2014 Master Plan Update
Alternative Development Concepts

Greater Rochester International Airport

October 2014

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Contents

Figures

Tables

1 Introduction

Monroe County, New York ("the County") has contracted CHA Consulting Inc. and its team of sub consultants, to prepare a Master Plan Update (MP) for the Greater Rochester International Airport (ROC or "the Airport"). This introductory chapter provides a brief overview and history of the Airport, as well as a discussion of the primary objectives of this study.

The MP provides planning and development guidance to address landside and airside facilities and land development considerations for the next 20 years and beyond. It serves as a strategic plan and marketing tool for the improvement of the Airport. Consistent with the guidance provided in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, and contractual agreements with the County, the contents of the complete report will include:

- Chapter 1: Introduction
- Chapter 2: Inventory of Existing Conditions and Facilities
- Chapter 3: Forecasts of Aviation Demand
- Chapter 4: Facility Analysis and Requirements
- Chapter 5: Airport Development Alternatives
- Chapter 6: Environmental Review
- Chapter 7: Airport Layout Plan

1.1 Purpose and Objectives

The purpose of this study is to provide long-term guidance for future Airport improvements required to satisfy regional aviation demand in a logical and financially-feasible manner. Consistent with this purpose, the following objectives were developed for the Master Plan Update:

- Provide a framework that allows the Airport to meet the long-term air transportation needs of the Region in a safe, secure, and efficient manner and in compliance with all FAA and Transportation Security Administration (TSA) requirements.
- Document changes in the aviation industry and economy to assist with preparing ROC for future challenges and competition.
- Identify the airfield, passenger terminal, ground transportation system, and aviation support facilities necessary to accommodate future aviation demand and fulfill the needs of Airport users and stakeholders.

- Develop a flexible and detailed long-range plan for terminal area expansion and the enhancement of passenger amenities within the terminal complex.
- Identify and plan for the impacts of the FAA's NextGen initiative.
- Provide strategies for improving Airport accessibility and the level-of-service of ground transportation, curbside, and parking activities.
- Support the development of compatible land uses in the Airport's vicinity in a manner that is sensitive to the surrounding environment.
- Identify aviation and non-aviation revenue-generation opportunities.
- Ensure that Master Plan Update findings are in harmony with the recommendations in Regional, Local, and other County planning efforts.
- Ensure that development plans are consistent with the safe, secure, efficient, environmentally responsible, and financially sound operation of the Airport.
- Actively solicit public input throughout the planning process.

In addition to addressing these objectives, this Master Plan Update will also fulfill the broad master planning goals set forth by the FAA in AC 150/5070-6B *Airport Master Plans*. These goals are:

- Document issues that the proposed development will address.
- Justify the proposed development through the technical, economic, and environmental investigation of concepts and alternatives.
- Provide an effective graphic presentation of the development of the Airport and anticipated land uses in the vicinity.
- Establish a realistic schedule for implementing the development proposed in the Master Plan Update, particularly the short-term capital improvement program.
- Propose an achievable financial plan to support the implementation schedule.
- Provide sufficient project definition and detail for subsequent environmental evaluations that may be required before the project is approved.
- Present a plan that adequately addresses the issues and satisfies local, state, and federal regulations.
- Document policies and future aeronautical demand to support the County's considerations concerning spending, debt, land use controls, and other policies necessary to preserve the integrity of the Airport and its surroundings.

- Set the stage and establish the framework for a continuing planning process. Such a process should monitor key conditions and permit changes in plan recommendations as required.

1.2 Airport Background

Understanding the background of an airport and the region it serves is essential in making informed decisions pertaining to airport-related improvements. This section discusses the background of the Airport.

1.2.1 Location

The County and the City of Rochester ("the City") are located in the Genesee/Finger Lakes Region of New York, about halfway between Buffalo and Syracuse. Now known as "The World's Image Center", Rochester was one of America's first "boomtowns" and rose to prominence initially as the site of many flour mills and then as a major manufacturing hub. It is an international center for higher education, health care, publishing, banking, and transportation industries. It is home to a large number of colleges and universities but it may be best known as the home to corporations such as Eastman Kodak, Bausch & Lomb, and Xerox. The population of Rochester was estimated to be approximately 210,565 in 2010, according to United States Census Bureau, making it New York's third most populous city after New York City and Buffalo.

The Airport is conveniently located about four miles southwest of downtown and the central business district of Rochester on approximately 1,136 acres and 12 miles south of Lake Ontario. **Figure 1-1** illustrates the County and Airport location within the State of New York and **Figure 1-2** depicts the Airport relative to the surrounding community. The Airport is accessible directly from Brooks Avenue Exit 18 off the Outer Loop Expressway (Interstate 390). Interstate 390 connects the Airport to the New York State Thruway (Interstate 90), Interstate 590 and Interstate 490 with the Inner Loop in downtown Rochester.

Figure 1-1 – Genesee/Finger Lakes Region

Figure 1-2 –Airport Location

MONROE COUNTY, NY

1.2.2 History

ROC's history began in 1922 with a 110-acre parcel of land in the town of Chili and was originally called "Britton Field". In 1927 the first scheduled passenger flights between New York City and Rochester began with the construction of Hangar No. 1 along Scottsville Road and two runways (1,000 and 1,500 feet long). When the City gained ownership the name was changed to "Rochester Municipal Airport" and improvements to the runways, drainage system, and the building of Hangar No. 2 were completed in 1928. The First and Second World Wars brought a period of great expansion as passenger volume, frequency of scheduled flights and civilian pilot training greatly increased, including the addition of a Cadet Flight training school. By 1941, the runways where extended and a number of additional buildings were constructed.

In 1948 the County took possession and ownership of the airport which now encompassed approximately 700-acres of land and was named "Rochester Monroe County Airport". Numerous improvements were completed by the County, including construction of Runway 10-28 measuring 5,000 feet long, an extension of Runway 1-19 from 2,670 feet long to 4,000 feet long and the building of an administration facility on Brooks Avenue. In 1960 Runway 10-28 was extended 500 feet to the west.

The new single-level terminal opened in 1953, was expanded substantially in 1963, and expanded again in 1978 and 1980. The 1963 expansion gave its final configuration that still exists today. The terminal had ten gates in two concourses. A small three-gate concourse at the east end served American Airlines, and a longer, angled concourse at the west end served Mohawk Airlines (four gates on the east side) and United Airlines (three gates on the west side). The 1980 expansion added a small second floor for administrative offices.

Jet service was initiated in 1964 by American Airlines, with the introduction of the Boeing 727. However, the airport's two longest runways, 10-28 (5,500 feet) and 1-19 (4,000 feet) were of less than ideal length for jet aircraft. In 1964, the County constructed runway 4-22. The new runway was built to a length of 7,000 feet and was extended in 1969 to its current length of 8,000 feet. Runway 10-28 remains for crosswind conditions and Runway 7-25 (1-19) is used for small general aviation (GA) aircraft. An Instrument Landing System (ILS) was originally installed on Runway 4 in 1966 and on Runway 22 in 1974.

American Airlines added the terminal's first jetways to gates 1 and 3 in 1977. New lounge space and three jetways were built for Allegheny Airlines (successor to Mohawk) as part of the 1978 expansion and in 1986, Allegheny (by then renamed US Air) added a fourth jetway. The 1980 expansion included two new lounge areas and jetways for United. In 1987, Piedmont Airlines, took over the United lounge closest to the terminal and added a second jetway to it.

In 1985, the new low-fare carrier People Express Airlines arrived at the airport. Since there was no space for them inside the terminal, a small ticket counter was built in office space in the northwest corner of the terminal and a wooden shed was built to house their outbound-baggage area, departure lounge, and baggage claim. People Express had a very dramatic effect on fares and ROC's enplanements increased 38 percent in 1985. In 1987, Continental Airlines took People Express over and they moved operations into the main terminal and shared gate space with American.

In the mid-1980s a County legislator introduced successful legislation to have the airport's name changed to "Greater Rochester International Airport." About this same time, the terminal was becoming very “cramped” and debate began about expanding the airport. In 1988, the County approved a $109 million plan to replace the terminal with an entirely new two-level facility with second level approach and parking garage. The County Legislature authorized the creation of the

"Monroe County Airport Authority" to issue the bonds for the construction. The new facilities were built in phases between 1989 and 1992.

The new terminal was constructed with two angled concourse with a total of 21 gates. The eastern or B concourse opened in 1990, while the eastern half of the main terminal opened in 1991. The western half of the main terminal, the western or A concourse, and parking garage, all opened in 1992.

The late 1980's saw the New York Air National Guard (NYANG) construct a small hangar (with office space) and apron area on the south side of the airport near the control tower. This facility has since been expanded.

The County consolidated the separate security checkpoints at each concourse, to one central security checkpoint, in 2006. Although it would close the terminal's large concessions atrium and airfield views to non-passengers, the County argued it would be more efficient and save money. A new public viewing area was designated at the west end of the terminal.

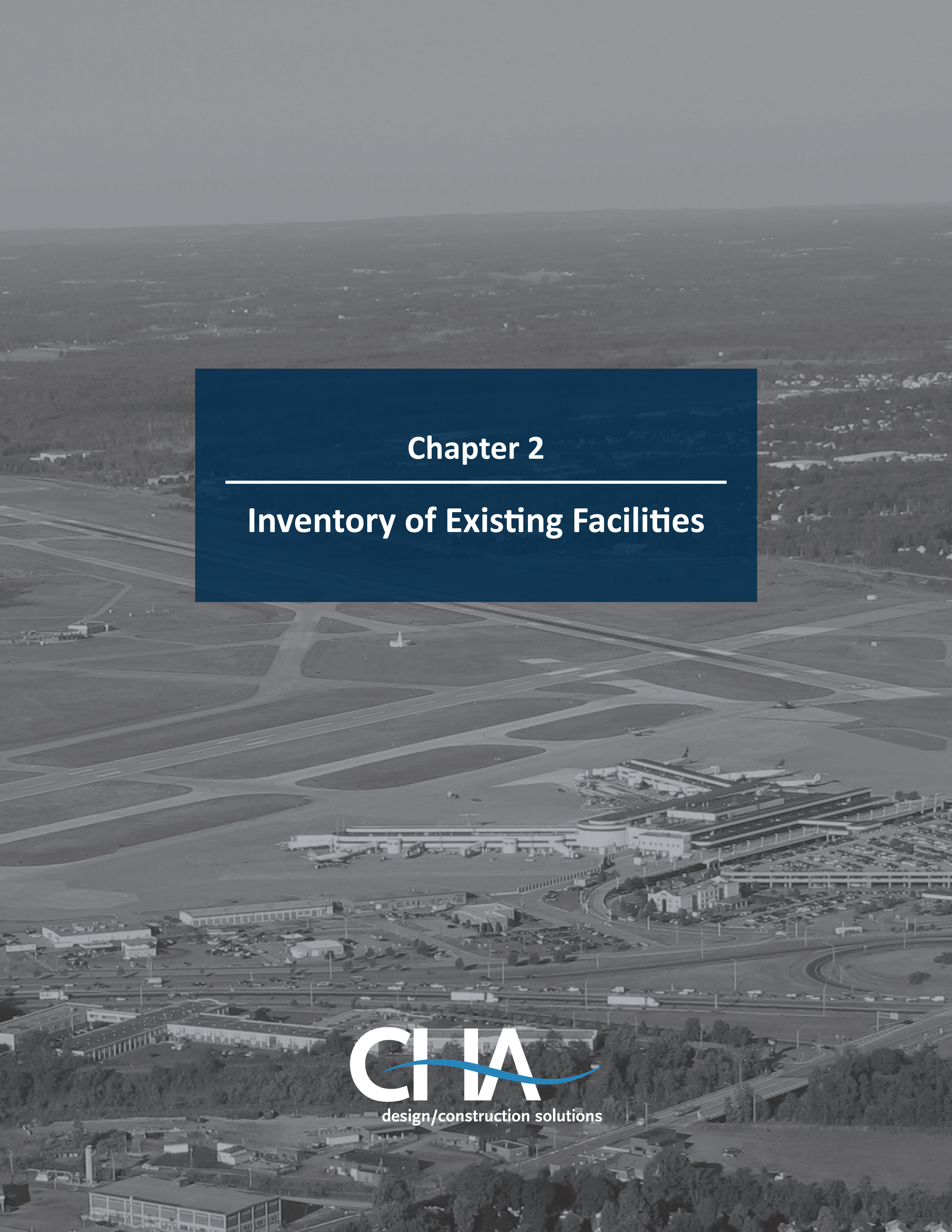
Numerous renovations were undertaken in 2008 and completed during 2009, including replacing floors, carpets, and seating in the concourses, moving explosives-scanning equipment from the ticketing lobby to the outbound baggage room, and replacing T-shaped baggage claim carousels with 360-degree walk-around carousels that receive luggage from belts through the ceiling. Also during 2009, the airport began work on an expansion of the automobile parking garage to the west. By early 2010, that project was completed.

In April 2013 with the ever changing market, Southwest Airlines completed its acquisition of AirTran Airways and shall begin a new low-fare air carrier service that will hopefully bring an increase in travelers to the airport.

1.2.3 Airport Role

The 2013-2017 National Plan of Integrated Airport Systems (NPIAS) identifies nearly 3,355 existing and proposed airports that are significant to national air transportation and thus eligible to receive Federal grants under the Airport Improvement Program (AIP). It also includes estimates of the amount of AIP funds needed for infrastructure development projects that will bring these airports into compliance with current design standards and add capacity to congested airports. The FAA is required to provide Congress with a five-year estimate of AIP-eligible development every two years. The Airport is currently designated as a Part 139, "small-hub" commercial service airport. Small hubs, as defined by NPIAS, are between 0.05 percent and 0.25 percent of enplanements of total U.S. passenger enplanements. There are 74 small hub airports that together account for 8% of all enplanements[1]. Small-hub airports usually have sufficient capacity to accommodate air carrier operations and a substantial amount of GA activity.

[1]NPIAS: http://www.faa.gov/airports/planning_capacity/npias/reports/media/2013/npias2013Narrative.pdf, 2013-2017



Chapter 2

Inventory of Existing Facilities

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2 Inventory of Existing Conditions and Facilities

The initial step in the master planning process is to develop an inventory of the existing physical conditions and operational characteristics of the airport and its surroundings. Some of the elements to be discussed in this chapter include:

- Airport Service Area
- Demographic and Socioeconomic Data
- Significant Regional Development Projects
- Regional Airport Facilities
- Airside Facilities
- Landside Facilities
- Airspace
- Airport Operations Data
- Land Use and Zoning

The information in this chapter provides the basis for evaluating facility requirements for ROC.

2.1 Airport Service Area

There are two types of criteria used in the aviation policy plan to define airport service areas; one reflects air access to local destinations from the particular airport for itinerant aircraft users, and the other reflects local ground access by based-aircraft users from their home or work locations to their preferred airport, or others using ROC air services.

The service area for ROC encompasses a two hour driving time from the Airport. Within that two hour drive time around ROC passengers can chose any of the four airports: Buffalo-Niagara International (BUF), Syracuse Hancock International (SYR), Ithaca Tompkins Regional (ITH), and Elmira Corning Regional Airport (ELM). BUF and SYR are the closest with drive times of 1 hour 7 minutes and 1 hour 28 minutes, respectively. ITH and ELM are closer to the two hour threshold drive time of 1 hour 57 minutes and 1 hour 43 minutes, respectively.

Passengers who live within the two hour drive around ROC, 38 percent use ROC, 42 percent use BUF, 16 percent use SYR, and 4 percent use ITH and ELM combined.

According to the NPIAS (2013-2017), "*Airports that do not receive scheduled commercial service or that do not meet the criteria for classification as a commercial service airport may be included in the NPIAS as general aviation airports if they account for enough activity (having usually at least 10 based aircraft) and are at least 20 miles from the nearest NPIAS airport.*" **Table 2-1** provides a list of airports surrounding ROC that serve the general aviation community.

Table 2-1 –ROC Service Area

Airport	Airport Id	Distance from ROC
Ledgedale Airpark	7G0	11 nautical miles west
LeRoy Airport	5G0	14 nautical miles southwest
Canandaigua Airport	D38	20 nautical miles southeast
Genesee County Airport	GVQ	22 nautical miles west
Williamson-Sodus Airport	SDC	25 nautical miles east
Pine Hill Airport	9G6	26 nautical miles west

Figure 2-1 depicts the airport service area for ROC.

Figure 2-1 –Service Area ROC

2.2 Demographic and Socioeconomic Data

The demographic and socioeconomic condition of the surrounding community is a key factor in forecasting the levels of aviation activity at an airport and evaluating the overall opportunity for future development. Often, population is a primary driver in the demand for aviation services and the types of aviation services necessary. Population demographics, in addition to employment and earnings statistics provide further indications to the community's ability to support aviation activities. The statistical link between these social and economic indicators provides a gauge of the community's demand for aviation services. This link is often used as a basis for forecasting aviation activity and planning airport development to meet the needs of the surrounding communities.

Information about the socioeconomic influences of an area can be derived from a variety of resources. For the purposes of this study, the Genesee/Finger Lakes Regional Planning Board, the US Census Bureau, the 2010 New York State Statistical Yearbook, and the Bureau of Economic Analysis served as the primary source for population, employment, and income information. The socio-economic factors for the City, County, and the State of New York will be discussed.

The purpose of this section is to identify major social and economic characteristics and to establish the socioeconomic influences and trends that will be incorporated into the aviation activity forecasts and development alternatives analyses presented in the following chapters.

2.2.1 Population

The County has experienced steady growth in population in the past 20 years. The population in 1990 was approximately 713,968 people and increased by approximately 3.2 percent to 736,738 people in 2003. From 2000 to 2010, the population increased approximately 1.2 percent to 744,344 people. The historic population and associated growth rates for the County and the City, for years 1990 to 2010, are shown in **Table 2-2**.

Table 2-2 –Monroe County/City of Rochester Population

Year	Monroe County	City of Rochester
1990	713,968	231,636
1995	712,417	232,000
2000	735,343	219,464
2003	736,738	215,093
2010	744,344	210,565
2011 (e)	745,625	210,855
1990-2003 % Change	**3.2%**	**-7.1%**
2000-2010% Change	**1.2%**	**-4.1%**

Source: Genesee/Finger Lakes Regional Planning Board and US Census Bureau

With a 2010 population of 1,217,156 persons, a 9-county area that surrounds the City and the Airport serves as the market area. The market area's population growth will often have a direct, sometimes indirect, impact on the utilization and growth prospects of ROC. The historic population and associated growth rates for the market area for years 1990 to 2010 are shown below. The populations for the 9-county area, from 1990 to 2010, grew at an average annual growth rate (AAGR) of approximately 1.5 percent. These trends shown in **Table 2-3** illustrates that positive population growth in the ROC market area is a significant driver of growth at the Airport.

Table 2-3 –County Population Data

County	1990	2000	2010	% Change 1990-2000	% Change 2000-2010
Genesee	60,060	60,370	60,079	0.5%	-0.5%
Livingston	62,372	64,328	65,393	3.1%	1.7%
Monroe	713,968	735,343	744,344	3.0%	1.2%
Ontario	95,101	100,224	107,931	5.4%	7.7%
Orleans	41,846	44,171	42,883	5.6%	-2.9%
Seneca	33,683	33,342	35,251	-1.0%	5.7%
Wayne	89,123	93,765	93,772	5.2%	0.008%
Wyoming	42,507	43,424	42,155	2.2%	-2.9%
Yates	22,810	24,621	25,348	7.9%	3.0%
9 County Total	**1,161,470**	**1,199,588**	**1,217,156**	**3.3%**	**1.5%**

Source: Genesee/Finger Lakes Regional Planning Board and US Census Bureau

2.2.2 Employment

Employment in the County and the Rochester Metropolitan Statistical Area (MSA) also experienced steady growth from 1990 through 2000. Total employment in the Rochester MSA from 1990 to 2000 increased approximately 11.6 percent, a pace greater than the State of New York overall. The trends in historical employment for the County, the Rochester MSA, the State of New York, and the United States, are shown in **Table 2-4**.

Table 2-4 –Civilian Labor Force

Year	Monroe County	Rochester MSA	New York State	United States
1990	371,200	511,400	8,309,000	115,461,000
2000	385,400	570,600	9,179,000	140,863,000
2008	378,900	536,400	9,604,000	154,287,000
1990-2000 % Change	**3.8%**	**11.6%**	**10.5%**	**22.0%**
2000-2008 % Change	**-1.5%**	**-6.0%**	**4.6%**	**9.5%**

Source: 2010 New York State Statistical Yearbook
Note: Civil work force comprises institutional population 16 years old and over.

Entities such as University of Rochester, Wegmans, Rochester General Health System and Xerox contribute to the labor force of the area.

2.2.3 Income

Per capita income (PCI) is the estimated average amount per person of total money income received during the calendar year for all persons residing in a given area. The basic assumption surrounds the idea that as income increases, the potential for a portion of that income to be spent on airport and aviation services increases accordingly. For example, commercial airline traffic and charter services can be significantly affected by the level of income available to pay for these and other services.

Historically, the County and the Rochester MSA PCI have increased since 1998, 34.9 percent and 36.3 percent, respectively. These increases have been similar to the State of New York and have exceeded the United States overall. The trends in historical PCI are shown in **Table 2-5**.

Table 2-5 –Per Capita Income (PCI)

Area	1998	2000	2002	2010	% Change 2000-2010
Monroe County	$29,091	$31,134	$32,506	$42,011	34.9%
Rochester MSA	$27,385	$29,329	$30,499	$39,970	36.3%
New York State	$31,555	$34,900	$35,805	$49,119	40.7%
United States	$26,883	$29,847	$30,906	$39,791	33.3%

Source: Bureau of Economic Analysis

2.3 Significant Regional Development Projects

Developments within the Finger Lakes District that may attract additional users to ROC include:

- **Golisano Children's Hospital** – Rochester, NY – includes the expansion of the Children's Hospital.
- **Yogurt Factories –** Batavia, NY – manufacturing plants for the development of yogurts. Some are already in place and others are planner. (NOTE – there is a GA airport in Batavia whose runway can accommodate business jet aircraft).
- **STAMP-** Alabama, NY- Science and Technology Advanced Manufacturing Park, a 1,243 acre Mega-Site focused on attraction of high-technology/clean technology companies. Full build-out of the site has the potential for 10,000 workers. Project is still

in early phases with an environmental impact statement recently completed and land acquisition anticipated as the next step.

- **Eastman Business Park Revitalization-** Rochester, NY**-** infrastructure is planned at the 1,200 acre park with the hopes of attracting new companies and additional jobs. Project is still in its early phases, but long term it has the potential to attract significant jobs and investment to the Rochester area.

- **Seneca Army Depot-** Romulus, NY reuse and redevelopment efforts continue at the Seneca Army Depot site. Long-term full build out of the site has the potential to result in up to 5,000 jobs to the site.

- **Lyons Industrial Park (Multi-Modal)** Lyons, NY- A site layout has been completed for a potential industrial park in Lyons that will take advantage of freight and goods movement opportunities provided by the intersection of CSX main line RR, the Corning Secondary RR, the Erie Canal, and the New York State Thruway.

2.4 Regional Airport Facilities

Airline passengers consider multiple variables such as cost, destination, and easy through-put prior to booking a flight. Passengers who work or reside in Rochester suburbs have opportune choices regarding the airport they select for their trips. With two of three surrounding airports less than 90 minutes of Rochester a passenger may only have an additional 30-60 minute drive to achieve a purchase that is more economically feasible. Passengers are known to dedicate upwards of an hour of ground travel to obtain a lower priced airfare, a more favorable flight schedule and connection, or to fly their airline of choice. Thus, this MP provides a comparison of the airline service available at the three surrounding airports, BUF, SYR, and ALB.

ROC is an origin and destination (O&D) market, meaning that the majority of passengers that enplane at ROC are beginning their trip in the Rochester area, and nearly all of those deplaning are ending their trip in the region. Relatively few flights from ROC serve other predominantly O&D markets, such as Albany, NY and White Plains, NY, but instead connect at airline hubs such as Chicago O'Hare (ORD), Washington Dulles (IAD), Atlanta (ATL), and New York John F. Kennedy (JFK) International. In recent years, there has been a consistent shift by the major airlines to pass along a number of routes (i.e., Boston, Cincinnati, and Baltimore) to their regional partners that were once served exclusively, or predominantly, by major carriers. The regional affiliates now fly predominately regional jets, which in many cases can operate with greater frequency and/or efficiency than larger narrow-body jet aircraft.

Table 2-6 illustrates enplanements at ROC, BUF, SYR, and Albany International (ALB) airports for comparative purposes. ROC captures a very high percentage of its total potential airline market share, as the nearest competitive airports are BUF (75 miles to the west) and SYR (88 miles to the east), both of which are more than a one hour drive from Rochester. In addition, there is little fare differential on similar routes among the three airports.

Table 2-6 –Regional Enplanements

Year	ROC	BUF	SYR	ALB
2000	1,195,600	2,038,440	1,058,002	1,313,954
2001	1,212,066	2,334,427	992,268	1,512,483
2002	1,115,216	2,006,638	913,422	1,374,398
2003	1,220,141	2,027,054	934,069	1,409,446
2004	1,322,703	2,165,365	1,081,575	1,508,523
2005	1,457,097	2,396,671	1,237,567	1,540,086
2006	1,412,225	2,500,875	1,130,175	1,461,303
2007	1,433,869	2,633,966	1,184,088	1,427,797
2008	1,384,043	2,753,671	1,131,786	1,390,560
2009	1,278,705	2,622,038	1,032,110	1,312,415
2010	1,266,945	2,595,934	1,011,119	1,255,405
2011	1,209,746	2,608,126	1,010,808	1,223,397
2012*	1,195,238	2,590,336	957,314	1,225,365
% Change	**-.03%**	**27%**	**-10%**	**-6.7%**

Sources:
2000-2010: December 2012 FAA APO Terminal Area Forecast
2011-2012: Airport Provided
*2012: December 2012 FAA APO Terminal Area Forecast (Estimate)

One noteworthy situation is Southwest Airlines, which serves both BUF and ALB airports in Upstate New York. As the country's largest low-cost airline, some passengers will travel to BUF for Southwest Airline flights; however, the presence of competing discount carriers at ROC, such as Jet Blue and Air Tran, has prevented substantial leakage. Enplanements at ROC peaked in 2005 and have fluctuated over the following seven years. With the addition of Southwest airlines to the fleet mix at ROC in April 2013, the Airport expects to see a slight increase in enplanements for 2013. The Airport and the County continue to provide innovative services and expert marketing, which encourage both passengers and airlines to fly out of ROC.

Elmira-Corning Regional Airport (ELM) in Horsehead and Tompkins County Airport (ITH) in Ithaca both have scheduled service and do not compete with ROC. Both are classified as non-hub commercial airports that serve fewer markets, have a lower frequency of daily flights, offer a lower level of jet service, and have fare levels that are equivalent to or higher than those available at ROC.

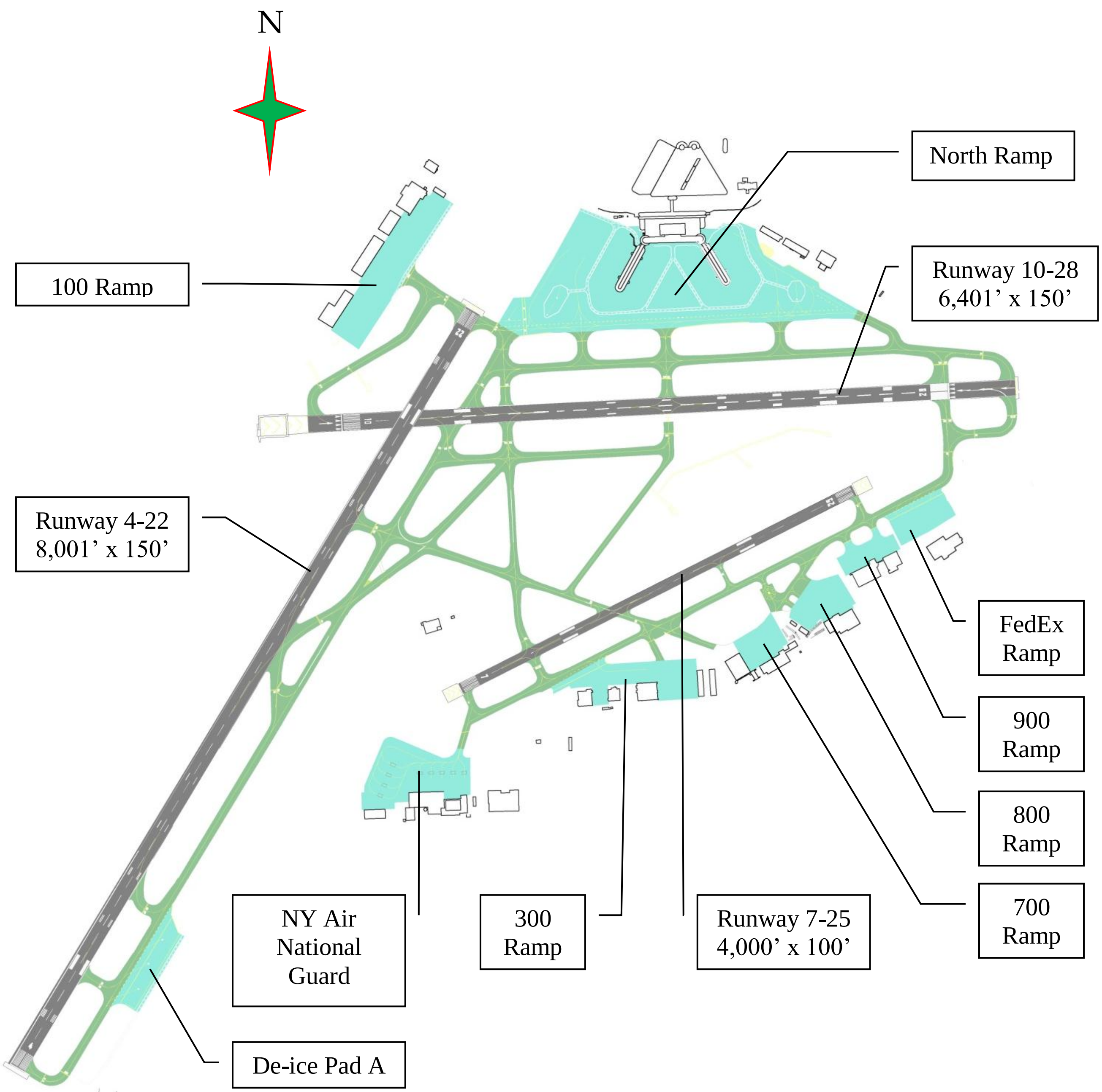
2.5 Airside Facilities

Airside facilities consist of all areas where aircraft operate including landing, take-off, taxi and park. Airside (or airfield) facilities are those directly used by aircraft, such as airspace, runways, taxiways, aprons, lighting, navigational aids (NAVAIDs), obstructions, FAR Part 77 Imaginary Surfaces and instrument approach procedures (IAP). As part of this study all Airside Facilities were visually inspected and inventoried, as described in this section.

This section will describe the Airport's airspace, runways, taxiways, navigational aids, lighting and IAP. The conditions reported in this section are based on on-site visual inspections, a review of the Airport's existing drawings and documents, and discussions with Airport Authority Management Staff.

The Airside components of ROC are comprised of (3) runways, (14) supporting taxiways, and several aircraft lighting and navigational systems, as illustrated in **Figure 2-2**.

Figure 2-2 - Airside Components



2.5.1 Runways

Runway characteristics are shown in **Table 2-7**. Runway 4-22 is aligned in a northeast-southwest direction, measuring 8,001 feet in length, and is the primary runway at the Airport. This runway supports the majority of airline and air cargo jet traffic at ROC. Runway 10-28 is aligned in an east-west direction, and has been lengthened to 6,401 feet. Declared distances have been adopted on this runway to enhance the take-off lengths. The third runway, Runway 7-25, measures 4,000 feet in length, and is intended to serve GA (private and corporate) aircraft.

The thresholds of Runway 28 and 25 have been identified as a hot spot. The close proximity of the two thresholds has resulted in a misidentification of the proper runway by pilots in the past.

Pavement strength and condition are presented in **Table 2-7**, but more details are available in The Pavement Management Study completed in 2014 for the Airport.

Table 2-7 Runway Data

	Runway		Runway		Runway	
	4	22	10	28	7	25
Runway Design Code (RDC)	D-IV		D-IV		C-II	
Length	8,001’		6,401’		4,000’	
Width	150’		150’		100’	
TORA	8,001’	8,001’	6,401’	6,401’	4,000’	4,000’
TODA	8,001’	8,001’	6,401’	6,401’	4,000’	4,000’
ASDA	8,001’	8,001’	5,801’	6,401’	4,000’	4,000’
LDA	8,001’	8,001’	5,501’	5,801’	4,000’	4,000’
Threshold Elevat.	527	559	555	541	545	536
Landing Pattern	Left	Right	Right	Left	Right	Left
Gradient	0.4% Avg.		0.3% Avg.		0.2% Avg.	
Surface	Asphalt-Grooved		Asphalt-Grooved		Asphalt	
Condition	Good		Good		Good	
Published PCN	85/R/C/X/T		90/F/C/X/T		95/F/C/X/T	
Strength						
Single Wheel	126,000 LBS		126,000 LBS		32,000 LBS	
Dual Wheel	160,000 LBS		160,000 LBS		42,000 LBS	
Dual Tandem	265,000 LBS		265,000 LBS		N/A	
Instrument Procedures	ILS 4 (CAT I) ILS (CAT II) RNAV 4 VOR/DME 4 VOR 4	ILS 22 (CAT I) RNAV 22	RNAV 10	ILS 28 (CAT I) RNAV 28	RNAV 7	RNAV 25
Lighting Approach or End Identifier	ALSF-2	MALSR	REIL	MALSR	REIL	REIL
VGSI	None	VASI-4	PAPI-4	PAPI-4	None	PAPI-4
TDZ	Yes	No	No	No	No	No
Centerline	Yes	Yes	No	No	No	No
Edge Lights	HIRL		HIRL		MIRL	
RGL	Taxiway C only		Taxiway A only		No	
Markings	Precision		Non-Precision	Precision	Non-Precision	
Condition	Good		Good		Good	
Displaced Threshold	No		300’	600’	No	

2.5.2 Taxiways

The taxiway system at ROC includes the basic elements of parallel taxiways for runways and appropriately placed exit taxiways along the runways. Runway crossing taxiways are relatively few. Two taxiways cross Runway 7-25 for GA access to Runway 4-22. Runway 4-22 has only one crossing taxiway to the cargo ramp (100 Ramp).

Four taxiways cross runway 10-28. Taxiway H crossing of Runway 10-28 has been identified as a hotspot due to a past runway incursion. The terminal apron is served by parallel taxiways that have relieved ground movement conflicts for airlines accessing Runway 4-22. Taxiway B was recently extended and Taxiway P was constructed to access the take-off end of Runway 28. Overall the taxiway system in place is effective for aircraft transit from runway to apron.

Table 2-8 summarizes the taxiway system. Taxiway pavements are reputed to be in fair to good condition. Refer to the pavement management study conducted as part of this update for more information.

Table 2-8 –Taxiways at ROC

Taxiway	Length (ft.)	Width (ft.)	Surface Type	Lighting
A	9,100	75	Concrete	MITL
B	5,300	75	Concrete	MITL
C	6,300	75	Concrete	MITL
D	2,100	60	Asphalt	MITL
D	800	75	Asphalt	MITL
E	600	50	Asphalt	MITL
E	1,350	60	Asphalt	MITL
E	1,500	75	Asphalt	MITL
F	4,150	60	Asphalt	MITL
F	1,900	60	Concrete	MITL
G	200	60	Asphalt	MITL
H	3,200	75	Asphalt	MITL
J	700	60	Asphalt	MITL
K	250	50	Asphalt	MITL
L	1,500	60	Asphalt	MITL
M	400	60	Asphalt	MITL
N	2,600	75	Asphalt	MITL
P	800	75	Concrete	MITL

2.6 Navigational Aids

Navigational aids (NAVAIDs) are radio facilities or, can be visual devices, providing either enroute or approach guidance information to aircraft. Enroute NAVAIDs are VOR's (Variable Omni Range) or NDB's (Non-Directional Beacons) and provide a radio signal for pilots to track either inbound or outbound of the NAVAID. Approach NAVAIDs are specialized radio transmission devices that help guide pilots to landing in low visibility conditions.

The primary approach NAVAID is the ILS (Instrument Landing System). ILS provides lateral and vertical guidance on approach to landing. VOR's and NDB's are also used for approach guidance, albeit at a lower accuracy of guidance information. ILS is referred to as a Precision Approach, due to its high accuracy, where VOR and NDB approaches are called Non-Precision Approaches. Distance Measuring Equipment (DME) is another ground based NAVAID usually collocated with a VOR or an ILS to display distance to the transmitter in an equipped aircraft.

An additional NAVAID associated with ILS are the marker beacons. Marker beacons mark a fixed point on the final approach course during an ILS approach. Marker beacons radiate a vertical signal that is received in equipped aircraft to announce crossing of the point. Marker beacons are normally placed at the point of glideslope (vertical guidance) intercept (called the Outer Marker) and at the horizontal location along the approach path where the glideslope passes through the decision altitude (called the Middle Marker). CAT II ILS systems normally have a third (Inner) marker beacon marking the CAT II decision altitude.

ILS systems are grouped into three categories. Category I (CAT I) is generally equipment capable of supporting horizontal and vertical guidance with visibilities as low as ½ mile. Category II (CAT II) is a system capable of supporting approaches with only ¼ mile visibility. Category III (CAT III) systems will support zero visibility. There are exceptions to the generalities here but the baseline is as above. CAT II and CAT III operations require specific air crew and aircraft certification. Not every aircraft or her crew may utilize a CAT II procedure. CAT I procedures are available to instrument rated pilots with supporting equipment installed in their aircraft. No other certification is required.

Ground based radio transmission NAVAIDs are generally being replaced by satellite based radio transmission navigation signals. The current system in place is the Global Positioning System (GPS). GPS is accurate enough for enroute navigation and limited approach capability. However, FAA has augmented the GPS signal with a combination of satellite and ground transmitters that increase the accuracy enough to permit instrument approach procedures nearly equal to ILS accuracy. Many GPS approach procedures now provide vertical guidance similar to ILS. Satellite based approach procedures fall under the area navigation category defined many years ago and is characterized by the acronym RNAV.

ROC has three ILS systems and a VOR, named Rochester, on airport property. An off-airport VOR, called Geneseo, is a supporting NAVAID for the Airport. There is a DME collocated with ROC's VOR and the Geneseo VOR. There is one NDB still in use called AVON and is located off-airport. Only one Outer Marker is still in use on the ILS for Runway 22. Runway 4 has an Inner Marker very near the CAT II decision altitude. More information on existing NAVAIDs at the Airport can be found in the Instrument Procedures discussion. The NAVAIDs at ROC are all owned and maintained by the FAA.

Runways 10, 22, 25 and 28 have lighting designed to provide a visual cue of glidepath angle on approach. These systems are collectively grouped as Visual Glide Slope Indicator (VGSI) lights. Runway 22 has a 4-box VASI, meaning four light units indicating white, red or both depending on the aircraft position on the glidepath. Runway 10, 25, and 28 use a 4-box PAPI which does the same thing with a different presentation of white and red lights. Other lighting on the airport considered to be visual NAVAIDS includes a high intensity airport beacon, reputed to be visible from 30 miles out, runway guard lights, lighted wind socks, and various obstruction lights.

2.6.1 Lighting

Existing lighting for the runways and taxiways was listed in **Table 2-7** under those sections. Obviously lighting is primarily for nighttime visual guidance along the runways and taxiways. The approach lighting systems are an aid to identifying the runway environment during low visibility conditions. Approach lights can be significant aids during daylight. Approach lighting systems are designed for the instrument procedures they support.

Runways with an ILS CAT I system would normally have a MALSR approach lighting system. A MALSR is a 2,400 foot long series of lights providing alignment indication and reference cues to the runway threshold. ALSF-2 approach lighting is associated with CAT II ILS systems. As previously indicated, Runways 22 and 28 have MALSR approach lights and Runway 4 has an ALSF-2 lighting system.

Runways 7, 10, and 25 have Runway End Identification Lights (REIL). These are flashing strobe lights that help pilots identify the end of the runway and are particularly useful where surrounding lights may confuse the visual cues of the runway end. REIL is not an approach light system and does not count for anything when instrument procedures are developed.

Figure 2-3 - Typical CAT II Runway Lighting

Runway 4 also has touch down zone (TDZ) lights which are installed in the first 3,000 feet of runway pavement and indicate the zone where the aircraft wheels meet the ground. Runway 4-22 has centerline lights to mark the centerline for pilots to align and guide their aircraft through roll-out after touch down. The ALSF-2, TDZ and centerline lights complement each other by design and present an impressive visual cue for transition from flight, to touch down, to roll-out. **Figure 2-3** is a photo of an ALSF-2 with TDZ, centerline and edge lights. The terminal apron has elevated area lighting for ground handling crews to work by. The cargo aprons and GA aprons have area lighting to varying degrees.

2.6.2 Instrument Approach Procedures

IAPs are designed from baseline visibility criteria and minimum descent altitude or decision altitude and modified based on the airport infrastructure and presence of obstacles. The supported IAP of any given runway end is all tied together into one system. As satellite based navigation signals take over as the primary guidance system, more runway ends can have instrument procedures developed for them. Runways 7 and 25 are good examples of this. A published procedure has not been available for either end of this runway before. Now each runway has an approach procedure published. Each published procedure lists minimum visibility and altitude for the four groups of aircraft approach speeds used in airport engineering. **Table 2-9** lists the particulars of published instrument approach procedures.

Table 2-9 –Instrument Approach Procedures

Instrument Approach Procedure	Aircraft Category Visibility (miles)–DA or MDA (ft. above sea level) (AGL)(ft. above touch down zone)							
	A		B		C		D	
ILS RWY 4 (CAT I)	3/8	735 (200)	3/8	735 (200)	3/8	735 (200)	3/8	735 (200)
ILS RWY 4 (CAT II)	1/4	635 (100)	1/4	635 (100)	1/4	635 (100)	1/4	635 (100)
ILS RWY 22	1/2	759 (200)	1/2	759 (200)	1/2	759 (200)	1/2	759 (200)
ILS RWY 28	1	798 (250)	1	798 (250)	1	798 (250)	1	798 (250)
RNAV RWY 4	3/4	866 (331)	3/4	866 (331)	3/4	866 (331)	3/4	866 (331)
RNAV RWY 7	1	1200 (651)	1	1200 (651)	1-3/4	1200 (651)	2	1200 (651)
RNAV RWY 10	1	960 (404)	1	960 (404)	1-1/4	960 (404)	1-1/4	960 (404)
RNAV RWY 22	1/2	759 (200)	1/2	759 (200)	1/2	759 (200)	1/2	759 (200)
RNAV RWY 25	1	1020 (471)	1	1020 (471)	1-1/4	1020 (471)	1-1/2	1020 (471)
RNAV RWY 28	1	839 (291)	1	839 (291)	1	839 (291)	1	839 (291)
VOR/DME RWY 4	3/4	1200 (665)	3/4	1200 (665)	1-1/4	1200 (665)	1-1/2	1200 (665)
VOR RWY 4	3/4	1240 (705)	3/4	1240 (705)	1-1/2	1240 (705)	1-3/4	1240 (705)

Notes:
Aircraft Approach Category (approach speed):
A: 0 – 90 Knots B: 91 – 120 knots C: 121–140 knots D: 141 knots and above
Best available minimum listed above. Other minimums for circling, localizer only, etc not listed.

The published circling minimum (not shown) for 6 of the 12 published procedures are lower or equal to the straight in minimum for RNAV RWY 7. No obstructions were identified in the 2009 Master Plan to explain this outcome. Also of note, the RNAV overlay on Runway 4 is not consistent with the infrastructure of Runway 4 whereas the RNAV RWY 22 minimum is equal to the ILS. The ILS RWY 28 is limited to 1 mile visibility. The 2009 Master Plan did identify several obstructions in the final approach course that may have resulted in the visibility minimum being set at 1 mile instead of the usual ½ mile for an ILS.

2.7 Landside Facilities

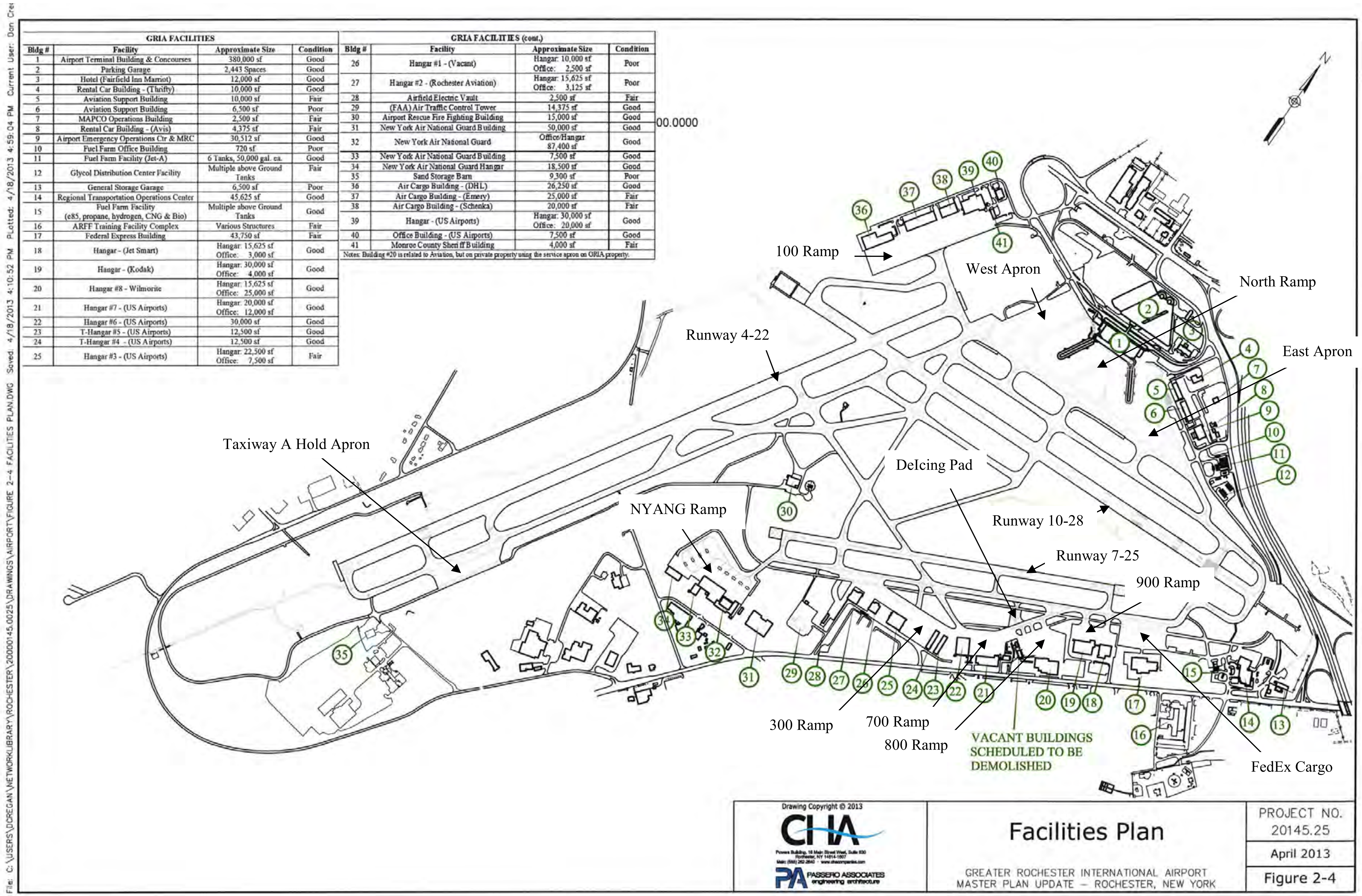
Landside facilities at the Airport consist of support buildings and structures, typically accessible to the airfield, as described and outlined in Table 2-10 and Figure 2-4., such as:

- Terminal Facility
- GA Facilities
- Air Cargo Facilities
- Maintenance Facilities
- Hangars, Aircraft Rescue and Fire Fighting Facility (ARFF)
- Aircraft Fuel Storage Facilities
- Airport Office and Maintenance Facility
- Emergency Operations Facility
- Glycol Distribution Facility
- Electric Vault
- FAA Air Traffic Control Tower (ATCT)
- Parking Garage
- Parking Facilities
- General Transportation Roadway System

Figure 2-4 illustrates the location, type, size and general condition of the buildings on the airport. The airport is more or less configured to support commercial passenger traffic on the north side while providing general aviation and corporate flight department support on the south side. Cargo facilities are on the southeast and northwest corners of the airport. The airport maintenance facility shops and the county fueling facility are on the south east corner also.

