREE ZONE	OFZ	
RUNWAY SAFETY AREA	RSA	RSA
RUNWAY OBJECT FREE AREA	ROFA	ROFA
FUEL STORAGE AREA		
AIRPORT BEACON		
LIGHTED WIND CONE & SEGMENTED CIRCLE		
WIND CONE		
VISUAL APPROACH SLOPE INDICATOR (VASI)		
RUNWAY END IDENTIFIER LIGHTS (REIL)		
AIRPORT REFERENCE POINT (ARP)		

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

RUNWAY INFORMATION

	RUNWAY 4/22			RUNWAY 13/31	
	EXISTING	FUTURE	ULTIMATE	EXISTING	FUTURE
APPROACH VISIBILITY MINIMUMS	1-MILE/3/4-MILE	SAME	1-MILE/1/2-MILE	VISUAL/VISUAL	SAME
FAR PART 77 APPROACH SLOPE	20:1/34:1	SAME	20:1/50:1	20:1/20:1	SAME
RUNWAY WIDTH X LENGTH	100' X 5500'	SAME	100' x 5500'	100' x 5500'	75' x 5500'
RUNWAY PAVEMENT TYPE	ASPHALT	SAME	SAME	ASPHALT	SAME
TAXIWAY PAVEMENT TYPE	ASPHALT	SAME	SAME	ASPHALT	SAME
PAVEMENT STRENGTH (IN 1000 LBS.)	75S,85D,130DT	SAME	SAME	485,620,92DT	SAME
RUNWAY LIGHTING	MIRL, NON-STD HIRL	SAME	SAME	MIRL	SAME
RUNWAY MARKING	NP/NP	SAME	NP/PREC	VISUAL/VISUAL	SAME
EFFECTIVE RUNWAY GRADIENT	0.5 %	SAME	SAME	0.2 %	SAME
MAXIMUM GRADE WITHIN RUNWAY LENGTH %	0.7 %	SAME	SAME	0.9 %	SAME
RUNWAY LINE-OF-SIGHT	CRITERIA MET	SAME	SAME	CRITERIA MET	SAME
PERCENT WIND COVERAGE (13kt, 10.5kt)	87.5, 91.4	SAME	SAME	89.5, 94.1	SAME
VISUAL APPROACH AIDS	VASI/VASI, REILS	SAME	SAME	NONE	SAME
INSTRUMENT APPROACH AIDS	VOR/DME, RNAV(GPS)	SAME	LPV/RNAV(GPS)	NONE	SAME
AIRPORT REFERENCE CODE	B-II	SAME		B-I	SAME
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HAWKER 800XP	KING AIR B-200	SAME
RUNWAY SAFETY AREA (RSA) WIDTH	150'	SAME	500'	120'	SAME
RSA LENGTH BEYOND STOP END	300'/300'	SAME	1000'/1000'	240'/240'	SAME
RUNWAY OBJECT FREE AREA (ROFA) WIDTH	500'	SAME	800'	400'	SAME
OFA LENGTH BEYOND STOP END	300'/300'	SAME	1000'/1000'	240'/240'	SAME
OBSTACLE FREE ZONE (OFZ) WIDTH *	400'	SAME	SAME	400'	SAME
OFZ LENGTH BEYOND STOP END *	200'/200'	SAME	SAME	200'/200'	SAME
RUNWAY CENTERLINE TO TAXIWAY HOLD LINE	200'	SAME	250'	200'	SAME
TAXIWAY WIDTH	35'	SAME	35'	N/A	25'
TOUCHDOWN ZONE ELEVATION	1137.0'/1117.3'	SAME	SAME	1136.7'/1148.0'	SAME

* No OFZ object penetrations

ROLLA NATIONAL AIRPORT

Rolla, Missouri

INNER PORTION OF THE APPROACH SURFACE
RUNWAY 31 - PLAN & PROFILE

Barnard Dunkelberg & Company

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DATE
JUNE 2009

SCALE
1" = 200'

SHEET NO.
9 OF 12

Terminal Area Plan

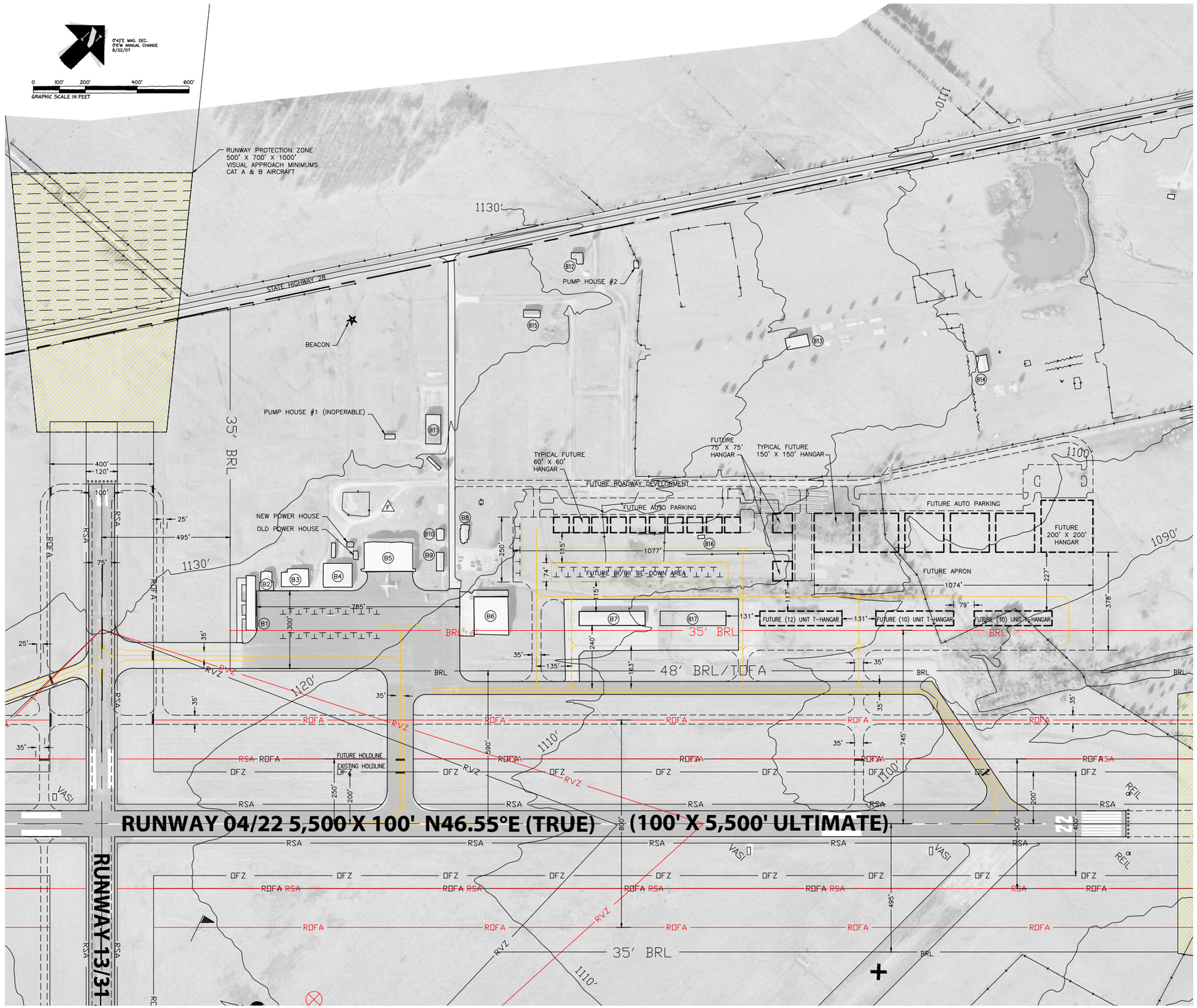
As described in the previous text on pages E.5 and E.6, the following illustration, entitled *TERMINAL AREA PLAN*, presents a detailed view of the more intensely developed landside and potential landside development use areas on the Airport.