Most structures are characterized as good condition. Four structures are characterized as poor condition. Two of these are the bulk hangars at the 300 Ramp. The other 2 are the sand storage barn near the threshold of Runway 4 and an aviation support building at the north ramp. The support building was used for airline cargo support at one time. It is used for storage at the current time.

Figure 2-4 –Landside Components



GRIA FACILITIES

Bldg #	Facility	Approximate Size	Condition
1	Airport Terminal Building & Concourses	380,000 sf	Good
2	Parking Garage	2,443 Spaces	Good
3	Hotel (Fairfield Inn Marriot)	12,000 sf	Good
4	Rental Car Building - (Thrifty)	10,000 sf	Good
5	Aviation Support Building	10,000 sf	Fair
6	Aviation Support Building	6,500 sf	Poor
7	MAPCO Operations Building	2,500 sf	Fair
8	Rental Car Building - (Avis)	4,375 sf	Fair
9	Airport Emergency Operations Ctr & MRC	30,512 sf	Good
10	Fuel Farm Office Building	720 sf	Poor
11	Fuel Farm Facility (Jet-A)	6 Tanks, 50,000 gal. ea.	Good
12	Glycol Distribution Center Facility	Multiple above Ground Tanks	Fair
13	General Storage Garage	6,500 sf	Poor
14	Regional Transportation Operations Center	45,625 sf	Good
15	Fuel Farm Facility (e85, propane, hydrogen, CNG & Bio)	Multiple above Ground Tanks	Good
16	ARFF Training Facility Complex	Various Structures	Fair
17	Federal Express Building	43,750 sf	Fair
18	Hangar - (Jet Smart)	Hangar: 15,625 sf Office: 3,000 sf	Good
19	Hangar - (Kodak)	Hangar: 30,000 sf Office: 4,000 sf	Good
20	Hangar #8 - Wilmorite	Hangar: 15,625 sf Office: 25,000 sf	Good
21	Hangar #7 - (US Airports)	Hangar: 20,000 sf Office: 12,000 sf	Good
22	Hangar #6 - (US Airports)	30,000 sf	Good
23	T-Hangar #5 - (US Airports)	12,500 sf	Good
24	T-Hangar #4 - (US Airports)	12,500 sf	Good
25	Hangar #3 - (US Airports)	Hangar: 22,500 sf Office: 7,500 sf	Fair

GRIA FACILITIES (cont.)

Bldg #	Facility	Approximate Size	Condition
26	Hangar #1 - (Vacant)	Hangar: 10,000 sf Office: 2,500 sf	Poor
27	Hangar #2 - (Rochester Aviation)	Hangar: 15,625 sf Office: 3,125 sf	Poor
28	Airfield Electric Vault	2,500 sf	Fair
29	(FAA) Air Traffic Control Tower	14,375 sf	Good
30	Airport Rescue Fire Fighting Building	15,000 sf	Good
31	New York Air National Guard Building	50,000 sf	Good
32	New York Air National Guard	Office/Hangar 87,400 sf	Good
33	New York Air National Guard Building	7,500 sf	Good
34	New York Air National Guard Hangar	18,500 sf	Good
35	Sand Storage Barn	9,300 sf	Poor
36	Air Cargo Building - (DHL)	26,250 sf	Good
37	Air Cargo Building - (Emery)	25,000 sf	Fair
38	Air Cargo Building - (Schenka)	20,000 sf	Fair
39	Hangar - (US Airports)	Hangar: 30,000 sf Office: 20,000 sf	Good
40	Office Building - (US Airports)	7,500 sf	Good
41	Monroe County Sheriff Building	4,000 sf	Fair

Notes: Building #20 is related to Aviation, but on private property using the service apron on GRIA property.

As part of this study all Landside Facilities were visually inspected (Exterior Only) and inventoried.

This section will describe the Airport's support buildings and structures. The conditions reported in this section are based on on-site visual inspections, a review of the Airport's existing drawings and documents, and discussions with Airport Authority Management Staff.

The Landside components of ROC are comprised of (23) Buildings, (13) Hangars, parking structure, (2) Fuel Farm Facilities, Glycol Distribution Facility, Electric Vault and FAA ATCT as illustrated in Figure 2-4.

2.7.1 Terminal Area

ROC terminal area facilities are located on the north side of the Airport. The passenger terminal building was constructed in phases from 1989 to 1992 as discussed in Section 1-2, and provides approximately 380,000 square feet of space for passenger and baggage processing functions, as well as airport administrative offices. Two concourses with eleven (11) gate positions each (22 total gate positions) are connected to a central processing facility. A multi-story parking structure with 2,443 spaces supports the passenger terminal complex.

2.7.2 Aprons and Hangars

As shown in **Table 2-10**, there are ten aprons located at ROC. Total apron area is approximately 340,000 square yards (sy). Aprons serve airline, cargo, military, and GA aircraft. Aircraft hangar storage and tie down ramps for GA users are located on the south side of the Airport. The fixed base operators (FBO) provide a full range of services to local and transient pilots. Additionally, local businesses have established corporate hangars in the GA terminal area.

Table 2-10 –Aprons at ROC

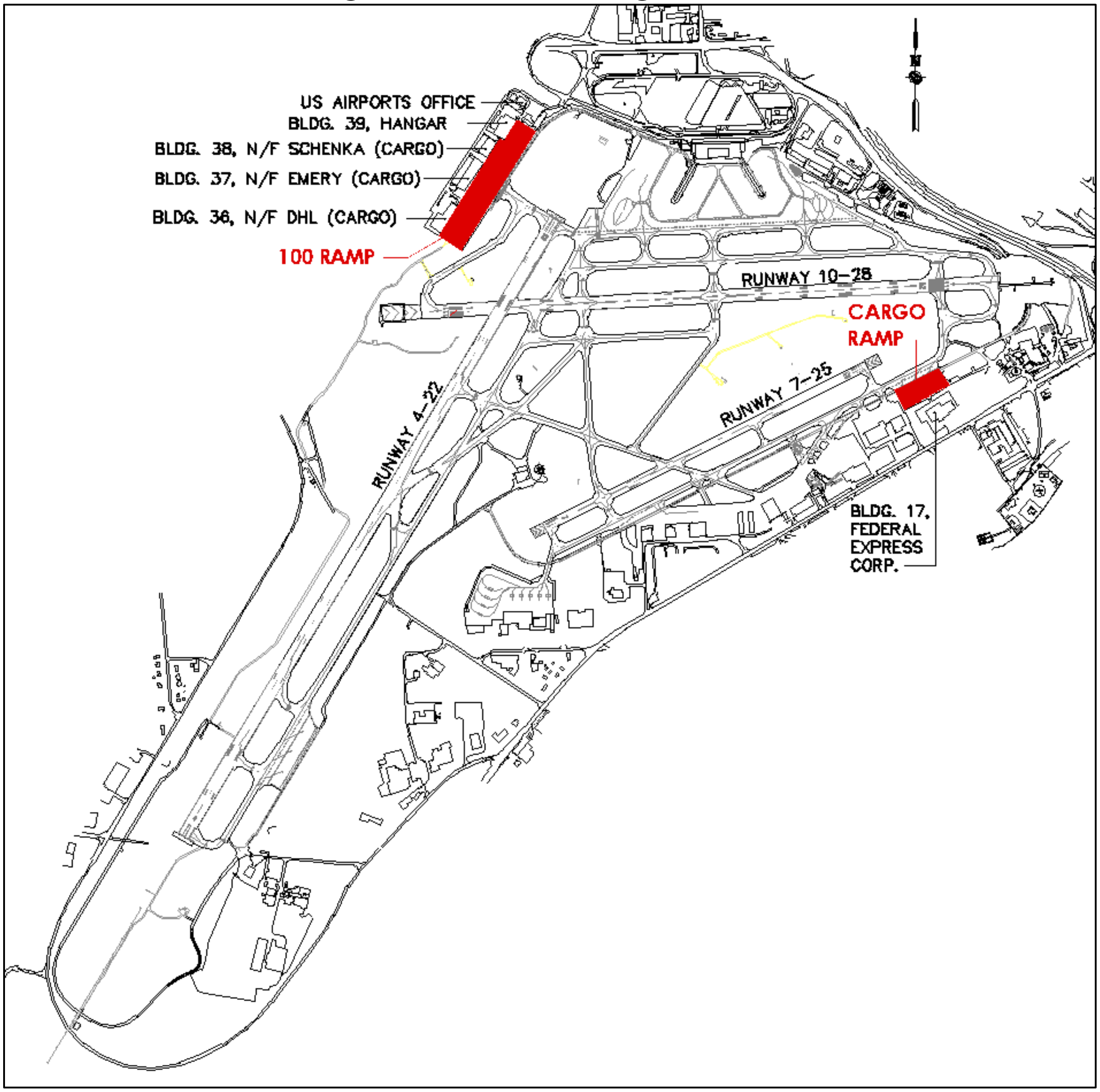
User	Aprons	Approximate Area	Surface Type
Passenger Terminal	West Apron	72,000 sy	Concrete
	North Ramp	65,000 sy	Concrete
	East Apron	44,000 sy	Concrete
	TOTAL	181,000 sy	
Air Cargo	100 Ramp	41,000 sy	Asphalt
	FedEx	9,000 sy	Asphalt/Concrete
	TOTAL		
GA and FBO	300 Ramp	29,000 sy	Asphalt
	700 Ramp	13,000 sy	Asphalt/Concrete
	800 Ramp	17,000 sy	Asphalt
	900 Ramp	11,000 sy	Asphalt
	TOTAL	70,000 sy	
Military	NYANG	43,000 sy	Asphalt
	TOTAL	43,000 sy	
Total Apron Area		**344,000 sy**	

Facilities for air cargo operations are located on the west side of the Airport on the main cargo ramp and along Scottsville Road, with convenient access to major highways. The NYANG occupies approximately 13 acres on the south side of the Airport to support their helicopter activity.

2.7.2.1 Air Cargo

Air cargo facilities at ROC are located in the northwest and southeast areas of the Airport, as shown in **Figure 2-5**. It should be noted that FedEx provides daily service from ROC utilizing Airbus A300-600 aircraft.

Figure 2-5 –ROC Air Cargo Facilities



2.7.2.2 Airport Access

Access to the passenger terminal at ROC is provided via I-390, Exit 18 (Brooks Avenue West). The US Airports Headquarters (Building 27) and the main cargo area are also accessible from Brooks Avenue by turning right on Airport Way. Access to many facilities on Scottsville Road (e.g., ATCT, FBO, NYANG) is provided via I-390, Exit 17 (Route-383), and turning right on Scottsville Road.

2.8 Airspace

Aircraft are subject to varying degrees of control depending on the specific airspace and meteorological conditions in which they operate. This system of air traffic control is the responsibility of the FAA, which has the statutory duty to establish, operate, and maintain air traffic control facilities and procedures.

There are two basic types of aircraft flight rules recognized by the air traffic control system: visual flight rules (VFR), and instrument flight rules (IFR). VFR operations depend primarily on visual conditions. IFR operations depend primarily on radar detection for separation by air traffic controllers. IFR flights are controlled from takeoff to touchdown, while VFR flights are controlled only within the vicinity of airports.

The United States airspace is structured into Controlled, Uncontrolled, and Special Use airspace, as defined below.

- **Controlled Airspace** – Airspace that is supported by ground to air communications, navigational aids, and air traffic services. Controlled airspace is further divided into five different classes (A, B, C, D, or E).

    - **Class A:** All airspace above 18,000 feet mean sea level (MSL) and up to 60,000 feet MSL. Class A airspace contains all high altitude airways – jet-routes. This airspace overlays the Class E airspace around ROC.

    - **Class B and C:** The airspace surrounding major commercial airports. Within Class B and C airspace, aircraft are required to communicate with ATC. To enter this airspace, communication and/or clearances must be received from ATC. There is no Class B airspace in western New York. ROC is surrounded by Class C airspace, which begins at ground level and extends upward to 4,000 feet above the Airport elevation. The Class C area extends outward with a 10 nautical mile radius. Class C airspace also surrounds Buffalo to the west and Syracuse to the east.

  - **Class D:** The terminal area airspace surrounding towered and military airports with a radius of five statute miles. The closest Class D airspace is located at the Niagara Falls and Elmira-Corning Airports.

  - **Class E:** General controlled airspace that includes most of the remaining airspace. This airspace contains the low altitude airways. Aircraft operating in Class E must follow the general regulations for Controlled airspace. Class E airspace extends upward from the ROC Class C airspace to the overlying Class A Airspace. Beyond the boundaries of ROC Class C airspace, Class E airspace may extend to the ground for un-towered certified airports, but generally begins at 700 or 1,200 feet above ground.

- **Special Use Airspace:** An area of special concern or restriction due to unusual hazards (e.g., military activity). Special Use airspace includes designated Prohibited Areas, Restricted Areas, Warning Areas, Military Operation Areas (MOA), and Alert Areas. Special use airspace in the vicinity of ROC includes several MOA's and a Restricted area located over Lake Ontario to the north. Active times, altitudes, and restrictions are published by the FAA and are available to pilots.

- **Uncontrolled Airspace** – All airspace that has not been designated as Controlled or Special Use, and within which Air Traffic Control (ATC) has neither the authority nor the responsibility for control. All uncontrolled airspace is considered Class G and typically exists beyond the limits of Class C airspace, from the ground up to 700 or 1,200 feet.

These airspace classifications impose several requirements upon the operations of aircraft, including visibility minimums, cloud clearances, contact with air traffic control, and special aircraft equipment. The airspace surrounding ROC is illustrated in **Figure 2-6**, and the classification system is summarized in **Figure 2-7** as follows:

Figure 2-6 –ROC Airspace Map

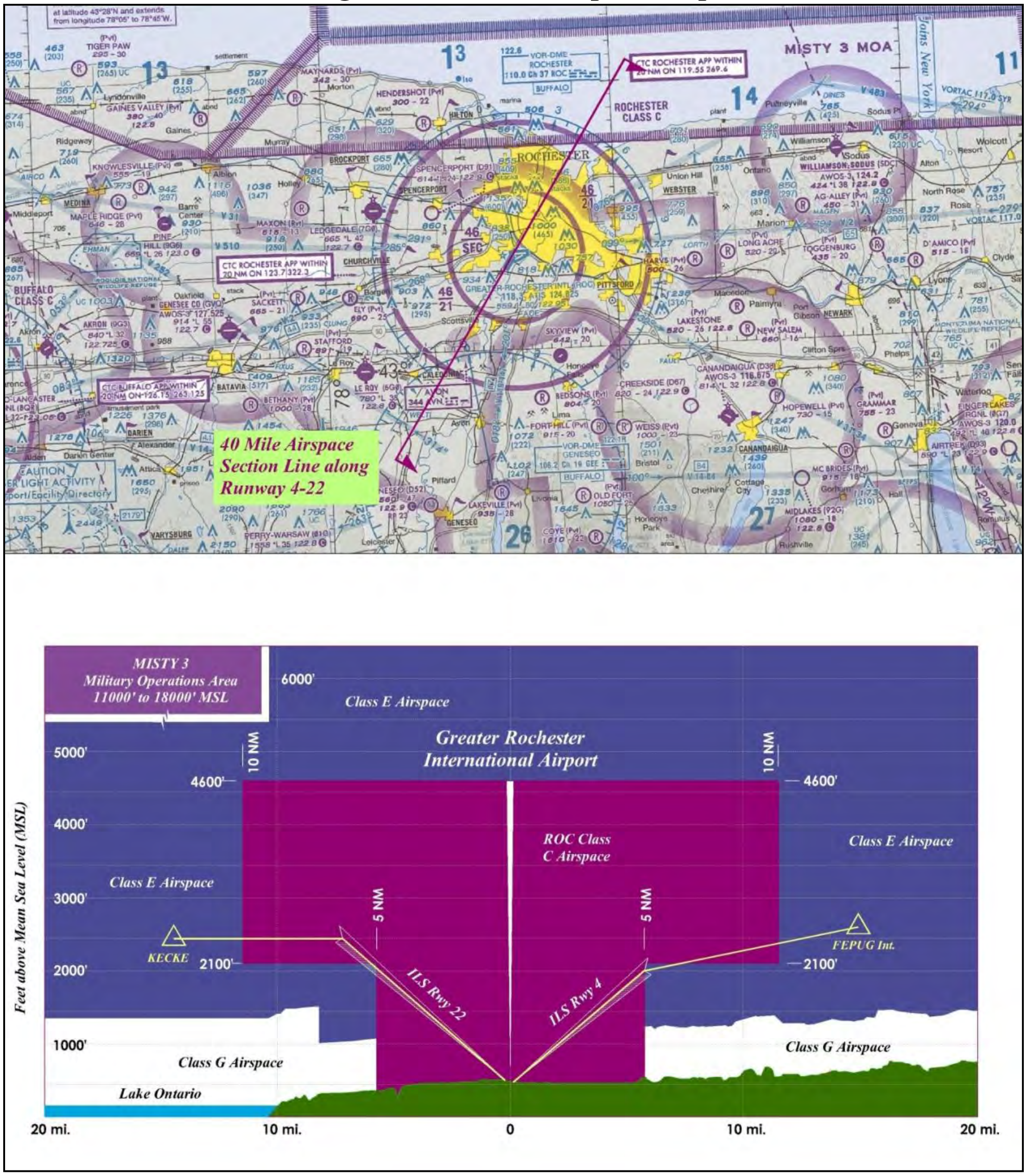
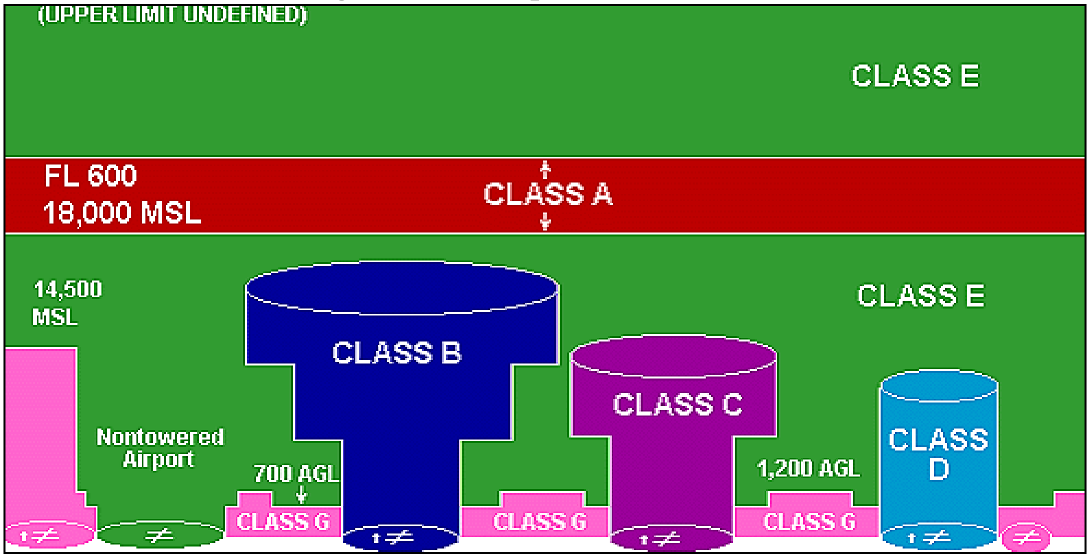


Figure 2-7 - Airspace Classification



2.9 Airport Operations Data

One of the most valuable measures of aviation activity at ROC is scheduled passenger service. Scheduled airlines generate the largest source of revenue for the Airport and largely define how effectively the Airport is serving its role in the region's transportation network.

Airlines can be classified various ways: majors, nationals, and regional based on annual income. The FAA Air Traffic Division (ATD) classifies airline operations at towered airports as either air carrier or air taxi (see FAA definition below); for the purpose of this study we will refer to the ATD classification of airline operations.

- **Air Carrier (AC)** – An aircraft with seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation. This includes U.S. and foreign flagged carriers.
- **Commuter/Air Taxi (Comm)** – Aircraft designed to have a maximum seating capacity of 60 seats or less or a maximum payload capacity of 18,000 pounds or less carrying passengers or cargo for hire or compensation. Many regional jets are classified as Comm.

2.9.1 Operations/Enplanements

The data contained in this section provides an understanding of past and present conditions at ROC, specifically related to enplanement and flight operations. The data presented in the following tables was gathered from the FAA and by the Airport.

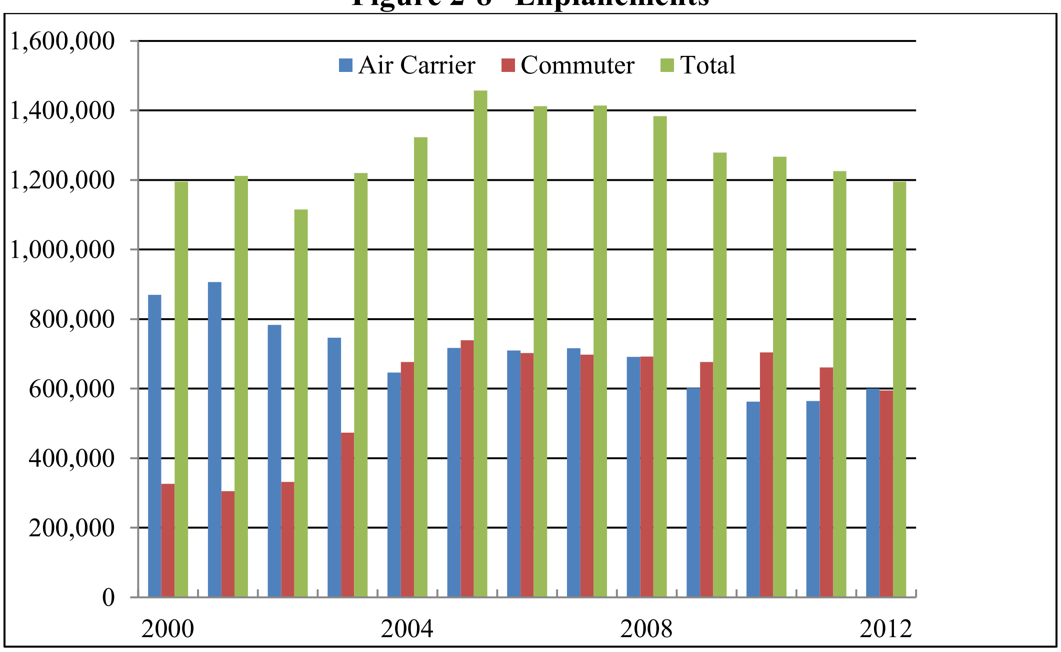
Enplanements are defined as the sum of all boarding passengers on scheduled airlines. In 2005 enplanements peaked at 1,457,097, a record high for the airport. Since 2005 enplanements have fluctuated from year to year, never falling below $1.1 million and never exceeding 2005's enplanement levels. **Table 2-11** and **Figure 2-8** graph illustrates historical enplanement data.

Table 2-11 –ROC Enplanements

Year	Air Carrier	Commuter	Total
2000	869,534	326,066	1,195,600
2001	906,717	305,349	1,212,066
2002	783,141	332,075	1,115,216
2003	746,950	473,191	1,220,141
2004	646,005	676,698	1,322,703
2005	717,518	739,579	1,457,097
2006	710,055	702,170	1,412,225
2007	716,332	697,537	1,433,869
2008	691,786	692,257	1,384,043
2009	601,828	676,877	1,278,705
2010	562,638	704,307	1,266,945
2011*	564,418	660,950	1,225,368
2012**	600,609	594,629	1,195,238
% Change 2000-2012	**-30.9%**	**82.4%**	**-.03%**

Sources:2000-2012: December 2012 FAA APO Terminal Area Forecast.
*2011: Airport Provided.
*Air Carrier & Commuter enplanements estimated from Airport provided data.
**2012: December 2012 FAA APO Terminal Area Forecast (Estimate).

Figure 2-8 –Enplanements



The U.S. Department of Transportation (DOT) requires airlines to submit activity level reports and subsequently categorizes the airlines as major, regional, or commuter (operating under Part 298C of the 1958 FAA Act). There are also different definitions within the industry itself. For example, some major airlines own and operate their own regional partner (such as American Airlines and some American Eagle carriers). In that case, the regional airline reports its activityand financial data as part of its parent company, rather than as a separate entity. Finally, some airports collect their own activity statistics (operations and passenger enplanements), and use their own definitions of airlines to classify the data. Consequently, it is difficult to compare airline activity data, particularly when the data is collected by a wide variety of sources and covers different time periods. **Table 2-12** illustrates enplanements by carrier at ROC in 2012.

Table 2-12 –Enplanements by Carrier

Carrier (Operator)	2012 Enplanements	% of Total	% by Carrier
Air Tran	217,176	17.8%	17.83%
American Eagle	59,192	4.9%	4.9%
Air Georgian (AC)	4,365	0.4%	0.4%
Delta	134,594	11.1%	26.8%
Expressjet (DL)	15,227	1.3%	
Chaut/Republic (DL)	6,884	0.6%	
Comair	32,055	2.6%	
Compass	16,102	1.3%	
GoJet (DL)	12,790	1.1%	
Mesaba	401	0.0%	
Pinnacle	87,841	7.2%	
Shuttle America (DL)	20,133	1.7%	
Jet Blue	135,114	11.1%	11.1%
United	53,492	4.4%	21.7%
Commutair (CO)	65,694	5.4%	
Expressjet (CO)	170	0.0%	
Expressjet (UA)	77,426	6.4%	
GoJet	13,832	1.1%	
Mesa	5,513	0.5%	
Shuttle America	16,990	1.4%	
Trans States	31,281	2.6%	
U.S. Airways	39,620	3.3%	17.4%
Air Wisconsin	92,059	7.6%	
Mesa	6,046	0.5%	
Piedmont	22,532	1.8%	
PSA	8,120	0.7%	
Republic	43,325	3.6%	
TOTAL	**1,217,974**	**100.0%**	**100.0%**

Sources: Airport website-http://www.monroecounty.gov/airport-airlines.php, Airport provided

Note that in some instances there were several regional operators for each major carrier.

By the end of February 2013, non-stop airline flights were available to 17 markets from ROC. Four destinations had four or more daily departures, with Chicago, Philadelphia, New York JFK and Atlanta topping the list. The furthest non-stop western destination from ROC was Minneapolis, the furthest non-stop eastern destination from ROC was Boston, and the furthest southern destination was Orlando in 2012. 2012 non-stop destinations are illustrated in **Table 2-13** and **Figure 2-9**.

Table 2-13 –Non-Stop Operations

Destination—Code	# Per Week	Average Daily	Rank
Atlanta-ATL	74	10.57	4
Baltimore-BAL	28	4.00	
Boston-BOS	34	4.86	10
Charlotte-CLT	16	2.29	
Chicago-ORD	122	17.43	1
Detroit-DTW	64	9.14	6
Minneapolis-MSP	12	1.71	
New York-JFK	93	13.29	3
New York-LGA	50	7.14	8
Newark-EWR	67	9.57	5
Orlando-MCO	28	4.00	
Philadelphia-PHL	116	16.57	2
Tampa-TPA	28	4.00	
Toronto-YYZ	24	3.43	
Washington D.C.-DCA	38	5.43	9
Washington D.C. -IAD	56	8.00	7
Total Departures	**878**	**125.43**	

Source: Each Airline Online Reservation System, February 20, 2013

Figure 2-9 –Map of US highlighting non-stop destinations

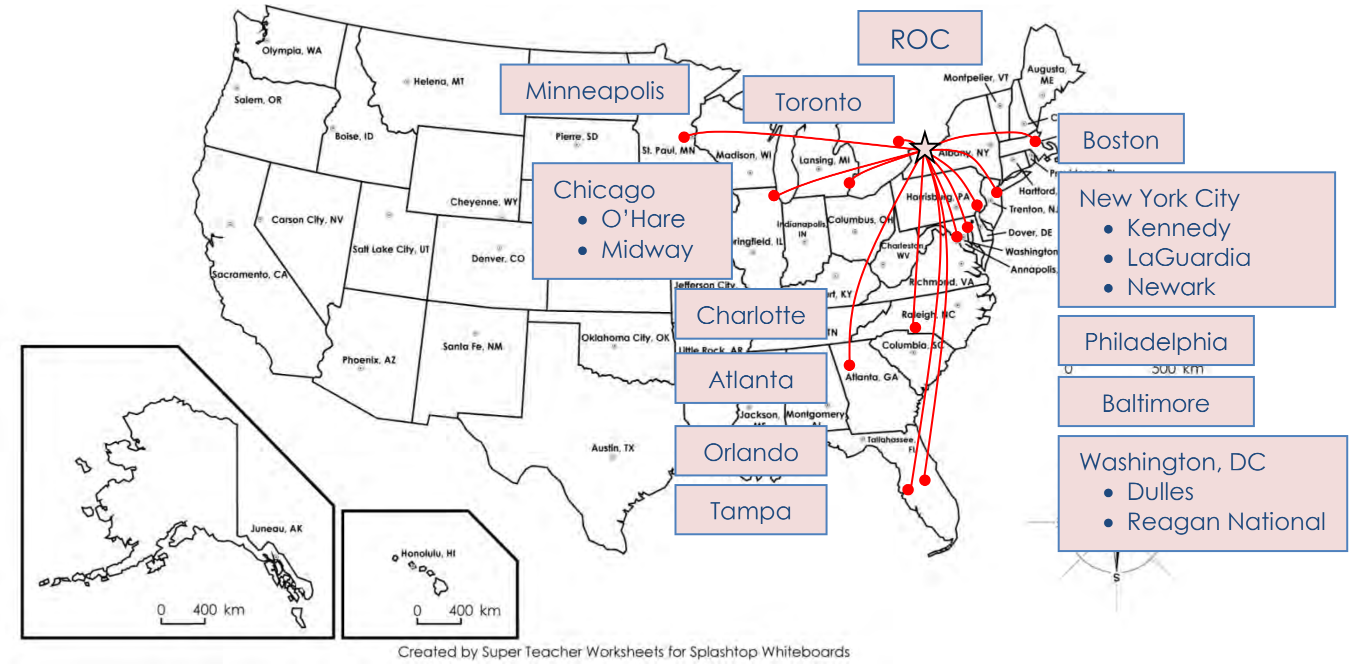


Table 2-14 illustrates 2013 scheduled non-stop airline flight operations at ROC by carrier. The airlines that had the highest operational status in 2011 were United, US Airways, Delta, and Airtran. United Airlines comprised of 243 (27.68%) of the 878 flights per week. Air Canada (Air Georgian) had the fewest weekly scheduled operations.

Table 2-14 –Scheduled Non-Stop Airline Flights (Arrivals & Departures) at ROC by Carrier

Carrier (Operator)	Weekday Flights	Weekend Flights	Total Flights Per Week	Average Daily Flights	Total Flights Per Week by Carrier
Air Tran	84	32	116	16.57	116
American Eagle	40	14	54	7.71	54
Air Canada (Air Georgian)	20	4	24	3.43	24
Delta	30	10	40	5.71	210
Chaut/Republic (DL)	30	6	36	5.14	
Compass	10	4	14	2.0	
GoJet (DL)	30	6	36	5.14	
Pinnacle	50	20	70	10.0	
Shuttle America (DL)	10	4	14	2.0	
Jet Blue	36	15	51	7.29	51
United	10	4	14	2.0	243
Commutair (CO)	59	22	81	11.57	
Expressjet (UA)	40	15	55	7.86	
Mesa	20	6	26	3.71	
Trans States	30	13	43	6.14	
US Airways Express	20	4	24	3.43	
U.S. Airways	10	4	14	2.0	180
Air Wisconsin	85	28	113	16.14	
Piedmont	25	4	29	4.14	
PSA	10	2	12	1.71	
Republic	10	2	12	1.71	
TOTAL	**659**	**219**	**878**	**125.4**	**878**

Source: Each Airline Online Reservation System, February 20, 2013

The smallest aircraft that operated out of ROC in 2012 were 19-passenger turboprops, such as the Beechcraft 1900. The largest aircraft that operated at ROC in 2012 were 150-passenger narrow-bodied jets, such as the Boeing 737 and Airbus A320. The most common regional jets operating at ROC include, but are not limited to, the Canadair and Embraer regional jets. Table 2-15 illustrates the 2012 airline aircraft models that operated at ROC.

Table 2-15 –Aircraft Equipment by Carrier

Carrier (Operator)	Wide Body Jet	Narrow Body Jet	Regional Jet	Turbo-prop	Aircraft Model
Air Tran		B717, 737			Boeing 717, 737-300
American Eagle			ER4, ERD		Embraer Regional Jet 140, 145
Air Georgian (AC)				BEH	Beechcraft 1900D
Delta Expressjet (DL) Chautaqua/Republic (DL) Comair Compass GoJet (DL) Mesaba Pinnacle Shuttle America (DL)		MD80, B757-200	CRJ200, CRJ700, CRJ 900; ERJ135 ERJ145 ERJ 170, 175, 190 ERJ 175 CRJ 700 CRJ 900 & 200 LR CRJ 900 & 200 LR ERJ 135, 145, 170, &175		McDonnel Douglas MD80 & Boeing 757-200 Bombardier Canadair Regional Jet 200, 700, 900, & Embraer Regional Jet 135 & 145 Embraer Regional Jet 170, 175, 190 Embraer Regional Jet 175 Bombardier Canadair Regional Jet 700 Bombardier Canadair Regional Jet 900 & 200-LR Bombardier Canadair Regional Jet 900 & 200-LR Embraer Regional Jet 135, 145, 170, & 175
FedEx	A300-600				Airbus A300-600
Jet Blue		A320	ERJ 190		Airbus A 320, Embraer 190
United Commutair (CO) Expressjet (CO) Expressjet (UA) GoJet Mesa Shuttle America Trans States United Express		B737, B735, B767, A320	 ERJ 145, CRJ 700 ERJ 145, CRJ 700 ERJ 145, CRJ 700 ERJ 145, CRJ 700 ERJ 145, CRJ 700 ERJ 145, CRJ 700 ERJ 145, CRJ 700 Dash 8		Boeing 737-300, 737-700, 737-800, 737-900; Airbus A 320 Bombardier Canadair Regional Jet 700 Bombardier Dash 8
U.S. Airways Air Wisconsin Mesa Piedmont PSA Republic		A319, A320	 CRJ200 CRJ900 Dash 8 CRJ200 ERJ 170 & 175		Airbus A 319, A 320 Bombardier Canadair Regional Jet 200 Bombardier Canadair Regional Jet 900 DeHavilland Dash 8 Bombardier Canadair Regional Jet 200 Embraer Regional Jet 170 & 175

Source: Airtran, Southwest, Air Canada, Delta, Jet Blue, United, and U.S. Airways respective websites.

Table 2-16 illustrates that ROC accommodated approximately 878 airline flight operations per week, with regional jets accounting for over half those flights. United airlines operated 229 weekly flights with regional jets, or approximately 26.08 percent of the total regional jet operations. Narrow-bodied jet operations accounted for 32.92 percent of operations at ROC, with Air Tran flying over half of those. There were 24 turboprop operations per week at ROC in 2013, with Air Canada airline flying 100 percent of those.

Table 2-16 –Average Weekly Aircraft Operations at ROC by Type and Carrier

Carrier	NBJ	RJ	TP	Total	% of Total
Air Tran	116	0	0	116	13.2%
American Eagle	54	0	0	54	6.2%
Air Georgian (AC)	0	0	24	24	2.7%
Delta	40	0	0	40	4.6%
Chaut/Republic (DL)	0	37	0	37	4.2%
Compass	0	13	0	13	1.5%
GoJet (DL)	0	36	0	36	4.1%
Pinnacle	0	70	0	70	8.0%
Shuttle America (DL)	0	14	0	14	1.6%
Jet Blue	51	0	0	51	5.8%
United	14	0	0	14	1.6%
Commutair (CO)	0	81	0	81	9.1%
Expressjet (UA)	0	55	0	55	6.3%
Mesa	0	26	0	26	3.0%
Trans States	0	43	0	43	4.8%
US Airways Express	0	24	0	24	2.7%
U.S. Airways	14	0	0	14	1.6%
Air Wisconsin	0	113	0	113	12.9%
Piedmont	0	29	0	29	3.3%
PSA	0	12	0	12	1.4%
Republic	0	12	0	12	1.4%
Total	**289**	**565**	**24**	**878**	**100.0%**
% of Total	**32.9%**	**64.4%**	**2.7%**	**100.0%**	

Key: NBJ: Narrow Body Jet RJ: Regional Jet TP: Turboprop
Source: Each Airline Online Reservation System, February 20, 2013

Airlines at ROC have followed the national trend of replacing turboprop flights with regional jet flights. Currently, only 2.7 percent of total airline flights are conducted by turboprop aircraft at ROC. This is a substantial drop since 1998, when 55 percent of flights were turboprop, and only six percent were regional flights.

2.9.2 Operational Trends

Table 2-17 illustrates operational data at ROC for the years 2000 to 2012. 2000 saw the highest number of total annual operations with 178,930; total annual operations have since experienced an overall decline. This is due to a significant drop in GA activity, which has been a national trend in recent years. Light GA activity and recreational flying has declined; however, corporate GA activity has increased. Total operations in 2012 were 89,244, the lowest in the illustrated time period (due to significant decline in light GA activity).

Table 2-17 –Aircraft Operations (Itinerant & Local)

Year	ITINERANT					LOCAL			TOTAL OPS
	AC	AT & COMM	GA	MIL	Total	Civil	MIL	Total	
2000	39,607	53,857	41,537	1,973	136,974	38,874	3,082	41,956	178,930
2001	39,139	50,806	39,329	2,312	128,586	35,956	4,326	40,282	168,868
2002	30,190	42,401	37,912	2,240	112,743	28,856	3,910	32,766	145,509
2003	27,428	42,835	35,755	1,826	107,844	28,909	2,637	31,546	139,390
2004	30,180	46,392	30,518	1,106	108,196	29,639	1,139	30,778	138,974
2005	32,494	45,424	26,419	1,134	105,471	29,678	1,620	31,298	136,769
2006	28,291	46,549	25,762	1,595	102,197	33,999	1,941	35,940	138,137
2007	26,124	40,214	24,172	1,069	91,579	22,283	820	23,103	114,682
2008	26,574	36,138	21,613	1,046	85,371	20,086	517	20,603	105,974
2009	24,359	34,457	18,941	1,303	79,060	30,378	881	31,259	110,319
2010	23,764	32,352	17,942	1,908	75,966	27,485	1,314	28,799	104,765
2011	20,651	31,067	18,820	1,900	72,438	30,223	1,815	32,038	104,476
2012*	21,688	30,560	17,963	1,729	71,670	17,049	525	17,574	89,244
Sub-total	**367,489**	**533,052**	**356,413**	**21,141**	**1,278,095**	**373,415**	**24,527**	**397,942**	**1,676,037**
% Change 2000-2012	**-45.2%**	**-43.3%**	**-56.8%**	**-12.4%**	**-47.7%**	**-56.1%**	**-83%**	**-58.1%**	**-50.1%**

Sources: 2000-2012: April 2013 ATADS: Airport Operations Standard Report

Air Carrier and air taxi/commuter operations are defined as scheduled airline service operations at ROC. Figure 2-10 illustrates air taxi/commuter operations surpassed air carrier operations in 2000, a trend that began in 1993. It is worth noting that air taxi and commuter aircraft seating capacities increased from 19 to 30 passengers (average) mid-1990's to 50 or greater passenger (average) late 2000s.

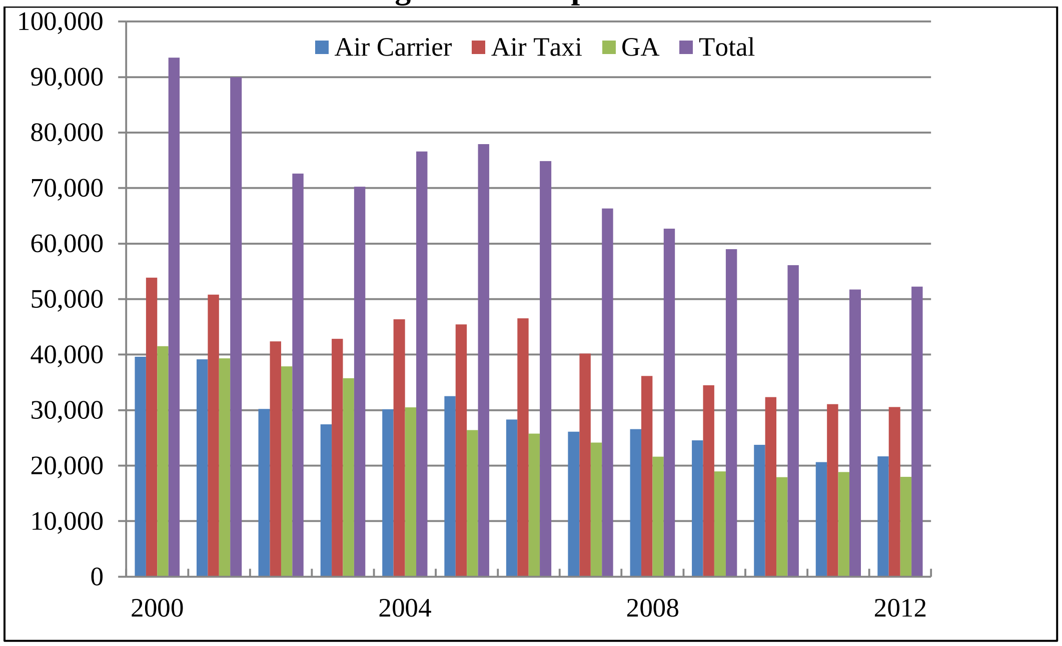
GA and military (MIL) operations are categorized as unscheduled itinerant and local operations. GA and MIL operations have significantly declined in recent years, with GA being the largest contributing factor to the decline of total annual operations at ROC since 2000. GA operations have dropped 56 percent since 2000, as illustrated in Table 2-18 below.

Table 2-18 –General Aviation Operations

Year	Itinerant	Local	Total
2000	41,537	38,874	80,411
2001	39,329	35,956	75,285
2002	37,912	28,856	66,786
2003	35,755	28,909	64,664
2004	30,518	29,639	60,157
2005	26,419	29,678	56,097
2006	25,762	33,999	59,761
2007	24,172	22,283	46,455
2008	21,613	20,086	41,699
2009	18,941	30,378	49,319
2010	17,942	27,485	45,427
2011	18,820	30,223	49,043
2012*	17,963	17,049	35,012
% Change 2000-2012	-56.8%	-56.1%	-56.5%

Sources: 2000-2012: April 2013 ATADS: Airport Operations Standard Report

Figure 2-10 –Operations



Source GA Operations Comprise of itinerant only.

Chapter 3

Forecasts of Aviation Demand

CHA design/construction solutions

3 Forecasts of Aviation Demand

This chapter presents the forecasts of aviation demand for the Greater Rochester International Airport (ROC). The forecasts predict aviation demand over a 20-year period at ROC, as required by the Federal Aviation Administration (FAA) for Airport Master Plans. All Master Plan recommendations for facility needs, both airside and landside, will, in one form or another, be directly impacted by the projected aviation activity levels presented in this chapter. In order to develop the most realistic forecasts possible, a solid understanding of current and historic Airport operations, industry trends, and socioeconomic conditions within the Airport's Metropolitan Statistical Area (MSA) and primary catchment area (i.e., market) is vital.

The set of aviation demand forecasts developed for this Master Plan Update use multiple FAA-approved methodologies and growth scenarios in accordance with the guidance provided in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans* to predict future levels of aviation activity at the Airport. Each individual forecast scenario was then evaluated for its applicability to the Airport, representation of actual and anticipated market conditions, and its relative consistency to the 2013 FAA ROC Terminal Area Forecast (TAF). From this effort, a "preferred forecast" was identified which, upon FAA concurrence, will serve as the basis for conducting subsequent demand/capacity analysis and identification of future facility requirements.

The assumptions, methodologies, and data used to create the forecast scenarios are presented and analyzed in the following sections. The specific activity elements for which forecasts were prepared include:

- Enplaned Passengers
  - 10- and 20-year forecast
  - Load Factors
- Air Carrier Activity:
  - Operations
  - Fleet Mix
- Air Cargo Activity
  - Operations
  - Cargo Volume
- General Aviation Activity
  - Based Aircraft
  - Operations
- Military Aviation Activity
  - Based Aircraft
  - Operations
- Peak Activity
  - Enplaned Passengers
  - Operations

3.1 Baseline Forecast Data

To prepare aviation activity projections for this Master Plan, it was first necessary to identify the forecast baseline (calendar year 2012) on which future activity levels would be developed. Data provided by the 2013 FAA TAF, airport management, the FAA's TFMSC (see Section 3.2), and the most current data statistics for 2012 will serve as the baseline for the 20-year planning horizon (i.e., 2013 through 2033).

Data collected includes aircraft operations by activity type (passenger carrier, air cargo, general aviation [GA], and military), passenger enplanements, fleet mix, load factors, and based aircraft counts. Additionally, the following sources were used to verify and provide additional clarity to the 2012 baseline data.

- ROC Carrier Schedules
- FAA Form 5010-1, (Airport Master Record)

3.1.1 FAA Terminal Area Forecast

The TAF is a detailed economic model with multiple variables. The TAF is prepared by the FAA for its planning, budget, and staffing purposes and is based on statistical interpretations of local and national trends.

The TAF includes historical and forecast data for passenger enplanements, airport operations, and based aircraft, and serves as the benchmark against which the FAA compares all airport activity forecasts. **Table 3-1** provides a summary of the 2013 ROC TAF, which was the most recent version available at the time of this report. It is important to note that the historical figures represent actual reported activity in the FAA system, and the 2012 ROC enplanement figure was provided by ROC management and will be substituted for the 2012 TAF projected activity level for commercial enplanements. The following sections described the baseline levels of activity by category as it is presented in the ROC 2013 FAA TAF.

Table 3-1 – 2013 FAA Terminal Area Forecast

		Itinerant Operations					Local Operations				
Year	**Enplane-ments**	**Air Carrier Ops.**	**Air Taxi Ops.**	**GA Ops.**	**Military Ops.**	**Total**	**Civil Ops.**	**Military Ops.**	**Total**	**Total Ops.**	**Based Aircraft**
Historic:											
2002	1,115,216	29,130	43,746	39,575	2,182	114,633	31,223	5,097	36,320	150,953	118
2007	1,433,869	26,705	42,380	24,475	1,105	94,665	23,942	919	24,861	119,526	94
2012*	1,195,238*	21,822	30,675	18,468	1,947	72,912	19,694	1,075	20,769	93,681	73
Projected:											
2013	1,191,935	23,209	30,131	17,303	1,947	72,590	20,935	1,075	22,010	94,600	73
2018	1,240,398	29,576	24,236	17,478	1,947	73,237	21,502	1,075	22,577	95,814	73
2023	1,277,056	31,716	21,565	17,653	1,947	72,881	22,084	1,075	23,159	96,040	73
2028	1,314,449	34,011	19,188	17,833	1,947	72,979	22,684	1,075	23,759	96,738	73
2033	1,352,592	34,975	17,073	18,013	1,947	73,505	23,301	1,075	24,376	97,881	73
2013-2033 AAGR**	**0.6%**	**2.1%**	**-2.8%**	**0.2%**	**0.0%**	**0.1%**	**0.5%**	**0.0%**	**0.5%**	**0.2%**	**0.0%**
2013-2033 Growth	**13.5%**	**50.7%**	**-43.3%**	**4.1%**	**0.0%**	**1.3%**	**11.3%**	**0.0%**	**10.7%**	**3.5%**	**0.0%**

Source: 2013 FAA Terminal Area Forecast, ROC Management, CHA 2013.
*Note: The 2012 enplanement figure is actual reported data provided by the ROC management
**AAGR is calculated by using the RATE formula in Microsoft Excel which provides annual growth over time.
AAGR = Average annual growth rate

3.1.2 Baseline Enplanements

An enplanement is defined as a revenue-paying passenger boarding an aircraft at a given airport. Enplanements are the primary measure of a commercial airport's passenger activity and are a key driver of terminal building and parking facility requirements. Enplanement levels are also a key metric used by airport management for revenue and financial planning purposes.