Airport Land Use Plan

The *AIRPORT LAND USE PLAN*, presented in the following figure, depicts existing and recommended use of all land within the ultimate airport property line and near the Airport. The purpose of the *AIRPORT LAND USE PLAN* is to provide airport management a plan for leasing revenue-producing areas on the Airport and guidance to local authorities for establishing appropriate land use zoning near the Airport.

Airport Property Map

The *AIRPORT PROPERTY MAP*, which is presented in the following illustration, indicates how various tracts of land within the airport boundaries were acquired (e.g., federal funds, surplus property, local funds, etc.). The purpose of this drawing is to provide information for analyzing the current and future aeronautical use of land acquired with federal funds.



BUILDING LEGEND

NO.	DESCRIPTION	.
B1	T-HANGAR - JIM SOWERS	.
B2	HANGAR - HORTEL	.
B3	HANGAR - JOHN WYSS	.
B4	HANGAR - WES STRICKER	.
B5	HANGAR - MILITARY	.
B6	HANGAR - BARON	.
B7	T-HANGAR - 10 UNITS	.
B8	AIRPORT OPS PILOTS LOUNGE	.
B9	FLIGHT CENTER	.
B10	GARAGE	.
B11	SHOP	.
B12	OLD MILITARY RADAR BUILDING	.
B13	EXTRAVAGANZA	
B14	BARN	
B15	5-CAR GARAGE	
B16	PAVILLION (TO BE REMOVED)	
B17	T-HANGAR - 10 UNITS	

AIRPORT INFORMATION

	EXISTING	FUTURE	ULTIMATE
AIRPORT ELEVATION (AMSL) NAVD 88	1148.0'	SAME	SAME
AIRPORT REFERENCE POINT (ARP) NAD 83	LAT. 38°07'38.76"N LON. 91°46'10.28"W	SAME SAME	LAT. 38°07'40.53"N LON. 91°46'08.63"W
MEAN MAX. TEMPERATURE (HOTTEST MONTH)	88°F (JULY)	SAME	SAME
COMBINED WIND COVERAGE (13kt,10.5kt)	95.58%, 98.32%	SAME	SAME
MAGNETIC VARIATION (DATE)	12°47'E (JUNE '06)	SAME	SAME
AIRPORT REFERENCE CODE	B-II	SAME	C-II
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HANKER 800XP
NPIAS SERVICE LEVEL	GA	SAME	SAME
TAXIWAY LIGHTING	MITL	SAME	SAME
TAXIWAY MARKING	C/L, HOLDLINES	SAME	SAME
AIRPORT & TERMINAL NAVAIDS	VOR/TAC,BEACON,RNAV(GPS)	SAME	LPV,BEACON,RNAV(GPS)
REMARKS			

DRAWING LEGEND

	EXISTING	FUTURE/ULTIMATE
AIRPORT PROPERTY LINE		
AIRPORT SECURITY FENCE	X	XX
AIRPORT BUILDINGS		
AIRFIELD PAVEMENT		
PAVED ROADS		
AIRFIELD PAVEMENT REMOVED		
RUNWAY PROTECTION ZONE		
BUILDING RESTRICTION LINE	BRL	BRL
OBSTACLE FREE ZONE	OFZ	
RUNWAY SAFETY AREA	RSA	RSA
RUNWAY OBJECT FREE AREA	ROFA	ROFA
RUNWAY VISIBILITY ZONE	RVZ	RVZ
FUEL STORAGE AREA		
AIRPORT BEACON		
LIGHTED WIND CONE & SEGMENTED CIRCLE		
WIND CONE		
VISUAL APPROACH SLOPE INDICATOR (VASI)		
RUNWAY END IDENTIFIER LIGHTS (REIL)		
AIRPORT REFERENCE POINT (ARP)		

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

ROLLA NATIONAL AIRPORT
Rolla, Missouri

TERMINAL AREA PLAN

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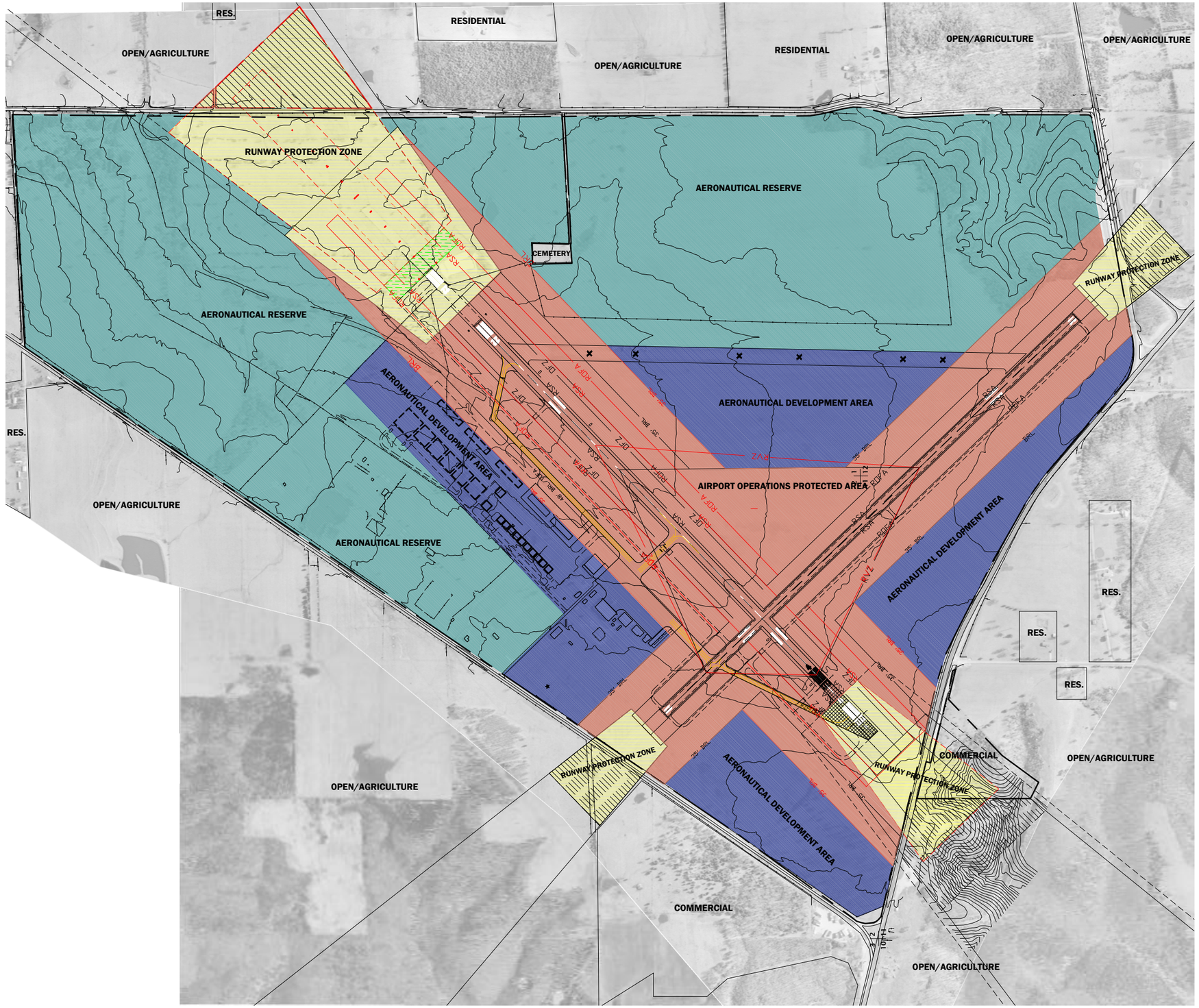
DATE
JUNE 2009