Enplanements at ROC reached an all-time high in 2005 with 1,457,097. The 2008 ROC Master Plan Update showed a recommended forecasts with a growth from 1,378,079 enplanements in 2004 to 2,083,541 in 2025; a change of 51 percent. The 2005 Terminal Area Forecast (TAF) showed a 60 percent change between 2003 and 2020. The 2013 published TAF displays a much lower growth of only 13.5 percent between 2013 and 2033. This indicates that the past projected growth of air travel was not realized and future projections will not be at the level of activity that was anticipated.

3.1.3 Baseline Operations

The TAF reported 2012 baseline operations data will serve as the foundation for the all of the operations forecasts. According to the TAF, the projected total number of operations for 2012 was 93,681, of which roughly 21,822 were Commercial Service operations and 30,675 were Air Taxi & Commuter. The following describes the difference between Air Carrier and Air Taxi & Commuter operations, as defined by the FAA. The operations data is presented by category in order to correspond with the individual forecasts developed for each activity type.

- Air Carrier – Operations with aircraft designed to have seating capacity of more than 60 seats or a maximum payload capacity of more than 18,000 pounds carrying passengers or cargo for hire or compensation. This includes US and foreign flagged carriers.
- Air Taxi & Commuter – Operations with aircraft designed to have a maximum seating capacity of 60 seats or less or a maximum payload capacity of 18,000 pounds or less carrying passengers or cargo for hire or compensation.

According to the TAF, Commercial service operations will experience an approximate growth of 50.7 percent throughout the planning period, with a corresponding -43.3 percent decline in Air Taxi & Commuter operations and a 10.7 percent growth in local operations. The decline in the projected Air Taxi & Commuter category can be associated with fleet mix transitions, airlines trending away from 50-seat regional jets (RJs) to larger 70-90-seat RJs and narrowbody aircraft, occurring throughout the aviation industry. This trend will be discussed later in this document.

It is important to note that the "Air Taxi & Commuter" category includes both scheduled air carrier operations and GA charter operations with 60-seats or less as categorized by the FAA. Therefore, to accurately gauge commercial operations in comparison to GA operations when examining TAF data, it is necessary to split GA Air Taxi operations from the commercial air carrier operations to account for the schedule air carrier operations using 50-seat regional jet aircraft. This split will be discussed in greater detail in **Section 3.6.2**.

3.1.4 Baseline Based Aircraft

The number of based aircraft at an airport is a key indicator of GA activity. By developing a based aircraft forecast, the anticipated growth of GA activities and associated facility needs (e.g., hangars, apron space, FBO services, fueling), as well as associated revenue streams, can be more accurately projected.

Based aircraft include those owned by individuals, businesses, or organizations that are stored at ROC on a regular basis. At ROC, the based aircraft include private- and corporate-use aircraft. In 2012, there were 73 based aircraft at ROC, 46 single-engines, 15 jets, and 17 multi-engines. The TAF shows the number of based aircraft remaining fixed throughout the planning period.

3.2 Data Sources

Information factored into both the Master Plan Update and the forecasting efforts include commercial carrier industry trends, aircraft order and retirement programs, FAA General Aviation (GA) fleet trends, anticipated changes in the aircraft fleet mix operating at ROC, and local and regional socioeconomic trends. The data and assumptions used to define baseline conditions and future activity trends were derived from several data sources. The following provides a brief description of these data sources:

- FAA Terminal Area Forecast (TAF) - TAF activity estimates are derived by the FAA from national estimates of aviation activity. These estimates are then assigned to individual airports based upon multiple market and forecast factors. The FAA looks at local and national economic conditions, as well as trends within the aviation industry, to develop each forecast.
- FAA Traffic Flow Management System Counts (TFMSC) – The FAA's Traffic Flow Management System Counts, previously referred to as the ETMSC, contains air traffic activity data and fleet mix data for the National Aerospace System.
- FAA Air Traffic Activity System (ATADS) – The Air Traffic Activity Data System contains the official air traffic operations data available for public release.
- ROC Air Traffic Control Tower (ATCT) – ATCT data is tabulated and recorded by the Tower operators and is available through request. This data includes all operations at the airport in a monthly summarized format.
- Airport Management – The Airport provides Commercial and Non-Commercial operations, GA, and military along with official passenger activity counts.
- Woods & Poole Economics, Inc. – Woods & Poole is an independent firm that specializes in developing long-term economic and demographic projections. Their database includes every state, Metropolitan Statistical Area (MSA), and county in the

U.S. and contains historic data and projections through 2040 utilizing more than 900 economic and demographic variables.

3.3 Socioeconomic Trends Affecting Aviation

Commercial service airport activity levels are typically influenced by national and regional trends associated with location, business travel, tourism, airport prominence, and air service options. Airports that offer enhanced facilities and services, multiple airline and destination options, and competitive airfares have a propensity to attract higher levels of airline and passenger activity.

However, on a macro scale, the factors that have the greatest impact on the growth prospects of an airport are the socioeconomic characteristics, such as population, income, and employment, present within the airport's catchment, or market, area. An airports catchment, or market, is defined as the area within which an airport captures the majority percentage of passengers within a certain radius. For the purposes of this forecast, the catchment area includes counties that are immediately adjacent to the county the airport is located (i.e., Monroe County), including counties identified in the leakage analysis where the Airport captures more than a 60 percent share of the counties passengers (e.g., Steuben and Yates Counties).

The catchment area population growth, or decline, has the potential to directly influence aviation demand within the area. In general, the greater the catchment area population, the greater the demand for air travel within the area. An airport's per capita income is also a strong driver of aviation demand as it is often reflectant of a community's level of discretionary income and ability to afford air travel. Lastly, employment levels within the catchment area provide an indication of the overall economic strength. Employment levels are often directly associated with per capita income.

The ultimate determinants of the future number of passengers and operations at a commercial service airport are the catchment area's population profile and economic characteristics, coupled with the continued availability of competitively priced air service at comparable levels through the forecast period. Consequently, a clear understanding of local demographic and economic trends is important for developing an accurate aviation activity forecast. In order to examine each socioeconomic factor influencing ROC, the following counties immediately surrounding the Airport have been identified as the Airport's primary catchment area:

- Genesee
- Livingston
- Monroe
- Ontario
- Orleans
- Seneca
- Steuben
- Wayne
- Yates

The Airport's primary catchment area includes the five counties listed within the Rochester Metropolitan Statistical Area (MSA), as defined by the U.S. Census Bureau (e.g., Livingston, Monroe, Ontario, Orleans, and Wayne). Additionally, according to a separate report done for

ROC, *Greater Rochester International Airport Catchment Area and Leakage Analysis*, the Airport provided service for a majority percentage of the respective counties passengers in Steuben, Seneca, and Yates Counties. Therefore, for the purposes of this study, these counties were included in the catchment area.

The following information, obtained from Woods & Poole Economics, Inc., highlights socioeconomic data specific to the ROC primary catchment area, the Rochester MSA, the State of New York, and the United States. This information will be used to develop and analyze aviation activity forecasts for ROC.

3.3.1 Socioeconomic Indicators

Population

Table 3-2 shows the historic and projected populations and corresponding average annual growth rates (AAGR) for the ROC catchment area, the Rochester MSA, the State of New York, and the United States for years 2002 through 2012 (historic) and 2013 through 2033 (projected).

Table 3-2 – Population Growth

Year	ROC Catchment Area (000)	AAGR	ROC MSA (000)	AAGR	State of New York (000)	AAGR	United States (000)	AAGR
2002	1,265	-	1,046	-	19,138	-	287,625	-
2007	1,266	0.0%	1,047	0.0%	19,132	0.0%	301,231	0.9%
2012*	1,276	0.2%	1,057	0.2%	19,527	0.4%	314,659	0.9%
AAGR 2002-2012		**0.1%**		**0.1%**		**0.2%**		**0.9%**
2013	1,278	0.1%	1,058	0.1%	19,593	0.3%	317,791	1.0%
2018	1,288	0.2%	1,067	0.2%	19,954	0.4%	333,953	1.0%
2023	1,300	0.2%	1,078	0.2%	20,341	0.4%	350,532	1.0%
2028	1,312	0.2%	1,089	0.2%	20,732	0.4%	367,162	0.9%
2033	1,323	0.2%	1,099	0.2%	21,112	0.4%	383,612	0.9%
AAGR 2013-2033		**0.2%**		**0.2%**		**0.4%**		**0.9%**

Source: Woods & Pool Economics, Inc., CHA 2013.
*Note: 2012 Woods & Poole Economics data is an estimated value.
AAGR = Average annual growth rate

These trends show that the historic population for the ROC catchment area and Rochester MSA are basically stable, with an AAGR of 0.1 percent. The historic population of the State is slightly higher, with the US population showing modest growth. For years 2012 through 2032, the projected population growth of the ROC catchment area and the Rochester MSA are anticipated to show very slow growth, with an AAGR of 0.2 percent. The AAGR for the projected population for the State of New York is anticipated to be twice that projected for the ROC catchment area and the Rochester MSA. The AAGR for the projected population for the United States, however, is anticipated to be almost 0.7 above the ROC catchment area and the Rochester MSA.

Although population growth is less than that for the State of New York and the United States, the population stability in the ROC market (i.e., the ROC catchment area and Rochester MSA), should be considered a significant indicator of continued airport demand.

Total Employment

Table 3-3 shows the historic and projected number of persons employed and percent of population group employed (i.e., persons employed divided by total population) for each market area for years 2002 to 2012 (historic) and 2013 through 2033 (projected). As shown, the projected catchment area employment growth exceeds the state and nation.

Table 3-3 – Employment Growth Levels

Year	ROC Catchment Area (000)	Percent Employed	ROC MSA (000)	Percent Employed	State of New York (000)	Percent Employed	United States (000)	Percent Employed
2002	712	56.2%	608	58.2%	10,361	54.1%	166,020	57.7%
2007	731	57.7%	626	59.8%	11,167	58.4%	179,645	59.6%
2012*	721	56.5%	618	58.5%	10,934	56.0%	177,066	56.3%
AAGR 2002-2012		**0.0%**		**0.1%**		**0.3%**		**-0.3%**
2013	728	57.0%	624	59.0%	11,041	56.4%	179,451	56.5%
2018	763	59.2%	656	61.5%	11,594	58.1%	191,872	57.5%
2023	799	61.5%	689	64.0%	12,177	59.9%	205,152	58.5%
2018	838	63.8%	725	66.6%	12,789	61.7%	219,350	59.7%
2033	878	66.4%	762	69.3%	13,433	63.6%	234,532	61.1%
AAGR 2013-2033		**0.8%**		**0.8%**		**0.6%**		**0.4%**

Source: Woods & Pool Economics, Inc., CHA 2013.
*Note: 2012 Woods & Poole Economics data is an estimated value
AAGR = Average annual growth rate

Per Capita Income

Table 3-4 shows the historic and projected per capita income for the ROC catchment area, the Rochester MSA, the State of New York, and the United States. As shown, the AAGRs for the historic per capita income for each area listed in the table remained within 0.3 percent with the ROC catchment area depicted with the highest AAGR. However, for the years 2013-2033, the AAGRs for the projected per capita income are forecast to be very similar at all levels.

Table 3-4 – Per Capita Income Trend

Year	ROC Catchment Area ($)	AAGR	ROC MSA ($)	AAGR	State of New York ($)	AAGR	United States ($)	AAGR
2002	25,097	-	26,209	-	35,448	-	30,720	-
2007	31,473	4.6%	32,660	4.5%	47,852	6.2%	36,804	3.7%
2012*	36,540	3.0%	37,510	2.8%	51,178	1.4%	43,408	3.4%
AAGR 2002-2012		**3.8%**		**3.6%**		**3.7%**		**3.5%**
2013	37,219	1.9%	38,530	2.7%	52,556	2.7%	43,756	0.8%
2018	45,922	4.3%	47,555	4.3%	64,535	4.2%	53,495	4.1%
2023	58,497	5.0%	60,586	5.0%	82,009	4.9%	67,799	4.9%
2028	75,613	5.3%	78,314	5.3%	105,820	5.2%	67,799	0.0%
2033	98,306	5.4%	101,810	5.4%	137,379	5.4%	113,496	10.9%
AAGR 2013-2033		**5.0%**		**5.0%**		**4.9%**		**4.9%**

Source: Woods & Pool Economics, Inc., CHA 2013.
*Note: 2012 Woods & Poole Economics data is an estimated value.
AAGR = Average annual growth rate

3.4 Aviation Demand Forecasts

To determine the facility sizing requirements necessary to adequately accommodate the current and future activity demand, a forecast of annual enplaned passengers and annual commercial aircraft operations was developed. The most basic indicator of activity demand for a commercial service airport is the number of annual enplaned passengers. It is the number of forecast enplanements that will drive passenger terminal sizing requirements, and to a lesser extent, commercial carrier operations and fleet mix. Commercial aircraft operations will influence the requirements for passenger terminal and airside infrastructure.

This section provides the methodology for the development of the forecasts of commercial enplanements and operations at ROC. The inventory of activity (Chapter 2), industry trends provided in the Airline Market Analysis, and FAA data were utilized in the evaluations. From this effort, the scenario that represented the most likely level of future activity was selected as the recommended forecast.

3.4.1 Potential Enplanement Forecasts

Enplanement data is the most important indicator of aviation demand at commercial service airports. Historical and forecast enplanement data can provide relevant evidence that improvements and/or expansions to an airport may be necessary. To determine the facility sizing requirements necessary to adequately accommodate the current and future activity demand, a forecast of annual enplaned passengers and annual commercial aircraft operations was developed.

Several FAA-approved forecast methodologies and statistical analyses were analyzed in order to provide a range of potential passenger activity levels. From these forecasts, a "preferred forecast" will be developed that represents the most likely projection of future activity based on existing data and current trends.

Adjusted Terminal Area Forecast: The Adjusted TAF takes the FAA's AAGR for 2013-2033 and applies that variable to actual airport reported data. In other words, the TAF growth is applied to an actual 2012 enplanement count and projected throughout the forecast period. For example, the 2013 TAF has an estimated 2012 enplanement number of 1,167,759. According to airport records; the actual enplanement number was 1,195,238. The TAF AAGR of 0.6 percent was then applied to the actual 1,195,238 enplanements and projected from 2013-2033. The result of this methodology was 1,356,240, slightly above the 1,352,592 reported in the TAF.

Historic Trend (Time-trend) Analysis: A historic trend forecast is a simple time-series model that relies on extrapolating historic enplanements and operations growth, specific to the Airport, into the future. Examining the historic growth rates and projecting them forward provides a picture of growth should the market area and the state of the commercial passenger airline industry reflect past trends through the forecast period. For the historic trend scenario, the historic enplanement data was projected forward through the forecast horizon. However, the ROC historical trend of passenger enplanements has shown to be unpredictable over the ten-year time period (i.e., showing rapidly increasing or decreasing enplanements from year to year). Therefore, the Historic Trend Analysis was not considered to be statistically reliable scenario to serve as the preferred forecast scenario.

Static Regional Market Share: This methodology uses the aggregate, regional level forecast of commercial activity projections from the FAA's 2013 TAF for the individual commercial service airports in the Upstate New York region including Buffalo Niagara International Airport (BUF), Syracuse Hancock International Airport (SYR), and Albany International Airport (ALB) to derive forecasts for the Airport based on market share. This forecast assumes that ROC will maintain its current level, or static market share, of commercial enplanements and operations relative to regional activity projections throughout the planning period. The Static Regional Market Share forecast is considered a conservative range of potential commercial activity based on market conditions within the region.

TAF Based Econometric Scenarios: The TAF Based Econometric forecasts adjusts the TAF projections to account for the socioeconomic growth in the Airport's MSA. As previously discussed, according to Woods & Poole Economics, the ROC MSA is projected to outpace the State of New York and the U.S. in both Per Capita Income and Employment level growths over the course of the forecast period. Based on the MSA's above-average socioeconomic growth, an adjustment percentage was calculated and applied as a variable in the following forecast scenarios.

The following forecast scenarios were developed by adjusting the Airport's TAF AAGR based on the MSA's socioeconomic indicators (i.e., per capita income and employment) growth projections relative to national growth projections.

The TAF Based Income and Employment Econometric forecast apply a growth adjustment percentage associated with each category against the Adjusted TAF AAGR, and then project the growth throughout the forecast period. For example, the ROC MSA employment percentages are projected throughout the 20-year forecast period at the national growth levels and then compared to the actual projections of the MSA. In 2033, the projected number of employed in the ROC MSA is 762,000. However, if projected at the national growth levels, the number of employed is lower at 664,400. This results in an employment adjustment percentage of 12.8 percent. That result is then applied to the adjusted TAF to calculate the 2033 TAF Based Employment enplanements figure.

The Average TAF Based Income/Employment Econometric scenario applies the same methodology as the previously described forecast scenarios. However, for the purposes of this scenario, the average of the two socioeconomic indicators (i.e., per capita income, and employment) is applied to the adjusted TAF baseline enplanement forecast.

The results of each forecasts scenario are as follows:

- **TAF Based Income Econometric -** 2013-2033 AAGR of 0.7 percent; a rate slightly above the TAF-predicted 0.6 percent AAGR.
- **TAF Based Employment Econometric –** 2013-2033 AAGR of 1.1 percent; a rate higher than that of the TAF-predicted 0.6 percent AAGR.
- **Average TAF Based Income/Employment Econometric –** 2013-2033 AAGR of 0.9 percent.

Regression Analysis Forecasts: A regression-based forecast examines aviation and passenger activity through the prism of current and historic activity levels, and seeks to find a relationship between the activity levels and the socioeconomic conditions prevalent during that time period. Predictive relationships between population, employment, and income are examined to determine if there is a statistically valid relationship correlation that may assist in projecting future activity. The regression analyses performed were utilized to determine if there is a relationship between any of the socioeconomic factors addressed earlier in the chapter (i.e., population, employment, and income) and the historic level of enplanements. The output of a regression analysis is the "coefficient of determination", or R2, which ranges from 0 to 1.0. If the R2 of an analysis is 0.85 or higher, there is a statistically reliable correlation. In other words, the higher the R2 value, the stronger the correlation is between the two variables.

Though the socioeconomic indicators have grown at rates that are consistent or slightly above those at the state and national levels, the five-year historical ROC enplanements have shown to be erratic over that time period. Based on these fluctuations in airport activity, it is evident that there is a poor correlation between this activity and the relatively stable socioeconomic conditions in the study area. Therefore, these socioeconomic regression analyses are not statistically reliable to serve as the preferred forecast scenario. The results of these analyses are presented in **Table 3-5**.

Table 3-5 – Enplanement Forecast Summary

Year	TAF	TAF Adjusted Growth	Static Regional Market Share	Air Service Econometric	TAF Based Income Econometric	TAF Based Employment Econometric	Average Econometric (Income and Employment)
2012	1,167,759*	1,195,238	1,195,238	1,195,238	1,195,238	1,195,238	1,195,238
2013	1,191,935	1,202,456	1,176,200	1,244,300	1,217,700	1,241,100	1,229,400
2014	1,209,360	1,209,718	1,205,300	1,268,200	1,238,700	1,267,000	1,252,850
2015	1,220,107	1,217,024	1,237,800	1,285,700	1,252,300	1,298,000	1,275,150
2016	1,227,435	1,224,374	1,262,700	1,299,900	1,262,100	1,313,500	1,287,800
2017	1,233,153	1,231,769	1,283,700	1,312,800	1,270,000	1,327,300	1,298,650
2018	1,240,398	1,239,208	1,304,200	1,327,500	1,279,300	1,342,700	1,311,000
2019	1,247,672	1,246,692	1,325,200	1,341,500	1,288,400	1,358,100	1,323,250
2020	1,254,975	1,254,221	1,346,600	1,355,700	1,297,500	1,373,500	1,335,500
2021	1,262,306	1,261,796	1,368,400	1,370,100	1,306,400	1,388,900	1,347,650
2022	1,269,667	1,269,416	1,390,800	1,384,600	1,315,200	1,404,300	1,359,750
2023	1,277,056	1,277,083	1,413,600	1,399,300	1,324,000	1,419,700	1,371,850
2013-2023 AAGR	**0.3%**	**0.3%**	**0.9%**	**12%**	**0.4%**	**0.6%**	**0.5%**
2013-2023 Growth	**7%**	**6%**	**20%**	**0.6%**	**9%**	**14%**	**12%**
% Above TAF		**0.0%**	**10.7%**	**9.6%**	**3.7%**	**11.2%**	**7.4%**
2024	1,284,475	1,284,795	1,436,900	1,413,300	1,332,700	1,435,100	1,383,900
2025	1,291,924	1,292,555	1,460,700	1,427,300	1,341,300	1,450,400	1,395,850
2026	1,299,402	1,300,361	1,485,000	1,441,500	1,349,800	1,465,700	1,407,750
2027	1,306,910	1,308,214	1,509,900	1,455,700	1,358,200	1,481,000	1,419,600
2028	1,314,449	1,316,115	1,535,300	1,470,000	1,366,600	1,496,200	1,431,400
2013-2028 AAGR	**0.5%**	**0.4%**	**1.3%**	**18%**	**0.6%**	**0.9%**	**0.7%**
2013-2028 Growth	**10%**	**9%**	**31%**	**0.8%**	**12%**	**21%**	**16%**
% Above TAF		**0.1%**	**16.8%**	**11.8%**	**4.0%**	**13.8%**	**8.9%**
2029	1,322,017	1,324,063	1,561,200	1,478,000	1,375,000	1,500,800	1,437,900
2030	1,329,615	1,332,060	1,587,700	1,486,100	1,383,200	1,516,000	1,449,600
2031	1,337,243	1,340,105	1,614,800	1,494,300	1,391,500	1,531,300	1,461,400
2032	1,344,903	1,348,198	1,642,400	1,502,400	1,399,600	1,546,500	1,473,050
2033	1,352,592	1,356,340	1,670,700	1,510,600	1,407,700	1,561,700	1,484,700
2013-2033 AAGR	**0.6%**	**0.6%**	**1.7%**	**21%**	**0.7%**	**1.1%**	**0.9%**
2013-2033 Growth	**13%**	**12%**	**40%**	**0.9%**	**15%**	**25%**	**20%**
% Above TAF		**0.3%**	**23.5%**	**11.7%**	**4.1%**	**15.5%**	**9.8%**

Source: FAA 2013 Terminal Area Forecast, ROC Airport management, Woods & Poole Economics, CHA 2013.
*Note: The 2012 enplanement count is reported number in the 2013 Terminal Area Forecast
AAGR = Average annual growth rate

3.4.1 Recommended Commercial Forecast

The Air Service Scenario was chosen as the preferred commercial operations scenario, and is the outcome of a multiple air service expansions into new and existing markets in both the eastern and mid-western United States resulting in additional air services (flights). The expanded services would be in response to the Southwest emergence at ROC creating passenger growth in the Upstate New York region and the understanding that ROC is predominately an origin and destination airport.

This scenario utilizes the Adjusted TAF growth scenario as the baseline forecast and incorporates recent airline activity trends including the Southwest-AirTran merger. To ensure that factors specific to the ROC market were incorporated into this forecast scenario, the Air Service Scenario was modified based upon the following factors:

- Gains in passenger activity as a result of the Southwest-AirTran merger
- Increasing the Airports share of regional enplanements
- A shift from regional jets to larger narrowbody jets

As a result of the recent Southwest-AirTran merger, it is anticipated that ROC has the potential to recapture passenger traffic in the surrounding market area that is currently being served by other commercial service airports such as Buffalo Niagara International Airport (BUF), Albany International Airport (ALB), and Syracuse Hancock International Airport (SYR), two of the airports being served by Southwest Airlines. This potential increase is expected to result in passenger traffic gains and an increase in the average number of passengers per departure at the Airport. Additionally, according to both Southwest Airlines and Delta Air Lines, Southwest will lease the newly acquired Boeing 717s (received in the merger with AirTran) to Delta Air Lines. The delivery of the aircraft is anticipated to occur over a two year period beginning in the second half of 2013. Delta Air Lines will use the Boeing 717s to replace a portion of its 50-seat regional jets, as well as some of their dated jets including the DC-9. With Delta assumed to be operating larger narrowbody aircraft in place of regional jets by 2014, and a growth in commercial service demand at ROC, an additional increase in the average number of passengers per departure can be anticipated.

According to Southwest Airlines, daily operations from ROC to Chicago-Midway Airport (MDW) began by the second quarter of 2013. This will result in approximately an additional 730 annual departures by the end of 2013. Furthermore, for the purposes of this analysis it was assumed that Southwest will increase this service to five daily departures by 2032, resulting in an additional 1,825 annual air carrier operations by 2033. However, with the shift to larger narrowbody aircraft, it is assumed that the number of operations to accommodate the growing number of passenger enplanements will not grow at a similar rate to that of the enplanements. Additional information will be analyzed later on in this report.

The air service assumptions that were used in this analysis were then applied to a load factor assumption. The load factor was derived by using ROC provided data to compute the estimated number of passengers per departure. The additional load factor assumption was made based on fleet mix restructuring by individual airlines transitioning from smaller regional jets to larger narrowbody jets, as well as Southwest Airlines operating the larger Boeing 737 in lieu of the Boeing 717 previously operated by AirTran. These assumptions are reinforced by modestly increasing socioeconomic factors (e.g., population, income, and employment) throughout the forecast period, suggesting a reemergence for commercial air service demand within the ROC market area.

According to Southwest Airlines schedules of passenger service, service expansion to Chicago Midway Airport (MDW) has already begun in April of 2013. Other considerations for new markets and expansion routes include but are not limited to the following:

Potential Expansion Routes:
Chicago Midway International Airport (MDW), Baltimore-Washington International Airport (BWI), and Charlotte/Douglas International Airport (CLT)

Potential New Domestic Destinations:
Hobby/Houston Airport (HOU), Dallas Love Field Airport (DAL), Nashville International Airport (BNA), Lambert-St. Louis International Airport (STL), Denver International Airport (DEN)

Potential New International Destinations:
Queen Beatrix International Airport, Aruba (AUA), Cancun International Airport, Mexico (CUN), Lynden Pindling International Airport, Bahamas (NAS), Punta Cana International Airport, Dominican Republic (PUJ)

This expanded service would result in gains of passenger traffic, airline operations, and the average number of passengers per departures at the Airport. It was assumed that these increases in passenger activity would result in approximately 6 additional daily flight operations during the 20-year forecast period. The expanded service assumptions accounted for in this growth scenario for each five-year planning increment are as follows:

5-year
- New service to one or two new hubs resulting in 2 added flight departures per day

10-year
- Service expansion to one or two additional hubs resulting in a total 3-4 added flight operations per day

15-year
- Expanded charter services resulting in a total of 4-5 additional commercial flight operations per day
- Expansion into new markets begins to slow resulting in steady lower annual growth, however continues to grow incrementally

20-year
- New service to one or two new hubs resulting in 6 additional flight departures per day

Commercial operations at ROC were projected with a similar methodology as the passenger enplanements, however based on the projected fleet mix transitions that will be detailed in **Section 2.5**, operations are not expected to grow consistent with enplanements. Commercial operations increase at a lower rate than enplanements based on assumed fleet mix transitions from smaller 50-seat regional jets (RJs) to larger 70-seat RJs and narrowbody aircraft. The additional air service assumptions were then applied to the projected baseline number of operations to calculate the recommended commercial operations throughout the forecast period. As a result, commercial operations are projected to increase at an AAGR of 0.6 percent shown in **Table 3-6**.

Table 3-6 – Recommended Commercial Activity Forecast

Year	Annual Enplanements	Annual Growth	Annual Operations	Annual Growth
2012	1,195,238	-	37,160	-
Projected:				
2013	1,244,300	4.1%	38,075	2.5%
2014	1,268,200	1.9%	38,335	0.7%
2015	1,285,700	1.4%	38,596	0.7%
2016	1,299,900	1.1%	38,857	0.7%
2017	1,312,800	1.0%	39,120	0.7%
2018	1,327,500	1.1%	39,383	0.7%
2019	1,341,500	1.1%	39,648	0.7%
2020	1,355,700	1.1%	39,913	0.7%
2021	1,370,100	1.1%	40,180	0.7%
2022	1,384,600	1.1%	40,447	0.7%
2023	1,399,300	1.1%	40,715	0.7%
2024	1,413,300	1.0%	40,984	0.7%
2025	1,427,300	1.0%	41,255	0.7%
2026	1,441,500	1.0%	41,526	0.7%
2027	1,455,700	1.0%	41,798	0.7%
2028	1,470,000	1.0%	42,071	0.7%
2029	1,478,000	0.5%	42,273	0.5%
2030	1,486,100	0.5%	42,475	0.5%
2031	1,494,300	0.6%	42,678	0.5%
2032	1,502,400	0.5%	42,882	0.5%
2033	1,510,600	0.5%	43,088	0.5%
2013-2033 AAGR	**1.0%**		**0.6%**	
2013-2033 Growth	**21.4%**		**13.2%**	

Source: FAA 2013 Terminal Area Forecast, ROC Airport management, CHA 2013.
AAGR = Average annual growth rate

Table 3-7 compares the Air Service Scenario forecast with the 2013 TAF. By the end of the forecast period, projected enplanements are expected to be 11.7 percent above what is predicted in the TAF, while operations are projected to be 3.6 percent below what is predicted in the TAF.

Although the TAF predicts the commercial operations to increase at an annual average growth rate of 0.9 percent, this percentage is not considered to be reliable based on the historic and the future fleet mix trends associated with ROC. Based on the projected fleet mix transitions, detailed in **Section 3.5**, commercial operations at ROC are not expected to grow at the same rate as the enplanements. Therefore, for the purposes of this forecast, commercial operations are expected to increase at approximately 0.6 percent per year throughout the forecast period. It is important to note that for the purposes of this forecast, the adjusted TAF was used for comparison to the recommended forecast scenario.

Table 3-7 – Recommended Forecast Scenario vs. TAF

	Enplanements			Operations		
Year	**TAF**	**Air Service Scenario**	**Forecast vs. TAF**	**TAF**	**Adjusted Market Share**	**Forecast vs. TAF**
2013	1,191,935	1,244,300	4.4%	38,275	38,075	-0.5%
2018	1,240,398	1,327,500	7.0%	41,694	39,383	-5.5%
2023	1,277,056	1,399,300	9.6%	42,499	40,715	-4.2%
2028	1,314,449	1,470,000	11.8%	43,605	42,071	-3.5%
2033	1,352,592	1,510,600	11.7%	45,009	43,088	-4.3%
2013-2033 AAGR	**0.6%**	**1.0%**		**0.8%**	**0.6%**	

Source: FAA 2013 Terminal Area Forecast, ROC Airport management, CHA 2013.
AAGR = Average annual growth rate

3.5 Commercial Carrier Fleet Mix

The commercial aircraft fleet mix projections are a function of the scheduled commercial passenger carriers that operate (or are expected to operate) at the Airport during the forecast period. Each carrier's anticipated future fleet mix (i.e., aircraft acquisitions, aircraft phase-outs, retirements, etc.) and forecast enplanement levels influence a carrier's aircraft type and level of operations. This data is then coupled with the forecast commercial air carrier operations to determine the number of annual departures by aircraft type. The following sections provide the commercial carrier fleet mix projections.

3.5.1 Commercial Air Carrier Fleet Mix

The first step in determining ROC's future commercial carrier fleet mix was to identify the overall market trends that will drive future airline fleets, as well as aircraft fleet mix decisions specific to each airline operating at the Airport. It is important to reiterate that overall passenger enplanements are projected to grow incrementally and maintain a positive stable growth throughout the planning period. With the increase in the number of short to medium haul, low-cost air carriers, and the replacement of older larger aircraft, such as early versions of the Boeing B737 and Airbus A320, the demand for smaller single-aisle aircraft has grown within the past decade trending the industry toward aircraft with fewer seats.[2] In general, this has translated to higher passenger load factor per flight. However, according to the *2013-2032 Boeing Current*

[2] Boeing, *Long-Term Market Outlook 2013-2033.*

Market Outlook, domestic air carriers have begun trending away from regional jet aircraft and retiring smaller 50-seat aircraft at an accelerated rate. These 50-seat aircraft are being replaced with larger 70- and 90-plus seat regional jets as well as larger narrowbody aircraft; however, replacements will not keep pace with retirements. Boeing predicts that the 2030 fleet of regional jets will consist of 760 aircraft, down from 1,780 in 2010. Single-aisle mainline aircraft will continue to comprise the majority of the domestic fleet and will increase market share from 56 percent of the fleet in 2009 to 73 percent in 2030.

As with the predicted national fleet shift toward newer, larger, and more efficient aircraft, ROC specific fleet mix characteristics and trends were identified and applied directly to the preferred passenger carrier forecasts through 2033. In order to provide a detailed picture of future ROC operations, the following assumptions are based upon airline-specific fleet plans and aircraft orders, as well as overall industry trends:

- Southwest Airlines Boeing B737-300 aircraft will be gradually phased out of service and replaced with Boeing B737-700 and B737-900 aircraft. For forecasting purposes, it was assumed that this transition will occur at a rate of 10 percent of the B737-300 fleet per year.[3]
- Southwest Airlines will be leasing the 88 newly acquired B717s to Delta Air Lines. This process is expected to begin in mid to late-2013 at a rate of three aircraft per month. It is expected that the move will be completed within three years.[4]
- Delta Air Lines McDonnell-Douglas MD-88 aircraft will be phased out of service and replaced with Canadair CRJ700 and CRJ900 aircraft, as well as the newly acquired Boeing B717s.[5] For forecasting purposes, it was assumed that this transition will occur at a rate of 20 percent of the MD-88 fleet per year.
- Based on Delta fleet mix transitions and the previously mentioned merger with Southwest Airlines, it was assumed Delta Air Lines McDonnell-Douglas MD-90 aircraft will continue to remain in service. However, operations specific to ROC will be gradually phased out with those operations being replaced with the newly acquired Boeing B717s. For forecasting purposes, it was assumed that this transition will occur at a rate of 10 percent of the MD-90 operations at ROC per year.
- Delta Air Lines regional jet aircraft with a passenger capacity of 50 seats or under (Canadair CRJ100/200, Embraer 145, Embraer 140, etc.) will be gradually phased out of service and replaced with larger 70-seat plus regional jet aircraft (CRJ700/900) and larger narrowbody B717s.[4]

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[3]Boeing, *Boeing to Lead Southwest Airlines 737 Flight Deck Modernization*, December 22, 2008; Boeing.com, *Orders through September 2010.*

[4] Southwest, *Southwest Airlines, Delta Air Lines, and Boeing Capital Reach Agreement to Lease or Sublease AirTran Boeing 717Fleet*, July 9,2012; Southwest.com, *New Releases.*

[5] Delta Air Lines*, Delta Air Lines Inc. 10-K Annual Report,* February 2, 2012; Delta.com, *Annual Reports*.

- A "cascading" effect will occur with 70-seat regional jets. As 50-seat regional jet operations transition to 70-seat aircraft, likewise a percentage of 70-seat regional jet operations will transition to larger 70-plus seat and 90-seat regional jets, and smaller narrowbody aircraft.
- Based on the Boeing *Current Market Outlook,* Delta Air Lines phasing out small regional jets, and airline industry trends, it was assumed that the 50-seat regional jet market will continue to decrease throughout the 20-year forecast period. For the purposes of this forecast, it was assumed that the 50-seat Delta operations will be phased out within the next five years, with the remainder of the 50-seat market transitioning at a rate of five percent per year.
- According to industry statistics, the average age of the US Airways Airbus A319 operating at ROC is 13 years of operation.[6] Based on the age of the aircraft, and Airbus.com showing no orders or deliveries of the A319, it was assumed that due to the age and timing out issues of the aircraft, the A319 operations will be transitioned into the newer A320s. For the purposes of this forecast, it was assumed the transition will occur at a rate of five percent of the fleet mix per year.

Consistent with what the *2013-2032 Boeing Current Market Outlook* is projecting, Delta Air Lines has begun to phase out smaller 50-seat RJs and replace those operations with larger RJs and narrowbody aircraft. According to Official Airline Guide (OAG) data, Delta only flew the McDonnell Douglas MD-88 and MD-90 series aircraft and the Airbus A320 during peak periods for the airline. With the transition to larger aircraft, and the tentative lease agreement with Southwest Airlines to acquire B717s, it is assumed that there will no longer be a need for the larger MD-88, and will not increase A320 operations, thus replacing those operations with the B717s.

Using a two-month sample of ROC commercial schedule data for calendar year 2013 provided by airport management, the air carrier fleet mix forecast takes into account the assumptions listed above, and the projected annual departures for the Airport as identified in the recommended commercial operations forecast. A departure is considered a single operation, while an arrival is another.

It is important to note that in 2012 and the first half of 2013, regional jet operations accounted for approximately 80 percent of commercial operations. Additionally, of the 80 percent of regional jet operations in 2012, 55 percent were 50-seat regional jet aircraft. For the purposes of this forecast, although the Bombardier Dash 8 series and Beechcraft 1900 series aircraft are not considered to be "Regional Jet" aircraft, rather "Turbo-Prop Airliners", for all intents and purposes will be categorized as commercial airline aircraft for the fact that they are service aircraft with commercial scheduled operations. **Table 3-8** details the projected commercial air carrier fleet mix in terms of annual departures by aircraft and type (narrowbody, large RJ, and

[6] "US Airways Fleet Details and History." *Plane Spotters*. N.p., n.d. Web. 12 Sept. 2013. <http://www.planespotters.net/Airline/US-Airways>.

small RJ), respectively. **Table 3-9** shows the same data presented in the previous table, but organized by percentages by aircraft and type to better illustrate the anticipated shift to larger aircraft. Note that this shift will also have a direct impact on capacity, as fewer flights are necessary to yield the same capacity.

Table 3-8 – Commercial Air Carrier Fleet Mix: Annual Departures by Aircraft

Aircraft Type	# of Seats	2013	2018	2023	2028	2033
Airbus Industrie A319	120	381	286	190	95	0
Airbus Industrie A320	136	300	337	375	413	447
Boeing 717	110	958	724	999	1,033	1,058
Boeing 737-300	137	115	0	0	0	0
Boeing 737-700	137	1,154	2,425	2,653	2,741	2,807
Boeing 737-900	167	23	54	56	57	59
McDonnell Douglas MD80 Series	137	450	0	0	0	0
McDonnell Douglas MD90 Series	120	485	242	0	0	0
Large Regional Jet 60-90-seat						
Bombardier Dash 8 Q400	74	485	942	1,400	1,447	1,482
Embraer E170	72	542	1,690	2,427	2,961	3,462
Embraer E175	90	900	1,305	1,712	1,978	2,225
Embraer E190	99	1,211	1,253	1,295	1,339	1,371
Canadair RJ-700	70	1,488	3,256	4,202	4,946	5,639
Canadair RJ-900	90	-	587	763	940	1,106
Regional Jet 50-seat						
Bombardier Dash 8 Q200	37	877	438	0	0	0
Bombardier Dash 8 Q300	50	773	387	0	0	0
Embraer ERJ	50	3,934	3285	2636	1987	1338
Bombardier CRJ 100/200	50	4,396	2198	1648	1099	549
Raytheon Beechcraft 1900	19	565	283	0	0	0
Total Departures:		**19,038**	**19,692**	**20,358**	**21,036**	**21,544**

Source: ROC Management, CHA, 2013.

Table 3-9 – Commercial Air Carrier Fleet Mix: Percent of Annual Departures by Aircraft

Aircraft Type	# of Seats	2013	2018	2023	2028	2033
Airbus Industrie A319	120	2.0%	1.5%	0.9%	0.5%	0.0%
Airbus Industrie A320	136	1.6%	1.7%	1.8%	2.0%	2.1%
Boeing 717	110	5.0%	3.7%	4.9%	4.9%	4.9%
Boeing 737-300	137	0.6%	0.0%	0.0%	0.0%	0.0%
Boeing 737-700	137	6.1%	12.3%	13.0%	13.0%	13.0%
Boeing 737-900	167	0.1%	0.3%	0.3%	0.3%	0.3%
McDonnell Douglas MD80 Series	137	2.4%	0.0%	0.0%	0.0%	0.0%
McDonnell Douglas MD90 Series	120	2.5%	1.2%	0.0%	0.0%	0.0%
Large Regional Jet 60-90-seat						
Bombardier Dash 8 Q400	74	2.5%	4.8%	6.9%	6.9%	6.9%
Embraer E170	72	2.8%	8.6%	11.9%	14.1%	16.1%
Embraer E175	90	4.7%	6.6%	8.4%	9.4%	10.3%
Embraer E190	99	6.4%	6.4%	6.4%	6.4%	6.4%
Canadair RJ-700	70	7.8%	16.5%	20.6%	23.5%	26.2%
Canadair RJ-900	90	-	3.0%	3.7%	4.5%	5.1%
Regional Jet 50-seat						
Bombardier Dash 8 Q200	37	4.6%	2.2%	0.0%	0.0%	0.0%
Bombardier Dash 8 Q300	50	4.1%	2.0%	0.0%	0.0%	0.0%
Embraer ERJ	50	20.7%	16.7%	12.9%	9.4%	6.2%
Bombardier CRJ 100/200	50	23.1%	11.2%	8.1%	5.2%	2.6%
Raytheon Beechcraft 1900	19	3.0%	1.4%	0.0%	0.0%	0.0%
Total Departures:		**100%**	**100%**	**100%**	**100%**	**100%**

Source: ROC Management, CHA, 2013.

As expected, the greatest increases in share of departures will come from narrowbody and large RJ aircraft as the small RJ fleet is gradually phased-out and their operations "cascade" toward larger aircraft. By the end of the forecast period, it is anticipated that that large RJs will have claimed roughly 71 percent of commercial carrier departures, whereas larger narrowbody aircraft will have accounted for over 20 percent.

3.5.2 Commercial Air Carrier Capacity

Commercial air carrier capacity is calculated by multiplying the total number of annual departures of a given aircraft type by the number of available seats on those aircraft. **Table 3-10** presents the available seats by aircraft of the projected annual fleet mix of ROC's forecast commercial air carrier activity.

Table 3-10 – Commercial Air Carrier Capacity: Available Seats by Aircraft

Aircraft Type	# of Seats	2013	2018	2023	2028	2033
Airbus Industrie A319	120	45,690	34,268	22,845	11,423	0
Airbus Industrie A320	136	40,798	45,881	50,997	56,148	60,819
Boeing 717	120	114,918	86,926	119,925	123,919	126,913
Boeing 737-300	137	15,807	0	0	0	0
Boeing 737-700	137	158,070	332,162	363,413	375,519	384,590
Boeing 737-900	167	3,854	8,969	9,272	9,581	9,812
McDonnell Douglas MD80 Series	110	49,498	0	0	0	0
McDonnell Douglas MD90 Series	120	58,151	29,076	0	0	0
Large Regional Jet 60-90-seat						
Bombardier Dash 8 Q400	74	35,860	69,713	103,626	107,078	109,665
Embraer E170	72	39,044	121,664	174,773	213,201	249,298
Embraer E175	90	80,997	117,457	154,046	178,044	200,225
Embraer E190	99	119,937	124,057	128,253	132,525	135,726
Canadair RJ-700	70	104,188	227,895	294,152	346,228	394,760
Canadair RJ-900	90	0	52,852	68,676	84,563	99,566
Regional Jet 50-seat						
Bombardier Dash 8 Q200	37	32,445	16,222	0	0	0
Bombardier Dash 8 Q300	50	38,652	19,326	0	0	0
Embraer ERJ	50	196,722	164,263	131,804	99,345	66,886
Bombardier CRJ 100/200	50	219,798	109,899	82,424	54,950	27,475
Raytheon Beechcraft 1900	19	10,742	5,371	0	0	0
Total Seats:		**1,365,172**	**1,566,002**	**1,704,207**	**1,792,522**	**1,865,734**

Source: ROC Management, CHA, 2013.

Table 3-11 presents the available seats by type in percentage terms to highlight the share of ROC capacity that narrowbody and large RJ aircraft are anticipated to accommodate by the end of the forecast period. By 2033 these two aircraft types are forecast to account for over 91 percent of all operations at ROC.

Table 3-11 – Commercial Air Carrier Capacity: Percent of Seats by Type

Aircraft Type	2013	2018	2023	2028	2033
Narrowbody	35.7%	34.3%	33.2%	32.2%	31.2%
Large RJ (over 70 seats)	27.8%	45.6%	54.2%	59.2%	63.7%
Small RJ (70 seats)	36.5%	20.1%	12.6%	8.6%	5.1%
Total Departures:	**100%**	**100%**	**100%**	**100%**	**100%**

Source: ROC Management, CHA, 2013.

3.5.3 Commercial Air Carrier Load Factors

The projected level of air carrier capacity (available seats), based on operations and fleet mix forecasts, are combined with passenger enplanement projections to determine future Average Seats per Departure and Average Boarding Load Factor. **Table 3-12** depicts the average seats available per departure based upon the projected fleet mix, available seats, and forecast enplanements.

Table 3-12 – Commercial Air Carrier Load Factor

	2013	2018	2023	2028	2033
Average Seats per Departure	72	80	84	85	87
Annual Enplanements	1,244,300	1,327,500	1,399,300	1,470,000	1,510,600
Annual Available Seats	1,365,172	1,566,002	1,704,207	1,792,522	1,865,734
Average Boarding Load Factor	90%	85%	82%	82%	82%

Source: ROC Management, CHA, 2013.

3.6 Forecast of General Aviation and Military Activity

General aviation (GA) includes all segments of the aviation industry except commercial air carriers/regional/commuter service, scheduled cargo, and military operations. General aviation represents the largest percentage of civil aircraft in the U.S. and accounts for the majority of operations handled by towered and non-towered airports. Its activities include flight training, sightseeing, recreational, aerial photography, law enforcement, and medical flights, as well as business, corporate, and personal travel via air taxi charter operations. General aviation aircraft encompass a broad range of types, from single-engine piston aircraft to large corporate jets, as well as helicopters, gliders, and amateur-built aircraft.

Military aircraft and operations are simply defined as those owned and operated by the nation's military forces. Military aircraft are often included in the based aircraft and operations projections, but are not forecast in the same manner as general aviation activity since their number, location, and activity levels are not a function of anticipated market and economic conditions, but are rather a function of military decisions, national security priorities, and budget pressures that cannot be predicted over the course of the forecast period. Typically, military based aircraft and military operations, for forecasting purposes, remain static at baseline year levels through the forecast period.

General aviation and military operations are further categorized as either itinerant or local operations. Local operations are those performed by aircraft that remain in the local traffic pattern or within a 20-mile radius of the tower. Local operations are commonly associated with training activity and flight instruction, and include touch and go operations. Itinerant operations are arrivals or departures other than local operations, performed by either based or transient aircraft that do not remain in the airport traffic pattern or within a 20-nautical mile radius.

3.6.1 Potential GA Operations Forecasts

Similar to commercial operations forecasts, several methodologies exist that could be used to forecast GA operations. In order to determine the most plausible and reasonable scenario for ROC, it is necessary to compare and eliminate those forecasts that do not support the key factors and variables that comprise the specific operational direction of the Airport. After careful evaluation, the following forecast scenarios are considered not to be statistically reliable for application to the ROC GA operations: Historical Growth Scenario and Market Share Scenario.

Historical Growth Scenario
The Historical Growth Scenario is a forecasting approach in which the trend of past years' aviation activity is extrapolated over the forecast horizon (20 years). Over the last decade, ROC has experienced a sharp decline in GA activity, from 86,377 total ops in 2000 to 38,162 total ops in 2012. It is highly improbable that this waning of activity will continue at such a rate, and will likely initiate a static path or experience an increase at some point in the future. Because of this, the Historical Growth Scenario was considered unreliable and was not used for this forecasting effort.

Market Share Scenario
The Market Share Scenario is a forecast model that compares local aviation activity levels with regional, state, and national level trends. This methodology assumes that the activity of any one airport is regular and predictable in accordance with the average of airports nationally. Due to the fluctuating nature of GA traffic and the fact that this approach does not account for specific regional socioeconomic conditions, the Market Share Scenario was considered unsuitable for the purposes of the ROC forecast.