SCALE
1" = 200'

SHEET NO.
10 OF 12

Figure E10 **Terminal Area Plan**



- RUNWAY PROTECTION ZONE (APPROX. 123 ACRES)
- AIRPORT OPERATIONS PROTECTED AREA (APPROX. 334 ACRES)
- AERONAUTICAL DEVELOPMENT AREA (APPROX. 215 ACRES)
- AERONAUTICAL RESERVE (APPROX. 548 ACRES)

AIRPORT INFORMATION

	EXISTING	FUTURE	ULTIMATE
AIRPORT ELEVATION (AMSL) NAVD 88	1148.0'	SAME	SAME
AIRPORT REFERENCE POINT (ARP) NAD 83	LAT. 38°07'38.76"N LON. 91°46'10.28"W	SAME SAME	LAT. 38°07'40.53"N LON. 91°46'08.63"W
MEAN MAX. TEMPERATURE (HOTTEST MONTH)	88°F (JULY)	SAME	SAME
COMBINED WIND COVERAGE (13kt,10.5kt)	95.58%, 98.32%	SAME	SAME
MAGNETIC VARIATION (DATE)	12°47'E (JUNE '06)	SAME	SAME
AIRPORT REFERENCE CODE	B-II	SAME	C-II
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HANKER 800XP
NPIAS SERVICE LEVEL	GA	SAME	SAME
TAXIWAY LIGHTING	MITL	SAME	SAME
TAXIWAY MARKING	C/L, HOLDLINES	SAME	SAME
AIRPORT & TERMINAL NAVAIDS	VOR/DME,BEACON,RNAV(GPS)	SAME	LPV,BEACON,RNAV(GPS)
REMARKS			

DRAWING LEGEND

	EXISTING	FUTURE/ULTIMATE
AIRPORT PROPERTY LINE		
AIRPORT SECURITY FENCE	X	XX
AIRPORT BUILDINGS		
AIRFIELD PAVEMENT		
PAVED ROADS		
AIRFIELD PAVEMENT REMOVED		
RUNWAY PROTECTION ZONE		
BUILDING RESTRICTION LINE	BRL	BRL
OBSTACLE FREE ZONE	OFZ	
RUNWAY SAFETY AREA	RSA	RSA
RUNWAY OBJECT FREE AREA	ROFA	ROFA
RUNWAY VISIBILITY ZONE	RVZ	RVZ
FUEL STORAGE AREA		
AIRPORT BEACON		
LIGHTED WIND CONE & SEGMENTED CIRCLE		
WIND CONE		
VISUAL APPROACH SLOPE INDICATOR (VASI)		
RUNWAY END IDENTIFIER LIGHTS (REIL)		
AIRPORT REFERENCE POINT (ARP)		

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

ROLLA NATIONAL AIRPORT
Rolla, Missouri

AIRPORT LAND USE PLAN

Barnard Dunkelberg & Company

TULSA
1616 East 15th Street
Tulsa, Oklahoma 74120
918.585.8844

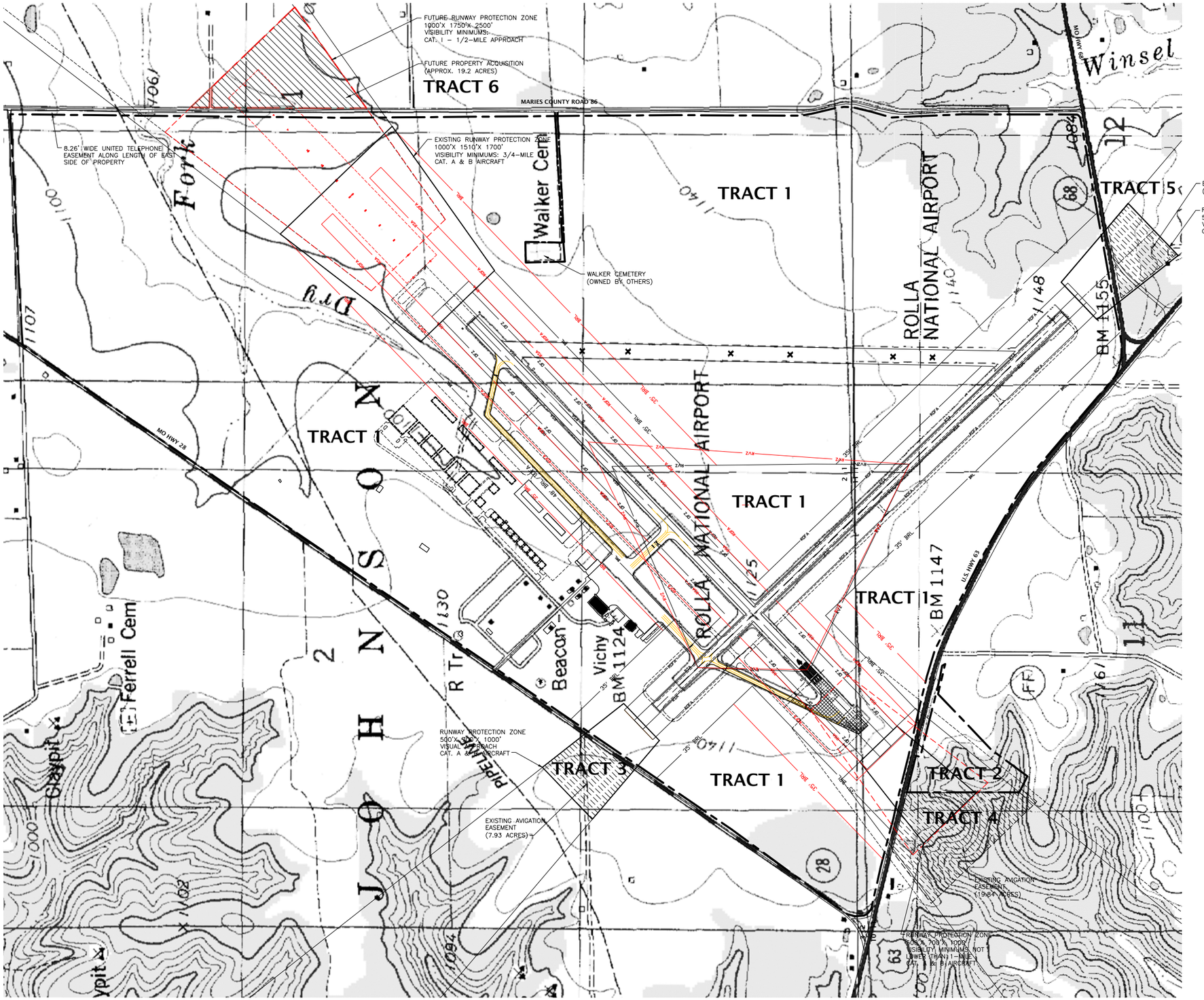
DENVER
1743 Wazee Street, Suite 400
Denver, Colorado 80202
303.825.8844

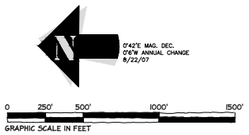
DATE
JUNE 2009

SCALE
1" = 500'

SHEET NO.
11 OF 12

Figure E11 **Airport Land Use Plan**





PARCEL DATA

NO.	OWNERSHIP	ACQUISITION TYPE	DATE	ACRES
TRACT 1	FEE SIMPLE	FEDERAL GRANT*	12/30/57	1201.27
TRACT 2	FEE SIMPLE	CITY FUNDED	.	14.29
TRACT 3	EASEMENT	ADAP–01	.	7.93
TRACT 4	EASEMENT	ADAP–01	.	19.84
TRACT 5	EASEMENT	ADAP–01	.	7.47
TRACT 6	FUTURE EASEMENT	.	.	19.2

* AUTHORITY – SEC 16 FEDERAL AIRPORT ACT (APPROVED MAY 13, 1946) IN CONFORMITY WITH EXECUTIVE ORDER NO. 10536 (JUNE 9, 1954)

AIRPORT INFORMATION

	EXISTING	FUTURE	ULTIMATE
AIRPORT ELEVATION (AMSL) NAVD 88	1148.0'	SAME	SAME
AIRPORT REFERENCE POINT (ARP) NAD 83	LAT. 38°07'38.76"N LON. 91°46'10.28"W	SAME SAME	LAT. 38°07'40.53"N LON. 91°46'08.63"W
MEAN MAX. TEMPERATURE (HOTTEST MONTH)	88°F (JULY)	SAME	SAME
COMBINED WIND COVERAGE (13kt,10.5kt)	95.58%, 98.32%	SAME	SAME
MAGNETIC VARIATION (DATE)	12°47'E (JUNE '06)	SAME	SAME
AIRPORT REFERENCE CODE	B–II	SAME	C–II
DESIGN AIRCRAFT	BEECH KING AIR B-200	SAME	RAYTHEON HAWKER 800XP
NPIAS SERVICE LEVEL	GA	SAME	SAME
TAXIWAY LIGHTING	MITL	SAME	SAME
TAXIWAY MARKING	C/L, HOLDLINES	SAME	SAME
AIRPORT & TERMINAL NAVAIDS	VOR/DME,BEACON,RNAV(GPS)	SAME	LPV,BEACON,RNAV(GPS)
REMARKS			

DRAWING LEGEND

	EXISTING	FUTURE
AIRPORT PROPERTY LINE		
AIRPORT SECURITY FENCE	X	XX
AIRPORT BUILDINGS		
AIRFIELD PAVEMENT		
PAVED ROADS		
AIRFIELD PAVEMENT REMOVED		
RUNWAY PROTECTION ZONE		
BUILDING RESTRICTION LINE	BRL	BRL
OBSTACLE FREE ZONE	OFZ	
RUNWAY SAFETY AREA	RSA	RSA
RUNWAY OBJECT FREE AREA	ROFA	ROFA
RUNWAY VISIBILITY ZONE	RVZ	RVZ
FUEL STORAGE AREA		
AIRPORT BEACON		
LIGHTED WIND CONE & SEGMENTED CIRCLE		
WIND CONE		
VISUAL APPROACH SLOPE INDICATOR (VASI)		
RUNWAY END IDENTIFIER LIGHTS (REIL)		
AIRPORT REFERENCE POINT (ARP)		

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

ROLLA NATIONAL AIRPORT
Rolla, Missouri

AIRPORT PROPERTY MAP

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DENVER
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Denver, Colorado 80202
303.825.8844

DATE
JUNE 2009

SCALE
1" = 500'

SHEET NO.
12 OF 12

Figure E12 **Airport Property Map**

ROLLA
NATIONAL AIRPORT MASTER PLAN

F

IMPLEMENTATION PLAN

Implementation Plan

Introduction

The development plan for Rolla National Airport has been placed into three phases: Phase I (1-5 years), Phase II (6-10 years), and Phase III (11-20 years). Additionally, some ultimate development items for the Airport have been identified as Post Planning Period (20+ years) development projects. The necessary development requirements for the Airport are illustrated graphically by time period on the illustration at the end of this chapter, entitled *PHASING PLAN*. The cost estimates for the necessary development requirements are presented on the following tables.

Cost Estimates

Cost estimates for individual projects, based on 2007 dollars, have been prepared for improvements during the 20-year planning period, as well as a few additional post planning period development items. Facility costs have been formulated using unit prices extended by the size of the particular facility and tempered with specific considerations related to the region, the Airport, and the development site. That being said, these estimates are intended to be used for planning purposes only and should not be construed as construction cost estimates, which can only be compiled following the preparation of detailed design documentation.

The cost estimates have been categorized by the total cost for each facility requirement, that portion eligible to be paid by the Federal Aviation Administration (FAA) under the Airport Improvement Program (AIP) – Missouri Block Grant State program; that portion qualifying for payment by the Missouri Department of Transportation; and, that portion to be borne by the sponsor, the Airport, or related local entity. In addition to airport funds, the local share can include sources such as state or local economic development funds, regional commissions, other units of government, as well as funding from private individuals or businesses.

Implementation Schedule

The tables at the end of this chapter, entitled *DEVELOPMENT PLAN PROJECT COSTS*, provide the suggested phasing for improvement projects throughout the 20-year planning period. The projects listed in Phase One (i.e., the first five years) are in priority order by year. During the second and third phases (i.e., years 6-20), as well as projects considered as a post planning development item, the projects are listed in priority order without year designators. With the best facts and assumptions available today, the tables provide information related to what projects will be needed, when those projects are likely to be constructed, and how the improvements are likely to be funded.

Capital Improvement Program (CIP)

The projects, phasing, and costs presented in this Master Plan are the best projections that can be made at the time of formulation. The purpose is to provide a reasonable anticipation of capital needs, which can then be used in fiscal programming to test for financial feasibility. To assist in the preparation of the Airport's CIP that the Airport keeps on file and updates annually with the FAA, the first phase of the projects list and cost estimates has been organized in a format similar to that used by the FAA. However, as soon as it is published, the long-term project list presented here begins to be out of date, as with any similar document; therefore, it will always differ to some degree with the Airport's five-year CIP on file with the FAA.

Financial Plan and Implementation Strategy

Funding sources for the capital improvement program depend on many factors, including Airport Improvement Program (AIP) project eligibility, the ultimate type and use of facilities to be developed, debt capacity of the Airport, the availability of other financing sources, and the priorities for scheduling project completion. For planning purposes, assumptions were made related to the funding source of each capital improvement. The projects costs provided in the *DEVELOPMENT PLAN PROJECT COSTS* tables are identified with likely funding sources.