3.6.2 Adjusted TAF-Based Operations Forecast

The Adjusted TAF-Based Forecast scenario utilizes FAA growth factors provided in the 2013 FAA Terminal Area Forecast to arrive at adjusted forecasted factors for the GA operations at ROC. Contrary to the forecasts of commercial activity, it is believed that the ROC TAF in relation to national and regional growth trends exhibits the related market growth characteristics suggested by local demographic conditions. As previously discussed, a similar split for Air Taxi & Commuter operations was necessary to accurately reflect the number of actual GA operations both in the baseline year, and throughout the forecast period.

As previously mentioned in **Section 3.1.3**, according to the FAA, the Air Taxi & Commuter category of the FAA TAF is defined as "Commuter - operations that include takeoffs and landings by aircraft with 60 or fewer seats conducting scheduled commercial flights, and "Air Taxi – operations that include takeoffs and landings by aircraft with 60 or fewer seats conducted on non-scheduled or for-hire flights". As such, the Air Taxi & Commuter category in the 2013 FAA TAF includes both scheduled Air Carrier operations 60-seats or less (i.e., this will include all 50-seat regional jet operations) and business and charter jet operations.

Therefore in order to accurately gauge projected commercial carrier and GA operations as compared to the TAF it is necessary to split GA Air Taxi operations from the commercial air carrier operations to account for the scheduled air carrier operations using 50-seat regional jet aircraft. This is accomplished by calculating the scheduled commercial air carrier operations categorized under commuter operations based on ROC-reported commercial carrier operations and reclassifying those operations as commercial operations. This methodology then adjusts the decline in Air Taxi & Commuter operations at ROC by applying the TAF projected GA growth to the split operations. By eliminating the scheduled commercial operations that are the main contributor to the decline and categorizes operations at the Airport by Air Carrier and GA, both categories then project growth throughout the forecast period.

For the purposes of the TAF-Based GA scenario, the ROC TAF annual growth numbers were used as the variable for yearly growth. The ROC TAF predicts GA operations to grow at a rate consistent with the growth rate of GA at the national level. Simply put, the ROC TAF already adjusts the national growth rates for GA operations to levels that reflect the incremental growth predicted in the Airport's catchment area. For this reason, it was concluded that no direct adjustment is needed for the GA operations forecast factors presented in the ROC TAF. The TAF-Based scenario will however use the TAF growth factors applied to actual 2012 operations. As shown in **Table 3-13**, the 2013 TAF represents a modest growth trend of 0.3 percent in overall GA operations at ROC. It is important to note that the Itinerant GA operations include the GA Air Taxi operations as a result of the previously mentioned split of Air Taxi & Commuter operations.

Table 3-13 – TAF GA Operations

	Itinerant Operations			Local Operations			
Year	GA Ops.	Military Ops.	Total	Civil Ops.	Military Ops.	Total	Total Ops.
Historic:							
2002	61,448	2,182	**63,630**	31,223	5,097	**36,320**	**99,950**
2007	45,665	1,105	**46,770**	23,942	919	**24,861**	**71,631**
2012*	33,806	1,947	**35,753**	19,694	1,075	**20,769**	**56,522**
Projected:							
2013	33,874	1,947	**35,821**	20,935	1,075	**22,010**	**57,831**
2018	34,216	1,947	**36,163**	21,502	1,075	**22,577**	**58,740**
2023	34,562	1,947	**36,509**	22,084	1,075	**23,159**	**59,668**
2028	34,911	1,947	**36,858**	22,684	1,075	**23,759**	**60,617**
2033	35,263	1,947	**37,210**	23,301	1,075	**24,376**	**61,586**
2013-2033 AAGR	**0.19%**	**0.00%**	**0.18%**	**0.51%**	**0.00%**	**0.49%**	**0.30%**
2013-2033 Growth	**4.1%**	**0.0%**	**3.9%**	**11.3%**	**0.0%**	**10.7%**	**6.5%**

Source: 2013 FAA Terminal Area Forecast, ROC Management, CHA 2013.
*Note: The 2012 enplanement figure is actual reported data provided by the ROC management
AAGR = Average annual growth rate

As the official forecast used by the FAA for planning, the TAF-Based Scenario was believed to be the most reasonable scenario for the ROC forecast. The projections in this model not only account for national economic conditions and trends within the aviation industry as a whole, but also reflect regional market and socioeconomic conditions and anticipated demand. Though not updated continuously (the baseline starts at the government's fiscal year, beginning October 1), this relatively top-down approach is a highly accurate means of predicting future aviation activity levels.

3.6.3 Based Aircraft Recommended Forecast

The methodology used to forecast based aircraft activity at the Airport assumes that ROC GA and military based aircraft and operations will grow at the FAA projected national rates and maintain their respective share of fleet and operations throughout the forecast period. This methodology represents a relatively conservative approach to projecting this type of activity.

For based aircraft projections at ROC, each aircraft type was anticipated to grow at the national rates projected in the *FAA Aerospace Forecasts, FY2013-2033*, which are detailed in **Table 3-14**. Since each aircraft type is forecast independently based on specific growth rates unique to the aircraft type, a more robust fleet mix and total based aircraft count can be predicted with the FAA Aerospace Forecast than when using the TAF as a sole source forecast (the TAF forecasts an aggregate based aircraft number, not by specific type).

Table 3-14 – FAA Aerospace National GA Fleet Growth Rates

Period	Single Engine	Multi-Engine Piston	Turbo-Prop	Jet	Rotorcraft
2013-2018 AAGR	-0.6%	-0.4%	1.6%	3.3%	3.4%
2018-2023 AAGR	-0.5%	-0.7%	2.0%	3.9%	3.7%
2023-2028 AAGR	-0.2%	-0.8%	2.1%	4.3%	3.4%
2028-2033 AAGR	0.3%	-0.6%	1.6%	3.9%	2.5%
2013-2033 Total	**-0.3%**	**-0.6%**	**1.9%**	**3.8%**	**3.2%**

Source: *FAA Aerospace Forecast FY 2013-2033*, CHA 2013.
AAGR = Average annual growth rate

Table 3-15 presents the market share based aircraft forecast in which the national growth rates are applied to the most current ROC based aircraft fleet mix. Note that growth projections for military aircraft are not provided and remain static, consistent with operations.

Table 3-15 – FAA Aerospace National GA Fleet Growth Rates

Year	Single Engine	Multi-Engine Piston	Turbo-Prop	Jet	Rotor	Military	Total
2012	46	8	9	10	1	24	**98**
2013	46	8	9	10	1	24	**98**
2014	45	8	9	11	1	24	**98**
2015	45	8	9	11	1	24	**99**
2016	45	8	10	11	1	24	**99**
2017	45	8	10	12	1	24	**100**
2018	44	8	10	13	1	24	**100**
2019	44	8	10	13	1	24	**100**
2020	44	8	10	13	1	24	**101**
2021	44	8	11	14	1	24	**101**
2022	44	8	11	15	1	24	**102**
2023	44	7	11	15	1	24	**103**
2024	43	7	11	16	2	24	**104**
2025	43	7	12	16	2	24	**104**
2026	43	7	12	17	2	24	**105**
2027	43	7	12	18	2	24	**107**
2028	43	7	12	19	2	24	**108**
2029	43	7	13	20	2	24	**109**
2030	44	7	13	21	2	24	**110**
2031	44	7	13	21	2	24	**111**
2032	44	7	13	22	2	24	**112**
2033	44	7	13	22	2	24	**113**
2013-2033 AAGR	**-0.2%**	**0.0%**	**0.0%**	**3.9%**	**3.3%**	**0.0%**	**0.7%**
2013-2033 Growth	**-4.4%**	**0.0%**	**0.0%**	**122.9%**	**99.0%**	**0.0%**	**14.8%**

Source: *FAA Aerospace Forecast FY 2013-2033*, CHA 2013.
AAGR = Average annual growth rate

3.7 Air Cargo Forecasts

Similar to most sectors within the aviation industry, air cargo activity and demand is cyclical in nature and fluctuates based on national and global economic trends. According to the FAA Aerospace Forecasts, FY 2013-2033, specific factors that influence air cargo activity include economic market conditions, fuel price instability, and globalization.

Air cargo traffic at ROC is comprised of freight/express and mail, transported in either the bellies of passenger aircraft or in dedicated all-cargo aircraft via scheduled and non-scheduled service. At ROC, this activity is conducted by several airlines that serve the Airport (Southwest, Delta Air Lines, and US Airways) and by FedEx.

In May 2013, an *Air Cargo Evaluation* was conducted to evaluate opportunities for freight activity growth and strategies for adequately handling large-scale cargo operations, taking into account current air cargo and market trends. The report indicated that existing cargo activity at ROC is limited by the capacity of the ground handlers to the transportation of small packages and envelopes. The majority of these operations are to and from Memphis International Airport (MEM).

Historically, the demand for air cargo is driven by the economy, having a high correlation with Gross Domestic Product (GDP). Parallel with the past decade's trend of recessions and overall sluggish economic growth, Boeing's *World Air Cargo Forecast 2012-2013* reported that air cargo traffic in the US declined by 1.5 percent between 2001 and 2011. Just as well, the FAA recounted in the *FAA Aerospace Forecast Fiscal Years 2013-2033* that 2012 was the second consecutive year demand had fallen, a trend that had been defied only once since 2004. Specific to ROC, the *Air Cargo Evaluation* conveyed a nearly 15 percent drop in total cargo volume since 2008. These regressions are due to a variety of factors including fuel price volatility, movement of real yields, and globalization.

While the air freight industry has experienced a relapse in volumes, this trend is not sustainable. According to the Congressional Budget Office (CBO), after the economy adjusts to the fiscal tightening imposed by the government in early 2013, underlying economic factors will lead to more rapid growth in GDP – an average rate of 3.6 percent through 2018, and 2.25 percent between 2019 and 2023. As air cargo growth is tied to GDP, the industry is expected to experience a similar upswing.

On a global scale, Boeing has predicted air cargo to have an average growth rate of 5.2 percent through 2031. Due to the maturity of the US market (making it less volatile than other countries), a domestic growth rate of 2.3 percent is expected, with continent-dependent international growth rates projected to be between 3.5 and 5.8 percent. The FAA's forecast is slightly more modest with regards to domestic traffic, anticipating only a 0.8 percent growth rate; international growth is expected to be around 5.7 percent.

For the purposes of this forecast, a single cargo forecast was developed based on the aforementioned forecasts and current economic trends and factors; a variable growth scenario was selected to forecast future cargo activity at ROC. This forecast methodology anticipates that air cargo activity at ROC will follow a rate similar to the US GDP, with a relatively slow growth of 0.8 percent through 2018, then incrementally increasing in rate through 2033. As shown in **Table 3-16**, the forecast predicts that at an AAGR of 1.4%, the Airport should experience an approximate 32 percent increase in air cargo volume throughout the forecast period.

Table 3-16 – Cargo Forecast

Year	Cargo Volume (kg)	Change
2012	40,500,000	-
Projected:		
2013	40,824,000	0.80%
2018	42,483,297	0.80%
2023	44,871,632	1.30%
2028	48,577,852	1.80%
2033	53,897,042	2.30%
2013-2033 AAGR	**1.4%**	
2013-2033 Growth	**32.0%**	

Source: *ROC Master Plan Update: Air Cargo Evaluation 2013*, *FAA Aerospace Forecast FY 2013-2033, World Air Cargo Forecast 2012-2013,* CHA 2013.
AAGR = Average annual growth rate

3.8 Recommended Forecast Summary

The following tables present a summary of the preferred aviation activity forecasts for air carrier activity (operations and enplanements), GA activity (based aircraft and operations), and military activity as detailed in the previous sections. Additionally, direct comparisons to the ROC TAF are provided for evaluation purposes. The recommended forecasts are the preferred projections on which future planning for the Airport will be based. **Table 3-17** presents the complete summary of the preferred forecast for based aircraft, enplanements, and operations by type.

Table 3-18 details the recommended air carrier enplanements and total operations (all activity types) forecast in comparison to the TAF forecast. At the end of the planning period, the recommended forecast predicts a level of enplanements 11.7 percent above the ROC TAF, and total Airport operations 1.8 percent below what is reported in the TAF. It is important to note that the projected enplanement is within 10 percent of the TAF in the first 5 years, and within 15 percent in 10 years as per the requirements set forth by the FAA in *AC150/5070-6B Airport Master Plans* for approval of Master Plan forecasts. The difference in airport operations between the recommended forecast and the 2013 TAF can be attributed to the limited fleet mix transition data available at the time the 2013 ROC TAF was prepared. The level at which the fleet mix transition was shifting throughout the aviation industry had only been experienced for a limited period of time. Therefore, the TAF was unable to reflect accurate industry trends related to a slower growth in commercial operations.

Table 3-17 – Recommended Forecast Summary

Year	Based Aircraft	Enplanements	Operations: Air Carrier	GA	Military	Total
2012	98	1,195,238	37,160	53,500	3,022	93,681
2013	98	1,244,300	38,075	54,809	3,022	95,906
2014	98	1,268,200	38,335	54,989	3,022	96,346
2015	99	1,285,700	38,596	55,170	3,022	96,788
2016	99	1,299,900	38,857	55,352	3,022	97,232
2017	100	1,312,800	39,120	55,535	3,022	97,677
2018	100	1,327,500	39,383	55,718	3,022	98,123
2019	100	1,341,500	39,648	55,902	3,022	98,571
2020	101	1,355,700	39,913	56,087	3,022	99,022
2021	101	1,370,100	40,180	56,272	3,022	99,473
2022	102	1,384,600	40,447	56,458	3,022	99,927
2023	103	1,399,300	40,715	56,646	3,022	100,383
2024	104	1,413,300	40,984	56,833	3,022	100,840
2025	104	1,427,300	41,255	57,022	3,022	101,298
2026	105	1,441,500	41,526	57,213	3,022	101,761
2027	107	1,455,700	41,798	57,404	3,022	102,224
2028	108	1,470,000	42,071	57,595	3,022	102,688
2029	109	1,478,000	42,273	57,787	3,022	103,082
2030	110	1,486,100	42,475	57,980	3,022	103,477
2031	111	1,494,300	42,678	58,174	3,022	103,874
2032	112	1,502,400	42,882	58,369	3,022	104,273
2033	113	1,510,600	43,088	58,564	3,022	104,674
2013-2033 AAGR	**0.7%**	**1.0%**	**0.6%**	**0.3%**	**0.0%**	**0.4%**
2013-2033 Growth	**14.6%**	**21.4%**	**13.2%**	**6.9%**	**0.0%**	**9.1%**

Source: ROC Management, 2013 ROC TAF, *2013-2033 Aerospace Forecast*, CHA 2013.
AAGR = Average annual growth rate

Table 3-18 – Recommended Forecast vs. FAA TAF

Year	Enplanements: ROC TAF	Enplanements: Recommended Forecast	Enplanements: Recommended Forecast vs. TAF	Operations: ROC TAF	Operations: Recommended Forecast	Operations: Recommended Forecast vs. TAF
2013	1,191,935	1,244,300	4.4%	96,105	95,906	-0.2%
2018	1,240,398	1,327,500	7.0%	100,434	98,123	-2.3%
2023	1,277,056	1,399,300	9.6%	102,166	100,383	-1.7%
2028	1,314,449	1,470,000	11.8%	104,222	102,688	-1.5%
2033	1,352,592	1,510,600	11.7%	106,595	104,674	-1.8%
2013-2033 AAGR	**0.6%**	**1.0%**		**0.5%**	**0.4%**	

Source: ROC Management, 2013 ROC TAF, *2013-2033 Aerospace Forecast*, CHA 2013.
AAGR = Average annual growth rate

3.9 Peak Activity Forecasts

Commercial service airports experience peaks in enplanements, commercial carrier operations, and total airport operations that will drive demand for various areas of airport infrastructure. To properly plan, size, and design passenger terminal facilities, an understanding of peak month-average day (PMAD) and peak hour enplanement demand is necessary. The peak month, PMAD, and peak hour forecasts are key elements in defining the future facility requirements needed to accommodate above average levels of utilization (i.e., peak activity). Therefore, each of these elements must be presented separately; peak commercial carrier operations define the demand for airside facilities (gates and ramp), while peak enplanements pose a direct impact on terminal (e.g., ticketing and baggage claim) and landside (e.g., access roads and parking) facilities, and peak airport operations determine runway capacity and airfield needs.

3.9.1 Peak Month – Average Day

The peak month is the calendar month of the year when the highest level of enplanements and aircraft operations typically occur. Peak month-average day is simply the total operations, or total enplanements, divided by the number of days in the peak month. The projected peak month levels of activity are a key component in the demand/capacity analysis used to determine future capacity requirements.

In order to provide the necessary metrics for the demand/capacity analysis, PMAD is forecast for the following

- Enplanements
- Commercial Carrier Operations
- Total Operations

Terminal facilities are generally designed to accommodate enplanements on the average day during the peak month, rather than the absolute peak level of activity. A review of historical enplanements and operations at ROC was performed in order to identify the peak month for passenger activity. With the limited amount of ROC record data available, it was necessary to analyze airports with similar activity levels to determine the peaking characteristics at the Airport. Using ROC records, and peaking characteristics associated with Airports at a similar level of activity as ROC, it was assumed that the month of July averaged the highest level of enplanements.

During the month of July, ROC experienced approximately 121,112 enplanements or approximately 9.7 percent of the total annual passengers. To calculate the PMAD, that percentage was applied to the total number of forecast annual enplanements to determine the peak month enplanements. The peak month enplanements were then divided by the number of days in the peak month (31) to define the PMAD. The forecasts for ROC peak month and peak month-average day enplanements, presented in **Table 3-19**, uses the approximate variable of 9.7 percent of total annual enplanements for the month through the forecast period.

Table 3-19 – Peak Month Average Day Enplanements

Year	Enplanements	Peak Month Percent	Peak Month Enplanements	Peak Month Average Day
2012	1,195,238	9.7%	116,336	3,753
2013	1,244,300	9.7%	121,112	3,907
2018	1,327,500	9.7%	129,200	4,168
2023	1,399,300	9.7%	136,179	4,393
2028	1,470,000	9.7%	143,061	4,615
2033	1,510,600	9.7%	147,022	4,743

Source: ROC Management, FAA TAF, CHA 2013.

The PMAD for commercial carrier operations is calculated in the same manner as PMAD for enplanements. A similar methodology to the enplanement analysis was utilized, using ROC records, and peaking characteristics of the same airports as previously mentioned, it was assumed that there was limited variation in carrier operations. For the purposes of this forecast, it was also assumed that the month of July experienced the highest level of commercial enplanements at ROC, yielding approximately 3,427 commercial operations resulting in 9.0 percent of the annual operations. The forecast for ROC peak month and PMAD carrier operations, presented in **Table 3-20**, uses a constant 9.0 percent ratio for the month throughout the forecast period. To compute PMAD, the peak month operations are divided by the number of days in the peak month to represent the peak average day for the forecast period.

Table 3-20 – Peak Month Average Day Commercial Operations

Year	Annual Total Operations	Peak Month Percent	Peak Month Operations	Peak Month Average Day
2012	37,160	9.0%	3,344	108
2013	38,075	9.0%	3,427	111
2018	39,383	9.0%	3,544	114
2023	40,715	9.0%	3,664	118
2028	42,071	9.0%	3,786	122
2033	43,088	9.0%	3,878	125

Source: ROC Management, FAA TAF, CHA 2013.

PMAD for all Airport operations (commercial carrier, GA, cargo, and military) are calculated in the same manner as the previous PMAD analyses. The historic monthly operation for ROC assumes July as the peak month, and utilizes industry averages, approximately 9.9 percent of total annual operations. The forecast for ROC peak month and PMAD total Airport operations, presented in **Table 3-21**, uses the approximate ratio 9.9 percent for the peak month through the forecast period.

Table 3-21 – Peak Month Average Day Total Airport Operations

Year	Annual Airport Operations	Peak Month Percent	Peak Month Airport Operations	Peak Month Average Day
2012	93,681	9.9%	9,274	299
2013	95,906	9.9%	9,495	306
2018	98,123	9.9%	9,714	313
2023	100,383	9.9%	9,938	321
2028	102,688	9.9%	10,166	328
2033	104,674	9.9%	10,363	334

Source: ROC Management, FAA TAF, CHA 2013.

3.9.2 Peak Hour Operations and Enplanements

Establishing peak hour activity is instrumental in terminal facility planning and forms the basis for identifying any potential capacity issues. Hourly operations and enplanements data were calculated using ROC provided commercial carrier schedule data during a peak week in the month of July to determine 2013 peak hour activity for the following categories.

3.9.2.1 Peak Hour Total Airport and Commercial Carrier Operations

As discussed previously, it was assumed the month of July averaged the greatest number of total Airport and commercial carrier operations in 2012 and 2013. To calculate the peak hour for commercial operations, it was first necessary to analyze the ROC provided commercial carrier schedule data for the peak month of July to define the peak hour, and the number of operations within the peak hour. This analysis determined the average peak number of operations to be 14 operations, or 12.6 percent of the PMAD, during the hour of 6:00 and 7:00 am. This percentage was then applied to the remainder of the forecast period to calculate the peak hour commercial operations.

The next step was to calculate the peak hour for total airport operations. Using the established peak month, it was determined that peak hour total airport operations (31) encompassed approximately 9.9 percent of the PMAD total airport operations. This percentage was then applied to the projected PMAD total operations to derive peak hour total airport operations through 2033.

3.9.2.2 Peak Hour Enplanements

According to ROC data and airports similar to ROC, it was assumed the month of July averaged the greatest number of enplanements. The month of July experienced a total of 14 peak hour commercial carrier departures in 2012 and 2013. Peak hour passenger enplanements were calculated by using the following methodology:

- Analyze ROC commercial carrier schedule data to determine the average air carrier departures.

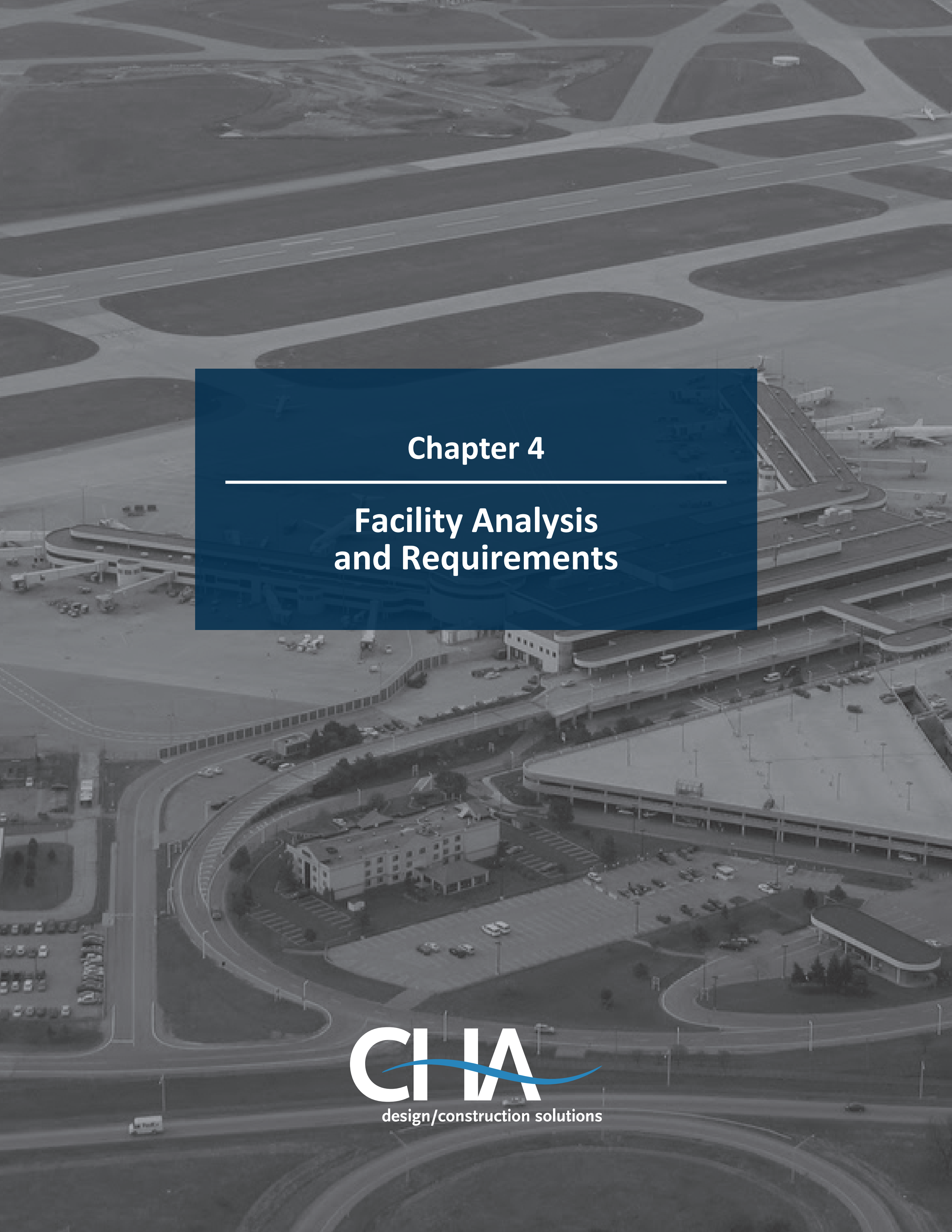
- Apply average air carrier departures to average seats per departure, provided in **Table 3-12**, to calculate average hourly seats.
- Apply the load factor percentage, also shown in **Table 3-12,** to the average hourly seats to calculate peak enplanements.

Table 3-22 shows the peak hour for passenger enplanements, commercial operations, and total Airport operations.

Table 3-22 – Projected Peak Hour Operations and Enplanements

	Enplanements		Commercial Carrier Operations		Total Airport Operations	
Year	**PMAD**	**Peak Hour**	**PMAD**	**Peak Hour**	**PMAD**	**Peak Hour**
2013	3,907	359	111	14	306	30
2018	4,168	425	114	15	313	31
2023	4,394	505	118	15	321	32
2028	4,615	512	122	16	328	32
2033	4,743	600	125	16	334	33

Source: ROC Management, CHA 2013.



Chapter 4

Facility Analysis and Requirements

design/construction solutions

4 Facilities Analysis and Requirements

This chapter identifies the facility requirements necessary to meet existing and forecast airport requirements, satisfy Federal Aviation Administration (FAA) design standards, and improve safety. The facility analysis is consistent with the guidelines and standards established in FAA Advisory Circulars. It is important to note that Fall 2013 was used as the baseline for this chapter.

The analysis includes the following components:

- Airside
  - Airfield Capacity
  - Airport Design Standards
    - Design Aircraft
    - Runway Length and Width Requirements
    - Taxiway and Taxilane Requirements
  - Airfield Lighting
  - Instrument Approach Procedures
  - Airport Perimeter Road
- Landside
  - Passenger Terminal and Concourses
  - Automobile Parking
  - Airport Access
  - Air Cargo Facilities
  - Corporate/General Aviation Requirements
  - Fuel Farm Facilities
  - ARFF Facilities
  - Airfield Maintenance Facilities
  - Deicing Facilities
  - Airport Property
  - Airport Fencing/Gates

The feasibility and impacts of providing the identified facilities is performed in subsequent chapters, prior to the development of the recommended plan.

4.1 Airside

Airside facilities at the Airport consist of all areas where aircraft operate (landing, takeoff, taxi and park). Airside (or airfield) facilities are those directly used by aircraft, such as airspace, runways, taxiways, aprons, lighting, navigational aids (NAVAIDs), Federal Aviation Regulation (FAR) Part 77 Surfaces and Instrument Approach Procedures (IAP).

This section will examine the airfield capacity, along with existing aircraft usage and forecasts compared to the Airport's airspace, runways, taxiways, and IAPs and perimeter road. The conditions reported in this section are based on visual inspections, a review of the Airport's existing drawings and documents, and discussions with Airport Authority Management Staff.

4.1.1 Airfield Capacity Analysis

This section reviews the airfield capacity of the Greater Rochester International Airport (ROC), evaluates any capacity surpluses or deficiencies, and identifies airfield improvements that may be required during the 20-year planning period. Airfield capacity is defined as the maximum rate that aircraft can arrive and depart an airfield with an acceptable level of delay. It is a measure of the number of operations that can be accommodated at an airport during a given time period, and is determined based on the available airfield system (e.g., runways, taxiways, NAVAIDs, etc.) and airport activity characteristics.

Forecasts of peaking hour activity drives the need for additional development; especially if there is insufficient capacity with the existing infrastructure, as the demand/capacity is reflected in the runway, taxiway and navigational air usage. This section evaluated the forecasted peaking characteristics to the service level at the airport.

The technique employed by the FAA to evaluate airfield capacity is described in Advisory Circular 150/5060-5, *Airport Capacity and Delay*. The previous Master Plan incorporated an airfield capacity analysis. The analysis evaluated the airfield capacity for the multiple runway-layout that exists at ROC. As no substantial change to the ROC airfield layout has occurred since the last Master Plan, the study findings are still valid. Annual Service Volume (i.e. airport capacity) has been calculated at 266,000 annual operations. The current forecast operations at ROC, presented in Chapter 2 for the study year of 2033, calculate to 39.4% of the annual service volume, well below the suggested 60% level before capacity improvements are recommended. All other study years predict fewer operations. Therefore, the airfield configuration at ROC provides ample capacity to accommodate existing and future average and peak hour operations, assuming all three runways are usable.

4.1.2 Airport Design Standards

This section identifies the airfield facilities necessary to accommodate existing and future aircraft activity in accordance with FAA design criteria, planning guidelines and safety standards. The requirements are based upon current activity levels and the forecasts presented in Chapters 3.

In order to establish the planning and design criteria for an airport, the "design" or "critical" aircraft must be identified. Frequency of use is the key factor in defining the design aircraft for an airport. FAA policy requires selection of the design aircraft and the associated Airport Reference Code (ARC) based on the most demanding aircraft that generates, or is expected to generate, at least 500 annual itinerant operations[7]. Occasional use by aircraft larger in size or faster in approach speed is not sufficient justification to upgrade the design of an airport.

Multiple design aircraft for different user groups (e.g., airlines, air cargo carriers, and general aviation) is not uncommon at commercial airports. The application of multiple design standards

[7] Advisory Circular 150/5325-4B, *Runway Length Requirements for Airport Design*, Section 102 a. (8), pg.1

enables certain portions of the Airport, such as general aviation facilities, to be designed to different dimensional standards than other areas, such as the airline terminal facilities.

Design aircraft for the purposes of airport geometric design is a composite aircraft representing a collection of aircraft classified by three parameters[8]:

- Aircraft Approach Category (AAC): Depicted by a letter and relates to aircraft approach speed (operational characteristics), **Table 4-1**;
- Airplane Design Group (ADG): Depicted by a Roman numeral and relates to either the aircraft wingspan or tail height (physical characteristics), whichever is most restrictive, **Table 4-2**.

Table 4-1 Aircraft Approach Category (AAC)

Aircraft Approach Category	Approach Speed
A	Approach speed less than 91 knots
B	Approach speed 91 knots or more but less than 121 knots
C	Approach speed 121 knots or more but less than 141 knots
D	Approach speed 141 knots or more but less than 166 knots
E	Approach speed 166 knots or more

Source: Advisory Circular 150/5300-13A

Table 4-2 Airplane Design Group (ADG)

Group Number	Tail Height	Wingspan
I	< 20'	<49'
II	20' - < 30'	49' < 79'
III	30'- < 45'	79' - < 118'
IV	45' - < 60'	118' - < 171'
V	60' < 66'	171' - < 214'
VI	66' < 80'	214' - < 262'

Source: Advisory Circular 150/5300-13A

The third component in determining the Runway Design Code (RDC), in addition to the AAC and ADG, relates to the visibility minimums expressed by runway visual range (RVR) values in feet of 1200, 1600, 2400 and 4000. See **Table 4-3**.

These parameters represent the aircraft that are intended to be accommodated by the airport. In cases where there are multiple runways, the identification of a design group for each runway should be identified. Combining the AAC, ADG and approach visibility minimums form the RDC of a particular runway. The RDC provides the information needed to determine certain design standards that apply for each runway.

[8] Advisory Circular 150/5300-13A, *Airport Design,* Section 105, pg 11-13

Table 4-3 Visibility Minimums

Runway Visual Range	Flight Visibility Category (Statute Mile)
4000	Lower than 1 mile but not lower than ¾ mile (APV ≥ ¾ but < 1 mile)
2400	Lower than ¾ mile but no lower than ½ mile (CAT-I)
1600	Lower than ½ mile but not lower than ¼ mile (CAT-II)
1200	Lower than ¼ mile (CAT-III)

Source: Advisory Circular 150/5300-13A

Design Aircraft: The ARC is an airport designation that signifies the airport's highest RDC minus the third (visibility) component of the RDC. The ARC is used for planning and design only. Based upon the existing users of ROC and forecasts presented in Chapter 3, the following design aircraft have been identified, as shown in **Table 4-4** below.

Table 4-4 – ROC General Fleet Characteristics

Aircraft Category	Aircraft Type	Sample Aircraft	RDC
Airline Aircraft	Narrow-Body Jets	B737, A320	C-III
Air Cargo Aircraft	Wide-Body Jets	A300-600	D-IV
General Aviation Aircraft	Piston	Beech Baron	B-I
	Turboprop	King Air	B-II
	Medium Corporate Jet	Citation 10	C-II
	Large Corporate Jet	Gulfstream G550	C-III

Source: Advisory Circular 150/5300-13A and Passero Associates

The RDC for each runway at ROC is summarized in **Table 4-5**. The recommendations are based on the current and forecast fleet summarized in **Table 4-4**.

Table 4-5 – ROC Recommended Runway Design Code

Runway	Recommended RDC	Recommended Visibility Minimum	Remarks
4-22	D-IV	RVR 1600	Existing for RWY 4 CAT II
10-28	C-III	¾ SM (RVR 4000)	Upgrade visibility minimum
7-25	B-II	1 SM (RVR 5000)	Existing, no change

Source: Passero Associates

These design criteria provided by FAA for each RDC are used to determine required separations, widths, clearances, pavement grades, turn radii, etc. for runways, taxiways and aprons at ROC. Some of the more important elements of airport design standards are defined below for better understanding of the dimensional requirements presented in **Table 4-6**.

- **Runway Safety Area (RSA)**: A defined surface surrounding the runway prepared or suitable for reducing the risk of damage to aircraft in the event of an undershoot, overshoot, or excursion from the runway. This area must also support snow removal equipment and Aircraft Rescue and Fire Fighting (ARFF) equipment. The RSA should be free of objects, except for those objects that must be located in the area because of their function.

- **Object Free Area (OFA)**: An area centered on the ground on a runway, taxiway, or taxilane centerline provided to enhance the safety of aircraft operations by remaining clear of objects, except for objects that need to be located in the OFA for air navigation or aircraft ground maneuvering purposes.
- **Runway Protection Zone (RPZ)**: An area at ground level prior to the threshold or beyond the runway end to enhance the safety and protection of people and property on the ground. Each runway end has a departure and approach RPZ. These are normally coincident, but application of declared distances or the presence of a displaced threshold causes the two RPZs to cover different areas. Such is the case for Runway 10-28.
- **Separation Standards**: Minimum distances between parallel or adjacent airfield facilities or from fixed objects.
- **Building Restriction Line (BRL)**: A line that identifies suitable and unsuitable locations for buildings on airports. It should be set beyond the runway protection zone (RPZ), object free zone (OFZ) and object free area (OFA), runway visibility zone, NAVAID critical areas, clearance areas required for TERPS, and ai traffic control clear line of sight. The location of the BRL is dependent upon the selected allowable structure height. A typical allowable structure height is 35 feet.
- **Movement versus Non-Movement Areas**:
  - **Movement areas** at ROC include runways, taxiways, and other areas of the airport that require clearance from air traffic control to move; whether on foot, in a vehicle or in an aircraft.
  - **Non-Movement areas** at ROC are the aprons, most service roads and aircraft parking areas and do not require a clearance from air traffic control to move.

Table 4-6 – Recommended FAA Runway Design Dimensional Standards

FAA Design Standard	Runway Design Code		
	Runway 4-22 D-IV (RVR1600)	Runway 10-28 C-III (RVR 4000)	Runway 7-25 B-II (RVR 5000)
Runway Safety Area (RSA)			
Width	500’	500’	150’
Length Prior to Threshold	600’	600’	300’
Length Beyond Departure End	1,000’	1,000’	300’
Object Free Area (OFA)			
Width	800’	800’	500’
Length Prior to Threshold	600’	600’	300’
Length Beyond Runway End	1,000’	1,000’	300’
Approach Runway Protection Zone			
Inner Width	1,000’	1,000’	500’
Outer Width	1,750’	1,510’	700’
Length	2,500’	1,700’	1,000’
Acres	78.914	49.978	13.770
Departure Runway Protection Zone		500’	
Inner Width	500’	1,010’	500’
Outer Width	1,010’	1,700’	700’
Length	1,700’	29.465	1,000’
Acres	29.465		13.770
Runway Width (minimum)	150’	150’	75’
Runway Centerline To:			
Holding Position	250’	250’	200’
Parallel Taxiway Centerline	400’	400’	240’
Aircraft Parking Area	500’	500’	250’

Source: Advisory Circular 150/5300-13A, Appendix 7

4.1.3 Runway Length and Width Requirements

The 1998 and 2009 Airport Master Plans conducted a detailed runway length analysis using aircraft manufacturers’ published guidelines and manuals. This analysis examined narrow-body jets: Airbus 320, Boeing 717 and 737; and regional jets such as Canadair (CRJ) 200, 700 and Embraer (EMB) 145, 170. The findings from that analysis concluded, “*for all airline aircraft to operate unconstrained (at MGTOW), a runway length of 9,000 to 9,200 feet is required. To serve the regional jet component of the fleet, a runway length greater than 7,500 feet is required, which is provided by Runway 4-22, but not Runway 10-28.*”[9] Based on the forecasts, the 50-seat class regional jet fleet is anticipated to decrease and be replaced by larger 70-100-seat regional jets. This transition is underway with three airlines operating Embraer 170 or 190 models out of ROC. The EMB 170 series was previously included in the runway length assessment.

Additional aircraft that will enter the market as the transition continues, but were not previously included in runway analysis include the EMB 190 and CRJ 900. The aircraft performance charts for these two aircraft types were reviewed, assuming standard temperature, and seal level elevation, consistent with the previous airport master plans; result in lengths of 5,500-6,100 feet

[9] Greater Rochester Airport Maser Plan, 1998, Page 3-11.

at maximum gross takeoff weight. These lengths are within the recommended runway lengths. Thus, the long-term recommended findings from the previous Airport Master Plan remain unchanged – consider a long-term runway extension to Runway 4-22 to a length of 9,000-9,200 feet. Refer to **Figure 4-1** for a diagram of the airport. The 8,001-foot runway is adequate for current flight destinations, but the longer runway length would accommodate longer stage lengths with full passenger loads.

Additionally, Runway 28 is configured with displaced thresholds to manage safety area requirements. This runway employs the declared distance protocol to declare take-off and landing lengths. The published take-off run available is 6,401 feet. Landing distance available (LDA) on Runway 28 is restricted to 5,801 feet, Runway 10 LDA is 5,501 feet. An obstruction evaluation is being conducted under this project. It may be possible to increase landing distance on Runway 28 with identification and management of obstructions in the approach area. Previous analysis determined that it is not feasible to extent Runway 10-28 beyond the existing 6,401 foot length. However, any option to increase the published available lengths would be a benefit to airport users. Recommendation to recapture 400 feet of the 600 foot displaced threshold to provide additional runway length.

Runway 7-25 is primarily used for general aviation operations because it provides the best wind coverage at 10.5 knots of the three runways. In 2007 the runway was adjusted to 4,000 feet by 100 feet for use by small and light business jet aircraft.

Table 4-6 identifies the runway width required for each runway based on FAA Advisory Circular 150/5300-13A, *Airport Design.* All runways meet the design standard width.

4.1.4 Runway Length Comparison with Other Airports

ROC operates in a very competitive service area. The airport is in close proximity to commercial service airports in Syracuse (SYR) and Buffalo (BUF), but has shorter primary and secondary runway lengths. **Table 4-7** is a comparison of the runway lengths of Rochester International Airport with the other commercial service airport's within its service area, specifically Syracuse Hancock Airport (SYR) and Buffalo International Airport (BUF).

Table 4-7 – Runway Length Comparison with Other Airports

Airport	Runway	Length
ROC	Runway 4-22 Runway 10-28 Runway 7-25	8001 x 1150 6401 x 150 4000 x 100
SYR	Runway 10-28 Runway 15-33	9003 x 150 7500 x 150
BUF	Runway 5-23 Runway 14-32	8829 x 150 7161 x 150

4.1.5 Runway Line of Sight/Visibility Zone

The runway line of sight requirements facilitate coordination among aircraft, and between aircraft and vehicles that are operating on active runways. This allows departing and arriving aircraft to verify the location and actions of other aircraft and vehicles on the ground that could create a conflict. The line of sight between intersecting runways is any point 5 feet above runway centerline and in the runway visibility zone must be mutually visibly with any point 5 feet above the centerline of the crossing runway and inside the runway visibility zone. The runway visibility zone is defined as an area formed by imaginary lines connecting the two runway line of sight points. The old electric building and the ARFF building are within the ROC visibility zone. Runway activity is controlled by the air traffic control tower.

4.1.6 Taxiway and Taxilane Requirements

Taxiways and taxilanes are the pathways for aircraft to move to locations on the airport. Taxilanes are specific to aircraft parking areas, analogous to the aisles in a vehicle parking lot. The taxiways at ROC serve to move aircraft between the terminal building and the runway, as well as provide means to move corporate/general aviation aircraft between the fixed based operator (FBO) and the runways. They also provide movement for cargo aircraft from the runways to the northwest quadrant of the airport. Parallel taxiway, as the name implies, run parallel to a runway and provide the most efficient route to runway ends, thereby reducing delay times and improving airport efficiency.

Design standards dictate the separation requirements between runway and parallel taxiways, along with the widths of each taxiway. A new taxiway design standard nomenclature was published by FAA in the most recent edition of Advisory Circular 150/5300-13A. The new standard introduced the term Taxiway Design Group (TDG) for classifying taxiways, and is based on the landing gear dimensions. Past practice was to define taxiway criteria based on the wingspan and tail height of expected aircraft. Some taxiways at ROC will only be used by smaller aircraft, so as a practical matter, taxiways may be constructed to different standards than other taxiways on the airfield. The location of services relative to the runway ends is the primary method of determining the TDG for any given or proposed taxiway. Runway 7-25 hold lines are presently set at 125 feet and should be relocated to 200 feet offset from runway centerline to meet the design standards.

Table 4-4 characterized the generic aircraft fleet at ROC. **Table 4-8** associates the fleet mix with the TDG for application to Rochester's taxiway system.

Table 4-8 – ROC General Fleet Taxiway Design Group

Aircraft Category	Aircraft Type	Sample Aircraft	TDG
Airline Aircraft	Narrow-Body Jets	B737, A320	TDG-3
Air Cargo Aircraft	Wide-Body Jets	A300-600	TDG-5
General Aviation Aircraft	Piston	Beech Baron	TDG-1
	Turboprop	King Air	TDG-2
	Medium Corporate Jet	Citation 10	TDG-3
	Large Corporate Jet	Gulfstream G550	TDG-3

Source: Passero Associates

Table 4-9 applies the Taxiway Design Group to individual taxiways and taxilanes on the airport. Refer to **Figure 4-1** for location of individual taxiways and taxilane ramps.

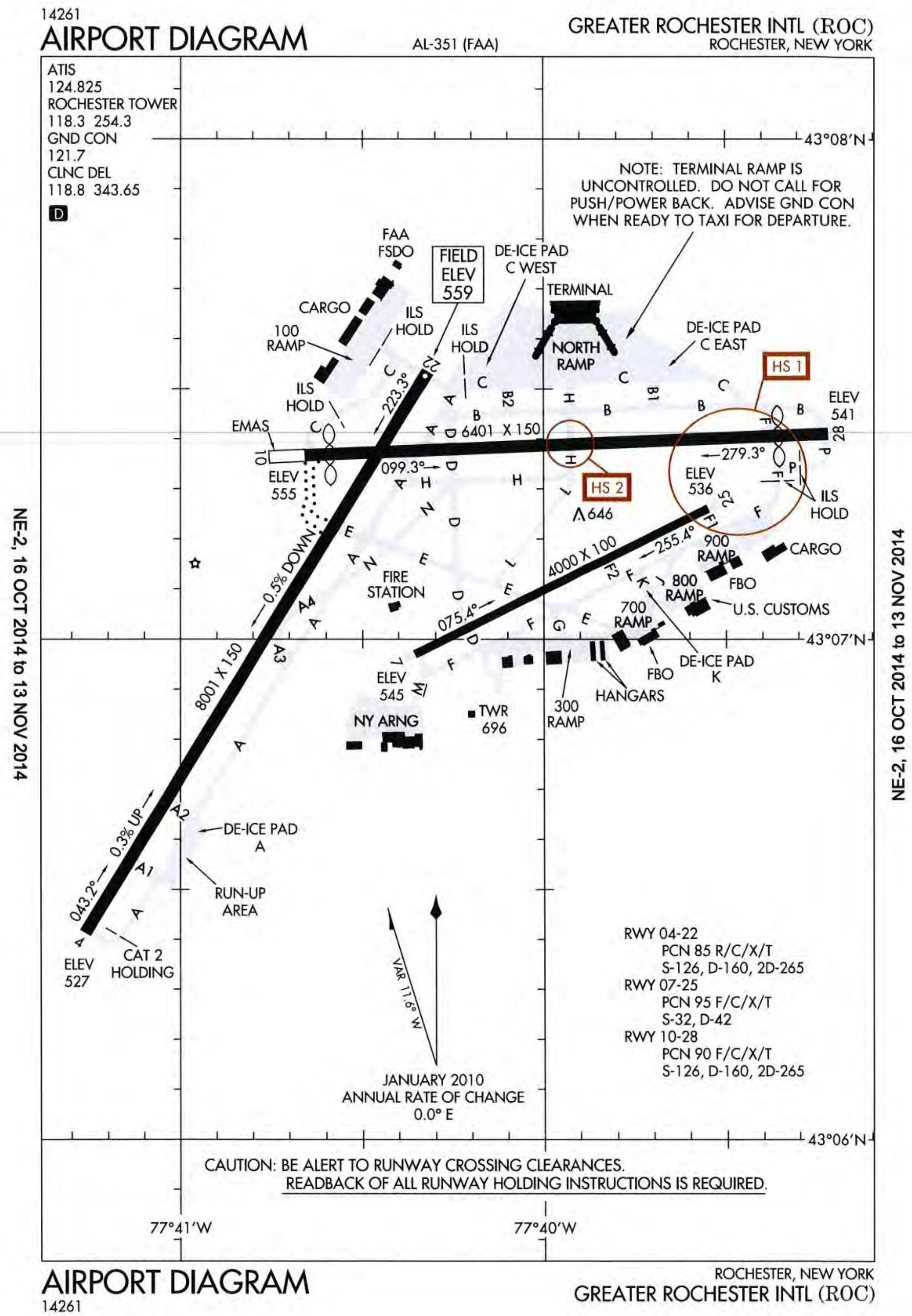
Table 4-9 - ROC Taxiway/Taxilane Design Standards

Airfield Facility	Taxiway Design Code
Taxiway A	TDG 5
Taxiway A1	TDG 5
Taxiway A2	TDG 5
Taxiway A3	TDG 5
Taxiway B (west of F)	TDG 5
Taxiway B (east of F)	TDG 3
Taxiway B1	TDG 5
Taxiway B2	TDG 5
Taxiway C	TDG 5
Taxiway C5	TDG 5
Taxiway D (North of Twy H)	TDG 5
Taxiway D (South of Twy H)	TDG 3
Taxiway E (West of N)	TDG 5
Taxiway E (East of N)	TDG 3
Taxiway F (West of Twy F1)	TDG 3
Taxiway F (East of Twy F1)	TDG 5

Airfield Facility	Taxiway Design Code
Taxiway F1	TDG 3
Taxiway F2	TDG 3
Taxiway G	TDG 2
Taxiway H	TDG 5
Taxiway J	TDG 3
Taxiway K	TDG 3
Taxiway L	TDG 3
Taxiway M	TDG 3
Taxiway N	TDG 5
Taxiway P	TDG 5
100 Ramp Taxilanes	TDG 5
North Ramp Taxilanes	TDG 5
300 Ramp Taxilanes	TDG 2
700 Ramp Taxilanes	TDG 3
800 Ramp Taxilanes	TDG 3
900 Ramp Taxilanes	TDG 3

Source: Passero Associates

Figure 4-1 - Airport Diagram



4.1.6.1 Application of Taxiway Design Standards

Steering Angle: The new taxiway design guidance also covers taxiway intersection alignments. It is recommended aircraft steering angles not exceed 50 degrees. There are two locations where this steering angle is exceeded:

- Taxiway E to A turning north (to access Runway 22 end). Taxiway D, however, provides an operational alternate that bypasses Taxiway A.
- Taxiway A3 turning north on Taxiway A also requires a large steering angle. Taxiway A3 geometry is termed a high speed exit for Runway 22 and requires a turn back to the terminal or the FBO. This design was standard for many years and now the new standard is requiring a larger offset to parallel taxiways when a reversal of direction is necessary.
- New standards specifically identify back to back high speed exits should not be collocated, such as Taxiways A3 and N. The entries to each exit should be separated. Taxiway A3 should be considered for elimination when rehabilitation becomes necessary.
- Taxiway J from the 800 Ramp should be straightened out to a right angle entrance to Taxiway F. Presently, the steering angle is exceeded to proceed west to access either Runway 7 or Runway 4, via Taxiways E and A.