Sources of Capital Funding

Following is a short description of capital improvement funding sources to provide background and context when reviewing the *DEVELOPMENT PLAN PROJECT COSTS* tables.

Federal Airport Improvement Program (AIP) Grants. The FAA provided grants on a 95% federal/5% local basis to airports similar to Rolla National Airport for public-use improvement projects until October 2007. On an entitlement grant basis, under current funding guidelines, the Airport receives $150,000 in matching funds annually. There are also discretionary funds available through AIP. Discretionary grants are over and above entitlement funding, and are provided to airports for projects that have a high federal priority for enhancing safety, security, and capacity of the Airport, and would be difficult to fund otherwise. The dollar amounts of individual grants vary and can be significant in comparison to entitlement funding. Discretionary grants are awarded at the FAA's sole prerogative. Discretionary grant applications are evaluated based on need, the FAA's project priority ranking system, and the FAA's assessment of a project's significance within the national airport and airway system.

FAA Facilities and Equipment Funds. Within the FAA's budget appropriation, money is available in the Facilities and Equipment (F&E) Fund to purchase navigational aids and air safety-related technical equipment, including Airport Traffic Control Towers (ATCTs), for use at commercial service airports in the national airport system. Each F&E development project is evaluated independently through a cost/benefit analysis to determine funding eligibility and priority ranking. The qualified projects are totally funded (i.e., 100%) by the FAA, with the remaining projects likely being AIP or PFC eligible. In addition, the Airport can apply for NAVAID maintenance funding through the F&E program for those facilities that are not AIP funded. It is possible that some of the proposed navigational aid-related development projects for Rolla National Airport will qualify for F&E funding, if available.

State of Missouri. The State of Missouri provides funding through the Missouri Department of Transportation (MoDOT) Multimodal Operations Division. MoDOT provides grant funding for airport projects and, as with many states, these funds have been primarily utilized to provide assistance on pavement "maintenance" oriented projects, such as crack seals and marking.

Missouri has been designated by the FAA with a State Block Grant Program. The FAA provides AIP funding to the State, granting the State the authority to prioritize airport projects.

The Missouri State Aviation Trust Fund Program provides matching funds up to a 90% state/10% local basis. For federal projects, MoDOT has a policy of funding appropriate projects at a participation level of 50%, with a local match of 50%.

Projects included on this program are preventative pavement maintenance; land acquisition; associated pavement earthwork and drainage; pavement construction; land acquisition or easements to satisfy FAA safety standards; identification or removal of safety area obstructions; lighting; perimeter fencing; navigational, communication, and landing aids; engineering projects; airport planning projects; and, safety equipment.

MoDOT also has a revolving, low interest loan program, MoDOT Innovation Finance (STAR) program. This loan program is available to any non-highway transportation mode, which includes aviation, port, and rail in the State of Missouri. For aviation use, the STAR program is used mostly to fund T-hangar development.

Private Third Party Financing. Many airports use private third party financing when the planned improvements will be primarily used by a private business or other organization. Such projects are not ordinarily eligible for federal funding. Projects of this kind typically include hangars, fixed based operator (FBO) facilities, fuel storage, exclusive aircraft parking aprons, industrial aviation use facilities, non-aviation office/commercial/industrial developments, and various other projects. Private development proposals are considered on a case-by-case basis. Often, airport funds for infrastructure, preliminary site work, and site access are required to facilitate privately developed projects on airport property.

Airport Revenues. The Airport generates revenue through the facility leases, commercial activity fees, fuel fees, etc. At many airports, including Rolla National Airport, generating the necessary cash flow to balance the operations and maintenance can be a difficult task and generation of money to adequately fund capital costs associated with the operation of an airport is even more of a challenge. Many general aviation airports rely on supplemental money from their Sponsor to assist with funding major projects. The Sponsor for Rolla National Airport is the City of Rolla. As with most cities, the City of Rolla's need for capital improvement funding is almost always greater than the money on hand, and careful planning is required to ensure that the critical capital needs are met with the scarce dollars that are available.

Phasing Plan

The following illustration and cost estimates indicate the suggested phasing for projects. These are suggested schedules and variance from them may be necessary, especially during the latter time periods. Attention has been given to the first five years, as they are the most critical, and the scheduled projects outlined in that time frame include many critical projects. The demand for certain facilities, especially in

the latter time frame, and the economic feasibility of their development, are to be the prime factors influencing the timing of individual project construction. Care must be taken to provide for adequate lead-time for detailed planning and construction of facilities in order to meet aviation demands. It is also important to minimize the disruptive scheduling where a portion of the facility may become inoperative due to construction, and to prevent extra costs resulting from improper project scheduling.

Summary

As presented in the accompanying tables, the estimates for the 20-year *Development Plan Project Costs*, not including maintenance and operational expenses, amount to approximately $13,673,000. Phase I is estimated to total approximately $2,737,000; Phase II totals approximately $8,164,000; and, Phase III totals approximately $2,772,000.

Table F4 contains cost items for projects that have been considered as post planning projects (20+ years). These projects are associated with the Airport's *ultimate* runway configuration upgrade to Airport Reference Code (ARC) C-II. Although it is not likely that the Airport will have sufficient traffic to warrant the upgrades to ARC C-II, from a land use compatibility standpoint, it is important to protect for the Airport for the ultimate runway configuration. The cost items were estimated using 2007 dollars.

It is recognized that maintenance and operation expenses will increase as the Airport develops and more facilities are completed. Revenues generated by the additional facilities should also increase and help offset increased maintenance and operation expenses. It is a worthy and potentially feasible goal that operational expenses and revenues should balance at the Airport. This relationship should be monitored closely so that future imbalances can be anticipated and provided for in the budgeting and capital improvements process.

The monetary commitments necessary from the City of Rolla, the State of Missouri Department of Transportation, and the FAA (through the Missouri State Block Grant Program) to enable the development of the Airport to meet the future aviation demand safely, efficiently and properly, are significant, but do not seem to be overly excessive when taken on a straight line basis over the 20-year period. However, capital improvements are rarely implemented in smaller even amounts; therefore, careful planning and need demonstration are required to compete for larger state and federal funds. The level that the FAA will fund airport improvements is governed by congressional appropriations to the AIP, and the amount dedicated to any specific

airport is determined by demonstrated need compared to need demonstrated at other airports within the regional and national airport system.

However, the future level of FAA funding does not alter the basic premise upon which the recommendations contained in this document, and the resulting list of improvement projects, were developed. That basic premise is *demand dictated development*. The objective of this Master Plan is to provide the City of Rolla with a flexible planning document that can be used to direct airport development to meet future demand as it occurs. If aviation demands continue to indicate that improvements are needed, and if the proposed improvements prove to be environmentally acceptable, the capital improvement financial implications discussed above are likely to be acceptable for the FAA, the State of Missouri, and the City of Rolla. However, it must be recognized that this is only a programming analysis and not a commitment on the part of the Sponsor or the FAA. If the cost of an improvement project is not financially feasible, its construction will not be instigated.

Before detailed planning on a particular project is developed, the funding structures and requirements should be identified and determined to reflect the current funding policies by the various funding entities.

Table F1
PHASE I (1-5 YEARS) DEVELOPMENT PLAN PROJECT COSTS
Rolla National Airport Master Plan

				Recommended Financing Method		
	Project Description	**Note**	**Total Costs**	**Local (A**	**State (B**	**Federal (C**
A.1	Sealcoat RW 13/31		$202,000	$20,200	$181,800	$0
A.2	Install ODALS or MALSF to approach end of RW 22		$150,000	$15,000	$135,000	$0
A.3	Install PAPIs to RW 13/31		$70,000	$7,000	$63,000	$0
A.4	Construct new apron for the T-hangar area		$360,000	$18,000	$0	$342,000
A.5	Construct new T-hangar		$340,000	$17,000	$0	$323,000
A.6	Design taxiway connectors, 35 feet wide, to the existing partial parallel taxiway on the west side of RW 4/22		$100,000	$5,000	$0	$95,000
A.7	Design partial parallel taxiway, 25 feet wide, separated 225 feet north of the RW 13 centerline		$80,000	$4,000	$0	$76,000
A.8	Design full parallel taxiway, 35 feet wide, separated 400 feet south of the RW 4/22 centerline		$400,000	$20,000	$0	$380,000
A.9	Design full parallel taxiway, 25 feet wide, separated 225 feet south of the RW 13/31 centerline		$305,000	$15,250	$0	$289,750
A.10	Sealcoat RW 4/22		$230,000	$23,000	$207,000	$0
A.11	Storm sewer replacements		$500,000	$25,000	$0	$475,000
	PHASE I TOTAL		**$2,737,000**	**$169,450**	**$586,800**	**$1,980,750**

Sources: BARNARD DUNKELBERG & COMPANY, TranSystems, and Rolla National Airport personnel.

Notes: Cost estimates, based on 2007 data, are intended for planning purposes only and do not reflect a detailed engineering evaluation.
(A Local funding - Current revenues, cash reserves, bonds, private/ third party funding, etc.
(B Missouri Department of Transportation, Multimodal Operations Division - State Aviation Trust Fund
(C Federal Aviation Administration Airport Improvement Program (AIP) - State Block Grant Program.

Table F2
PHASE II (6-10 YEARS) DEVELOPMENT PLAN PROJECT COSTS
Rolla National Airport Master Plan

				Recommended Financing Method		
	Project Description	**Note**	**Total Costs**	**Local (A**	**State (B**	**Federal (C**
B.1	Construct taxiway connectors, 35 feet wide, to the existing partial parallel taxiway on the west side of RW 4/22		$870,000	$43,500	$0	$826,500
B.2	Construct partial parallel taxiway, 25 feet wide, separated 225 feet north of the RW 13 centerline		$530,000	$26,500	$0	$503,500
B.3	Construct full parallel taxiway, 35 feet wide, separated 400 feet south of the RW 4/22 centerline		$3,467,000	$173,350	$0	$3,293,650
B.4	Construct full parallel taxiway, 25 feet wide, separated 225 feet south of the RW 13/31 centerline		$2,595,000	$129,750	$0	$2,465,250
B.5	Sealcoat RW 13/31		$202,000	$20,200	$181,800	$0
B.6	Storm sewer replacements		$500,000	$25,000	$0	$475,000
	PHASE II TOTAL		**$8,164,000**	**$418,300**	**$181,800**	**$7,563,900**

Sources: BARNARD DUNKELBERG & COMPANY, TranSystems, and Rolla National Airport personnel.

Notes: Cost estimates, based on 2007 data, are intended for planning purposes only and do not reflect a detailed engineering evaluation.
(A Local funding - Current revenues, cash reserves, bonds, private/ third party funding, etc.
(B Missouri Department of Transportation, Multimodal Operations Division - State Aviation Trust Fund
(C Federal Aviation Administration Airport Improvement Program (AIP) - State Block Grant Program.

Table F3
PHASE III (11-20 YEARS) DEVELOPMENT PLAN PROJECT COSTS
Rolla National Airport Master Plan

				Recommended Financing Method		
	Project Description	**Note**	**Total Costs**	**Local (A**	**State (B**	**Federal (C**
C.1	Sealcoat RW 13/31		$202,000	$20,200	$181,800	$0
C.2	Relight RW 13/31		$715,000	$35,750	$0	$679,250
C.3	Sealcoat RW 4/22		$230,000	$23,000	$207,000	$0
C.4	Construct new flight center/terminal building		$625,000	$625,000	$0	$0
C.5	Storm sewer replacements		$1,000,000	$50,000	$0	$950,000
	PHASE III TOTAL		**$2,772,000**	**$753,950**	**$388,800**	**$1,629,250**
	GRAND TOTALS		**$13,673,000**	**$1,341,700**	**$1,157,400**	**$11,173,900**

Sources: BARNARD DUNKELBERG & COMPANY, TranSystems, and Rolla National Airport personnel.

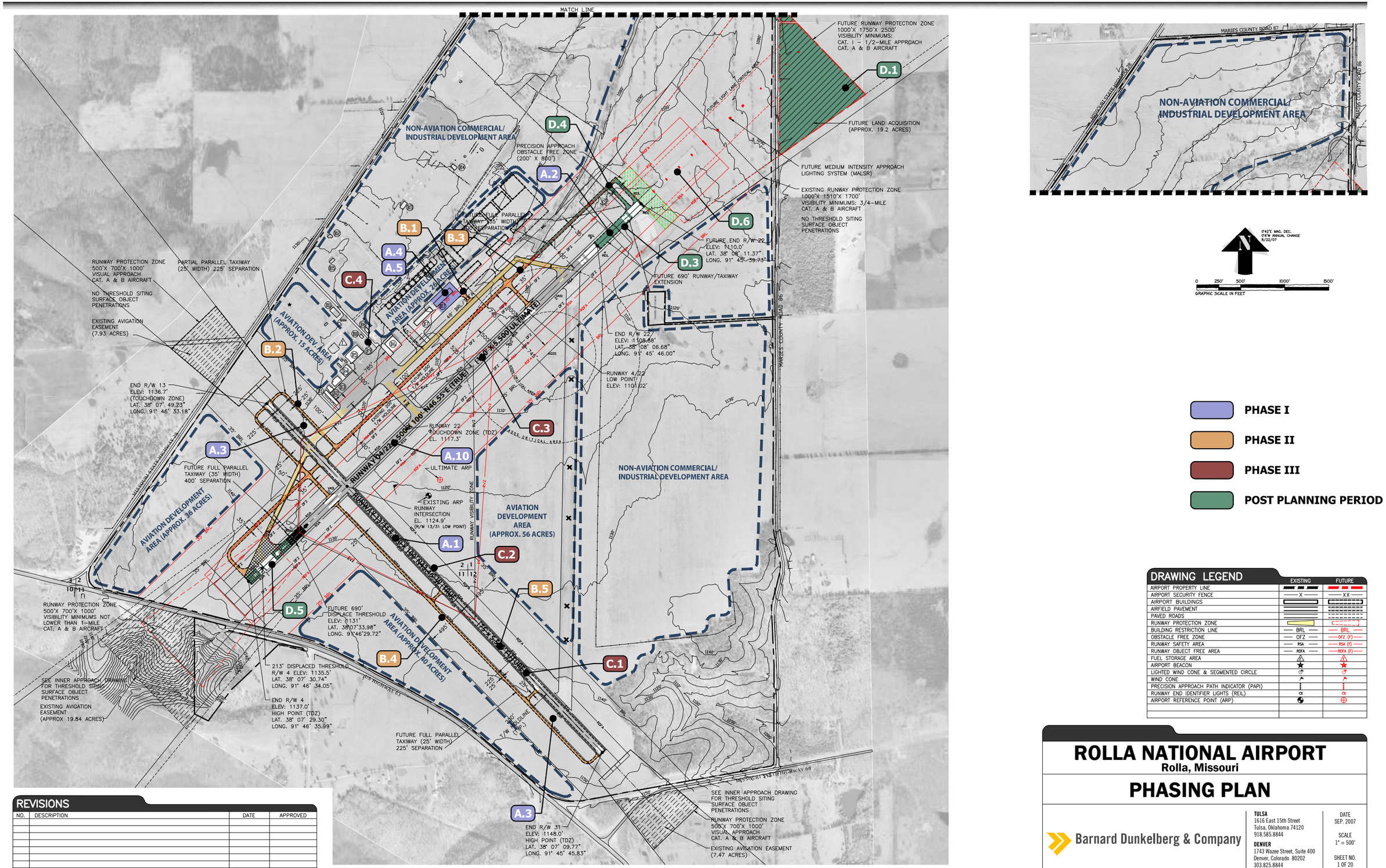
Notes: Cost Estimates, based on 2007 data, are intended for planning purposes only and do not reflect a detailed engineering evaluation.
(A Local funding - Current revenues, cash reserves, bonds, private/ third party funding, etc.
(B Missouri Department of Transportation, Multimodal Operations Division - State Aviation Trust Fund
(C Federal Aviation Administration Airport Improvement Program (AIP) - State Block Grant Program.