3 Node Concept: Taxiway intersections should be designed so only three choices for continuation are presented to a pilot. This is analogous to a cross road intersection. There are two taxiway intersections that exceed the 3 node concept at ROC. First is the intersection of Taxiway N with Taxiway H and Taxiway D. It is recommended Taxiway N from E to H be eliminated. The second intersection exceeding the 3 node concept is Taxiway G at F and E. Taxiway G should be eliminated with an expansion of the 300 ramp.

The intersection of Taxiways A, B, C, and D is in minimal conformance of the three node concept with minimal separation of centerlines. However, if pilot confusion is observed in this area consideration should be given to reconfiguring the intersection.

Runway Incursions: Part of the revised airport design standard includes consideration of taxiway alignments that reduce the probability of runway incursions. It is suggested that taxiways should not connect directly from an aircraft parking apron to a runway. Runway crossing taxiways should not be in the middle third of a runway due to potential catastrophic high speed collision in this part of a runway. Taxiway H at Runway 10-28 does not conform to either of these design objectives. Taxiway H should be relocated east between Taxiway B and Taxiway C. Taxiway H should be eliminated from Taxiway B to Runway 10-28. This intersection is one of two designated hot spots on the airport. This action should alleviate the hot spot designation.

The Taxiway C intersection with Runway 4-22 from the 100 Ramp and the North Ramp is not the same as the Taxiway H/Runway 10-28 conflict. The orientation of parking on both these ramps requires aircraft to make a turn to align with Taxiway C in order to access the runway.

The required turn is enough to meet the intent of the design standard discouraging direct connections between parking and runways.

Taxiway E from the 700 Ramp should also be eliminated. Expansion of the 700 Ramp should move the connection to the east so a turn on Taxiway F is required prior to entering Taxiway E.

Other Considerations: Lastly it is recommended that Taxiway L be abandoned when it comes time for rehabilitation, as the usage of this taxiway is limited.

4.1.6.2 Proposed New Taxiways

Additional taxiway recommendations to further increase the safety and efficiency of the airfield.

<u>Runway 4-22 Taxiway Requirements</u>

- Provide parallel taxiway on west side to serve as the connection between airport development on the west and Runway 4-22. This taxiway system should be designed to TDG 5 standards for potential airport development, if and when such development occurs.

<u>Runway 10-28 Requirements</u>

- Extend Taxiway H to parallel the full length of Runway 10-28. The proposed taxiway should be designed to TDG 5 standards to provide a more efficient pathway to Runway 4 from the east side cargo operation. This proposed taxiway requires the relocation of the Runway 28 glideslope antenna, and may impact the wind cone and PAPI..
- Taxiway E should be extended to provide direct access to Runway 10. This extension will also provide direct access to the corporate parking exiting Runway 10 and proceeding to the 700/800 ramps via Taxiway E.

<u>Runway 7-25 Requirements</u>

- No new parallel taxiways are recommended for Runway 7-25. Taxiway F provides access to the 300 ramp. Retain this Taxiway for long-term development and apron expansion of the 300 ramp

4.1.7 Airfield Lighting

Table 4-10 identifies the lighting and instrumentation at the airport.

Table 4-10 – Runway Lighting and Instrumentation

Runway	Existing	Required	Deficit
Runway 4-22	HIRL CL Precision Marking	HIRL CL Precision Marking	None
Runway 4 End	ALSF-2 TDZL ILS LPV	ALSF-2 TDZL ILS LPV PAPI	PAPI
Runway 22 End	MALSR VASI (4 box) ILS LPV	MALSR PAPI ILS LPV	Replace VASI with PAPI
Taxiways	Guard Lights	Guard Lights (recommended)	None
Runway 10-28	HIRL Precision Marking	HIRL Precision Marking	None
Runway 10 End	PAPI (4 box) REIL	PAPI REIL	None
Runway 28 End	MALSR ILS PAPI (4 box) LP Approach	MALSR ILS PAPI LP Approach	None
Taxiways	Guard Lights “A” only	Guard Lights (recommended)	Guard Lights
Runway 7-25	MIRL Non-Precision Marking	MIRL Non-Precision Marking	None
Runway 7 End	REIL NPI (RNAV)	REIL PAPI LP/LPV	PAPI LP/LPV
Runway 25 End	REIL PAPI (4 box) NPI (RNAV)	REIL PAPI LP/LPV	LP/LPV

Source: Published Data

HIRL – High Intensity Runway Lights
CL – Centerline Lights
ALSF2 – High Intensity Approach Lighting System with Sequenced Flashing Lights, Category II Configuration
PAPI – Precision Approach Path Indicator
REIL – Runway End Identifier Lights
TDZL – Touchdown Zone Lights
ILS – Instrument Landing System
VASI – Visual Approach Slope Indicator
LP/LPV – Lateral Precision/Lateral Precision with Vertical Guidance
MALSR – Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights
NPI – Non-Precision Instrument

Each runway end should be equipped with a Visual Glide Slope Indicator (VGSI) meeting FAA standards. Currently, Runways 4 and 7 are not equipped, and therefore it is recommended.

VASI are older equipment, and should be considered for replacement with a PAPI, when the need arises. The reclamation of Runway 28 threshold will impact the approach lighting that will need to be reconfigured with FAA input. Similarly an extension to Runway 4 would impact the approach lights that would need to be reconfigured with FAA input as well.

4.1.8 Instrument Approach Procedures

Chapter 2 of this report identified the existing instrument approach procedures at the airport, and the associated airfield lighting. This section will identify potential for improved RNAV procedures with vertical guidance. RNAV is an acronym for aRea NAVigation and encompasses a variety of equipment on aircraft. The most common equipment is GPS navigation receivers and Flight Management Systems that compute positional data from a variety of sensors. RNAV is a method of navigation suitable to complete enroute, transition and approach to land phases of flight. FAA is currently working toward development of prescribed routing that encompasses takeoff to cruise to descent and land. The procedures under development will allow more efficient aircraft operations. This can conserve flight distance, reduce congestion, and allow flights into airports without ground based equipment. Types of RNAV approach procedures include:

- **LNAV**: lateral navigation refers to navigating over a ground track with guidance from installed equipment, which gives the pilot error indications in the lateral direction only and not in the vertical direction. Left and right deviations of the aircraft are available displayed to a pilot from the desired ground track. In the context of aviation instrument approaches, an LNAV approach (one that uses lateral navigation) is implied to be a GPS-based approach and to have linear lateral guidance. A VOR based approach will have angular lateral guidance.[10]
- **VNAV**: vertical navigation, controlling the vertical movement of an aircraft, or changes in altitude.
- **LPV:** localizer performance with vertical guidance (LPV) are the highest precision aviation instrument approach procedures currently available using GPS, without specialized aircrew training requirements. Landing minima are similar to those in a precision instrument approach with an instrument landing system (ILS), capable of a decision height of 200 feet (61 m) and visibility of 1/2 mile.[11]

Table 4-11 presents the existing RNAV approaches at ROC. The airport currently has an RNAV approach to each runway end, however only Runways 7, 10 and 25 do not have written LPV approaches. According to the FAA Master Status LPV List, dated February 2013, Runway 10, 7 and 25 are awaiting new survey data for LPV analysis to be conducted by the FAA flight procedures team.

[10] FAA Airmen Information Manual
[11] FAA Airmen Information Manual

Table 4-11 – Existing RNAV Approaches

Runway	Existing RNAV Approach	Minima (elevation above TDZE/Visibility in miles)				Recommendation
Category		A	B	C	D	
4	LPV	331/ ¾				None
	LNAV/VNAV	786/ 2 ¼				
22	LPV	200/ ½				None
	LNAV/VNAV	440/ 1				
10	LNAV	404/ 1		404/ 1 ¼		New Survey for LPV
28	LPV	291/ 1				None
	LNAV	792/ 1		792/ 1 ¾	792 / 2	
7	LNAV	651/ 1		651/ 1 ¾	651/ 2	New Survey for LPV
25	LNAV	471/ 1		471/ 1 ¼	471/ 1 ½	New Survey for LPV

Source: Published Data and Passero Associates

Advisory Circular 150/5300-13A, *Airport Design*, section 205b (3) identifies the requirements for runways with vertical guidance to include: minimum runway length of 3,200 feet, with a width greater than 60 feet (with 75 or 100 feet typically being optimum), and must have at least MIRL with non-precision runway markings. Runway 7-25 measures 4,000 feet by 100 feet with medium intensity lighting and non-precision markings. Both runway ends are also equipped with runway end identification lights, and Runway 25 maintains precision approach path indicator lights (PAPI).

Runway 10 exceeds the minimum requirements for length, width and lighting; and is equipped with runway end identification lights, precision approach path indicator lights (PAPI).

Instrument Approach Procedure Recommendations: Instrument flight procedures are designed and implemented by FAA's Flight Technologies and Procedures Division. Instrument approach procedures are developed based on field surveys of obstructions and their relationship to clear space requirements defined in FAA Order 8260.3B, *Standard for Terminal Instrument Procedures (TERPS)*. Each procedure whether it be an ILS, VOR or RNAV has its own clearance criteria as well as other requirements such as airborne equipment, ground based equipment, and airport infrastructure components.

Most instrument approach procedures allow a circle to land minima, where a pilot is allowed to approach and land on a different runway than the one described in the published procedure. Circle to land minima are published with the runway end procedure. The circle to land procedure has its own clearing criteria as well.

This review examines the consistency and continuity of the procedures published for ROC. Inconsistencies are noted, where applicable. Several recommendations for improvements to the published procedures follow.

- **RNAV Rwy 4**

The published LPV minima for Runway 4 are significantly different than the Category (CAT) I ILS minima for Runway 4. The visibility minimum is ¾ mile and the decision altitude is 866 MSL, or 331 feet above the touchdown zone elevation (TDZE). The Runway 4 CAT I ILS minima are ½ mile visibility and 200 feet above TDZE. Contrast this to Runway 22 where the ILS and LPV minima are the same at ½ mile visibility and 200 feet above TDZE. Runway 4 has the infrastructure to support CAT II operations which are even lower minima than the CAT I ILS. It is assumed there is an inconsistency in the survey data for the ILS and LPV for Runway 4. ***Recommendation*:** Perform a survey and update published procedures.

- **RNAV Rwy 7**
  The published LNAV procedure and without a currently published LPV procedure indicate a lack of field survey for IAP development. The LNAV minima are the basic 1 mile for small aircraft, 1-¾ mile or 2 mile for larger aircraft. ***Recommendation*:** Perform a survey and publish new procedures for Runway 7. The 2009 Master Plan Update did not indicate any obstructions disqualifying the runway for an LPV approach.

- **RNAV Rwy 10**
  The published LNAV approach to Runway 10 is the lowest LNAV minimum descent altitude of all the lateral navigation only approaches at ROC. This runway appears to have had a field survey done but it is either older than the LPV criteria or there are obstructions preventing implementation of an LPV. The 2008 Master Plan indicated tree obstructions that may penetrate the Glideslope Qualification Surface used to screen potential LPV candidate runways. ***Recommendation*:** Perform a survey and publish new procedures for Runway 10. Determine obstructions that cause limitations to development of an LPV. Any obstructions identified should be pursued by airport for removal.
- **RNAV Rwy 22**
  The published procedure has the same minimums as the ILS for Runway 22. ***Recommendation*:** None.
- **RNAV Rwy 25**
  The LNAV procedure for Runway 25 has three step-down fixes. The other LNAV procedures at ROC only have two step-downs. Multiple step down fixes are thought to be more difficult to fly than vertically guided approaches. The FAA's Instrument Flying Handbook states, "*A constant-rate descent has many safety advantages over nonprecision approaches that require multiple level-offs at stepdown fixes or manually calculating rates of descent. A stabilized approach can be maintained from the FAF[Final Approach Fix] to the landing when a constant-rate descent is used. Additionally, the use of an electronic vertical path produced by onboard avionics can serve to reduce CFIT [Controlled Flight Into Terrain], and minimize the effects of visual illusions on approach and landing*." ***Recommendation*:** Perform a survey and publish an LPV procedure for

Runway 25. The last master plan does not indicate any obstructions precluding development of an LPV.

- **RNAV Rwy 28**
  The published LPV procedure is the same visibility minimum as the ILS procedure with 41 foot higher decision altitude. Inquiries to FAA resulted in a list of 5 penetrations to the 20:1 and/or 34:1 approach slopes. Two of these are thought to have been removed. Remaining are the perimeter fence and two additional trees off airport property, one by the clover leaf exit and the other across the Erie Canal. It is believed FAA needs to update the approach survey for this runway. Also, if the threshold is relocated as recommended at paragraph 4.1.3, then it will become necessary to relocate the glideslope antenna, adjust the MALSR, relocate the PAPIs and obtain a new survey for all the approaches to Runway 28. ***Recommendation*:** Identify obstructions from this master plan update, remove any obstructions or mitigate as feasible, and coordinate an approach survey with a threshold relocation based on declared distance criteria.
- **Circle to Land Operations**
  Circle to land procedure is available on each published approach except the CAT II ILS RWY 4 procedure. The lowest minima for circle to land is shared by four procedures. These four procedures are the ILS RWY 4, ILS RWY 22, RNAV RWY 10 and RNAV RWY 25. Each of these procedures have 1 mile visibility and allow a minimum descent altitude of 1,060 feet MSL or 501 feet above the airport elevation. In contrast, the straight in LNAV procedure to Runway 7 minima is 1 mile and 1,200 feet MSL or 140 feet higher than circling from four other runways. The four procedures with the lowest circling minimum are also 140 feet to 180 feet lower than the two VOR procedures to Runway 4. The remaining seven procedures have circling minimums of 1 mile or more and minimum descent altitudes ranging from 641 feet to 781 feet above the airport elevation. ***Recommendations*:** Coordinate the circle to land minima to coincide with new surveys as they are obtained.
- **Departure Procedure**
  A published departure procedure is in place at ROC. Departure obstacles are noted on the procedure. The procedure requires radar surveillance. No issues are identified.

4.1.9 Airport Perimeter Road

The airport perimeter road is approximately eight miles long comprised of gravel, and encircles the airfield inside the perimeter fence. This allows for airfield inspections and vehicles to move about the airfield without interfering with aircraft movements on the runways and taxiways. A segment of the perimeter road on the west side of Runway 4-22 is closer to the Runway than is suggested. Recommend realigning this portion of the perimeter road to provide a clear object free area, minimally offset 400 feet from the runway centerline. The realignment of this roadway may impact existing drainage ditches or wetlands. Based on funding and need, paving the entire road should be considered.

4.2 Landside Facilities

Various special studies examining landside facilities were conducted under separate cover including: Air Service Evaluation, May 2013

- Concessions Evaluation, May 2013
- Security Evaluation, June 2013
- Air Cargo Evaluation, July 2013

Given the nature of these individual reports, the existing terminal facilities are adequate to meet the projected needs, and only the number of gates within the terminal building will be analyzed within this report.

Landside Facilities at the Airport consist of support buildings and structures, typically accessible to the airfield, including:

- Passenger Terminal, Parking and Access
- Air Cargo Facilities
- Corporate/General Aviation Facilities (hangars, tie-downs, maintenance, FBO, fuel, vehicle parking)
- Support Facilities (deicing, administration, maintenance and storage)

4.2.1 Passenger Terminal and Concourses

To adequately accommodate the forecasted number of enplaned passengers, the number of gates is an important element. A "gate" is defined as an aircraft parking position near the terminal which is used on a daily basis for loading and unloading passengers. The passenger terminal consists of twenty-one (21) total gate positions in two concourses. Concourse A has eleven (11) gates and Concourse B has ten (10) gates. The Airport Cooperative Research Program (ACRP) Report 25, *Airport Passenger Planning Terminal and Design*, methodologies for gate planning were reviewed. The annual enplaned passengers per gate approach, uses the current ratio of annual enplaned passengers per gate, adjusted for forecast changes in fleet mix and annual load factors; while the departures per gate approach assumes a change in gate utilization. For most airports that assume gate utilization, the departure per gate approach will result in a demand for fewer gates than the annual enplaned passengers per gate approach.

Based on the projected enplanements in Chapter 3 of this report, the annual enplaned passengers per gate were applied, consistent with the previous master plan update. While there are twenty-one (21) total gates, not all gates are being used at this time. Historically the existing gate configuration has accommodated enplanements to the 1.4 million level before reaching capacity. Projected forecasts indicate that the 1.4 million enplanement level will not be realized until 2028, at which time the airport should consider expansion to the terminal building of at least two (2) gates to provide airlines with effective passenger/aircraft turnaround times and greater flexibility in the scheduling of arrivals and departures. Additional passenger terminal gates would also provide leasable space for new airlines. Any additional gates should be situated to accommodate a fleet mix of narrow-body aircraft and larger regional jets, as indicated in the activity demand section of this report. Expansion of the terminal concourses will impact circulation of taxiing aircraft around the terminal ramp, especially relative to Taxiway C. As such the pavement for Taxiway C will need to be offset further to accommodate taxing aircraft.

As an origin and destination (O&D) airport, there is typically a demand for remain overnight (RON) aircraft parking. In the morning, aircraft typically depart to major hub airports where connecting flights are available, and in the evening, those aircraft typically return to ROC to remain overnight until they depart the next morning for the first flight out. Airport Management has indicated there are seventeen (17) aircraft that are parked at fifteen (15) gates overnight. Additional overnight parking is not needed in the short-term; however if the terminal building is expanded, these additional gates would be available for overnight parking as well.

4.2.2 Automobile Parking

ROC experienced an average enplanement growth of 6% from 2002 to 2005, reaching its highest enplanement numbers of 1.4 million in 2005 before declining to its current level of 1.19 million enplanements in 2012. As an O&D airport enplanement growth has a direct correlation to public automobile parking demand.

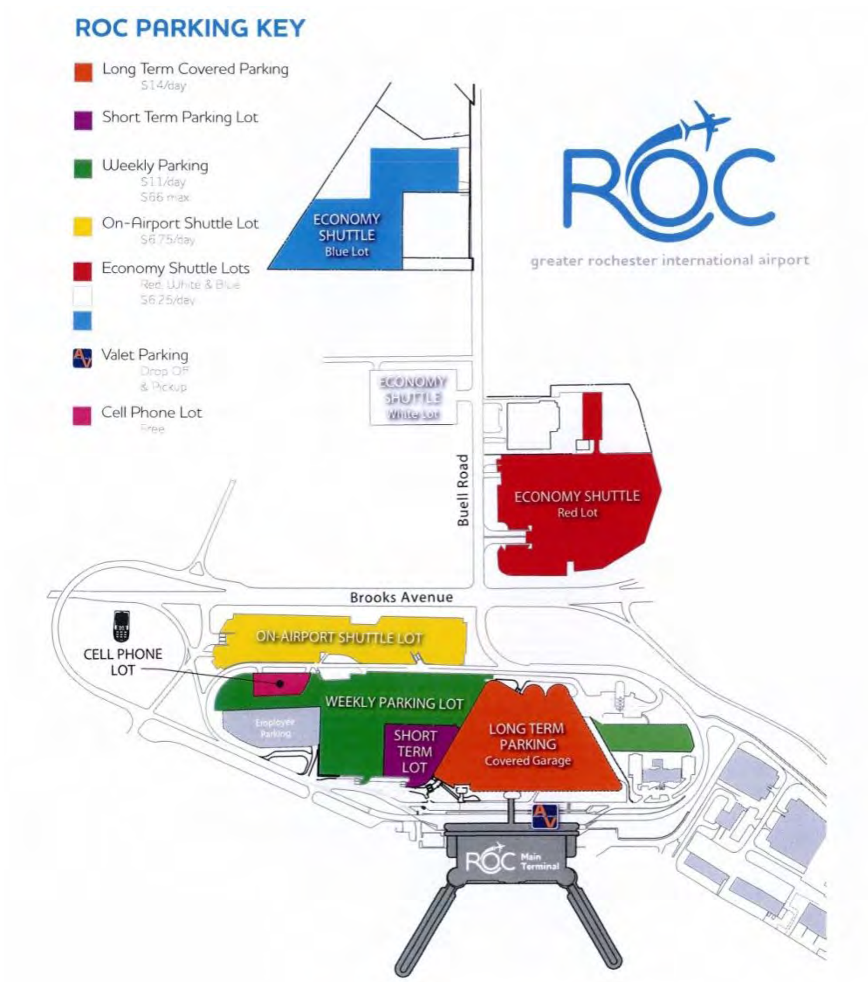
In 2008, an "Automobile Parking Needs Assessment" was completed to determine how to address the need for additional parking. In 2010 the airport expanded the terminal parking garage by 784 spaces to meet the projected demand up to 1.6 million enplanements. **Table 4-12** provides an overview of the total automobile parking spaces that are available, with **Figure 4-2** providing a graphic presentation of their locations.

Table 4-12 – Existing Automobile Parking

Lot	Type	Capacity
Blue	Shuttle	532
White	Shuttle	302
Red	Shuttle	1,174
Yellow	Shuttle	669
Green	Long Term	798
Ramp Garage	Long Term	2,189
Short-Term	< 2 Hours	181
Cell Phone	< 2 Hours	28
Total Passenger Parking	**-**	***5,873***
W. Employee Lot	-	326
Lot A (Employee)	-	108

Source: Passero Associates Airport Base Mapping

Figure 4-2 - ROC Parking Key



Source: Monroe County, Greater Rochester International Airport Website, retrieved June 2013

The parking lots are equipped with parking access and revenue control systems. Some of these systems are dated, approximately 20 years old, causing the maintenance of the systems to be costly due to dated technology. In fall 2013, the airport commenced updating its airport parking access and revenue control system. Based on the *Automobile Parking Needs Assessment* the number of parking spaces is adequate up to 1.6 million enplanements. Above 1.6 million enplanements, consideration should be given to a ramp garage expansion.

The airport cell phone lot is a requirement for all airports to avoid having cars park curbside at the terminal building. Access to the cell lot requires visitors to drive past the terminal building and circle around to the lot. To avoid circling the terminal building, and to expand the cell phone lot capacity, an auxiliary cell phone lot, with direct roadside access prior to the terminal building, should be considered off Terminal Circle.

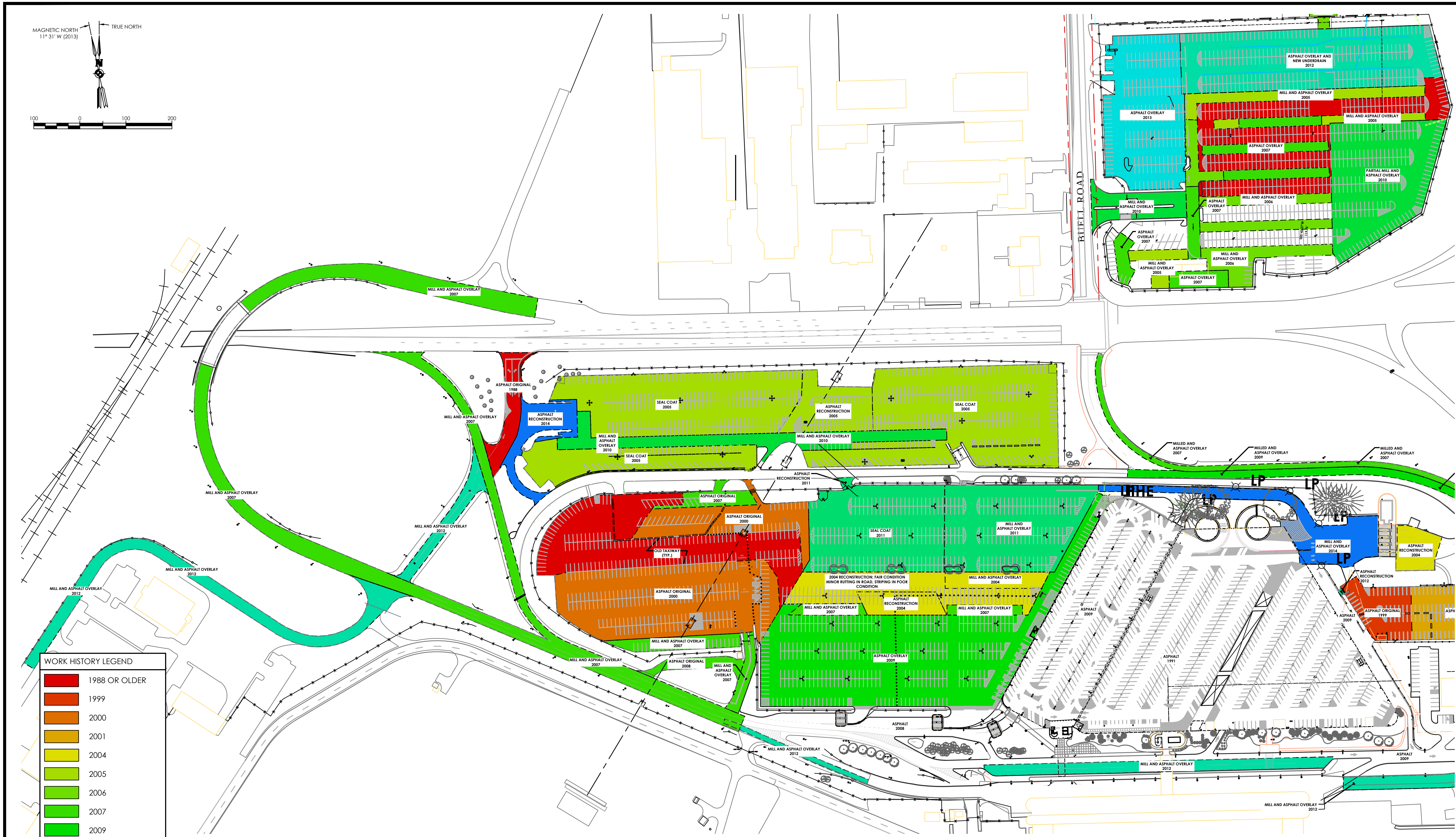
4.2.3 Airport Access

There is one main access roadway to the terminal and on-site parking facilities, termed Terminal Circle, which begins at a Brooks Avenue off ramp. Traffic flows in a counter-clockwise direction around Terminal Circle. Entrances to the various parking facilities are from Terminal Circle. Vehicular traffic for the cargo operation center also uses Terminal Circle and a special exit to Airport Way, before the terminal Building. The Green lot, short term parking and Ramp Garage each have two lane entrances, each with a gate. The Yellow shuttle lot also has one entrance along Terminal Circle and another entrance at the Yellow lot control booth. Terminal Circle road extends behind the parking garage, between the cell lot and the yellow lot, which permits automobiles to continue to circle the terminal area without exiting airport property. Terminal Circle offers a three lane exit onto Brooks Avenue at a signalized intersection. On-going pavement management activity is done on an annual basis. **Table 4-13** is a summary of the last landside pavement assessment, as of February 2013. Portions of pavement, as depicted in red in **Figures 4-3 and 4-4** indicate the oldest pavement that may need rehabilitation; otherwise it is recommended to continue maintenance of pavements as needed.

Table 4-13 – Existing Access Roads

Road	Condition	Year Constructed	Last Year Maintenance
Airport Way	Fair – Alligator Cracks, Opening Seams	1986-1987	Portions: 2013
Jug Handle Entrance Rd	Road – good Shoulders- poor	1990	2007 Entrance: 2013
Short term/long-term entrance	Good	1991	2010
Lower B bypass	Fair – Alligator Cracks, Opening Seams	1991	2012-2013
Arrival Pick up	Fair – Alligator Cracks, Wheel ruts	1991	2012
Departure	Rough surface	1991	Joint repair – 2006
Main Airport Exit	Shoulders – fair to poor	1990	2007 Exit at Brooks: 2013
Return Circle	Alligator Cracks	1990	Portions 2009
Short-term parking	Good	1991	2010
W. Employee Lot	Fair to Poor, Alligator Cracks, Open Joints	1991, 2000	Portions: Original 2000, 2007
Green Lot	Alligator Cracks	1991, 1999-2001	1999, 2001, 2004, 2007, 2009, 2011
Yellow Lot	Fair to good	1998	2005 Portion: 2010
Lot A – East Employee	Good	1998	2006
Lot B –Maintenance	Poor – Alligator Cracks	1988	2005 Entrance 2012
Red Lot	Good to Fair – Rutting, Cracks	-	Portions: 2005, 2010, 2012, 2013
White Lot	Good	-	2005
Blue Lot	Fair to Poor	-	2006-2007

Source: Passero Associates



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EXISTING ACCESS ROADS

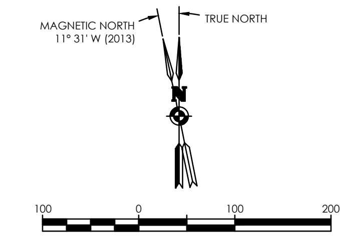
GREATER ROCHESTER INTERNATIONAL AIRPORT
MASTER PLAN UPDATE – ROCHESTER, NEW YORK

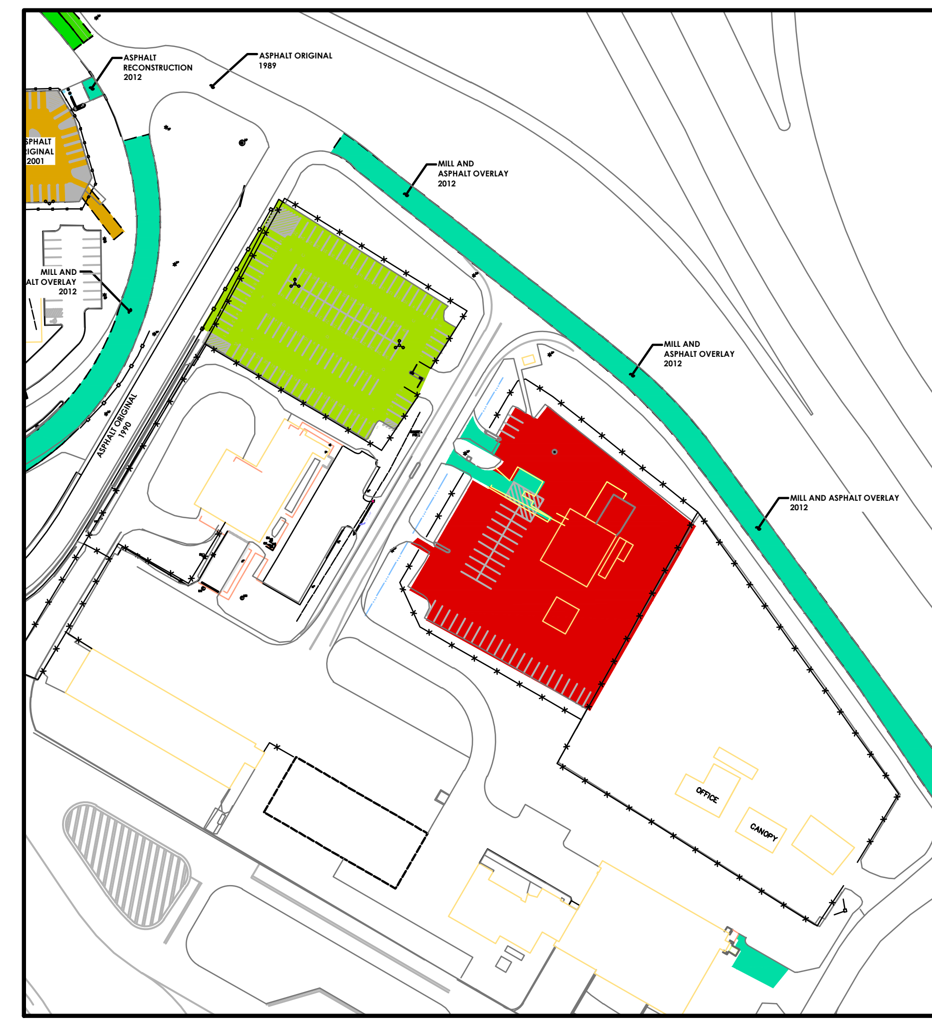
PROJECT NO. 20145.0025

DATE: OCT. 2014

FIGURE 4-3

WORK HISTORY LEGEND	
(red)	1988 OR OLDER
(red-orange)	1999
(orange)	2000
(amber)	2001
(yellow)	2004
(yellow-green)	2005
(light green)	2006
(green)	2007
(bright green)	2009
(green)	2010
(green-teal)	2011
(teal)	2012
(cyan)	2013
(blue)	2014





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EXISTING PARKING LOTS (BUELL ROAD)

GREATER ROCHESTER INTERNATIONAL AIRPORT
MASTER PLAN UPDATE – ROCHESTER, NEW YORK

PROJECT NO. 20145.0025

DATE: OCT. 2014

FIGURE 4–4

4.2.4 Air Cargo Facilities

The *Air Cargo Evaluation*, completed in July, 2013, prepared under separate cover, identified two methods for air cargo, cargo integrators (e.g., FedEx) and the second in the belly of passenger aircraft. Air cargo facilities at ROC are located in the northwest and southeast areas of the Airport. The southeast area is designated for FedEx only. The FedEx building utilizes Airbus A300-600 aircraft. Taxiway F, from FedEx building to Runway 28 can accommodate this ARC D-IV aircraft.

The northwest area of the airport is designated the 100 ramp and used for other air cargo operations. This area encompasses air cargo and US Airports (FBO). The three air cargo buildings, account for 71,250 SF of building space, adjoining 41,000 SY of asphalt apron. **Table 4-14** shows the historic air cargo volume and landing weights for ROC. Air cargo volumes were obtained from the *Air Cargo Evaluation* study, while landing weights were obtained from the FAA Air Carrier Information System (ACAIS). Over the years there has been a decrease in air cargo at ROC as shown in **Table 4-14**

Table 4-14 – Air Cargo Volume and Landing Weight

Calendar Year	Cargo Volume (kg)[1]	Landing Weight (lbs)[2]
2008	48,000,000	301,000,000
2009	45,000,000	284,000,000
2010	44,500,000	266,000,000
2011	40,500,000	257,000,000
2012	40,200,000	262,000,000
% change 2007-2012	-16 %	-22%

Source: [1] Air Cargo Evaluation, July 2013 and Table 2-6 Cargo Forecasts of this AMPU
[2] FAA ACAIS, Cargo, 2007-2012

The *Cargo Forecasts* report provides a modest increase in cargo volume. By 2028 the levels will reach those of 2008, which were approximately 48,577,852 kg, and ultimately forecasted to 53,897,042 by 2033. Volumes anticipated for the long term, if realized, may require additional facilities, or replacement of aged facilities. The current facilities are adequate to accommodate future demand with traditional maintenance upkeep of the facilities.

4.2.5 Corporate/ General Aviation Requirements

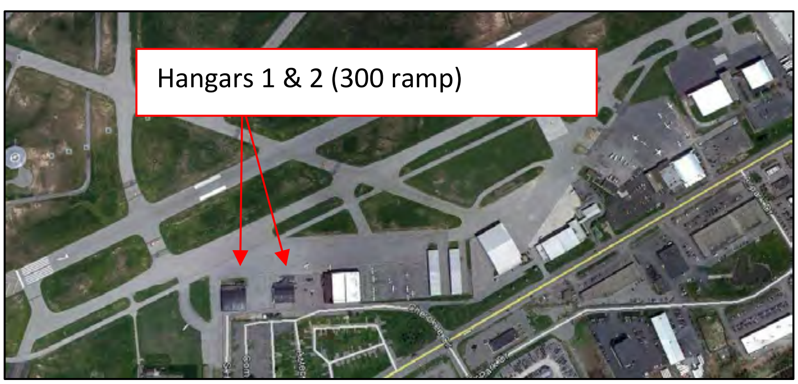
Corporate and general aviation facilities are on the southeast side of the airport, with access directly from Scottsville Road. Related ramps are 300 ramp, where most general aviation hangars and t-hangars are located, and the 700, 800 and 900 ramps which are used by USAirports and private corporations. Smaller general aviation aircraft utilize Runway 7-25, but some corporate aircraft will utilize Runway 10-28 or Runway 4-22.

General aviation facility requirements compared the available conventional hangar, T-hangar, and apron tie down space at ROC, with the projected demand. **Tables 4-15** and **4-16** show the existing hangar and apron space available, but does not include T-hangar space, which will be addressed shortly. It is noted that an assumption of 30 percent of the total conventional hangar space is reserved for storage of maintenance and support equipment.

Table 4-15 – Available Leasable Conventional Hangar Space

Bldg #	Conventional Hangar	Approximate Size (sf)	Condition
18	Jet Smart	15,625	Good
21	US Airports (Hangar #7)	20,000	Good
22	US Airports (Hangar #6)	30,000	Good
25	US Airports (Hangar #3)	22,500	Fair
26	Vacant (Hangar #1)	10,000	Poor
27	Rochester Aviation (Hangar #2)	15,625	Poor
39	US Airports (NW Hangar)	30,000	Good
	Total Conventional Hangar Space	143,750	
	Less 30% Equipment & Maintenance	43,125	
	Available Conventional Hangar Space	**100,625**	

Source: Building # refers to Fig 2-4 Facilities Plan of this document. Approximate size is for hangar only and does not include office space.



Given the conditions of Hangars #1 and #2 on the 300 ramp replacement of these two structures should be considered. The loss of these hangars reduces the available hangar space by 25,625 feet, to a total of 82,688, after accounting for 30% less space for equipment and maintenance. The JetStream (900 Ramp) and Wilmorite (800 Ramp) hangars are excluded from the above mentioned calculations because these spaces are not leasable to outside parties. Together these account for an additional 45,625 square feet of hangar space.

GA facility needs are determined by the number of based aircraft forecast at ROC.

Table 4-16 - Based Aircraft Summary

Aircraft Type	2012	2033
Piston	54	51
Turboprop	9	13
Jet	10	22
Total	73	86

Note: Kodak and Military aircraft are not included in this table.

Source: Passero Associates

In general, owners/operators of corporate jets and turboprops prefer conventional hangar storage. Owners of piston general aviation generally prefer the lower cost T-hangars or apron tie downs. The following assumptions were used to calculate the GA facility requirements for ROC, consistent with the percentages that have been applied to the airport through past planning efforts:

Aircraft Type	Desired Type of Storage	Area Requirements
Piston	20% Hangar	1,200 sf/aircraft
	50% T-Hangar	1,200 sf/aircraft
	30% Apron Tie down	300 sy/aircraft
Turboprop	100% Hangar	2,000 sf/aircraft
Jet	100% Hangar	4,000 sf/aircraft

Based on the aircraft storage assumptions above, required conventional hangar, T-hangar, and apron tie down space were determined for the existing and forecasted based aircraft, and shown in **Table 4-17**. A surplus (deficit) was identified for each type.

Table 4-17 - General Aviation Facility Requirements

Aircraft	2012-Storage Type			2033 – Storage Type		
	Hangar (sf)	T-Hangar (sf)	Apron (sy)	Hangar (sf)	T-Hangar (sf)	Apron (sy)
Piston	13,200	32,400	4,800	12,000	31,200	4,500
Turboprop	18,000	-	-	26,000	-	-
Jet	40,000	-	-	88,000	-	-
Required Area	71,200	32,400	4,800	126,000	31,200	4,500
Available Area	100,625	25,000	29,000	82,688	25,000	29,000
Surplus(Deficit)	29,425	(7,400)	24,200	(43,312)	(6,200)	24,200

Source: Passero Associates

Based on the forecasted increase in jet aircraft, and the condition of Hangars #1 and #2 (near the 300 Ramp), 2033 Hangar storage type has been decreased by the loss of Hangars #1 and #2, 25,625 sf. With this loss, a deficit of hangar space will be experienced in the long-term.

There are 20 T-Hangar units on the airport. By 2033 the demand for T-hangar will be 26 resulting in a deficit. **Table 4-17** shows in square feet what the deficit are. Given the surplus of apron space, the aircraft that would be in T-hangars are likely parking on the apron.

Recommended action to satisfy this shortfall consists of constructing approximately 6,200 square feet of T-hangar space, and an additional 43,312 square feet of hangar space. To minimize the construction of multiple facilities, consideration to incorporate the T-hangar shortfall into the conventional hangar storage can be an alternative.

The general aviation apron are comprises 29,000 square yards. Although there appears to be sufficient apron space, the general aviation apron near the 300/700 ramps are poorly configured to allow for proper aircraft circulation. It is recommended to expand this apron to accommodate sufficient aircraft clearances around parked aircraft.

4.2.6 Fuel Farm Facility Requirements

There is a six tank, 300,000 gallon Jet A, above ground fuel farm for commercial service aircraft, located in the northeast quadrant of the airport. The fuel farm meets all Federal and State environmental requirements for above ground storage tanks. Originally designed with expansion capability, this fuel farm was adequate to meet the historic 1.4 million enplanements, and previous forecasted demand up to 2 million enplanements, thus is adequate to meet the projected forecasts.

In July 2013 a small, 100LL, fuel tank located in the general aviation area, near the 300 ramp was moved to the fuel farm. This tank is suitable to meet the fuel needs for 100LL for the general aviation aircraft.

4.2.7 Aircraft Rescue and Fire Fighting (ARFF) Facility Requirements

The 15,000 sf ARFF building, located midfield, north of the Runway 7 end, provides rapid access to emergency calls on the airfield. In Fall 2013, a new Index C ARFF vehicle was delivered to comply with their FAR Part 139 certification. This facility is sufficient to accommodate the current and future demands of the airport.

4.2.8 Airport Maintenance Facility

In mid 1990's the Regional Transportation Operation Center (RTOC) was constructed encompassing 45,000 square feet, and replacing the 18,000 square foot maintenance building. This facility provides storage for maintenance equipment. This facility is located along Scottsville Road, in the northeast corner of the airport, north of FedEx, and connects directly to the airport perimeter road. While this facility was anticipated to be sufficient to accommodate current and forecasted maintenance equipment and storage demands of the Airport, the RTOC Facility currently is at capacity, as Airport activity increases and additional equipment is required, the expansion of the current building or the addition of a supplemental maintenance garage facility should be considered.

4.2.9 Deicing Facilities

The airport has six areas set aside for deicing aircraft, four of which are depicted on **Figure 4-1.** The cargo areas (FedEx ramp and the 100 ramp) are the two additional deicing areas not shown on Figure 4-1. All six areas are configured to drain to sanitary sewers during deicing season. Monroe County Pure Waters, a County agency, manages flow rates into the sewer. Gate deicing is also permitted as apron grading permits the fluid to be collected and conveyed to the sanitary sewer system and county owned treatment plant. Vacuum trucks for surface collection should be considered for increased fluid collection on the air carrier apron.

Fresh, unused deicing material is stored in the fuel farm area on a pad for secondary containment. The parcel east of the glycol pad was previously remediated for old tanks, and cannot have any construction lower than 12 inches.

4.2.10 Airport Property

The FAA recommends that airports control their runway object free areas and runway protection zones. A review of airport property and these design surfaces reveals that the airport does not maintain control over portions of the runway protection zone (RPZ) that extend beyond airport property.

A potential Runway 4 extension would result in additional land acquisition, as the RPZ is shifted with the runway. The Runway 22 RPZ extends over a developed industrial/commercial corridor. Avigation easements should be considered for this area to limit the height of future development. The airport should continue with their efforts to acquire lands in this area, as they become available, for potential lease for compatible, revenue generating purposes.

The Runway 10 RPZ contains the Rochester and Southern Rail Line and extends over some residential areas. As these lands become available the airport sponsor should acquire the properties for compatible land uses and airspace preservation. Similarly, Runway 28's RPZ should be purchased to recapture the Runway 28 displaced threshold.

4.2.11 Airport Fencing/Gates

The entire airfield operations area (AOA) is surrounded by a combination of buildings and perimeter security fence, made of chain link fabric. In fall 2013, a small portion of fence, near the 900 Ramp, was upgraded to an eight foot fence with one foot barbed wire to be consistent with the remainder of the airport fence. The remainder of the airfield fencing should continue being monitoring, and replacement, or maintenance should be conducted when required.

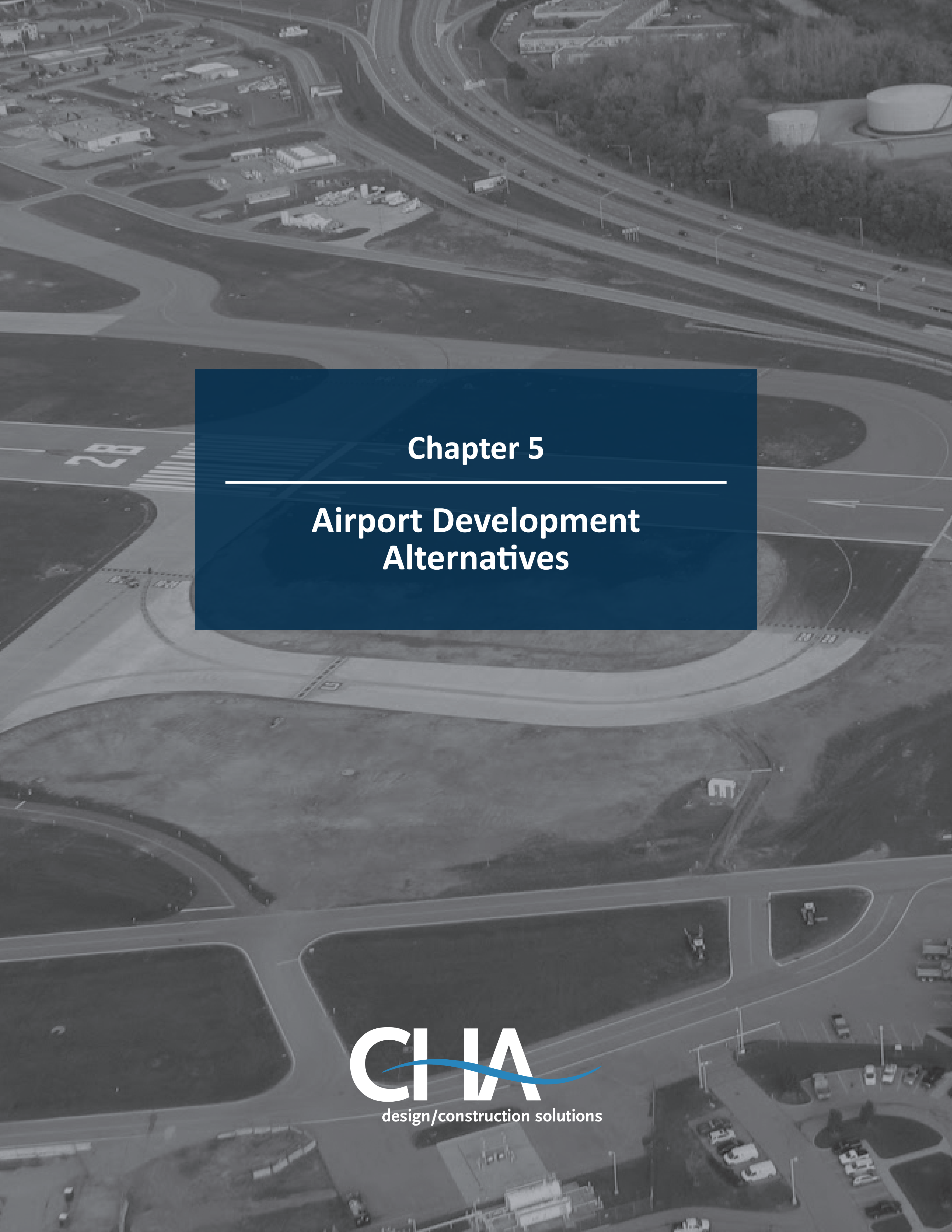
The airport perimeter fence contains various gates around the airfield. Each gate is marked and controlled, however some of the gates are manual. It is recommended to eliminate manual gates where practical and replace with fence fabric, especially gates that are not used. Provide lights at access gates should also be considered.

4.3 Facility Requirements Summary

Table 4-18 summarizes key facility deficits at ROC. The deficits are used to develop the alternatives, which will be presented next in this report.

Table 4-18 – Airport Facility Deficits

Facility	Key Deficit
Airside Deficits	
Runway 4-22 Length	• Consider long-term extension to 9,000' - 9,200'
Runway 10-28 Length	• Reclaim 400' of the 600' Runway 28 displaced threshold through obstruction review/mitigation and declared distance parameters
Lighting	• Install Runway 4 PAPI • Install Runway 7 PAPI • Install Taxiway Guard Lights on Runway 10-28 • Replace VASI with PAPI as needed • Relocate Runway 28 approach lighting, with relocated threshold • Relocate Runway 4 approach lighting with extension
Taxiways	• Remark taxiway hold lines for Runway 7-25 from 125' to 200' from runway centerline • Remove/Relocate Taxiway G • Relocate Taxiway E from 700 Ramp to Taxiway F • Realign Taxiway J to be perpendicular to Taxiway F • Relocate Taxiway H between Taxiway B1 and Taxiway B2 • Extend Taxiway H to full length of Runway 10-28 • Extend Taxiway E to access Runway 10 • Construct parallel Taxiway on west side of Runway 4-22 • Retain Taxiway F for access to 300 Ramp expansion
Aprons	• Expand General Aviation/FBO apron (i.e., Apron 300/700)
Instrument Approach Procedures	• Perform an approach survey for Runway 7 • Perform an approach survey for Runway 25 • Update the procedure to Runway 4 • Coordinate the circle to land minima to coincide with new surveys as they are obtained • Mitigate any Runway 28 identified obstructions, notify FAA of removal. • Coordinate Runway 28 threshold relocation with FAA, Perform new approach survey for relocated threshold • Demolish VOR/Electric Building and provide individual support buildings
Airport Perimeter Road	• Relocate the airport perimeter road on the west side of Runway 4-22 outside the OFA • Pave the airport perimeter road
Landside Deficits	
Passenger Terminal Area	• Expand number of terminal gates as enplanements approach 1.4 million • Expand Taxiway C to accommodate additional terminal gates
Airport Access Roads/Parking	• Continue annual maintenance/refurbishment contracts as needed • Consider expanding the parking garage when enplanements exceed 1.6 million • Relocate/expand cell phone lot
Conventional Hangar	• Expand area behind 300 ramp for additional hangar/apron development (replacement of Hangars #1 and #2 in this area)
Property Acquisition/Easements	• Acquire lands (fee or easement) within RPZs as they become available
Airfield Fencing/Gates	• Replace manual gates with chain link fabric • Add security lights at gates



Chapter 5

Airport Development Alternatives

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design/construction solutions

5 Airport Development Alternatives

The primary focus of this element of the Master Plan Update for the Greater Rochester International Airport (ROC) is the identification and evaluation of development alternatives to be considered as key components of the overall Airport's improvement strategy. This chapter provides development strategies to accommodate future aviation demand identified in Chapter 2, *Forecasts of Aviation Demand*, as well as any deficiencies or constraints identified in Chapter 3, *Facilities Analysis and Requirements*. The overall goal of this analysis, as stated in Federal Aviation Administration (FAA) Advisory Circular (AC) 150/5070-6B, *Airport Master Plans*, is to:

- Identify alternative concepts to address previously identified facility requirements.
- Evaluate these alternatives, individually and collectively, so there is a clear understanding of strengths, weaknesses, and implications of each.
- Select a reasonable alternative.

Development alternatives, or concepts, may focus on demand/capacity relationships, operational safety, and/or improving the Airport's revenue stream. Additionally, it may be necessary to include development concepts for future years beyond the term of the planning period, in order to protect areas reserved for future runway or taxiway development, facility expansion, etc.

The development concepts presented in this chapter are organized based on specific areas at the Airport (e.g. airfield, terminal, general aviation [GA] campus, associated land uses on airport owned properties, etc.). From this effort, and using the previously determined facility requirements, the most reasonable and feasible alternative was identified for each area. The alternatives identified represent a level of detail consistent with FAA guidance for a master planning effort.

The following sections summarize previous findings related to facility requirements and the approach and objectives of the alternative development process.

5.1 Influencing Development Factors

There are several factors that influence the evaluation of the alternatives and determine the final recommended development plan. These factors include:

- **FAA Design Standards and Guidance** – Airfield recommendations and designs consistent with the guidance provided by FAA AC 150/5300-13A, *Airport Design*
- **Environmental Impacts** – Evaluation of the potential impacts on the environment
- **Consistency with Master Plan Objectives**:

  - **Aviation Demand** – Accommodating projected passenger and operational growth
  - **Airfield/Terminal Capacity** – Satisfying the projected needs and constraints of the terminal and airfield
  - **Airport Property Development** – Commercial and aeronautical development capability associated with on-airport land use compatibility
- **Construction and Maintenance Costs** – The overall project feasibility, associated costs, constructability, and financing.

Each of these influencing factors and will be considered in the evaluation and feasibility determination of each development alternative.

5.2 Summary of Facility Requirements

Table 5-1 summarizes the facility requirements identified in the previous chapter.

Table 5-1 – Facility Requirements Summary

Airside	
Runway 4-22 Length	• Consider long-term extension to 9,000’-9,200’
Runway 10-28 Length	• Reclaim 400’ of the 600’ Runway 28 displaced threshold through obstruction review/mitigation and declared distance parameters
Lighting	• Install Runway 4 PAPI • Install Runway 7 PAPI • Install Taxiway Guard Lights on Runway 10-28 • Replace VASI with PAPI as needed • Relocate Runway 28 approach lighting, with relocated threshold • Relocate Runway 4 approach lighting with extension
Taxiways	• Remark taxiway hold lines for Runway 7-25 from 125’ to 200’ from runway centerline • Remove/Relocate Taxiway G • Relocate Taxiway E from 700 Ramp to Taxiway F • Realign Taxiway J to be perpendicular to Taxiway F • Relocate Taxiway H between Taxiway B1 and Taxiway B2 • Extend Taxiway H to full length of Runway 10-28 • Extend Taxiway E to access Runway 10 • Construct parallel Taxiway on west side of Runway 4-22 • Retain Taxiway F for access to 300 Ramp expansion
Aprons	• Expand general aviation/FBO apron (i.e., Apron 300/700)

Table continued on the next page

Instrument Approach Procedures	• Mitigate any Runway 28 identified obstructions, notify FAA of removal. • Coordinate Runway 28 threshold relocation with FAA, Perform new approach survey for relocated threshold
Airport Perimeter Road	• Relocate the airport perimeter road on the west side of Runway 4-22 outside the OFA • Pave the airport perimeter road
Landside	
Passenger Terminal Area	• Expand number of terminal gates as enplanements approach 1.4 million • Expand Taxiway C to accommodate additional terminal gates
Airport Access Roads/Parking	• Continue annual maintenance/refurbishment contracts as needed • Consider expanding the parking garage when enplanements exceed 1.6 million • Relocate/expand cell phone lot
Conventional Hangar	• Expand area behind 300 ramp for additional hangar/apron development (replacement of Hangars #1 and #2 in this area)
Property Acquisition/Easements	• Acquire lands within RPZs as they become available
Airfield Fencing/Gates	• Upgrade/Remove manual gates and replace with automatic security gates • Install security badge readers and cameras to all entrances • Install security lights at gates

Note: Summary provided in Chapter 3, *Facilities Analysis and Requirements.*
*Seek FAA Modification of Standards as an alternative

5.3 Airside Alternatives

The airfield facility requirements identified potential improvements needed to meet the FAA design standards for taxiways and runways, as well as potential future development opportunities beyond the 20-year planning period. As previously mentioned in Chapter 3, the airfield facility requirements analyses show that there are minimal capacity restraints and the existing airfield is capable of satisfying the increasing activity demand throughout the 20-year planning period. Nevertheless, there are areas on the airfield that, if improved upon, could optimize the overall use and functionality of the airfield.

5.3.1 Runway Alternatives

As discussed in Chapter 3, the facility requirements identified deficiencies associated with the current layout of the primary and secondary runways at ROC. The main deficiencies are the published declared distances, and runway length needed to serve the future commercial fleet mix at the Airport. According to the facility requirements for Runway 10-28:

"*A review of aircraft performance charts for the EMB 190 series, adjusted for airfield conditions yields a length of approximately 7,650 feet at maximum gross takeoff weight*."

With the current physical constraints on the airfield (i.e., Railroad and Interstate 390), extending the runway beyond its current layout will be difficult and ineffective. However, with a 600ft. displaced threshold on the Runway 28 end, attaining as much runway length possible is recommended to improve the functionality and operational efficiency on the airfield. The current length of the Landing Distance Available (LDA) associated with Runway 28 is 5,801ft. However, in specific conditions (i.e., icy and wet precipitation) the current LDA does not ensure operational safety and maximum functionality of the runway due to the longer length requirements to support the current and projected commercial fleet mix utilizing ROC. By displacing the threshold to include 400ft. more LDA, the utilization of Runway 10-28 will increase and provide necessary length for landing distance during these conditions. **Table 4-2** shows the published declared distances of Runway 10 and 28.

Table 5-2 - Declared Distances as published by FAA

Runway	Take-off Run Available (TORA)	Take-off Distance Available (TODA)	Accelerate to Stop Distance Available (ASDA)	Landing Distance Available (LDA)
10	6,401	6,401	5,801	5,501
28	6,401	6,401	6,401	5,801

Source: Airport Master Records 5010 Form, CHA, 2014.
Note: All lengths provided in feet

Additionally, an extension to the primary Runway 4-22 is recommended to be included in the Airport Layout Plan (ALP). Although the projected growth in operations and stage lengths will not exceed the available runway length, an extension is recommended to be shown on the ALP for the purposes of reserving the land and airspace necessary to meet FAA requirements. The following concepts address these requirements.

5.3.1.1 Runway Alternative 1 – Runway 28 Displacement

Alternative 1 (**Figure 5-1**) illustrates that 400ft. of the current 600ft. Runway 28 Displaced threshold would be recaptured to extend the current LDA from 5,801 to 6,201ft. As part of this scenario, the current 600ft. displaced threshold would be reduced to 200ft. in length. This alternative does not require extending any pavement. The benefit of the additional 400ft. is to have an adequate landing distance for use by commercial airlines and cargo service providers.

Design Standard Considerations

Though the Runway 28 displaced threshold is 600ft. in length, it is not feasible to reclaim the entire length for runway extension. With the proposed shift of the Runway 28 end, the Runway Safety Area (RSA), Runway Object Free Area (ROFA), and Runway Protection Zone (RPZ) would correspondingly shift. As such, the associated safety area impacts would make elimination of the displaced threshold cost prohibitive. FAA guidance requires the RSA and ROFA for Runway 28 to extend 600ft. beyond the landing threshold. As a result, a portion of Interstate 390 would be located within the RSA and ROFA if the full displaced threshold were removed.

The most reasonable solution is to recapture 400ft. more of landing length as the associated impacts would be minimized while capturing as much distance towards the Runway 28 LDA length as possible. The available clearance area off the east end of the runway provides enough space for the safety area.

The proposed alternative would not affect the declared distances associated with Runway 10. With the 400ft. shift in the threshold, typically the safety areas would also shift. However, for this alternative, the declared distances would be retained as the Runway 10 distances at their current length. Prevailing winds rarely favor use of Runway 10.

Construction and Maintenance Costs

With the displaced threshold shift, the RPZ would also have associated impacts. As previously mentioned, the Runway 10 declared distances would not be affected; therefore the departure RPZ would remain in the same location with no associated impacts. However, the Runway 28 approach RPZ would correspondingly shift and, as result, a small portion of the residential neighborhood on the east side of Interstate 390 would be affected. The new RPZ location would encompass four homes and portions of four additional residential properties. For the purposes of this alternative, it is recommended that these properties be acquired through voluntary acquisition. The displaced threshold and RPZ would also have associated impacts on the Runway 28 approach navaids and lighting systems, specifically the Medium Intensity Approach Lighting System With Runway Alignment Indicator (MALSR), Precision Approach Path Indicators (PAPI), and the Instrument Light System Glide Slope (ILS GS). This displacement and associated MALSR/PAPI/ILS GS shift requires FAA involvement and necessitates a feasibility study for the MALSR, PAPI, and ILS GS relocations.

Additionally, as part of this alternative, it is recommended to shift the existing Runway 28 departure RPZ 300ft. to the west. The existing departure RPZ is located 200ft. from the current displaced threshold of Runway 10. In order to effectively utilize the proposed runway length and declared distances for Runway 28, it is necessary to depict the RPZ in compliance with FAA design standards. As such, FAA guidance requires the Runway 28 departure RPZ to begin 200ft. beyond the end usable runway pavement. Therefore, the RPZ would begin 200ft. beyond the departure end of Runway 28. This would result in the 300ft. shift of the Runway 28 RPZ. Consequently, this shift will impact approximately eight residential properties that will be located fully or partially within the proposed departure RPZ. Therefore, it is recommended the Airport pursue voluntary acquisition of the homes within the departure RPZ.

5.3.1.2 Runway 4 Extensions

Runway Alternative 2A - Runway 4 Extension

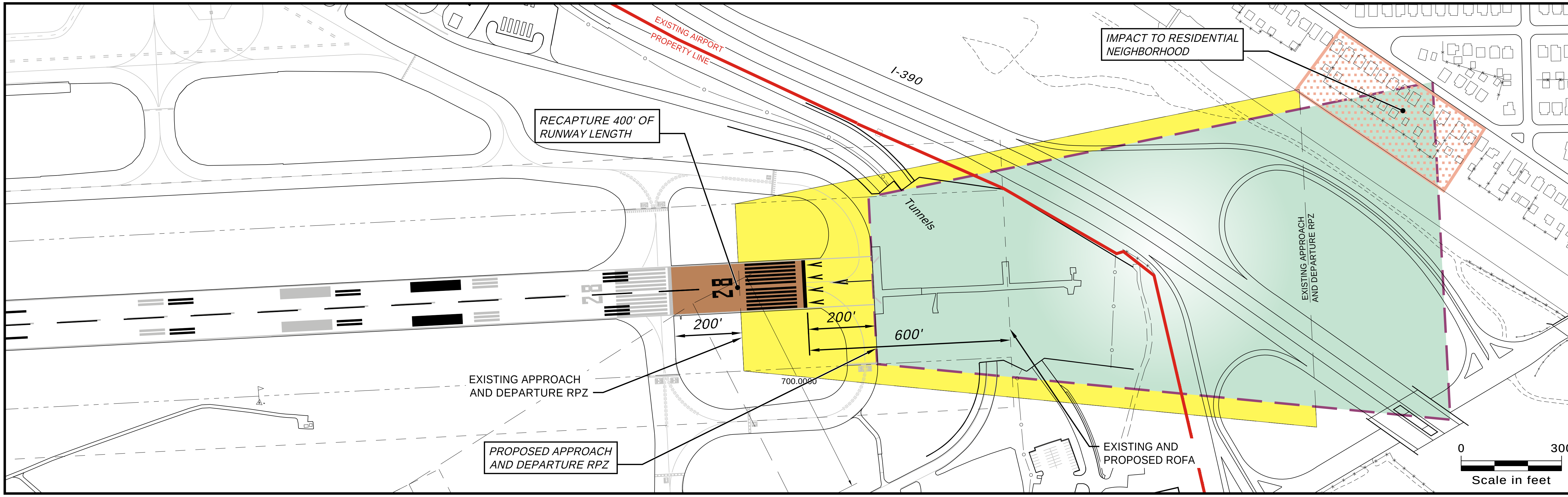
As shown in **Figure 5-2**, Alternative 2A recommends a 1,000ft. extension to the current runway length of 8,001ft. to Runway 4. This extension would effectively reserve the land and airspace necessary for expansion should demand exceed capacity, or the Airport begin service on longer haul routes associated with airline route expansion.

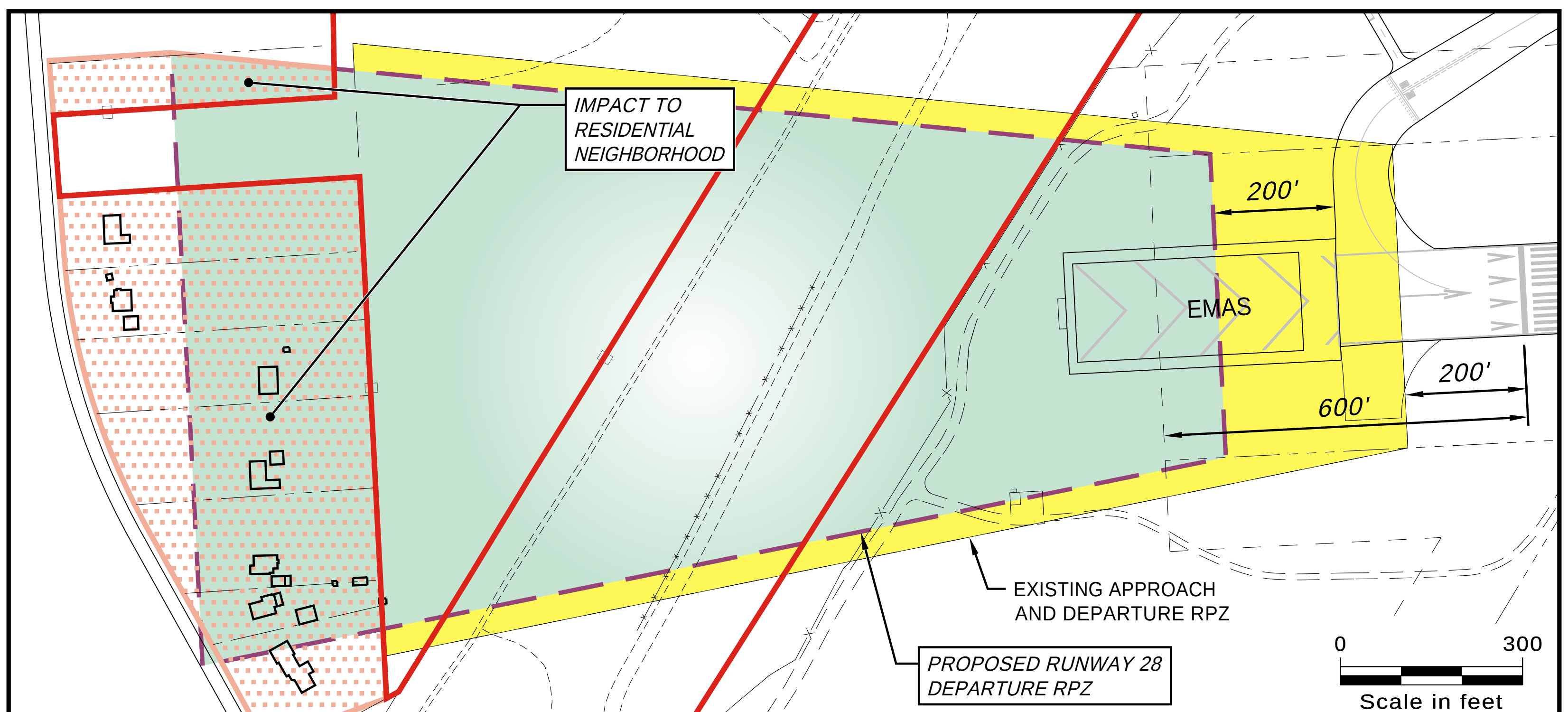
As discussed in Chapter 3, "*for all airline aircraft to operate unconstrained (at MGTOW), a runway length of 9,000 to 9,200 feet is required*." With the additional 1,000ft., Runway 4-22 would then be able to adequately accommodate future aircraft. Additionally, the safety areas (i.e. ROFA and the RSA) associated with the runway extension may have associated environmental impacts (e.g., wetlands, flood plains, etc.) however the area is free of development.

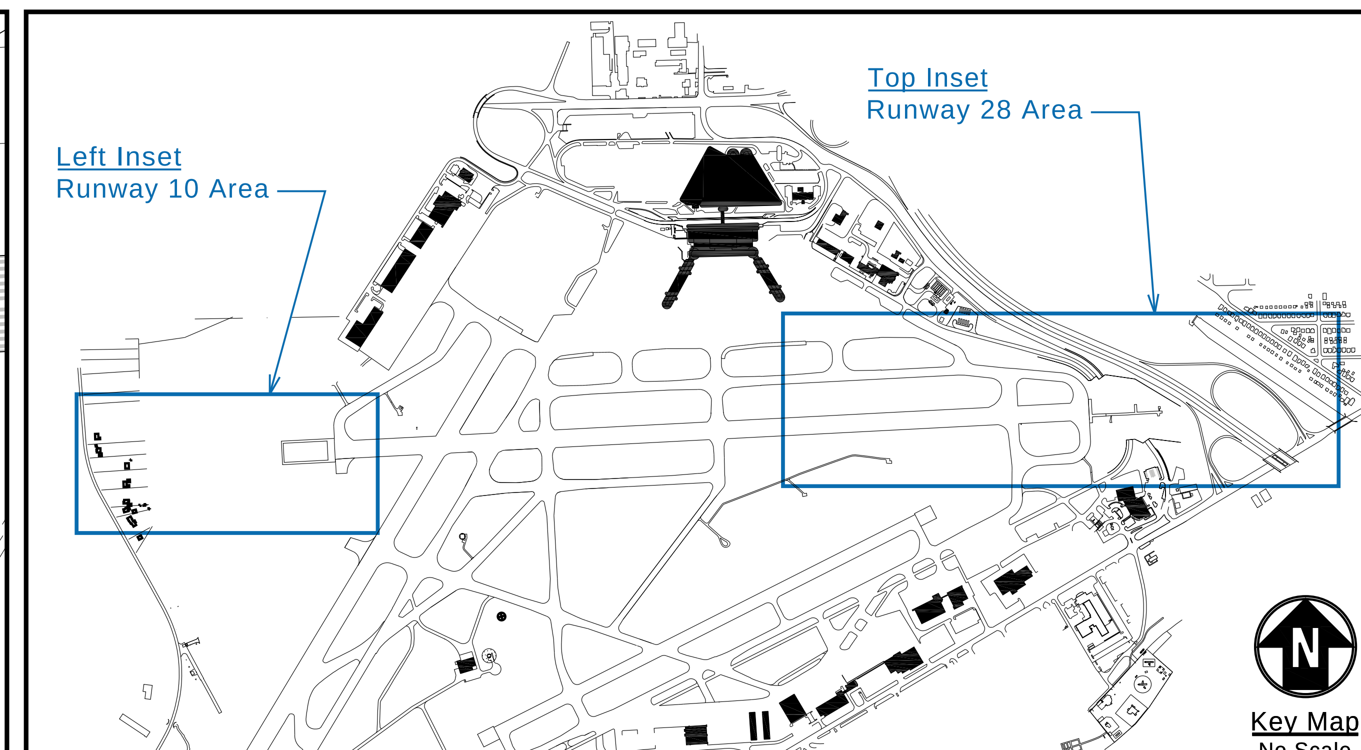
Runway Concept 2B – Runway 4 Extension

Alternative 2B recommends a 1,200ft. extension to Runway 4-22. This is the maximum length extension due to property and clearance restrictions. The longer runway would support heavier aircraft and/or longer haul routes that could be associated with airline route expansion (e.g., airline service to the West Coast), maintenance repair and overhaul (MRO), cargo, aircraft manufacturing or long-haul international type operations (e.g., airline route expansion with direct routes to Caribbean, Western Canada).

However, as shown in **Figure 5-3**, with the additional 1,200ft., the Object Free Area (OFA) would not provide the 1,000ft. length required by the FAA due to Paul Road directly off the southern most portion of the Runway 4 end. Therefore, it was determined that this concept was not the most practical alternative for functionality of the airfield and will not be recommended.







LEGEND

- Impact to Residential Areas
- Proposed RPZ
- Existing RPZ
- Airport Property Line

RPZ Dimensions*	
Inner Width	500'
Outer Width	1,010'
Length	1,700'

*Visibility Not Lower Than 1 Mile

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RUNWAY ALTERNATIVE 1
RUNWAY 28 DISPLACEMENT

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FIGURE 5-1

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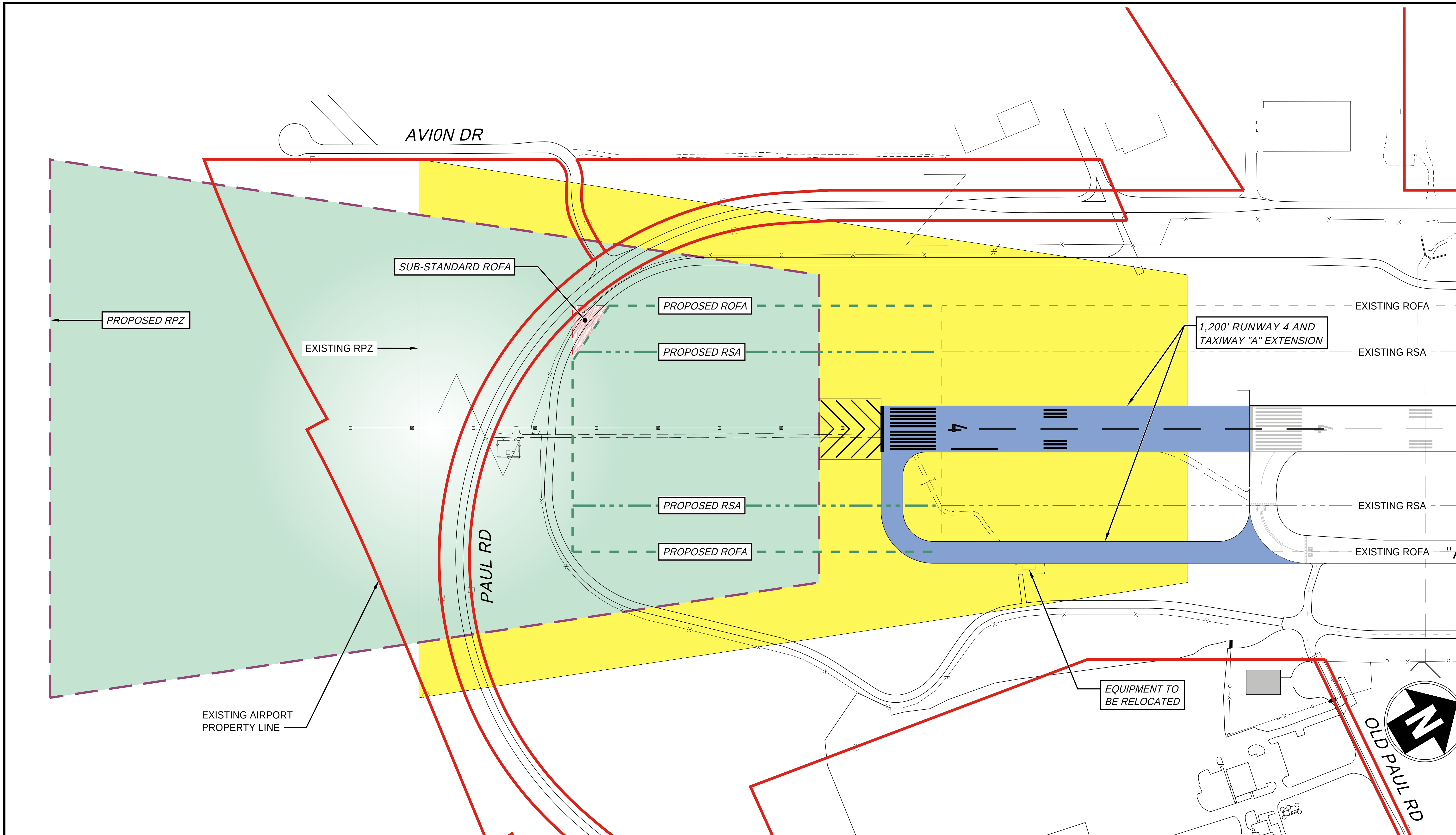

LEGEND

Proposed RPZ

Existing RPZ

Airport Property Line

Proposed Pavement

0 300 Scale in feet

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RUNWAY ALTERNATIVE 2B
RUNWAY 4 EXTENSION

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FIGURE 5-3

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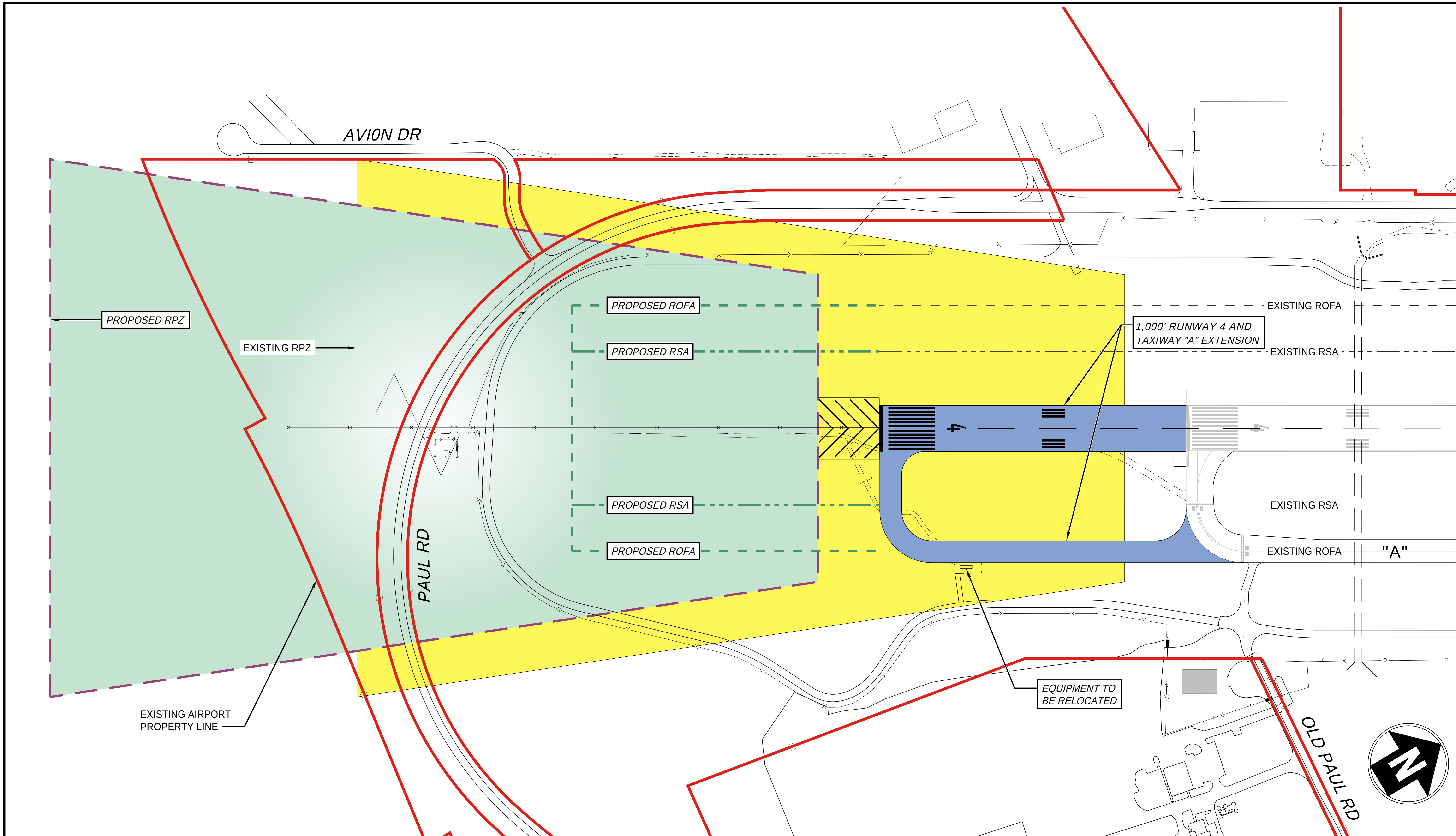

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LEGEND

Proposed RPZ
Existing RPZ
Airport Property Line
Proposed Pavement

0 300
Scale in feet

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RUNWAY ALTERNATIVE 2A
RUNWAY 4 EXTENSION

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FIGURE 5-2

5.3.2 Taxiway Development Alternatives

An airport's taxiway infrastructure is one of the most vital elements on an airfield. The airport must provide adequate methods of travel between the terminal facilities and the runway ends. As mentioned in Chapter 3, the taxiway infrastructure in its current layout is adequate to support the current and future aircraft fleet mix at ROC. However, functionality and operational efficiency can be increased by additional improvements.

Multiple taxiway developments are included in this section to improve the overall efficiency of the airport, as well as certain improvements to comply with FAA design standards as described in FAA AC 150/5300-13A, *Airport Design.* The following improvements are under consideration (**Figure 4-4**):

- Shift Taxiway "H" between Taxiway "B1" and "B2" 200ft. to the east to comply with FAA design standards. This compliance with FAA standards may be satisfied by a Modification to Standards requesting approval of the current configuration
- Extend Taxiway "H" approximately 2,400ft. between Taxiway "F" and Taxiway "L"
- Extend Taxiway "H" approximately 550ft. from Runway 4-22 to the Runway 10 end to complete a full parallel taxiway to Runway 10-28
- Extension of Taxiway "E" approximately 850ft. from Runway 4-22 to the Runway 10 (Project currently under design)
- Relocate electrical vault building between Taxiway "A" and "N" to the west side of Runway 4-22 to comply with FAA Taxiway Design Group (TDG) V clearance requirements
- Ultimate full parallel taxiway on the west side of Runway 4-22 (5,900ft.)

Taxiway "H" provides direct access to the mid-portion of Runway 10-28 from the Terminal ramp. Per the FAA design standards, "*Do not design taxiways to lead directly from an apron to a runway*", additionally "*taxiway design is recommended to avoid "high energy" intersections. These are intersections in the middle third of the runways*". To comply with FAA guidance it may be necessary to shift Taxiway "H" 200ft. to the east to ensure operational safety and limit the possibility of incursions on the airfield. However, as mentioned previously, the

Airport may submit a Modification to Standards form with the FAA requesting the current taxiway design be approved based on the cost for demolition and re-construction, the Airport's 24-hour Air Traffic Control Tower (ATCT), and the current taxiway was constructed before the amendment in airfield taxiway standards. Additionally, guide lights on the taxiway would further improve safety.

The taxiway concepts include extending Taxiway "H" the full length of Runway 10-28. Currently Taxiway "H" provides limited access to portions of Runway 10-28 on the south side of the runway. The current taxiway is not connected between Taxiway "L" and Taxiway "F", and does not extend beyond Taxiway "A" to the end of Runway 10-28. To access the Runway 10 end, aircraft from the GA campus must cross two active runways. By completing Taxiway "H", this would eliminate multiple runway crossings and improve efficiency by allowing FedEx cargo carriers to only cross one active runway.

The full build-out of this concept is split between two planning periods, short-term and ultimate long-term recommendations. The short-term recommendation is to connect Taxiway "H" between Taxiways "L" and "F" and the long-term and ultimate build-out extending the taxiway beyond Taxiway "A" connecting to the Runway 10 end. The extension would impact the Runway 28 glideslope; therefore the concept includes the relocation of the current glideslope location.

Figure 5-4 depicts the full length extension of Taxiway "H" as well as potential relocation sites for the Runway 28 glideslope. It is important to note that the remaining items of the taxiway facility requirement summary are located on the GA Campus at ROC and are addressed in detail in the subsequent sections.

The recommendation of the Taxiway "E" extension from Runway 4-22 to the Runway 10 end is currently an approved project under design and expected to be completed in 2015. However, this concept will still be included as a recommendation shown on the ALP. The extension is necessary as part of an increase in operational safety and reducing the potential of runway incursions on the airfield. **Figure 5-4** depicts the taxiway extension.

Additionally, an ultimate full parallel taxiway on the west side of Runway 4-22 is recommended to be included in the ALP. Although the projected growth in both commercial and cargo operations will not exceed capacity restraints for the runway, a full parallel taxiway is recommended to be shown on the ALP for the purposes of reserving the land to meet FAA requirements.

5.4 Terminal Area Development

This section outlines the Terminal and Landside Area alternatives for ROC. Similar to the previous sections, the alternatives are intended to satisfy deficits associated with the facility requirements evaluated in the previous chapter.

5.4.1 Concourse Extension for Additional Gates

As mentioned in Chapter 3, it is recommended that as enplanements begin to reach 1.4 million, the Airport considers expanding the number of available Terminal gates to accommodate the increase in demand. This alternative includes extensions to both concourses (A & B) of the passenger terminal at ROC. The extensions could provide up to four total additional narrow-body aircraft gates, or eight total regional jet positions. This alternative would efficiently utilize the existing terminal design. However, expansion of the terminal apron and relocation of Taxiway "C" would be required. The apron expansion would provide approximately eight acres of new pavement (40,000 square yards). The existing apron grading enables "at-gate" aircraft deicing and deicing fluid collection; therefore, the concourse extensions would also necessitate re-grading/re-construction of the apron to fully maintain this capability. **Figure 5-5** depicts the concept for the Terminal expansion. Based on existing capacity, development alternatives are not necessary for the terminal building, roadway, or parking.

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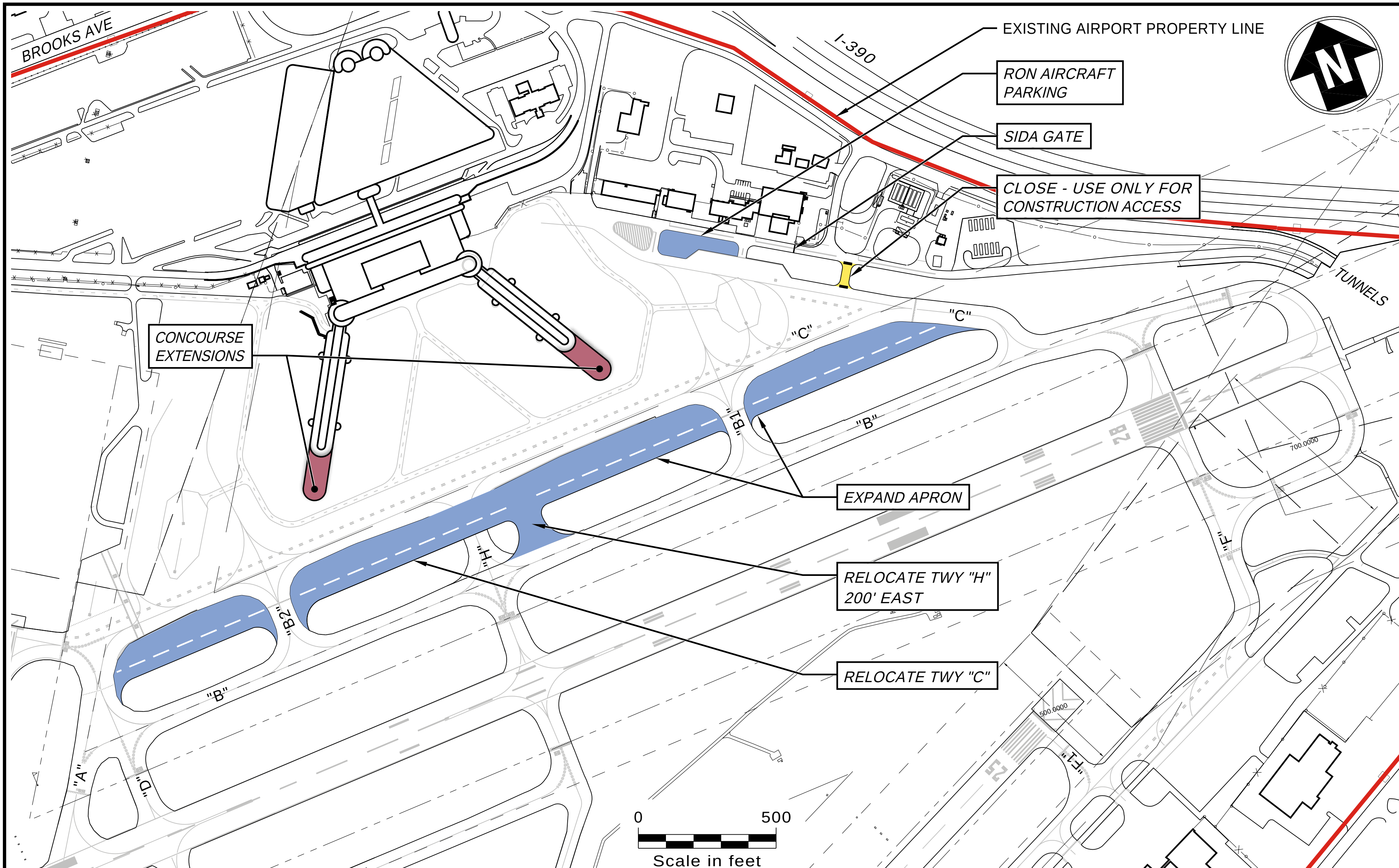

LEGEND

- New Airfield Pavement
- Concourse Extensions
- Airport Property Line

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CONCOURSE EXTENSION FOR ADDITIONAL GATES

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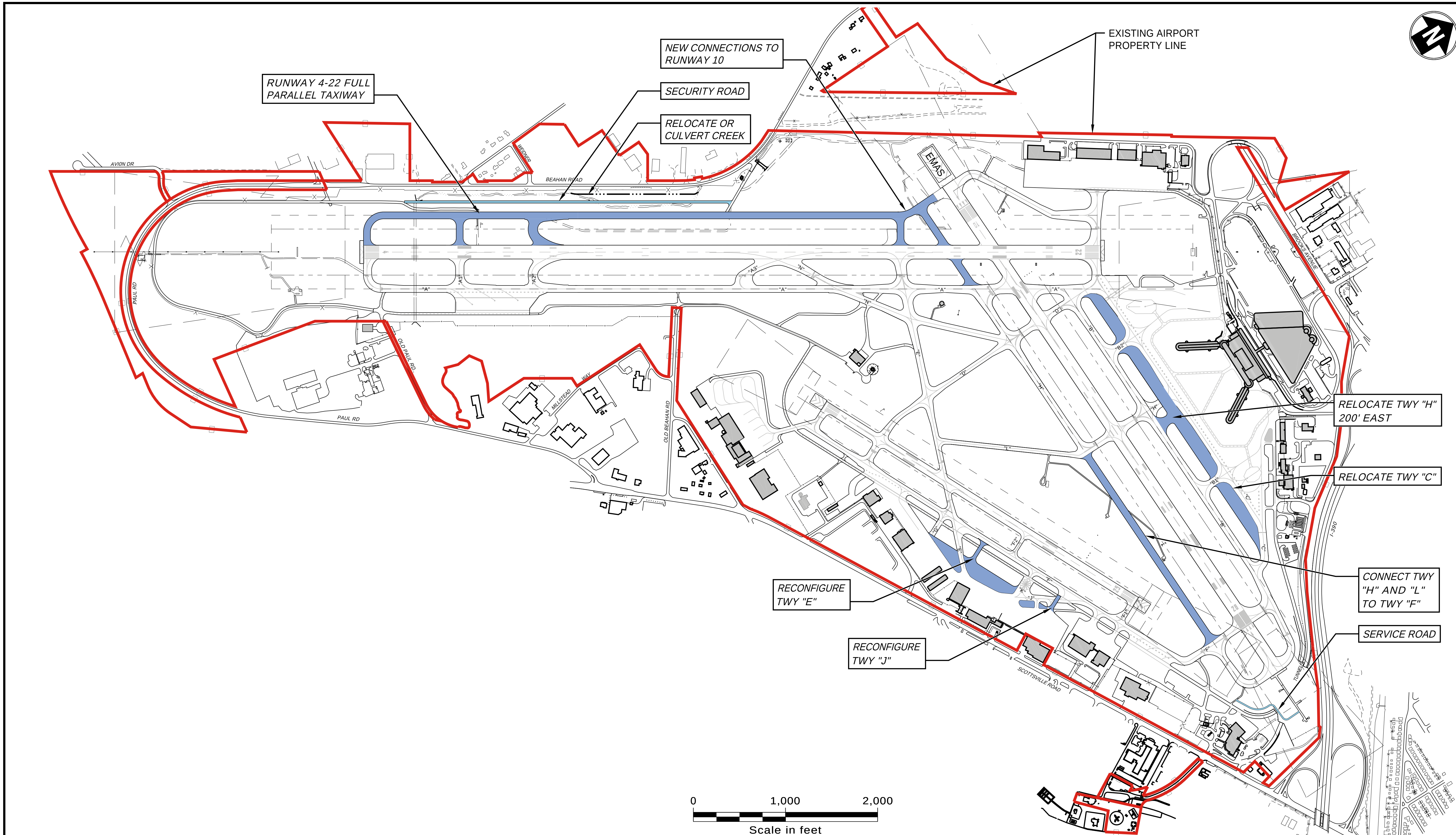
FIGURE 5-5



LEGEND

- New Airfield Pavement
- New Roads/Parking
- Airport Property Line

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TAXIWAY DEVELOPMENT ALTERNATIVES

GREATER ROCHESTER INTERNATIONAL AIRPORT
MASTER PLAN UPDATE - ROCHESTER, NEW YORK

PROJECT NO. 23916

DATE: Oct. 2014

FIGURE 5-4

File: V:\PROJECTS\ANY\K2\23916\CADD\FIGURES\23916-FIGURE5-4.DWG Saved: 10/31/2014 11:16:46 AM PLotted: - - - - User: Medina, Perry LastSavedBy: 976

5.5 General Aviation and Support Facility Development

The General Aviation (GA) campus area and the New York Air National Guard (NYANG) area are located south of Runway 7-25. The GA area facilitates a mix of aircraft ranging from small single-engine piston aircraft to large multi-engine turbine aircraft, while the NYANG area mostly supports military helicopter activity. The following presents an alternative concept (**Figure 5-6**) for both areas in order to maximize efficiency of the space while ensuring compliance with FAA standards.

5.5.1 GA Campus Alternatives

The GA terminal area consists of four apron areas encompassing a total of approximately 70,000 square yards. As mentioned, small- to large-sized aircraft utilize the GA terminal area. As such, there is variety of aircraft needs with varying FAA design requirements within this area.