Table F4
POST PLANNING PERIOD DEVELOPMENT PLAN PROJECT COSTS
Rolla National Airport Master Plan

				Recommended Financing Method		
	Project Description	**Note**	**Total Costs**	**Local (A**	**State (B**	**Federal (C**
D.1	Purchase land for RW 22 RPZ		$360,000	$18,000	$0	$342,000
D.2	Design RW 22 extension- 690 feet to the north		$262,500	$13,125	$0	$249,375
D.3	Extend RW 22 690 feet to the north (to meet ARC C-II standards)		$1,750,000	$87,500	$0	$1,662,500
D.4	Extend RW 4/22 parallel taxiway 690 feet to the north		$434,951	$21,748	$0	$413,203
D.5	Remove 690 feet of unused pavement south of RW 4 threshold	(D	$153,333	$7,667	$0	$145,667
D.6	Install MALSR to the approach end of RW 22		$430,000	$21,500	$0	$408,500
D.7	Implement Category I ILS approach to RW 22	(E	$0	$0	$0	$0
	POST PLANNING PERIOD TOTAL		**$3,390,784**	**$169,539**	**$0**	**$3,221,245**

Sources: BARNARD DUNKELBERG & COMPANY, TranSystems, and Rolla National Airport personnel.

Notes: Cost Estimates, based on 2007 data, are intended for planning purposes only and do not reflect a detailed engineering evaluation.
(A private/ third party funding, etc.
(B Missouri Department of Transportation, Multimodal
(C Federal Aviation Administration Airport Improvement
(D Cost shown is an estimate, based on 2007 unit cost/square yard for pavement removal only.
(E No cost associated, 100% funded by Federal Aviation Administration Facilities & Equipment (F&E) Program.



PHASE I

PHASE II

PHASE III

POST PLANNING PERIOD

DRAWING LEGEND

	EXISTING	FUTURE
AIRPORT PROPERTY LINE		
AIRPORT SECURITY FENCE	X	XX
AIRPORT BUILDINGS		
AIRFIELD PAVEMENT		
PAVED ROADS		
RUNWAY PROTECTION ZONE		
BUILDING RESTRICTION LINE	BRL	BRL
OBSTACLE FREE ZONE	OFZ	OFZ (F)
RUNWAY SAFETY AREA	RSA	RSA (F)
RUNWAY OBJECT FREE AREA	ROFA	ROFA (F)
FUEL STORAGE AREA		
AIRPORT BEACON		
LIGHTED WIND CONE & SEGMENTED CIRCLE		
WIND CONE		
PRECISION APPROACH PATH INDICATOR (PAPI)		
RUNWAY END IDENTIFIER LIGHTS (REIL)		
AIRPORT REFERENCE POINT (ARP)		

REVISIONS

NO.	DESCRIPTION	DATE	APPROVED

ROLLA NATIONAL AIRPORT

Rolla, Missouri

PHASING PLAN

Barnard Dunkelberg & Company

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DATE
SEP. 2007

SCALE
1" = 500'

SHEET NO.
1 OF 20

Figure F1 **Phasing Plan**

ROLLA
NATIONAL AIRPORT MASTER PLAN

G ENVIRONMENTAL OVERVIEW

Environmental Overview

Introduction

The following narrative presents an analysis and inventory of environmental information gathered through research with various state and federal agencies regarding the potential environmental impacts associated with the future development of Rolla National Airport. The purpose of this analysis and inventory is to provide preliminary information concerning environmental resources in an effort to define and identify critical resources that would need to be addressed prior to the implementation of any of the proposed airport planning recommendations. This process of information gathering within an Airport Master Plan is also necessary to identify potential projects that may require environmental clearance (e.g., an environmental assessment) prior to construction. It will also provide an overview analysis to ensure compliance with guidelines contained in Federal Aviation Administration (FAA) Order 1050.1E, *Environmental Impacts: Policies and Procedures* and in FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions.*

Alternatives involving the future configuration of the Airport have been reviewed in the previous chapters. The major improvements proposed for the Airport that have the most potential for environmental impacts are the completion of the ultimate 690-foot runway extension to the existing main runway and the construction of a full-length parallel taxiway along the west side of Runway 4/22, the construction of a full-length parallel taxiway along the south side of Runway 13/31, and a partial parallel taxiway on the northern portion of Runway 13.

Potential Impacts

Air and Water Quality

According to the Missouri Division of Environmental Quality (MDEQ) and the Environmental Protection Agency (EPA) *Designated Nonattainment Areas for All Criteria Pollutants*, there are no significant, long-term impacts on the quality of air in the vicinity of the proposed airport development areas outlined in this *Master Plan*. Currently, the area is in compliance with all National Ambient Air Quality Standards (NAAQS). The closest non-attainment area is St. Louis, which is over 100 miles from the Airport. There is a total of 16,000 operations a year, which is well below the threshold (180,000 general aviation operations, according to FAA Order 5050.4B) required to do an air quality analysis. Short-term air quality impacts may be expected from heavy equipment pollutant emissions, fugitive dusts resulting from cut and fill activities, and the operation of portable concrete batch plants during the construction activities from the proposed runway extension and new parallel taxiways. Compliance with all applicable local, state, and federal air quality regulations and permitting requirements will be the responsibility of all contractors.

According to the Federal Emergency Management Agency (FEMA), the Airport is not located within a major floodplain. However, Dry Fork Creek flows north of Runway 4/22. This creek may be impacted by the proposed runway extension and the parallel taxiway to the new, extended runway end. Further environmental examinations may be required before these projects are implemented. Additional water quality considerations related to airport development often include increased surface runoff and erosion and pollution from fuel, oil, solvents, and deicing fluids. Potential pollution could come from petroleum products spilled on the surface and carried through drainage channels off of the Airport. State and federal laws and regulations have been established to safeguard these facilities. These regulations include standards for aboveground and underground storage tanks, leak detection, and overflow protection.