5.5.2 GA Campus Concept

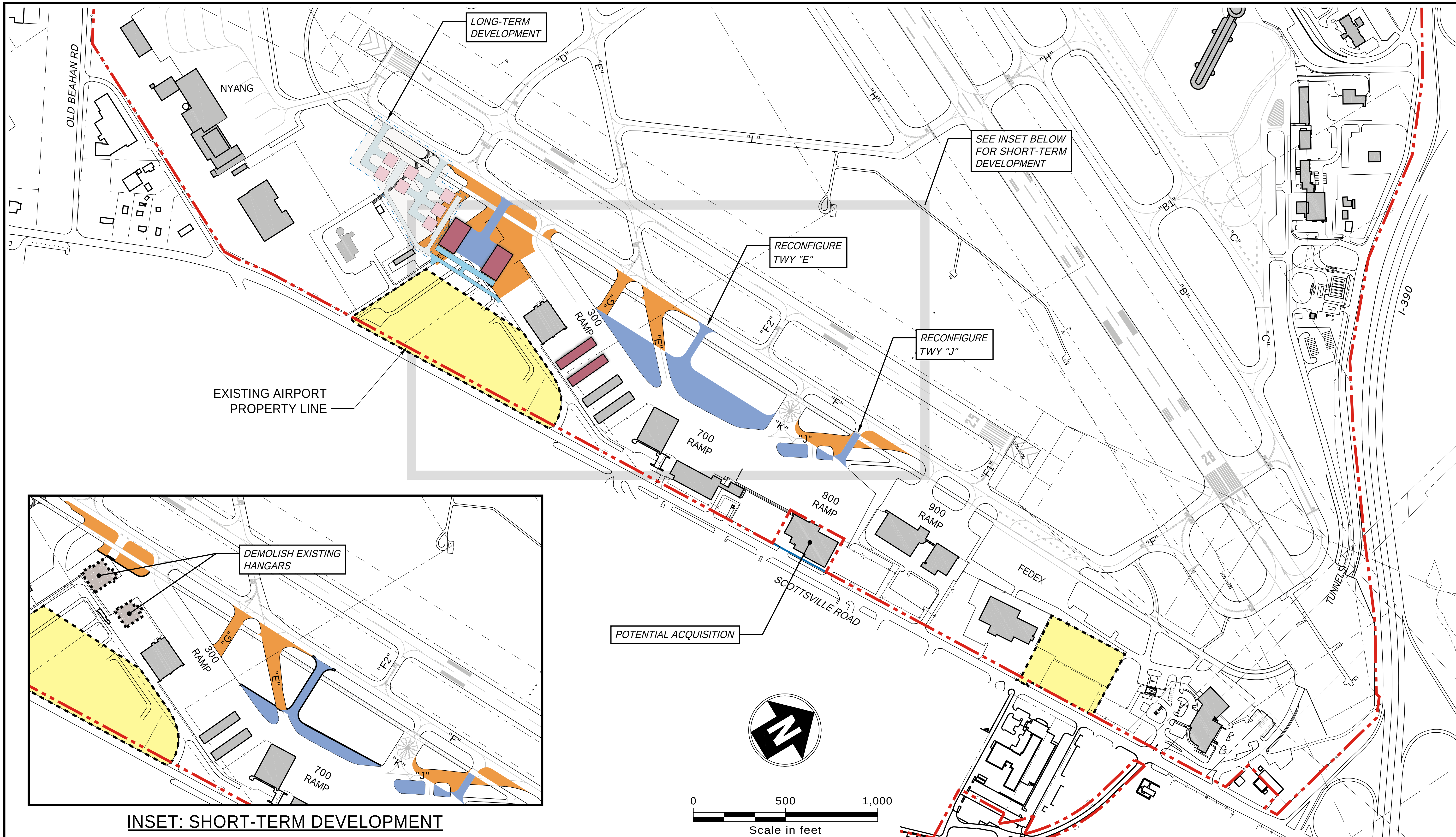
Apron

The current configuration of the GA apron area does not currently provide sufficient space to layout buildings perpendicular in relation to Runway 7-25. Therefore, a portion of the open space located between the 300, 700, and 800 Ramps and Taxiway "F" is depicted to be expanded approximately 200ft. to the north in order to consolidate all three apron areas providing additional space for aircraft movement and/or building locations. This concept also recommends the reconfiguration of Taxiway connectors "J" and "E" to be perpendicular to Taxiway "F" to provide more functional access and ease of use to the apron area. Furthermore, Taxiway Connector "G" is depicted to be eliminated.

Hangars

There are currently two 10-unit T-hangars located south of Taxiway "E" that provide a total of 20 aircraft stalls. To reserve area for future T-hangar development, **Figure 5-6** depicts two additional 10-unit T-hangars located west of the existing units. Each T-hangar would likely facilitate Group I aircraft and require a minimum separation distance of 79ft. to accommodate a Group I taxilane OFA. The additional T-hangars would provide sufficient T-hangar space at ROC throughout the planning period.

Figure 5-6 also depicts a conventional/corporate hangar campus located south of Taxiway "F" and "D". On the west side of the campus, there are several 4,300 square foot conventional hangars capable of accommodating Group II aircraft. The taxiway for each Group II hangar has a width of 35ft. On the east side of the campus, there are two 20,000 square foot conventional hangars capable of accommodating Group III aircraft. The taxiway for each Group III hangar has a width of 50ft. It is recommended that Hangars 1 and 2 are demolished and replaced due to their age and condition. The age and condition of both hangars have declined to the point where occupation is not permitted, additionally the office/support spaces of these buildings also need significant work in order to be occupied. Therefore, it is beneficial to the Airport that this project be completed in the short-term planning period, however although these hangars are Airport owned, it is important to note that these unoccupied hangars are leased under the FBO US Airports and any renovation would be coordinated through the FBO. In order to accommodate the campus area, the pavement associated with Hangars 1 and 2 is also depicted to be removed. A vehicle access road is depicted to each area of the campus with access to South Hangar Road. The location of the campus area provided sufficient line-of-sight clearance from the ATCT. The corporate hangar campus would provide sufficient conventional hangar space at ROC throughout the planning period.



LEGEND

- New Airfield Pavement
- New Building
- New Roads/Parking
- Reserved for Future Development
- Pavement Removal
- Building Removal
- Long-Term Development
- Existing Airport Property Line
- Potential Airport Property Line

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GA CAMPUS DEVELOPMENT ALTERNATIVES

GREATER ROCHESTER INTERNATIONAL AIRPORT
MASTER PLAN UPDATE - ROCHESTER, NEW YORK

PROJECT NO. 23916

DATE: Oct. 2014

FIGURE 5-6

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5.6 Recommended Development Plan Summary

Based on the review of the Airport's goals and objectives, as well as its needs and constraints, specific alternatives were identified as the most reasonable to form the recommended development plan for ROC. This plan improves the safety, operational efficiency, and functionality of the airfield, and incorporates all necessary facilities. The recommended plan is shown in **Figure 5-7** in its entirety, and summarized below.

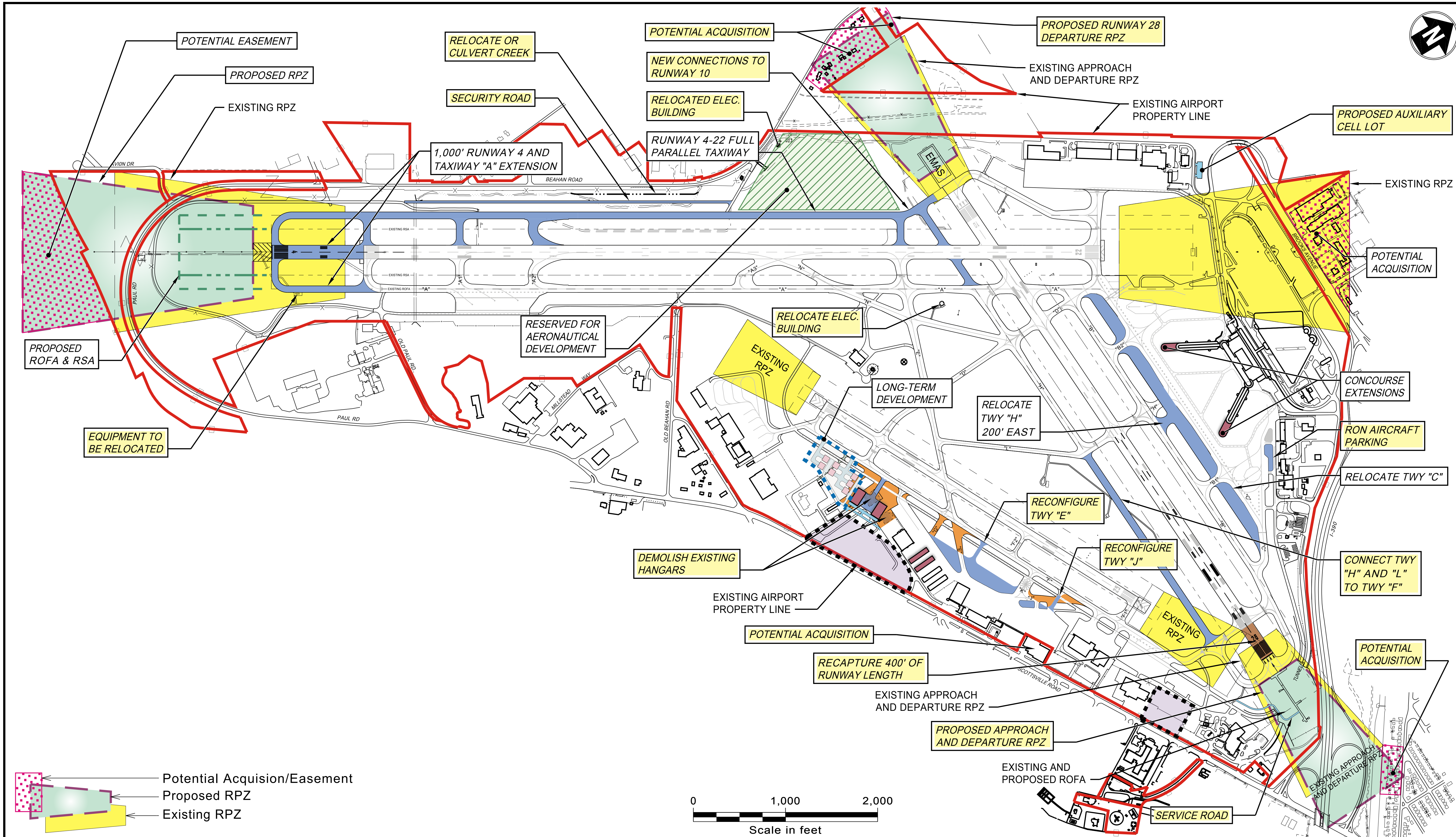
Airfield Recommendations

- **Environmental Assessment** – Evaluate potential environmental impacts associated with project development around the Airport
- **Airport Perimeter Road Relocation** – Relocate the Airport perimeter road from within
- **Runway 28 Modification** – Recapture 400ft. of the 600ft. Runway 28 displaced threshold.
- **Taxiway "E" Extension** – Extend Taxiway "E" 850ft. from Runway 4-22 to the Runway 10 end to connect the GA Campus to each Runway 10-28 end (Project currently under design)
- **Electrical Vault Relocation** - Relocate electrical vault between Taxiway "A" and "N" to the west side of Runway 4-22 to comply with FAA Taxiway Design Group (TDG) V clearance requirements
- **Reconfiguration of Taxiways "E" and "J" -** Reconfigure Taxiways to be perpendicular to Taxiway "F" from the GA Campus Apron to provide apron area for taxilane clearance to comply with FAA safety requirements
- **Residential Property Acquisition –** It is recommended to pursue voluntary acquisition of residential properties impacted by the shift in the Runway 28 approach and departure RPZs
- **Taxiway "H" Extension** – Extend Taxiway "H" 2,400ft. between Taxiway "L" and Taxiway "F"
- **Taxiway "H" Extension (Full Parallel)** – Extend Taxiway "H" 550ft. from Runway 4-22 to the Runway 10 end to complete a full parallel taxiway to Runway 10-28
- **Removal of Taxiway "G"** – Taxiway to be removed between Taxiway "F" and the GA Campus apron
- **Taxiway "H" Shift** – Shift Taxiway "H" between Taxiway "B1" and "B2" 200ft. to the east to comply with FAA design standards and safety requirements

- **Expand GA Campus Aprons** – Expand the 300, 700, and 800 ramps approximately 200ft. to the north creating one GA Campus apron
- **Runway 4-22 Extension** – Extend Runway 4-22 1,000ft. to the south
- **Full Parallel Taxiway to Runway 4-22** – Ultimate full 5,900ft. parallel taxiway on the west side of Runway 4-22

Landside Recommendations

- **Commercial Property Acquisition** – Pursue acquisition of available commercial property with the runway protection zones and other locations adjoining the airport property
- **Security Fencing** – Upgrade/Replace manual gates with automatic security gates with card readers and security cameras, and outfit 8ft. fences with barbed wire fence fabric
- **GA Apron Expansion** – Consolidate and reconfigure the GA Campus apron area. Including the removal of excess taxiways and paving in the open grassy areas with new pavement
- **Hangar Development** – Construct two additional T-Hangars when it is determined that the existing hangars 1& 2 are no longer viable structures for aircraft storage
- **GA Corporate Campus Development** – Develop a corporate GA Campus on the southwestern side of the GA Campus near the Runway 7 end to accommodate the increase in corporate GA demand
- **Terminal Expansion** – Consider additional terminal gates as enplanements approach 1.4 million



LEGEND

New Airfield Pavement	Potential Non-aeronautical Development
New Building	Pavement Removal
New Roads/Parking	Building Removal

SHORT-TERM DEVELOPMENT

Long-Term Development

Airport Property Line

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RECOMMENDED DEVELOPMENT PLAN

GREATER ROCHESTER INTERNATIONAL AIRPORT
MASTER PLAN UPDATE - ROCHESTER, NEW YORK

PROJECT NO. 23916

DATE: Nov. 2014

FIGURE 5-7

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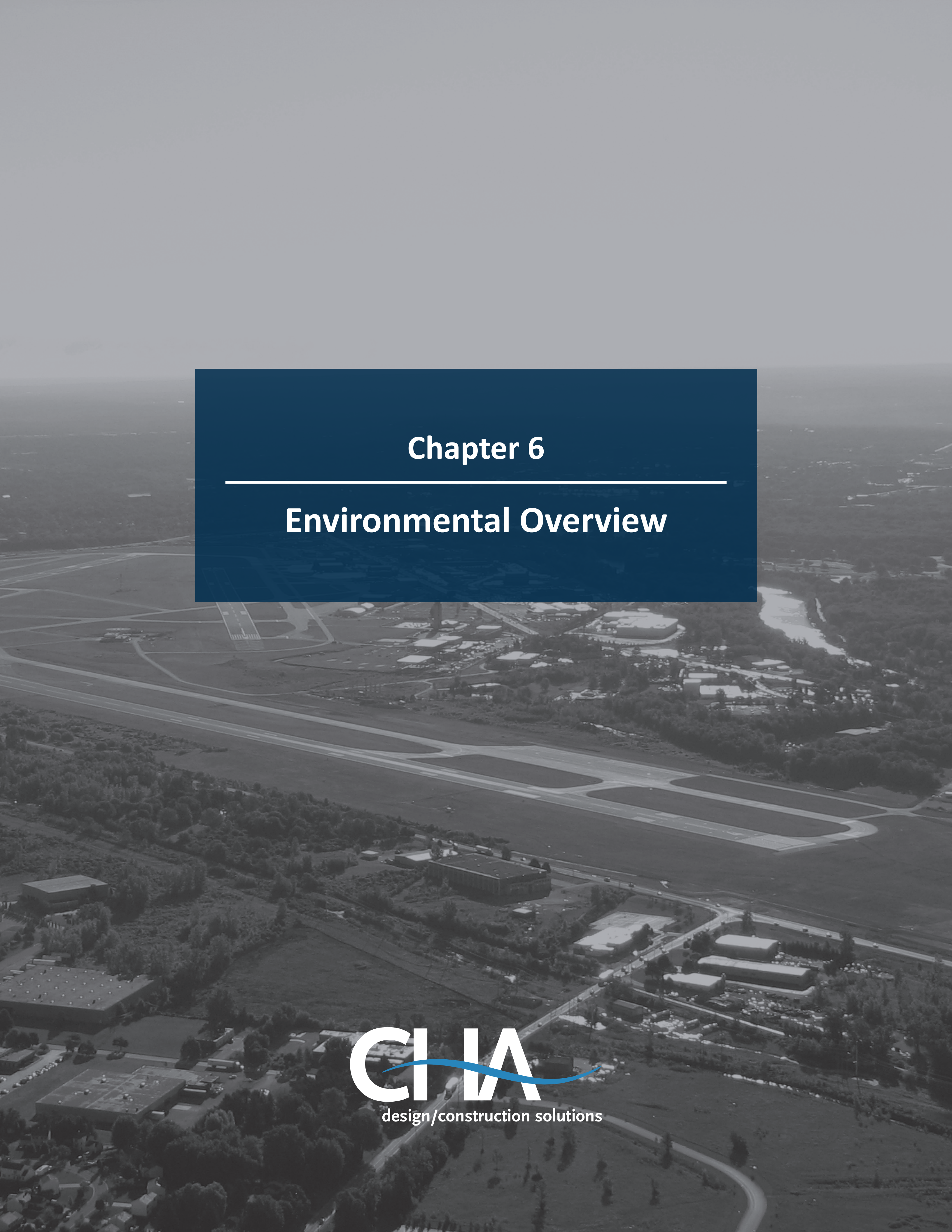


Chapter 6

Environmental Overview

6 Environmental Overview

This chapter of the Master Plan Update describes the social and environmental considerations associated with the implementation of the recommended plan. The potential impacts identified in this chapter were analyzed in accordance with FAA Order 5050.4B, National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions, and FAA Order 1050.1E, Environmental Impacts: Policies and Procedures. A table with proposed projects requiring additional environmental analysis is identified at the conclusion of the chapter.

Overall, the recommended airport improvements include both airside and landside development projects. Several of the projects will require the use of federal and state funding. As a result, airport development will be subject to the National Environmental Policy Act (NEPA) and the New York State Environmental Quality Review (SEQR) Act, requiring some additional environmental review and permitting.

This Environmental Overview provides an initial review of the recommended facilities to determine the projects that will require additional environmental study.

Consistent with the FAA Orders, the following impact categories were addressed**:**

- Air Quality
- Coastal Resources
- Compatible Land Use
- Construction Impacts
- USDOT Section 4(f)
- Farmland
- Fish, Wildlife and Plants
- Floodplains
- Hazardous Materials, Pollution Prevention and Solid Waste
- Historic and Cultural Resources
- Light Emission and Visual Impacts
- Natural Resources & Energy Supply
- Noise
- Secondary (Induced) Impacts
- Water Quality
- Wetlands
- Wild and Scenic Rivers
- Socioeconomic, Environmental Justice & Children’s Health and Safety

6.1 Air Quality

The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) for six “criteria air pollutants” (i.e., ozone, carbon monoxide, particulates, sulfur dioxide, nitrogen dioxide, and lead). Currently, Monroe County is listed as a “nonattainment” area for Ozone (8-hour, 1997 standard), as is most of New York State. The County is in compliance with the other regulated emissions. Based on the nonattainment ozone status, projects at the Airport must review the level of emissions generated and determine if the project will have a significant air quality impact. Impacts can potentially occur for the direct construction activity of the project, or from future airport activity levels generated by the project.

A detailed air quality review was prepared for the airport (as a separate report) to review existing and potential future emissions. Based on the modest nature projects recommended for ROC in the short-term, it is unlikely that the air quality emissions would exceed the significant levels.

6.2 Coastal Resources

Federal activities involving or affecting coastal resources are governed by the Coastal Barrier Resources Act (CBRA), the Coastal Zone Management Act (CZMA), and E.O. 13089, Coral Reef Protection. NYS Coastal Resources review indicates the airport is not near any coastal zones and proposed development would not affect the use of any coastal resources.

6.3 Compatible Land Use

The Greater Rochester International Airport predominantly lies within City of Rochester and the Town of Chili, with a small potion in the Town of Gates. Below is a discussion of the zoning and land uses within these communities, along with bordering Town of Brighton. Potential land use impacts associated with proposed projects are discussed below. In general land use impacts result from projects that require land acquisition or noise impacts associated with aircraft operations.

The Monroe County Charter authorizes the Director of Planning and Development, to review and approve land uses surrounding the airport. The Charter defined two areas under the Airport Review Area (ARA) – Area 1 and Area 2.

- Area 1 covers 1 mile radius around the airport including approach/departure corridors of instrument equipped runways at the airport, which do not exceed 3 miles in length from the runway end and 1 mile in width. Review and approval is required for all land use and land subdivisions, including height of all structures.

- Area 2 covers the area outside Area 1 and requires that any proposed structure which will exceed the height limit be submitted to the Director of Planning.

Parts of the Towns of Brighton, Chili, Gates and the City of Rochester are subject to the Airport Review criteria. Each Town, and City, adopted their own Airport Overlay District Zoning, which follows the criteria of the Monroe County Charter.

6.3.1 City of Rochester

The City borders the Airport to the north and northeast. Airport property is zoned M-1 (Manufacturing), with a land use of Public Service. Areas to the northeast, within the Runway 22 approach are zoned R-1 (Residential). Similarly, areas to the northeast, which are within the Runway 28 approach, are zoned R-1. These residential areas are comprised mostly of single family homes. To the immediate east of the airport across the Genesee River is zoning O-S (Open Space). Within this area is Genesee Valley Park. Beyond that are various land uses for the University of Rochester, Mount Hope Cemetery and commercial and mixed residential. The proposed airport development would not impact any of the lands to the east.

In addition to the general zoning, Article XIII, of the City's Zoning Code establishes an Overlay Airport District (O-A). This district "*prevents the establishment of flight or safety hazards within the vicinity of the Airport.*" Prior to City approval of a project, such project shall be referred to the County Director of Planning for their review and approval.

Proposed projects that may have compatible land use impacts relate to recapturing Runway 28 threshold. This project is not anticipated to result in increased noise exposure over the City of Rochester. This project however shifts the Runway Protection Zone (RPZ) further from the airport. The result of the shift is the inclusion of six to nine properties, inclusive of six residential homes that will be within the RPZ. The FAA recommends easement or acquisition of property within the RPZ. These properties will be sought through voluntary acquisition. The approach lighting system would be relocated as well, associated with the shift in the runway threshold. If additional properties are impacts for the lights, they will be obtained through easement.

There is no recommendation to alter Runway 22, and it is anticipated the existing noise level of 65 DNL will continue to stretch over a portion of the residential development within the City of Rochester.

6.3.2 Town of Chili

The southern portion of the Airport lies within the Town of Chili. Similar to the City, this Town has its own zoning regulations. The Airport is zoned LI (Limited Industrial), with a public service land use. Other zoning around the airport consist of RA (Rural Agricultural), FW (Floodway), AC (Agricultural Conservation), General Business (GB), General Industrial (GI), and RAO (Rural Agricultural District). Land uses are a mixture of commercial and undeveloped properties, with a few single family homes.

This Town also maintains an Airport Development Overlay District (AOD), per Article III, section 500-25 of the Town Zoning Code. This district "*limits height of structures within the* *vicinity of the airport and assuring that land use and land subdivision in the vicinity of the airport will be of such character as not subject undue concentrations of people to aircraft crash hazards, aircraft noise or other adverse impact to airport operations.*" Before building permits can be issued by the Town, approval from the County Director of Planning is required.

Zoning to the west of the Airport include industrial, residential and rural agricultural zones. Land use consists of an active railroad, scattered residential and commercial/light industrial development. Areas to the south consist of Floodway and Agricultural Conservation zoning, consisting mostly of Black Creek, the Black Creek floodway, scattered agricultural and low density residential. Areas to the east are zoned General Business and General Industrial, with land uses consisting of commercial/industrial development.

The recommended Runway 4 extension would shift the existing RPZ further south, extending into the floodway of Black Creek, which would require easements to provide sufficient control. The potential extension would shift the approach lighting system (ALSF2) to the south, further disturbing the floodway.

Within the Runway 10 RPZ, the Airport has purchased some of the lands to control the heights of trees and restrict future development. Additional voluntary land acquisition is sought for the remainder of the RPZ, impacting approximately 8 properties. Additional tree trimming on these parcels will assist in maintaining a clear approach to Runway 10.

The proposed acquisition of lands between Millstead Way and Old Beahan Road are appropriately zoned LI or GB.

6.3.3 Town of Gates

The Town of Gates borders the airport to the northwest, across Beahan Road. This town is a mix of residential and commercial usage. Zoning in this area immediately adjacent to the airport includes Light Industrial (LI), General Business (GB), and General Industrial (GI).

In addition to the general zoning, Article XXVIII, of the Town of Gates Zoning Code establishes an Overlay Airport District (OAD). This district "*promotes safe and efficient flight operations connected with the Rochester-Monroe County Airport by limiting the heights of structures and objects of natural growth in areas necessary for airport operations, in accordance with Federal Aviation Agency standards for planes using the airport, and to protect the lives and property of the occupants of land in the vicinity of the airport by regulating the use of property within specified areas adjacent to and extending outward from the boundary of the airport, in the Town of Gates."* Prior to Town approval of a project, such project shall be referred to the County Director of Planning for their review and approval.

The proposed recommendations are not anticipated to alter the noise impact. The area immediately north of Runway 22 lies within the existing 65 LDN. This area is mostly commercial development, or parking lots. Some of the Runway 22 RPZ overlies lands, on the north side of Brooks Ave, should be considered for acquisition when the lands become available for the protection of the RPZ.

6.3.4 Town of Brighton

The Town of Brighton borders the Airport to the southeast on the opposite side of the Genesee River and Route 390. The Town is mostly suburban development, with a scattering of commercial/light industrial development.

In addition to the general zoning, Article XIII, of the Town of Brighton Zoning Code establishes an Overlay Airport District (O-A). This district "*protect the efficient use and safe operation of the Greater Rochester International Airport by requiring that land use and land subdivision in the vicinity of the airport be kept free of undue concentrations of persons who are subjected to potential aircraft crash hazards, aircraft noise or other adverse impacts from airport operations, and to prevent development which pose hazards to aircraft operations in the vicinity of the airport*." Prior to Town approval of a project, such project shall be referred to the County Director of Planning for their review and approval.

As the recommended runway extensions are not anticipated to result in increased noise impacts, or property acquisition, no compatible land use impacts are anticipated.

In summary, airside development would be consistent with local land uses and do not alter or interrupt current land uses. Landside development, except land acquisition of the runway protection zones, occurs on airport property and would be consistent with local land uses. Land acquisition within runway protection zones would seek voluntary land acquisition.

6.4 Construction Impacts

Construction impacts include dust, noise, and air and soil pollution. It is anticipated there will be short-term impacts resulting from construction operations. Adhering to day hours, where noise levels from construction operations will increase slightly, but not be noticeable to the surrounding land uses; and controlling sedimentation runoff and controlling dust, individual projects should be limited to short-term impacts. Construction contract specifications will contain provisions of FAA Airport Advisory Circular 150/5370-10A titled "*Standards for Specifying Construction of Airports*", Item P-156, "*Temporary Air and Water Pollution, Soil Erosion and Siltation Control*", and Advisory Circular 150/5320-5B titled "*Airport Drainage*". Water is commonly used during construction to minimize the dust impact. Construction impacts affecting greater than 1 acre require a State Pollution Discharge Elimination System (SPDES) permit to adhere with the Clean Water Act. No long-term construction impacts are expected to occur.

6.5 Department of Transportation Act, Section 4(f)

The US Department of Transportation Act of 1966 included a provision (Section 4(f)) that protects certain historic resources, parks, recreation areas, and wildlife refuges from impacts caused by US DOT projects. These are referred to as "4(f) resources".

Genesee Valley Park is southeast of the airport. The proposed development occurs on airport property, with the exception of some RPZ extensions that will not impact Genesee Valley Park and therefore no anticipated use of any Section 4(f) resources.

6.6 Farmland

The Farmland Protection Policy Act (FPPA) regulates Federal actions with the potential to convert farmland to non-agricultural uses. Farmland protected under FPPA includes farmland that is of state or local importance as determined by appropriate state or local agencies with the concurrence of the Secretary of Agriculture. The closes farmland is in Town of Chili, more than three miles away from a runway end, that will not be impacted.

The majority of the airport and the surrounding area contain soils that are not designated as either prime agricultural soils or agricultural soils of statewide importance (namely Schoharie silt loam (SeB), Lakemont silt loam (Le) and made land (Mb). There are no agricultural fields adjacent to the airport; and no land on airport property is currently used for agricultural purposes.

The proposed development would not involve the conversion of active farmland to non-agricultural uses, and therefore there is no anticipated impact to farmland.

6.7 Fish, Wildlife and Plants

Section 7 of the Endangered Species Act applies to Federal agency actions and sets forth requirements for consultation to determine if the proposed action “may affect” an endangered or threatened species. According to the U.S. Fish and Wildlife Service (USFWS) critical habitat portal the bog turtle and northern long-eared bat were identified for Monroe County. The bog turtle are known to occur in Riga and Sweden townships, which are outside out project area, however if their habitat, generally occupying open-canopy, unpolluted, herbaceous sedge meadows and fens bordered by wooded area, is encountered within a project area due diligence for presence of bog turtle should be undertaken. A newly identified species is the northern long-eared bat. Similar to the Indiana Bat its summer habitat is exfoliating tree bark, like Nig Shellbark Hickory. The Big Shellbark Hickory are located along the Black Creek Swamp, near the project area. Any tree trimming of this species tree should be selectively trimmed or removed during winter to avoid adversely impacting the northern long-eared bat. Construction of the Runway 4 extension, and associated projects, should verify the presence of the Big Shellbark Hickory to determine its impact on the bat habitat.

The Natural Heritage Program indicated three species (Pink Heelsplitter, Silver Maple Ash Swamp and Big Shellbark Hickory) occurring near the airport site. The Silver Maple Ash Swamp and Big Shellbark Hickory are identified in the Black Creek Swamp. The freshwater mussel (Pink Heelsplitter), is known to occur in Genesee River and Black Creek, and their habitat comprised of silt bottoms. The drainage ditches around the airport consist of rocky bottoms. Any work south of Runway 4, including the runway extension and approach lighting system relocation could impact the Silver Maple Ash Swamp community, and consultation with the NYSDEC should be undertaken. Periodic tree trimming required for clear approaches/departures should not negatively impact this community.

The construction of a west taxiway to Runway 4-22 would impact Little Black Creek. The stream bed composition of Little Black Creek is silt and gravel. There may be potential for impact to the freshwater mussel, and further investigation would be required for this project. The tree species were not present in this area. Consult with the NYSDEC prior to undertaking the project.

6.8 Floodplains

Flood plains are defined in Executive Order 11988, Flood Plain Management, as "*the lowland and relatively flat areas adjoining inland and coastal waters including flood-prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year.*" The Threshold of Significance (TOS) is exceeded when there is an encroachment on a base flood plain (100-year flood). An encroachment involves:

- A considerable probability of loss of life;
- Likely future damage associated with encroachment that could be substantial in cost or extent, including interruption of service or loss of vital transportation facilities; or a notable adverse impact on natural and beneficial flood plain values.

A review of the Flood Insurance Rate Map (FIRM) 36055C0331G, dated August 2008, a 100-year floodplain exists to the south, west, and east of Runway 4, along Little Black Creek and a floodway around Genesee River, east of the airport. The proposed Runway 4 extension, westerly parallel taxiway to Runway 4, and proposed service road extension east side of Runway 4, could impact the floodplain, and further coordination would be required. The proposed land acquisition between Millstead Way and Old Beahan Road also lies within the floodplain.

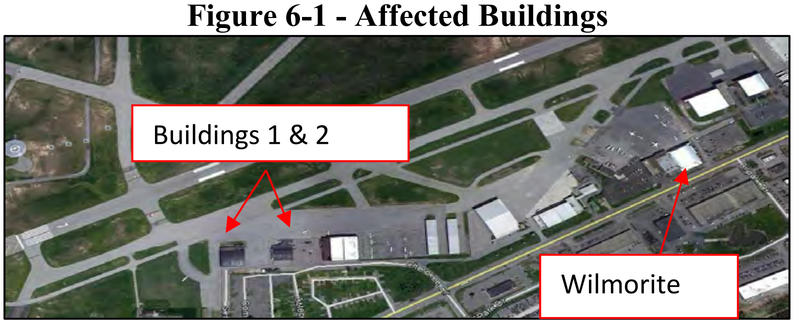
6.9 Hazardous Materials

Two primary laws of importance to the FAA are the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). RCRA governs the generation, treatment, storage, and disposal of hazardous wastes; while CERCLA provides consultation with natural resource trustees and cleanup of any release of a hazardous substance (excluding petroleum) into the environment. Review of the EPA NPL site list indicated there are five RCRA sites, none are near the airport. Aircraft deicing fluid used at the airport is not considered a hazardous material, as its active ingredient is propylene glycol.

Relative to solid waste, airport actions that relate only to airfield development (e.g., runways, taxiways, and related items) will not normally increase the production of solid waste after project completion. However, terminal area development may involve circumstances that require consideration of solid waste impacts. Solid waste disposal facilities are considered incompatible with airports because they attract large number of birds, thereby creating an air safety hazard. The closest open land fill is in the Town of Riga, more than 10,000 feet from any runway. Proposed expansion or construction of terminal area buildings and hangars will require assessment of solid waste production and disposal alternatives. In any case, construction debris should be minimized through greening efforts, or disposal at an appropriate site. Continued use of the county landfill should be adequate to meet the slight increase in solid waste. The airport should continue, and expand, its recycling efforts to help offset the potential increase in solid waste. Construction of airport improvements resulting in debris will be disposed of by the contractor in accordance with applicable regulations.

Prior to the demolition of buildings #1 (vacant) and #2 (Rochester Aviation), near the 300 ramp, an Environmental Due Diligence Audit should be conducted following FAA Order 1050.19, this will include an asbestos survey, fuel tanks, lead paint, etc. Any hazardous pollutant found would need to be treated prior to demolition. The acquisition of Wilmorite Building (near the 800 ramp) may require an Environmental Due Diligence audit prior to purchase to determine presence of environmentally sensitive materials, see **Figure 6-1** for building locations.

Figure 6-1 - Affected Buildings



6.10 Historic and Cultural Resources

Section 106 of the National Historic Preservation Act of 1966 (NHPA) requires Federal agencies to take into account the effects of their undertakings on historic properties. The NHPA requires any work at the airport involving Federal funding, licensing, or permitting must consider the effects of a project on a historic property. The responsible Federal agency must determine whether the action could affect historic properties included in the National Register of Historic Places or meet the criteria for the National Register. Additionally, the requirements of the Archeological and Historic Preservation Act of 1974, are included.

The State Historic Preservation Office (SHPO) website indicates the airport is within an archeological sensitive area. As such coordination with SHPO is required for construction projects that cannot document significant ground disturbance. Rehabilitation projects, and projects occurring on previously disturbed areas, like the proposed 300 ramp expansion, air cargo development east of FedEx, and auxiliary cell phone lot near Airport Way, should not require coordination from SHPO. The ROTC expansion may require coordination if the selected site was not previously disturbed. Genesee Valley Park, to the east of the airport, is on the State/National Register List, and will not be impacted by any proposed project.

6.11 Light Emission and Visual Effects

In order to assess the potential light emissions impacts, the extent to which any airport lighting will create an annoyance among people in the vicinity of the installation, must be addressed.

The recapturing of Runway 28 threshold would extend the approach lighting system further east. The FAA should be consulted to determine how many lights would be required to support the approach to Runway 28. The extension of Runway 4 would also extend the approach lighting system further south. Further study to determine the light impacts would need to be performed during the environmental assessment for the runway extension. Additional airfield lights would be associated with any new taxiway, but these lights will be consistent with the existing airport operations, with minimal impact expected.

6.12 Natural Resources & Energy Supply

Impacts to energy requirements fall into two categories: (1) those that relate to increased energy demands for stationary facilities, such as airfield lighting; and (2) comparative increase in fuel consumption related to increased aircraft and ground vehicle activity.

Energy requirements will increase as a result of the proposed expansion of the terminal building. Energy efficient design measures will be incorporated into the terminal expansion, minimizing the energy increase. Minor energy increases would also be expected from other airfield lighting projects. These increases are not expected to significantly alter the regional energy demand.

6.13 Aircraft Noise

In compliance with FAA requirements, as On-Airport development projects and potential expansion of the Airport is a possibility, ROC is required to complete an Airport Noise Analysis to identify potential associated impacts on residential and commercial areas adjacent to the Airport. This helps ROC management to recognize any necessary mitigation concerns related to excess noise.

A detailed noise review was prepared for the airport to review existing and potential future impacts. Based on the current and future fleet mix projections, and the projects recommended for ROC in the short- and long-term, it is not anticipated that the current and future noise levels would have any associated impacts. The complete noise study is located in Appendix A.

6.14 Secondary (Induced) Impacts

Induced impacts relate to changes in business and economic activity in the community, impacts to public service demands, and induced shifts in population movement and growth as a result of large airport improvement projects. Socioeconomic impacts are linked to impacts to other resource categories through cause-effect relationships. The proposed recommendations do not include projects that have the potential to change the general character of the area. An Environmental Assessment would evaluate the induced impacts of the runway extensions and terminal expansion.

6.15 Socioeconomic, Environmental Justice and Children's Health and Safety

There are three primary regulations which must be considered when evaluating potential impacts related to Socioeconomic Impacts, Environmental Justice and Children's Health and Safety Risks. These regulations are as follows:

- Executive Order 12898, which was enacted in 1994, requires that an Environmental Justice evaluation be conducted for all transportation projects that are undertaken, funded, or approved by the Federal Aviation Administration (FAA) to avoid, minimize, or mitigate disproportionately high and adverse human health and environmental effects, and social and economic effects, on minority populations and low-income populations.

- Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks, requires Federal agencies to "make it a high priority to identify and assess environmental health risks and safety risks that may disproportionately affect children"

- The Uniform Relocation Assistance and Real Property Acquisition Policies Act of 1970 apply for land acquisition or displacement of persons.

The proposed projects are not anticipated to alter the noise impacts significantly. Land acquisition within the RPZ is anticipated to be on a voluntary basis, or as lands become available (refer to **Section 6.3**). As such, socioeconomic and environmental justice issues are not anticipated.

Additionally, Children's Health and Safety Risks include "*risks to health or to safety that are attributable to products or substances that a child is likely to come in contact with or infest, such as air, food, drinking water, recreational waters, soil, or products that might use or be exposed to*." The recommended developments do not include projects that would have the potential to adversely impact water, soil or air.

6.16 Water Quality

The Clean Water Act of 1977 applies to both surface and ground water (or subsurface waters), providing the authority "*to establish water quality standards, control discharges into surface and subsurface waters, develop waste treatment management plans and practices, and issue permits for discharge of dredge and fill material.*" Impacts to water quality are not considered significant if a project meets state and federal water quality standards.

Impacts to water quality, as well as water quantity, may arise as the result of airport improvement projects, specifically the increase in surface runoff as a result of increased impervious areas and/or decreases in plant cover can produce increased erosion with associated sedimentation in area surface waters. The release of contaminants such as oil, grease, deicing compounds, and fuel during normal airport operations and/or in the event of an aircraft or vehicle crash incident can also have an adverse effect on water quality. Proposed construction at the airport shall incorporate Best Management Practices (BMPs) to minimize impacts on water quality. Soil erosion and siltation controls are used to minimize adverse water quality effects during construction, as specified in Advisory Circular 150/5370-10, *Standards for Specifying Construction of Airports*.

FAA Order 5050.4B identifies the water quality impact threshold as any action that would not meet water quality standards. Other issues to be considered include whether or not a proposed action or a reasonable alternative would threaten a public drinking water supply, a sole source aquifer, or water of national significance.

6.16.1 Surface Water

Surface water features on the airport include wetland complexes, Little Black Creek, on airport it is classified as a class C stream, and unnamed tributary to Little Black Creek. The unnamed tributary flows through the southerly portion of airport property, through various wetland complexes ultimately into Black Creek, to the south, and the Genesee River, to the east. Both Black River and Genesee River are off airport property.

The recommended project to realign the perimeter road and constructing a westerly parallel taxiway to Runway 4-22 would impact Little Black Creek. The realignment of the perimeter road would require a Section 404 permit from the ACOE, and from the NYSDEC a Section 401 Water Quality Certification, and a possible Article 15 "Stream Crossing" permit to construct culverts to continue to convey Little Black Creek waters. The proposed westerly taxiway to Runway 4-22 would require the realignment of Little Black Creek, thus requiring a Section 404 permit from the ACOE, and Section 401 Water Quality Certification from the NYSDEC. Further explanation of wetlands will be covered in **Section 6.17.** The runway 4 extension would require filling wetland to meet grading standards, and the relocation of the approach lighting system would impact Black Creek floodway. Similar coordination and permitting would be required for the Runway 4 extension projects with the ACOE and NYSDEC.

6.16.2 Storm water

The airport property does not have water ponds or basins. All storm water runoff is collected through the drainage system on the airport, enters into the storm sewer system and ultimately empties into the Genesee River. In New York water quality regulations are permitted through the NYS Department of Environmental Conservation, through the State Pollutant Discharge Elimination System (SPDES) permitting process. A Storm Water Pollution and Prevention Plan (SWPPP) was prepared for the airport, and submitted to Monroe County Department of Environmental Services, who manage the Airport and other County facilities to comply with NYSDEC permitting requirements. The Airport is incorporated under Monroe County's general permit coverage for storm water runoff. Increased impervious surface from additional pavement (the apron and taxiway expansions) will continue to incorporate drainage improvements to avoid erosion and siltation into the surrounding water system and comply with Monroe County Department of Environmental Services requirements.

6.16.3 Groundwater Water

Ground water can be adversely impacted by spills, leaks or discharges associates with fuel tanks, deicing and anti-icing materials. According to the Environmental Protection Agency (EPA) website there are no known sole source aquifers in or around the airport. The airport is served by City of Rochester Municipal water.

Commercial service, and general aviation, fuel tanks are in the fuel farm and surrounded by secondary containment to comply with NYSDEC permit requirements, in the event of a spill. Unused deicing materials are stored in the fuel farm area; while spent deicing/anti-icing material is control released and sent through the sanitary sewer system to be treated at the Van Lare

Treatment Plant. While deicing is conducted at various sites around the airport, proper containment systems are in place to prevent contamination to surface or underground water.

Overall, the recommended development are not expected to cause significant water quality impacts to surface water or groundwater, as proposed projects will meet state and federal water quality standards through permitting processes.

6.17 Wetlands

Wetlands are regulated at the state and federal levels. The fundamental intent of these regulations is to minimize the reduction and degradation of these resources, and strive to achieve the government's "no net loss" policy. The Federal program is based on Section 404 of the Clean Water Act. In addition, Executive Order 11990 directs all Federal agencies to minimize the destruction, loss, and degradation of wetlands, and to preserve and enhance the natural and beneficial values of wetlands. The regulations require an ACOE permit for the placement of dredge or fill material in wetlands or other waters of the US.

A review of the National Wetland Inventory Map (NWI), for federal wetlands, and NYSDEC maps, for state wetlands, identified wetlands around the Airport. The state wetland, known as CI-30, is a 48 acre wetland, located to the east of Runway 4 end, and south, along Beahan Road. Several federal wetlands exist in the same area, and extend around the runway 4 end and up the west side of Runway 4-22, coincident with Little Black Creek. In 2003, several wetlands were field verified, mostly along the east, south and west of Runway 4. In 2013 portions of these wetlands were delineated and are documented as part of the Airport's Wetlands Report not included in this Master Plan. The results concluded that wetlands exist north of Old Beahan Road, and on the west side of Runway 4, along Little Black Creek. Field reconnaissance confirmed the wetlands south of Runway 4. The remainder of the airport is mostly upland (non-wetland), or has been previously disturbed.

The soils survey identified soil types occurring at the airport. While the majority of the airport is Schoharie silt loam or made land, there are some soils that have potential for hydric inclusions, and indicator of wetlands. These soils occur in the same area of the wetlands off Runway 4.

Land acquisition between Millstead Way and Old Beahan Road has mapped wetlands in the area. Air Cargo Development area near Runway 10 lies within an area that has a field verified wetland that would be impacted.

Projects that impact one acre or greater of wetlands require a Section 404 Individual Permit from the ACOE. Projects that involve less than one acre of wetland impact generally qualify for a General Permit. Of the proposed development projects the relocation of the perimeter road, west of Runway 4-22, construction of a parallel taxiway to Runway 4-22, and extension to Runway 4, including the relocation of the approach lighting system, would all impact wetlands and require a Section 404 Permit from the ACOE, and a Water Quality Permit from the NYSDEC.

6.18 Wild and Scenic Rivers

The Wild and Scenic Rivers Act describes those river areas eligible to be included in a system that offers protection to rivers which "*are free flowing and possess…outstanding remarkable scenic, recreation, geologic, fish and wildlife, historic, cultural or other similar values*." According to the National Park Service, Nationwide River Inventory, there are no wild and scenic water bodies in Monroe County, so no impact will occur.

6.19 Future Required Analysis

Based on this environmental overview, **Table 6-1** provides a summary of the proposed projects and potential impact categories the may require further analysis. To implement the recommended development at ROC, the following environmental permits could be required, and obtained during the design phase of a project:

- U.S. ACOE Wetland Permit
- NYSDEC Section 401 Water Quality Permit
- NYSDEC State Pollutant Discharge Elimination System (SPDES) Permit
- NYSDEC Article 15 Stream Crossing Permit

Table 6-1 - Proposed Development Projects Requiring Further Environmental Review

Airside	
Project	**Potential Impact**
Runway 4-22 Length/Relocation of approach lighting system	Wetlands, Water Quality, Compatible Land Use (Land Acquisition), Floodplain, Light Emissions (Relocation of Approach Lighting), Historic, Endangered Species (Silver Maple Ash, Northern Long-Eared Bat, Bog Turtle), Secondary Impacts
Runway 28 Threshold and approach lighting system relocation	Compatible Land Use (Land Acquisition), Light Emissions (Relocation of Approach Lights)
Taxiway Runway 4-22 (west side)	Wetland, Water Quality, Floodplain, Historic, Endangered Species (Pink Heelsplitter)
Relocation/Construction of Taxiways	Water Quality
Expand Aprons	Water Quality
New Cargo apron (west side)	Wetland, Historic
Airport Perimeter Road Relocation	Wetland, Water Quality, Historic

Table continued on next page

Landside	
Project	**Potential Impact**
Terminal Building Expansion	Air Quality, Construction, Solid Waste, Energy Supply, Water Quality, Secondary Impacts
Auxiliary Cell Phone Lot	Water Quality
Hangar Development	Construction, Water Quality, Historic
Removal of Buildings #1 & #2 (300 ramp)	Hazardous Materials (Asbestos)
Airport Maintenance Facility	Historic
Land Acquisition (RPZ)	Compatible Land Use, Socioeconomic
Land Acquisition (Non-RPZ)	Wetlands
Acquisition Wilmorite Building (800 ramp)	Hazardous Materials

Chapter 7

Airport Layout Plan

design/construction solutions

7 Airport Layout Plan

This chapter presents the Airport Layout Plan (ALP) for the recommended developments at ROC. The ALP illustrates the recommended future airport facilities and airspace, and serves as the official development plan for the Airport. A number of additional drawings that illustrate surrounding airspace and land use support the ALP. The combined set of drawings is termed the ALP Drawing Set. This chapter contains the Summary of the Recommended Plan and the Airport Layout Plan details.

7.1 Summary of Recommendation Plan

Chapter 5 presented the overall recommended airport developments for ROC. The plan includes recommendations for airfield, passenger terminal, landside, general aviation (GA), and air cargo development which have been organized into three implementation phases:

Short-Term (0-5 years, 2014-2018)

- Environmental Assessment
- Runway 28 Modification (recapture 400 ft. of displaced threshold)
- Airport Service Road Relocation
- Taxiway “E” Extension
- Electrical Vault Relocation
- Reconfiguration of Taxiways “E” and “J”
- Residential Property Acquisition
- Hangar Development (private development)
- Terminal Security Improvements

Mid-Term (5-10 years, 2018-2024)

- Taxiway “H” Extension
- Taxiway “H” Extension (Full Parallel)
- Removal of Taxiway “G”
- Commercial Property Acquisition
- Perimeter Fencing

Long-Term (10-20 years, 2024-2034)

- Taxiway “H” Shift
- Expand GA Campus Aprons
- Runway 4-22 Extension
- Full Parallel Taxiway to Runway 4-22
- GA Corporate Campus Development (private development)
- Terminal Concourse Expansion

It should be noted that the projects list above are new facilities or property acquisition. Throughout the planning period, numerous rehabilitation projects and minor facility upgrades, both airside and landside, will also be pursued by ROC, but are not listed above.

7.2 Airport Layout Plan

The ALP drawings illustrate all development projects identified for ROC throughout the 20-year planning horizon. Upon approval by the FAA and NYSDOT, the ALP becomes the official development document for the Airport. The FAA requires that all new airport facilities be consistent with the ALP. As such, keeping the drawings accurate and up to date is a high priority. FAA policy now requires that the ALP be updated at least every five years.

Although the ALP is the only drawing that is signed by the FAA, it is part of a larger drawing set that includes the sheets listed below. ROS and the FAA maintain full size copies of the ALP Set. Each of the drawings is described below.