Contractors will be required to follow guidelines outlined in the FAA's Advisory Circular (AC) 150/5370-10A, *Standards for Specifying Construction of Airports*, which is the FAA's guidance to airport sponsors concerning protection of the environment during construction. The final plans and specifications for any project will incorporate the provisions of AC 150/5370-10A to ensure minimal impact due to erosion, air pollution, sanitary waste, and the use of chemicals. Additionally, a National Pollutant Discharge Elimination System (NPDES) permit, administered by the Missouri Division of Environmental Quality, will be required for construction projects.

Historical, Architectural, Archaeological, and Cultural Resources

Section 106 of the National Historic Preservation Act requires federal agencies, or their designated representatives, to take into account the effects of their undertakings on historic properties, which include archaeological sites, buildings, structures, objects, or districts. According to the National Register of Historic Places, there are no listed historic sites near the Airport. However, it is recommended that before implementing future projects involving the acquisition and displacement of any structures, additional consultation with the Missouri Department of Natural Resources should be conducted for potential impacts to historically significant properties, verification should be provided showing that the structures are not more than 50 years of age, and confirmation should be given that those structures older than 50 years of age are not eligible for listing on the National Register of Historic Places. Additionally, should construction activity expose previously unidentified archaeological, historical, or cultural resources, work must be discontinued pursuant to Section 106, and, the Office of Historic Preservation should be contacted.

Threatened and Endangered Species

The Endangered Species Act, as Amended, requires each federal agency to ensure that any action authorized, funded, or carried out by such agency is not likely to jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of habitat of such species. According to the U.S. Fish and Wildlife Service, there are several endangered or threatened species that occur or may occur near Rolla. The following tables list the endangered and threatened species that are listed for Missouri. The U.S. Fish and Wildlife Service would need to be contacted to identify which, if any, of these species might be present within the specific project area.

Table G1
MISSOURI ENDANGERED AND THREATENED SPECIES (ANIMALS)
Rolla National Airport Master Plan

Common Name	Scientific Name	Status
Gray bat	*Myotis grisescens*	E
Indiana bat	*Myotis sodalist*	E
Ozark big eared bat	*Corynorhinus townsendii ingens*	E
American burying beetle	*Nicrophorus americanus*	E
Ozark cavefish	*Amblyopsis rosae*	T
Tumbling Creek cavesnail	*Antobia culven*	E
Eskimo curlew	*Numenius borealis*	E
Niangua darter	*Etheostoma nianguae*	T
Bald eagle	*Haliaeetus leucocephalus*	T
Higgins eye (pearlymussel)	*Lempsilis higginsii*	E
Neosho Madtom	*Noturus placidus*	T
Winged Entire Mapleleaf	*Quadrula fragosa*	E
Pink mucket (pearlymussel)	*Lamsilis abrupta*	E
Scaleshell mussel	*Leptodea leptodon*	E
Curtis mussel	*Epioblasma florentina curtisii*	E
Piping plover	*Charadrius melodus*	T
Fat pocketbook	*Potamilus capax*	E
Topeka shiner	*Notropis Topeka*	E
Pallid Sturgeon	*Scaphirhynchus albus*	E
Least tern	*Sterna antillarum*	E
Gray wolf	*Canis lupis*	E

Source: U.S. Fish and Wildlife Service.
Notes: E = Endangered. T = Threatened.

Table G2
MISSOURI ENDANGERED AND THREATENED SPECIES (PLANTS)
Rolla National Airport Master Plan

Common Name	Scientific Name	Status
Decurrent false aster	*Boltonia decurens*	T
Missouri Bladderpod	*Lesquerella filiformis*	T
Running buffalo clover	*Trifolium stoloniferum*	E
Mead's Milkweed	*Asclepias meadii*	T
Geocarpon minimum	*Geocarpon minimum*	T
Eastern prairie fringed orchid	*Platanthera leucophaea*	T
Western prairie fringed orchid	*Platanthera praeclara*	T
Small whorled pogonia	*Isotria medeoloides*	T
Pondberry	*Lindera melissifolia*	E
Virginia Sneezeweed	*Helenium virginicum*	T

Source: U.S. Fish and Wildlife Service.
Notes: E = Endangered. T = Threatened.

Wetlands

Wetlands are defined as areas inundated by surface or groundwater, with a frequency sufficient to support vegetation or aquatic life requiring saturated or seasonally saturated soil conditions for growth and reproduction. According to the U.S. Fish and Wildlife Service Wetlands Mapper, there are several freshwater ponds, and Dry Fork Creek, within the area. As previously stated, Dry Fork Creek may be impacted by the proposed runway extension and the associated parallel taxiway on Runway 4/22. Wetlands mitigation measures and an individual permit would be required prior to the commencement of work if the proposed construction would disturb these areas, and if they were determined by the Army Corps of Engineers (the Corps) to be a "water of the U.S." Dry Fork Creek is part of one of the major watersheds within Maries County. Because of this, Dry Fork Creek may be considered to be part of the "waters of the U.S." Further analysis would need to be completed prior to project implementation to determine the potential effects to wetlands or other important water bodies. If the further analysis and coordination with the Corps determine that Dry Fork Creek would be impacted and is considered to be a "water of the U.S.," the Airport would need to complete an Environmental Assessment prior to implementation. Contractors would also be required to follow guidelines outlined in the FAA's AC 150/5370-10A to minimize the impacts to the environment, including wetlands.

Farmland

According to the Natural Resources Conservation District Soil Survey, some of the soils located within airport property are considered prime farmland. There are several soil types located in the airport vicinity, one of which is Hartville Silt Loam. Hartville Silt Loam has a one to three percent slope and is considered to be prime farmland. The northeast section of airport property contains Union silt loam of three to eight percent slopes. Union silt loam soil is considered to be farmland of statewide importance. Much of the rest of airport property contains Mariosa silt loam, a soil type that is considered to be prime farmland only if drained. Before future airport development commences, the Airport should consult the Natural Resources Conservation Service and fill out a Farmland Conversion Impact Rating Form (Form AD-1006) in order to assess the impact to prime farmlands from proposed airport projects.

Section 4(f) Property

Section 4(f) of the Department of Transportation Act (recodified at 49 USC, Subtitle I, Section 303) provides that no publicly owned park, recreation area, wildlife or waterfowl refuge, or land of a historic site that is of national, state, or local significance will be used, acquired, or affected by programs or projects requiring federal assistance for implementation. There are no known historic sites, wildlife refuges, recreation areas, or publicly owned parks within close proximity to the Airport.

Noise and Compatible Land Use

The proposed projects are not predicted to significantly alter the noise contours around the Airport. The runway extension might slightly increase noise contours, but it should be over compatible land uses.

Need for Additional Environmental Documentation

According to the FAA Order 5050.4B, *National Environmental Policy Act (NEPA) Implementing Instruction for Airport Actions*, an Environmental Assessment might be required for the runway extension and the parallel taxiway construction if they had potential for impacting a natural resource like prime farmland, or a wetland, or Dry Fork Creek that the Corps has determined to be part of the "waters of the U.S." For the other projects, it is most likely that only a categorical exclusion would be required. Before construction of any kind occurs at the Airport, a "coordinated categorical exclusion" would need to be pursued with the various governmental agencies to clear the implementation of these projects.

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