7.2.1 Existing and Proposed Airport Layout Plan

Table 7-1 – ALP Drawing Index

DRAWING INDEX		
Sheet No.	Sheet Title	DWG. No
1	Existing Airport Layout	ALP-1
2	Airport Layout Plan	ALP-2
3	Airport Data Summary	ALP-3
4	Terminal Area Plan (Passenger Terminal)	ALP-4
5	Terminal Area Plan (General Aviation)	ALP-5
6	Airport Airspace Plan	ALP-6
7	Airport Airspace Plan (continued)	ALP-7
8	Inner Approach Surface Drawing, Runway 4	ALP-8
9	Inner Approach Surface Drawing, Runway 22	ALP-9
10	Inner Approach Surface Drawing, Runway 10	ALP-10
11	Inner Approach Surface Drawing, Runway 28	ALP-11
12	Inner Approach Surface Drawing, Runway 7	ALP-12
13	Inner Approach Surface Drawing, Runway 25	ALP-13
14	Obstruction Tables	ALP-14
15	Land Use Plan	ALP-15
16	Airport Property Map	ALP-16

The first sheet of the drawing set is the Existing Airport Layout. This sheet depicts the Airport as it exists today. The drawing identifies all key FAA airfield design standards (e.g. Runway Safety Areas, Object Free Areas, Runway Protection Zones, etc.) and illustrates all landside facilities.

Sheet 2 consists of the proposed ALP, which includes all features of Sheet 1, plus all proposed facilities, airfield improvements, and recommendations. This drawing is reviewed by several offices within the FAA for consistency with airport design standards, flight procedures, airspace, and environmental requirements. Approval indicates the FAA's endorsement of the proposed project types and locations, but development may still be predicated upon environmental approvals and demand/capacity justification.

It should be noted that projects illustrated on the ALP do not commit the Airport, State or FAA to pursue their development nor does it ensure that funding will be available. The projects are intended to depict the maximum build-out of the Airport within the planning period.

The ALP drawings were prepared in accordance with the FAA design standards for Airport Reference Code (ARC) D-IV, which includes jet aircraft such as the Airbus A300 and Boeing 757. The crosswind Runway 10-28 primarily serves regional, and corporate jets, and turboprop aircraft typically falling within ARC C-III or below. Runway 7-25 is designed for general aviation aircraft with an ARC of B-II, intended primarily for Utility Aircraft (<12,500 pound maximum takeoff weight). The following publications were used during the drawing preparation:

- FAA Advisory Circular 150/5300-13, Airport Design
- FAA Advisory Circular 150/5070-7B, Airport Master Plans
- Federal Aviation Regulations, Part 77, Objects Affecting Navigable Airspace

As a large amount of information is contained on the ALP drawing, additional charts and tables relating to the ALP were placed on Sheet 3, Airport Data Summary, in order to reduce clutter.

The major proposed facilities on the ALP include runway and taxiway extensions, new taxiways, apron areas, hangars, and property acquisition. A substantial amount of pavement rehabilitation and maintenance will also occur during the planning period but is not specifically listed. In fact, at some time during the planning period, all runways, taxiways, aprons, and parking lots will be resurfaced or reconstructed.

Currently, Runway ends 4, 22 and 28 have precision instrument approaches (using ILS), and RNAV GPS non-precision approaches on Runways 10, 7, and 25. The Master Plan recommendation is to retain these capabilities throughout the planning period.

The full list of potential projects is contained in the Airport Capital Improvement Plan (ACIP) and is provided in Appendix B. The ACIP must be continuously refined during the planning period. The ACIP is used to present annual development goals and identify anticipated costs for each project. Airport Management will use a revised ACIP each year to provide its annual project requests and other the short-term projects to the FAA New York Airports District Office (NYADO). The ACIP serves as a planning tool for the Airport and reference guide for long-range development.

7.2.2 Terminal Area Plans

The Airport Terminal Area Plans, Sheets 4 and 5, illustrate the landside facilities depicted on the ALP at a larger scale and in greater detail. The drawings do not show additional facilities, but provide a clearer depiction of the proposed terminal area facilities at a scale useful for future site planning. Highlights of the proposed new facilities on these Plans include:

- General aviation apron expansion
- Areas reserved for several new corporate hangars
- Areas reserved for T-hangar development
- Areas reserved for other airport-related developments
- Expansion of the terminal building concourses and terminal apron
- Locations for potential non-aeronautical development

It is anticipated that these planned facilities account for more development than may actually occur through the year 2034. However, their inclusion serves an important role of ensuring that ample landside areas are reserved for potential airport-related developments of all types, as well as potential non-aeronautical revenue.

7.2.3 Airport Airspace Plan

The next nine sheets of the ALP drawing set illustrate the airspace requirements described in Federal Aviation Regulations (FAR) Part 77, Objects Affecting Navigable Airspace. Part 77.23 identifies a series of geometric planes (i.e., imaginary surfaces) that extend outward and upward from the Airport's runways and define the obstruction clearing requirements. These surfaces identify the maximum acceptable height of objects by defining three-dimensional areas surrounding all sides of the airfield. When an object penetrates an imaginary surface, it is considered an airspace obstruction and all obstructions are treated as potential hazards to air navigation (unless a FAA aeronautical study determines otherwise).

The height and dimensions of the imaginary surfaces are determined by the airfield and runway end elevations, the type of aircraft using the facilities, and the availability of instrument approaches to the runway ends (approach type and visibility minimums). For ROC, the specific surfaces are described below.

Primary Surface: A surface longitudinally centered on each runway and extending 200 feet beyond each runway end. The width of the primary surface for precision instrument Runways 4-22 and 10-28 is 1,000 feet and 500 feet for non-precision instrument Runway 7-25 (serving small utility aircraft).

Horizontal Surface: A horizontal plane is 150 feet above the airport elevation of 559 feet mean sea level (MSL). Therefore, the horizontal surface at ROC is situated 709 feet above MSL. The shape of the surface is created using radial arcs of 10,000 feet from the ends of the primary surface of Runways 4, 22, 10, and 28, connected by lines tangent to the arcs. Runway 7-25 is not used in defining the shape of the horizontal surface, as the 5,000 foot radial arcs from its runway ends would be completely encompassed by the 10,000 foot arcs of the precision instrument runways.

Conical Surface: A surface extending outward and upward from the periphery of the horizontal surface at a slope of 20 to 1, for a horizontal distance of 4,000 feet. At ROC, the elevation of the outer edge of the conical surface is 909 feet above MSL.

Approach Surface: Surfaces that are longitudinally centered on the runway centerlines and extend outward and upward from the ends of the primary surfaces. For ROC, the dimensions and slopes of the approach surfaces are listed below.

Table 7-2 – Approach Surface Dimensions

Runway End	Inner Width	Outer Width	Length	Slope
Runway 4 (Precision)	1,000	16,000	50,000	50:1 & 40:1*
Runway 22 (Precision)	1,000	16,000	50,000	50:1 & 40:1*
Runway 10 (Non-Precision)	1,000	3,500	10,000	34:1
Runway 28 (Precision)	1,000	16,000	50,000	50:1 & 40:1*
Runway 7 (Non-Precision, Utility)	500	2,000	5,000	20:1
Runway 25 (Non-Precision, Utility)	500	2,000	5,000	20:1

*50:1 for the first 10,000 ft., then 40:1 thereafter

Transitional Surface: Surfaces extending outward and upward at right angles from the sides of the primary and approach surfaces at a slope of 7 to 1. The transitional surfaces terminate at the overlying horizontal surface.

Runway Protection Zone (RPZ): A ground area that underlies the final approach area. The RPZ itself is not a FAR Part 77 surface; its purpose is to restrict development beneath the inner portion of the approach surface, and thus enhance the protection of people and property on the ground. The dimensions of the RPZs for ROC are listed below and are not anticipated to change during the planning period.

Table 7-3 – RPZ Dimensions

Runway End	Inner Width	Outer Width	Length
Runway 4 (Pre. ½ mi.)	1,000’	1,750’	2,500’
Runway 22 (Pre. ½ mi.)	1,000’	1,750’	2,500’
Runway 10 (NPI, 1-mi.)	500’	1,010’	1,700’
Runway 28 (Pre., 1-mi.)	500’	1,010’	1,700’
Runway 7 (NPI, 1-mi.)	500’	700’	1,000’
Runway 25 (NPI, 1-mi.)	500’	700’	1,000’

Sheets 6 and 7, Airport Airspace Plan, illustrates the overall dimensions of the Part 77 surfaces and the a few obstructions located within the outer portions of the approach, horizontal, and conical surfaces. Sheets 8 through 14 illustrate airspace obstructions to the inner portions of the Approach Surfaces in a level of detail to identify specific objects. As common to most airports, the drawings identify several penetrations to the surrounding airspace.

Building Restriction Line (BRL): The BRL surrounds all runways and is based upon FAR Part 77 obstruction criteria. For precision instrument Runways 4-22 and 10-28, a 750 foot runway offset is used for the BRL to represent the required runway clearance for a 35-foot tall building, in order to avoid a Transitional Surface penetration. This BRL offset is consistent with the previously approved ALP for ROC. For Runway 7-25, the 35-foot BRL offset is only 495 feet from the runway centerline, of the narrower Primary Surface. The Existing Airport Layout Sheet, the ALP Sheet, and each of the Terminal Area drawings illustrate the BRL for ROC. The BRL offsets are determined as follows:

BRL Offset from Runway Centerline = (Primary Surface width / 2) + (7 x 35 feet)

- Runway 4-22 & 10-28: (1,000'/2) + (7 x 35') = 745 feet, rounded to 750 feet.
- Runway 7-25 (500'/2) + (7 x 35') = 495 feet

7.2.4 Land Use Plan

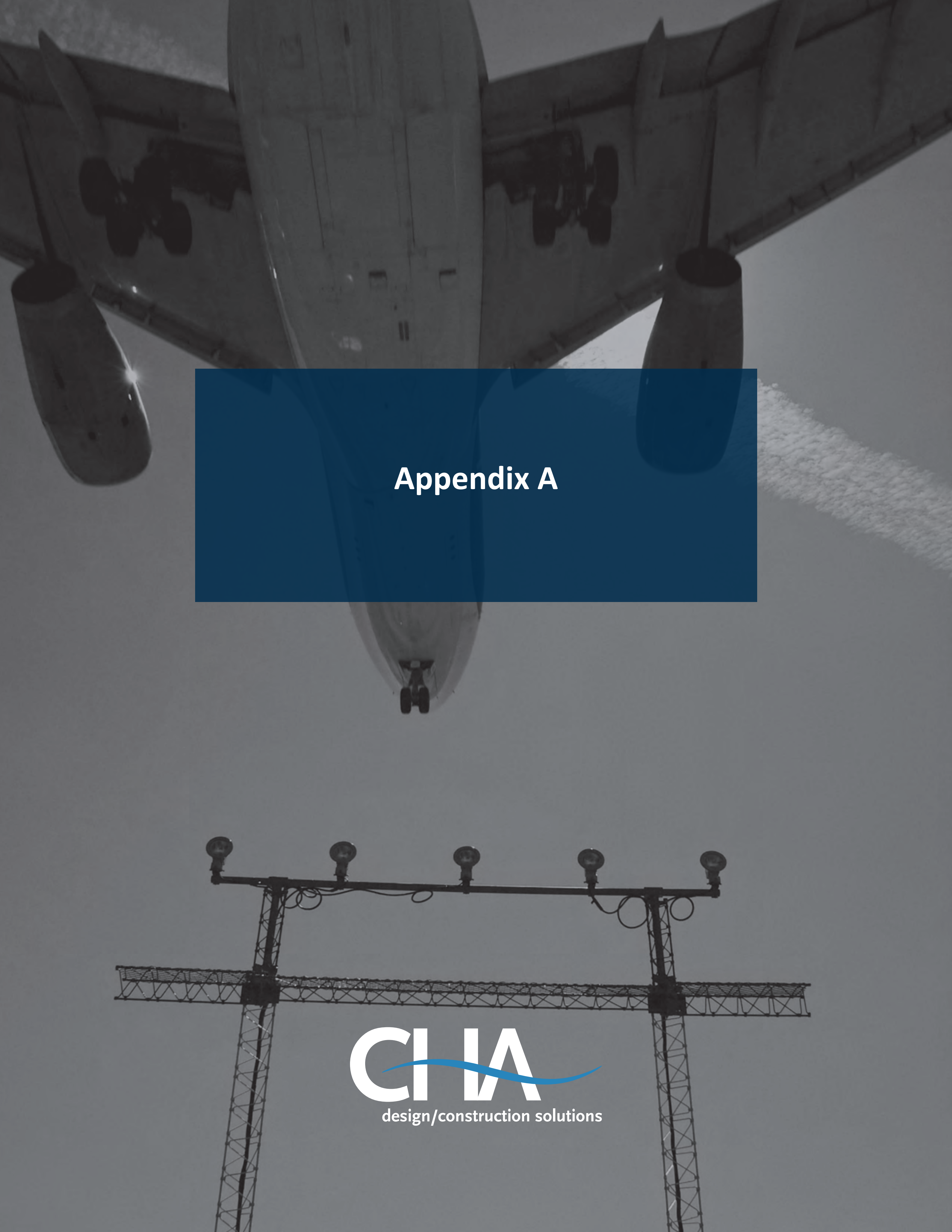
Airport development and expansions have the potential to impact sensitive areas such as residences, schools, churches, etc. Conversely, airports are typically considered to be compatible with commercial, industrial, and agricultural activities and land uses. As discussed in detail above in Chapter 6, the land use surrounding the airport contains a diverse mix of commercial and residential activities, as well as locations of industrial use, public land, and educational activities. Sheet 15 of the ALP set depicts the surrounding land use.

7.2.5 Airport Property Map

The final sheet of the ALP set is the Airport Property Map and Property Line drawings. These drawings are often called the "Exhibit A" because the property map is a required attachment for FAA grant applications, and is attached as Exhibit A.

The primary purpose of this drawing is to provide information indicating how various tracts of airport property were and will be acquired (i.e., federal programs, local funds only, etc.). The maps identify for the FAA the current and future aeronautical use of properties acquired with federal funds. They also identify each location that is proposed or planned for ultimate acquisition. An "Exhibit A" is for illustration purposes and does not constitute a property boundary survey or other legal document.

Appendix A



GREATER ROCHESTER INTERNATIONAL AIRPORT

MASTER PLAN UPDATE

Noise Analysis Technical Report

Prepared for:
CHA, Inc.

Prepared by:
KB Environmental Sciences, Inc.

DRAFT
August 6, 2014

KB Environmental Sciences

TABLE OF CONTENTS

SECTION 1
Introduction

Greater Rochester International Airport (ROC) located in Rochester, New York is currently preparing an update to its Master Plan. As part of the Master Plan Update, Noise Exposure Maps (NEMs) were prepared for the following scenarios:

- *Existing Conditions,* using the Master Plan baseline year of 2012;
- *Future No Build Conditions,* using the Master Plan out-year forecast for 2033; and,
- *Future Build Alternative,* including a proposed runway threshold relocation using the same forecast year of 2033.

This noise analysis technical report describes the methodology used to develop the NEMs and the resulting noise exposure levels in the vicinity of the airport.

SECTION 2

Methodology

The NEMs were developed using the Federal Aviation Administration (FAA) Integrated Noise Model (INM) Version 7.0d. The INM was developed by the FAA using methods and calculations from SAE International's Aerospace Information Report (AIR) 1845, *Procedure for the Calculation of Airplane Noise in the Vicinity of Airports*.

The INM produces aircraft noise contours that delineate areas of equal day-night average sound levels (DNL). The INM works by defining a network of grid points at ground level around an airport. It then selects the shortest distance from each grid point to each flight track and computes the noise exposure generated by each aircraft operation, along each flight track. Corrections are applied for atmospheric acoustical attenuation, acoustical shielding of the aircraft engines by the aircraft itself, and aircraft speed variations. The noise exposure levels for each aircraft are then summed at each grid location. The cumulative noise exposure levels at all grid points are then used to develop noise exposure contours for selected values (e.g. 65, 70 and 75 DNL). Using the results of the grid point analysis, noise contours of equal noise exposure can then be plotted.

A DNL is a 24-hour (average day), time-weighted sound level that is expressed in A-weighted decibels and is abbreviated as dB(A) or dB. The FAA, and other federal agencies, use DNL as the primary measure of noise impact because: it correlates well with the results of attitudinal surveys regarding noise; it increases with the duration of noise events; and, it accounts for an increased sensitivity to noise at night by increasing each noise event that occurs during nighttime hours (i.e., 10 pm to 7 am) by 10 dB(A).

In Appendix A of 14 CFR Part 150, the FAA identifies, as a function of yearly (365-day average) DNL value, land uses which are compatible and land uses which are noncompatible in an airport environs. As shown in **Table 2-1**, the FAA considers all land uses to be compatible with aircraft noise if the DNL is less than 65 dB(A).

The procedures used to develop the 2012 and 2033 NEMs are described in 14 CFR Part150 Appendix A and Subpart B. Appendix A of 14 CFR Part 150 stipulates the following regarding the preparation, illustration, and documentation of NEMs:

- Continuous contours depicting 65, 70, and 75 DNL must be developed;
- NEMs must identify runway locations, flight tracks, an outline of an airport's boundaries, noncompatible land uses within the 65 DNL, and the location of noise sensitive buildings (e.g., schools, hospitals);
- Estimates are to be made of the number of people residing within the 65, 70, and 75 DNL contours.

Subpart B of 14 CFR Part 150 stipulates that forecast conditions are to be representative of conditions at least five years in the future and assumptions concerning future conditions are to be reasonable regarding, among other factors, the type and frequency of aircraft operations and the number of nighttime operations.

Table 2-1. Land Use Compatibility

Land use	DNL expressed in dB(A)					
	Below 65	65–70	70–75	75–80	80–85	Over 85
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
Public Use						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Governmental services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
Commercial Use						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale and retail—building materials, hardware and farm equipment	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade—general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
Manufacturing and Production						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
Recreational						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

SLUCM=Standard Land Use Coding Manual. Y (Yes) = Land Use and related structures compatible without restrictions. N (No) = Land Use and related structures are not compatible and should be prohibited. NLR = Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
25, 30, or 35=Land use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structure.
(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10 or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.
(2) Measures to achieve NLR 25 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
(3) Measures to achieve NLR of 30 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
(4) Measures to achieve NLR 35 dB must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal level is low.
(5) Land use compatible provided special sound reinforcement systems are installed.
(6) Residential buildings require an NLR of 25.
(7) Residential buildings require an NLR of 30.
(8) Residential buildings not permitted.

Source: 14 CFR Part 150

SECTION 3
Existing Conditions (2012)

This section details the development of DNL contours at 65, 70, and 75 dB(A) for the current 2012 conditions. The data used as input to the INM for the year 2012 NEM were comprised of the following:

- Runway layout and use,
- Number of aircraft operations,
- Operational time-of-day,
- Aircraft fleet mix, and
- Flight tracks and profiles.

This section discusses each of the above data elements and concludes with the NEM.

3.1 Runway Layout and Use

ROC has three runways: Runway 4/22 which is 8,001 feet long and 150 feet wide; Runway 10/28 which is 6,401 feet long and 150 feet wide; and, Runway 7/25 which is 4,000 feet long and 100 feet wide. **Table 3-1** below details the utilization of each runway by jet, turboprop, and piston-propeller aircraft as well as helicopters. Runway 4/22 is the most-used runway at the airport.

3.2 Aircraft Operations

An aviation activity forecast for ROC was prepared as part of the Master Plan Update with a baseline year of 2012. The overall forecast of aviation activity was divided into categories of aircraft. The 2012 aircraft operations by category are provided in **Table 3-2.** As shown, in 2012 there were 93,681 operations at the airport (an average of approximately 257 operations per day). An aircraft operation is defined as either one arrival or one departure. A touch-and-go operation – an arrival of an aircraft and the departure of the same aircraft – is defined as two operations.

Table 3-1. Estimated Runway Use by Aircraft Category

Aircraft Category	Runway						
	4	22	7	25	10	28	Total
Itinerant Arrivals							
Air Carrier Jet/Turboprop	35%	45%	–	–	5%	15%	100%
General Aviation Jet/Turboprop	25%	35%	–	5%	5%	30%	100%
General Aviation Piston	5%	5%	20%	40%	–	30%	100%
Military Helicopter	–	–	25%	70%	–	5%	100%
Itinerant Departures							
Air Carrier Jet/Turboprop	25%	45%	–	–	5%	25%	100%
General Aviation Jet/Turboprop	20%	35%	–	5%	5%	35%	100%
General Aviation Piston	5%	5%	20%	40%	–	30%	100%
Military Helicopter	–	–	5%	95%	–	–	100%
Local							
General Aviation Jet/Turboprop	–	90%	–	–	–	10%	100%
General Aviation Piston	–	–	20%	75%	–	5%	100%
Military Helicopter	–	–	10%	90%	–	–	100%

Source: FAA ATCT, 2014

Table 3-2. 2012 Aircraft Operations by Category

Aircraft Category	Operations
Air Carrier	37,160
General Aviation	53,500
Military	3,022
Total	**93,681**

Source: 2014 Greater Rochester International Airport Master Plan Update. Note: Rounding error of +/- 1 operation.

3.3 Operational Time-of-Day

As previously stated, DNL is calculated such that aircraft operations that occur after 10 pm and before 7 am (i.e., during the nighttime) are penalized by the addition of 10 dB(A) to each operation. Based on data received from the FAA Air Traffic Control Tower (ATCT), it was estimated that approximately 10 percent of itinerant operations and 5 percent of local operations at the airport occur during the nighttime hours.

3.4 Fleet Mix

The FAA's Traffic Flow Management System Count (TFMSC) for calendar year 2012 was used to develop the 2012 INM aircraft fleet mix. TFMSC data provides information on traffic counts by airport and includes the specific aircraft types operating at that airport. TFMSC source data are created when pilots file flight plans. In addition, the Master Plan Update Forecast Chapter was used as the primary source of commercial air carrier fleet mix (Table 2-9 – Commercial Air Carrier Fleet Mix: Percent of Annual Departures by Aircraft). This table included commercial jet and regional jet percentages for 2013, which were multiplied the 2012 air carrier forecast operations to derive the 2012 fleet mix.

The INM includes a number of individual aircraft types as well as a number of FAA-approved substitute aircraft. The TFMSC data and Master Plan fleet mix were reviewed and each aircraft type was assigned an INM aircraft type or approved substitute. The cargo fleet mix was confirmed through interviews with airport management. Cargo operations were developed in a separate category from the passenger air carrier category.

For the purposes of preparing DNL contours, operational data were segregated by aircraft type and by type of operation. Aircraft operations were segregated as being local or itinerant. An itinerant operation is defined as an aircraft departure where the aircraft leaves the airport vicinity and lands at another airport, or an aircraft landing where the aircraft arrives from another airport. Local operations are aircraft conducting touch-and-go training operations. A touch-and-go operation occurs when an aircraft departs an airport, lands on a runway and then departs again without stopping. The 2012 INM aircraft operations and fleet mix by aircraft category are provided in **Tables 3-3** through **3-7.**

Table 3-3. 2012 Air Carrier Aircraft Operations

Aircraft Category	INM Aircraft	Annual Operations
Large Jet	A319-131	744
	A320-232	586
	717200	1,870
	737300	224
	737700	2,253
	737800	45
	MD83	878
	MD9025	947
Regional Jet/ Commercial Turboprop	EMB170	1,058
	EMB175	1,757
	EMB190	2,364
	CRJ9-ER	2,905
	DHC830	4,167
	EMB145	7,679
	1900D	1,102
	CL601	8,581
	Total	**37,160**

Source: 2014 Greater Rochester International Airport Master Plan Update, KB Environmental Sciences, Inc.
Note: Rounding error of +/- 1 operation.

Table 3-4. 2012 Cargo Aircraft Operations

Aircraft Category	INM Aircraft	Annual Operations
Cargo	A300-622R	609
	DC1030	583
	757PW	1,015
Turboprop	CNA208	1,553
	Total	**3,760**

Source: 2014 Greater Rochester International Airport Master Plan Update,
FAA Traffic Flow Management System Count (TFMSC), KB Environmental Sciences, Inc.
Notes: Rounding error of +/- 1 operation. Cargo operations were included in the General Aviation category.

Table 3-5. 2012 General Aviation Itinerant Aircraft Operations

Aircraft Category	INM Aircraft	Annual Operations
Jet	CL600	1,004
	LEAR35	1,003
	MU3001	987
	CNA55B	748
	CNA560XL	478
	F10062	444
	CNA560E	325
	CIT3	240
	ECLIPSE500	189
	CNA750	158
	CNA680	135
	CNA510	101
	GIV	89
	GV	84
	IA1125	60
	LEAR25	55
	GIIB	59
Turboprop	CNA441	919
	SD330	165
	DHC6	47
	CNA208	2,748
Multi-Engine Piston	BEC58P	6,594
Single Engine Piston	GASEPV	7,236
	CNA172	2,118
	CNA182	939
	PA31	866
	CNA206	1,497
	PA28	454
	GASEPF	303
	Total	**30,045**

Source: 2014 Greater Rochester International Airport Master Plan Update,
FAA Traffic Flow Management System Count (TFMSC), KB Environmental Sciences, Inc.
Note: Rounding error of +/- 1 operation.

Table 3-6. 2012 Local Aircraft Operations

Aircraft Category	INM Aircraft	Annual Operations
Single-Engine Piston	GASEPV	11,816
Multi-Engine Piston	BEC58P	5,908
Turboprop	CNA208	1,970
	Total	**19,694**

Source: 2014 Greater Rochester International Airport Master Plan Update, KB Environmental Sciences, Inc.
Note: Rounding error of +/- 1 operation.

Table 3-7. 2012 Military Aircraft Operations

Aircraft Category	INM Aircraft	Annual Operations
Rotorcraft Itinerant	CH47D	974
	S70	974
Rotorcraft Local	CH47D	537
	S70	537
	Total	**3,022**

Source: 2014 Greater Rochester International Airport Master Plan Update, KB Environmental Sciences, Inc.
Note: Rounding error of +/- 1 operation.

3.5 Flight Tracks and Profiles

The location of flight paths is an important factor in determining the geographic distribution of noise contours on the ground. The INM uses airport-specific ground tracks and vertical flight profiles to compute three-dimensional flight paths for each modeled aircraft. The “default” INM vertical profiles, which consist of altitude, speed, and thrust settings, are compiled from data provided by aircraft manufacturers. For departures, multiple default profiles are available in the INM for air carrier aircraft. These multiple profiles are related to differences in aircraft weight according to trip distance or “Stage Length”. Stage Length 1 ranges from 0-500 nautical miles (nm) and Stage Length 2 ranges from 501-1,000nm. For this analysis, aircraft were modeled as Stage Lengths 1 and/or 2 as appropriate.

Flight paths utilized by arriving, departing, and local touch-and-go aircraft operating on each runway were provided by the ATCT. A series of flight path centerlines were then established for each runway. These centerline tracks were splayed within the INM in order to reflect the typical range of flight paths used by individual flights. The arrival and departure itinerant INM flight tracks are shown on **Figures**

3-1 and **3-2**, respectively. It should be noted that itinerant rotorcraft follow two specific arrival and departure paths. Both of these paths are located south of the airport – one along Interstate 390 and one along the Genesee River – and operate at an altitude of 1,800 feet above mean sea level (MSL).

All aircraft arrival flight tracks are generally straight-in of all runway ends. Air carrier aircraft departures are generally straight-out to approximately 5 miles from the airport. The general aviation aircraft departures can execute a straight-out departure or either be turned to the left or right. For modeling purposes, approximately one third of general aviation departures went straight, one-third turned to the left, and one-third to the right.

The local touch-and-go tracks are shown on **Figure 3-3**. There is a touch-and-go track from each runway end. Touch-and-go operations use a left traffic pattern from Runways 4, 10, and 25 and a right pattern from Runways 7, 22, and 28. The pattern altitude at DMW is 800 feet above field elevation (AFE).

3.6 2012 Noise Exposure Map

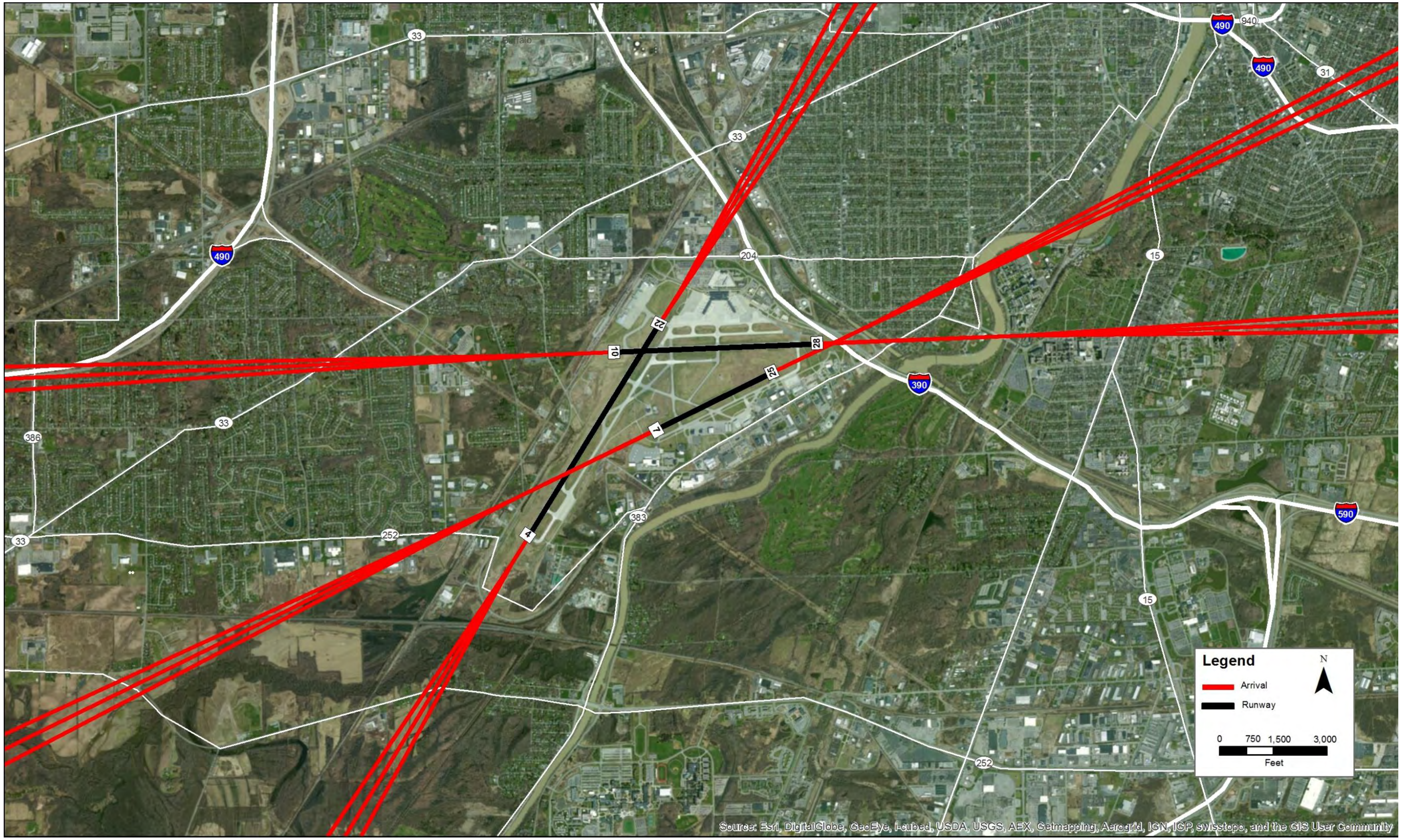
The aircraft noise contours for 2012 are provided on **Figure 3-4. Table 3-8** provides the area, in acres, of each contour interval (i.e., 65-69 DNL, 70-74 DNL, and 75 and greater DNL). As shown, the total area encompassed by the 65 DNL contour is 600.3 acres. There are no residences or other noise sensitive land uses within the 2012 65 DNL contour.

Table 3-8. 2012 Noise Contour Areas

DNL (dB(A))	Area (Acres)
65 - 69	338.5
70 - 74	163.0
75 +	98.8
Total	**600.3**

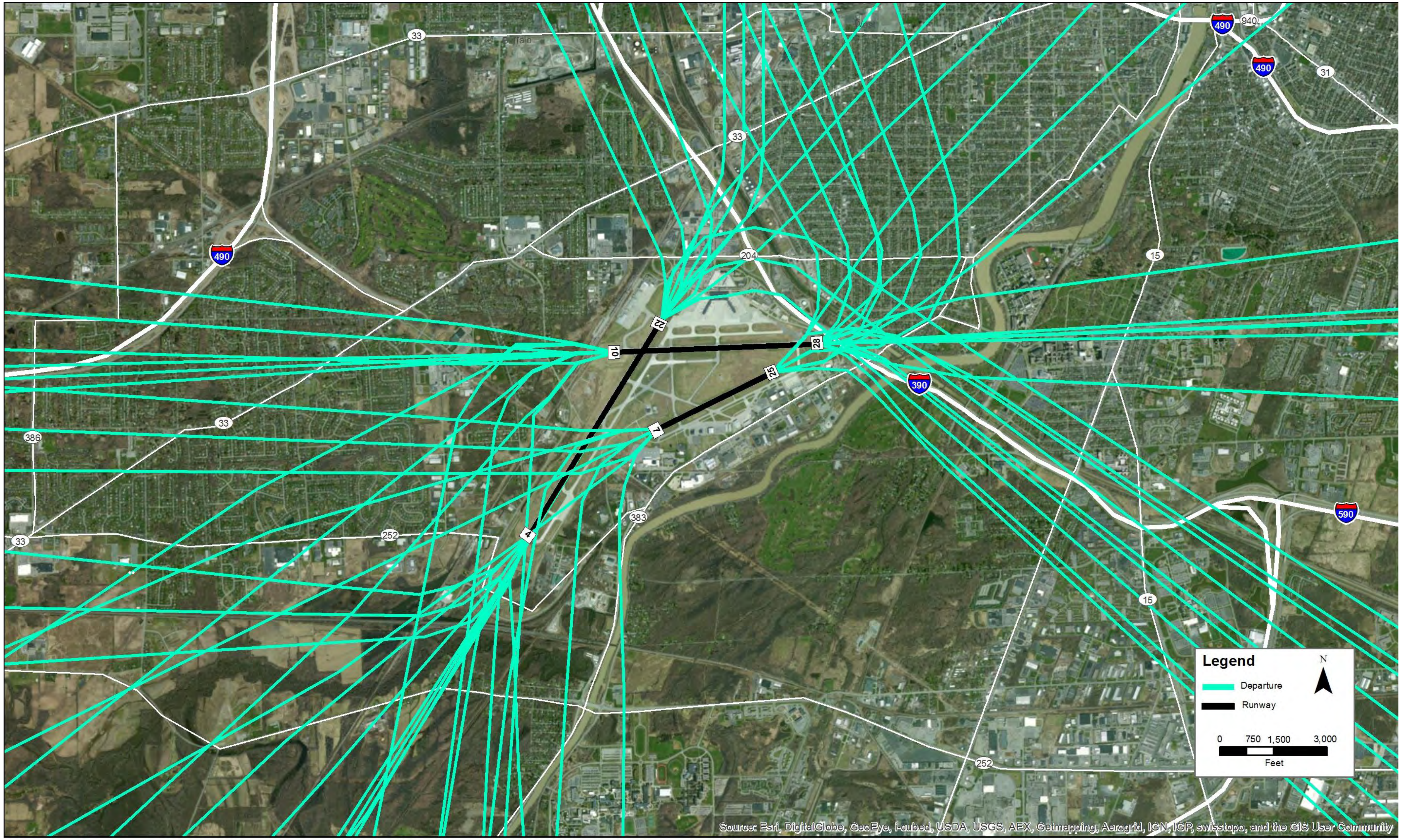
Source: INM 7.0d

Figure 3-1. 2012 Modeled Arrival Tracks



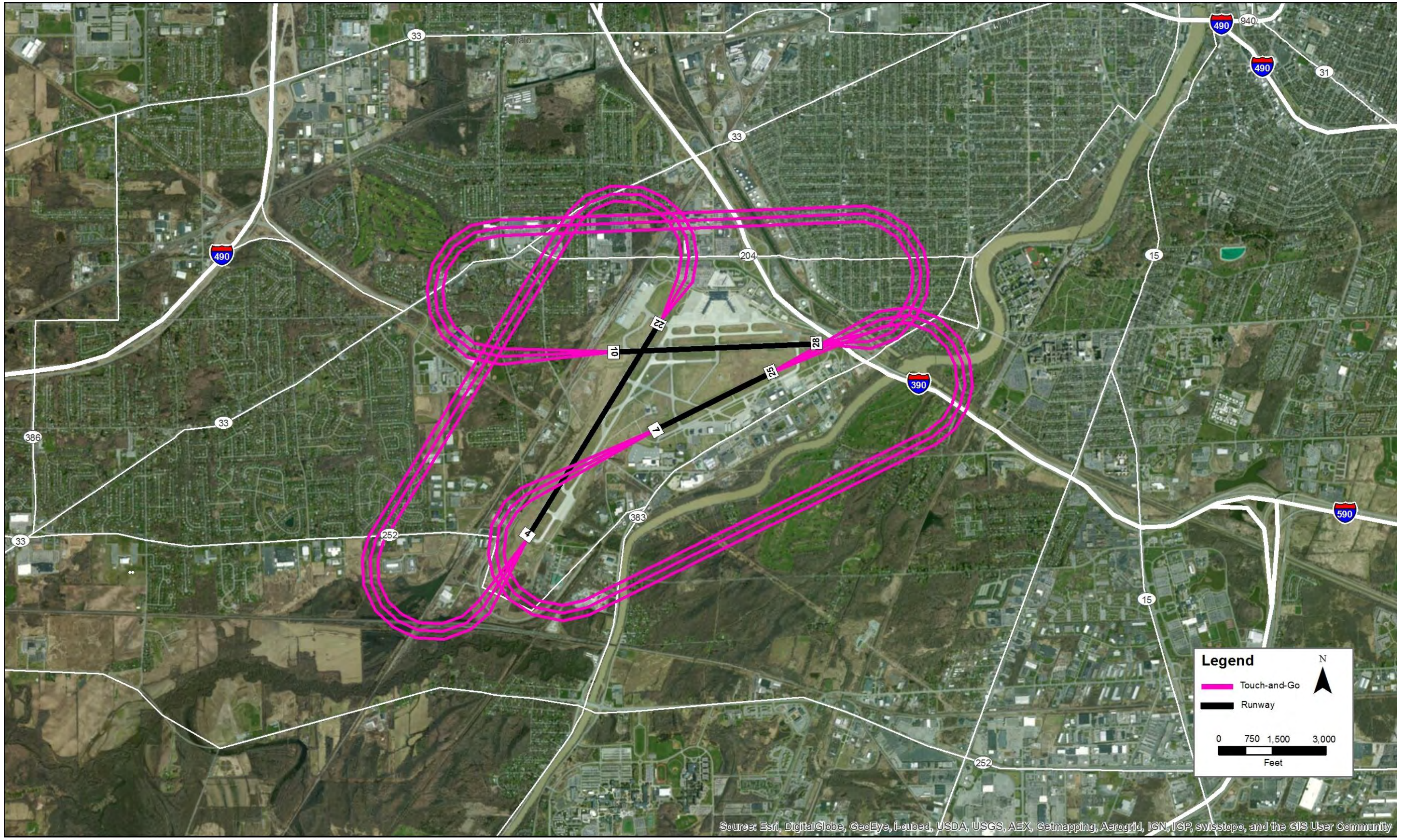
Greater Rochester International Airport Master Plan
Modeled Arrival Flight Tracks

Figure 3-2. 2012 Modeled Departure Tracks



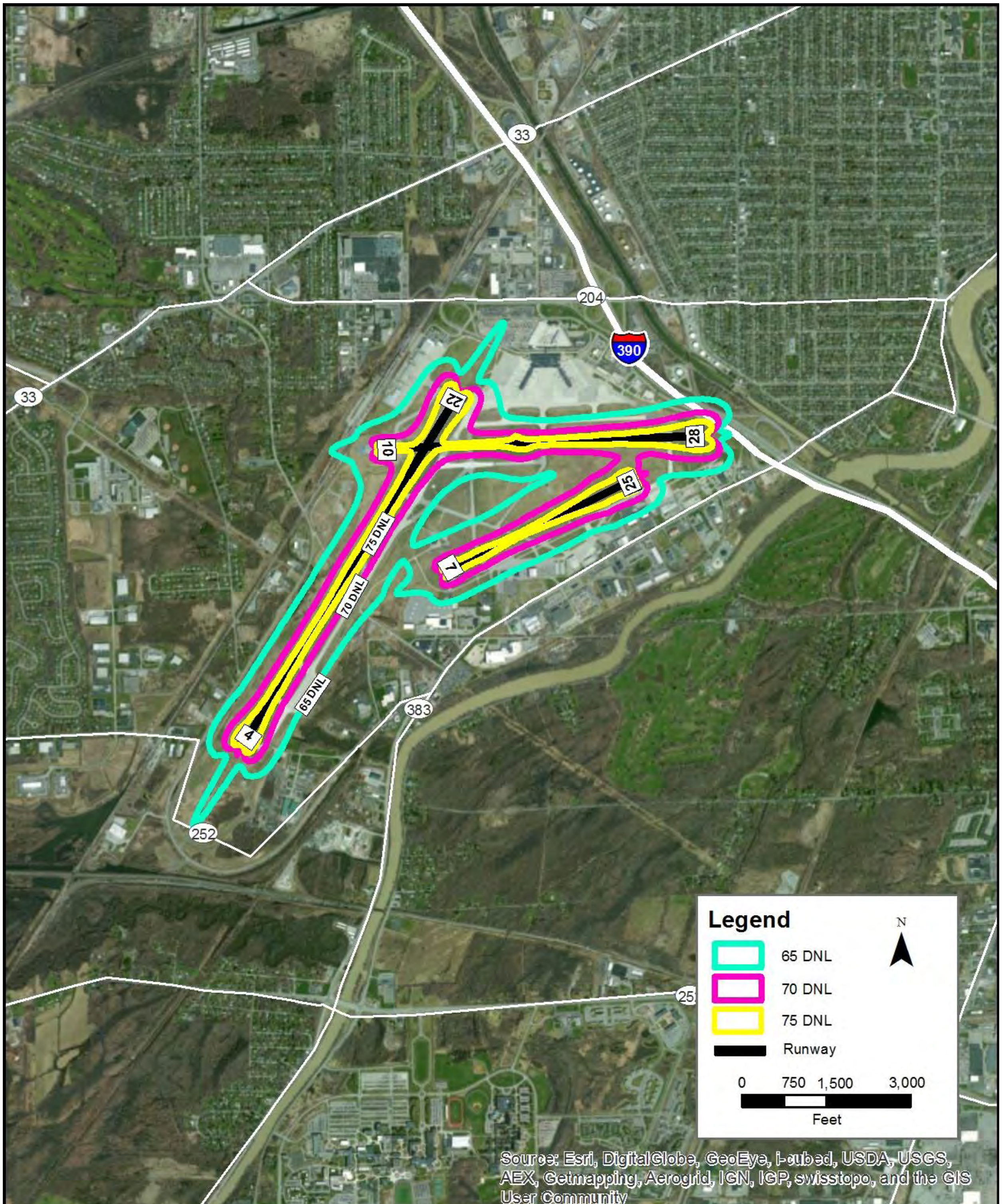
Greater Rochester International Airport Master Plan
Modeled Departure Flight Tracks

Figure 3-3. 2012 Modeled Local Tracks



Greater Rochester International Airport Master Plan
Modeled Local Flight Tracks

Figure 3-4. 2012 DNL Contours



Greater Rochester International Airport Master Plan
2012 DNL Contours

SECTION 4

Future No Build (2033)

This section discusses the input data developed for the year 2033 No Build scenario and the resulting Noise Exposure Map. The No Build scenario includes the same runway layout and use, flight tracks, and profiles. However, the year 2033 aircraft operations and fleet mix were defined using the aviation activity forecast from Chapter 2 of the Master Plan Update.

4.1 Runway Layout and Use

The airfield configuration modeled for the 2033 No Build scenario was the same as the Existing Conditions in 2012. Likewise, the runway use for the 2033 No Build scenario was the same as the Existing Conditions in 2012.

4.2 Aircraft Operations

A forecast was prepared as part of the Master Plan Update. The forecast of operations for the year 2033 by aircraft category is presented in **Table 4-1.** As shown, the 2033 forecast includes 104,674operations (an average of approximately 287operations per day).

Table 4-1. 2033 Aircraft Operations by Category

Aircraft Category	Operations
Air Carrier	43,088
General Aviation	58,564
Military	3,022
Total	**104,674**

Source: 2014 Greater Rochester International Airport Master Plan Update
Note: Rounding error of +/- 1 operation.

4.3 Operational Time-of-Day

The percentages of nighttime operations for the 2033 No Build scenario were the same as those for the Existing Conditions 2012.

4.4 Fleet Mix

The Airport Master Plan Update was used to determine the 2033 No Build air carrier fleet mix. The 2033 No Build general aviation aircraft fleet mix was determined by multiplying the percentages (by aircraft type) that occurred in 2012 by the total operations forecasted to occur at the airport in 2033. The 2033 No Build INM aircraft operations and fleet mix are provided in **Table 4-2 through 4-6.**

Table 4-2. 2033 Air Carrier Aircraft Operations

Aircraft Category	INM Aircraft	Annual Operations
Large Jet	A320-232	894
	717200	2,116
	737700	5,614
	737800	118
Regional Jet/ Commercial Turboprop	EMB170	6,924
	EMB175	4,450
	EMB190	2,742
	CRJ9-ER	13,492
	DHC830	2,964
	EMB145	2,676
	CL601	1,098
	Total	**43,088**

Source: 2014 Greater Rochester International Airport Master Plan Update, KB Environmental Sciences, Inc.
Note: Rounding error of +/- 1 operation.

Table 4-3. 2033 Cargo Aircraft Operations

Aircraft Category	INM Aircraft	Annual Operations
Cargo	A300-622R	810
	DC1030	775
	757PW	1,350
Turboprop	CNA208	2,065
	Total	**5,000**

Source: 2014 Greater Rochester International Airport Master Plan Update,
FAA Traffic Flow Management System Count (TFMSC),
KB Environmental Sciences, Inc.
Notes: Rounding error of +/- 1 operation. Cargo operations were included in the General Aviation category.

Table 4-4. 2033 General Aviation Itinerant Aircraft Operations

Aircraft Category	INM Aircraft	Annual Operations
Jet	CL600	1,128
	LEAR35	1,010
	MU3001	994
	CNA55B	753
	CNA560XL	481
	F10062	447
	CNA560E	327
	CIT3	242
	ECLIPSE500	190
	CNA750	159
	CNA680	136
	CNA510	102
	GIV	90
	GV	85
	IA1125	60
Turboprop	CNA441	926
	SD330	166
	DHC6	47
	CNA208	2,768
Multi-Engine Piston	BEC58P	6,642
Single Engine Piston	GASEPV	7,289
	CNA172	2,133
	CNA182	946
	PA31	872
	CNA206	1,508
	PA28	457
	GASEPF	305
	Total	**30,263**

Source: 2014 Greater Rochester International Airport Master Plan Update, FAA Traffic Flow Management System Count (TFMSC), KB Environmental Sciences, Inc.
Note: Rounding error of +/- 1 operation.

Table 4-5. 2033 Local Aircraft Operations

Aircraft Category	INM Aircraft	Annual Operations
Single-Engine Piston	GASEPV	13,981
Multi-Engine Piston	BEC58P	6,990
Turboprop	CNA208	2,330
	Total	**23,301**

Source: 2014 Greater Rochester International Airport Master Plan Update, KB Environmental Sciences, Inc.
Note: Rounding error of +/- 1 operation.

Table 4-6. 2033 Military Aircraft Operations

Aircraft Category	INM Aircraft	Annual Operations
Rotorcraft Itinerant	CH47D	974
	S70	974
Rotorcraft Local	CH47D	537
	S70	537
	Total	**3,022**

Source: 2014 Greater Rochester International Airport Master Plan Update, KB Environmental Sciences, Inc.
Note: Rounding error of +/- 1 operation.

4.5 Flight Tracks

The flight tracks, flight track use, and profiles/Stage Lengths for the 2033 No Build scenario were the same as those for the Existing Conditions 2012.

4.6 Noise Exposure Map

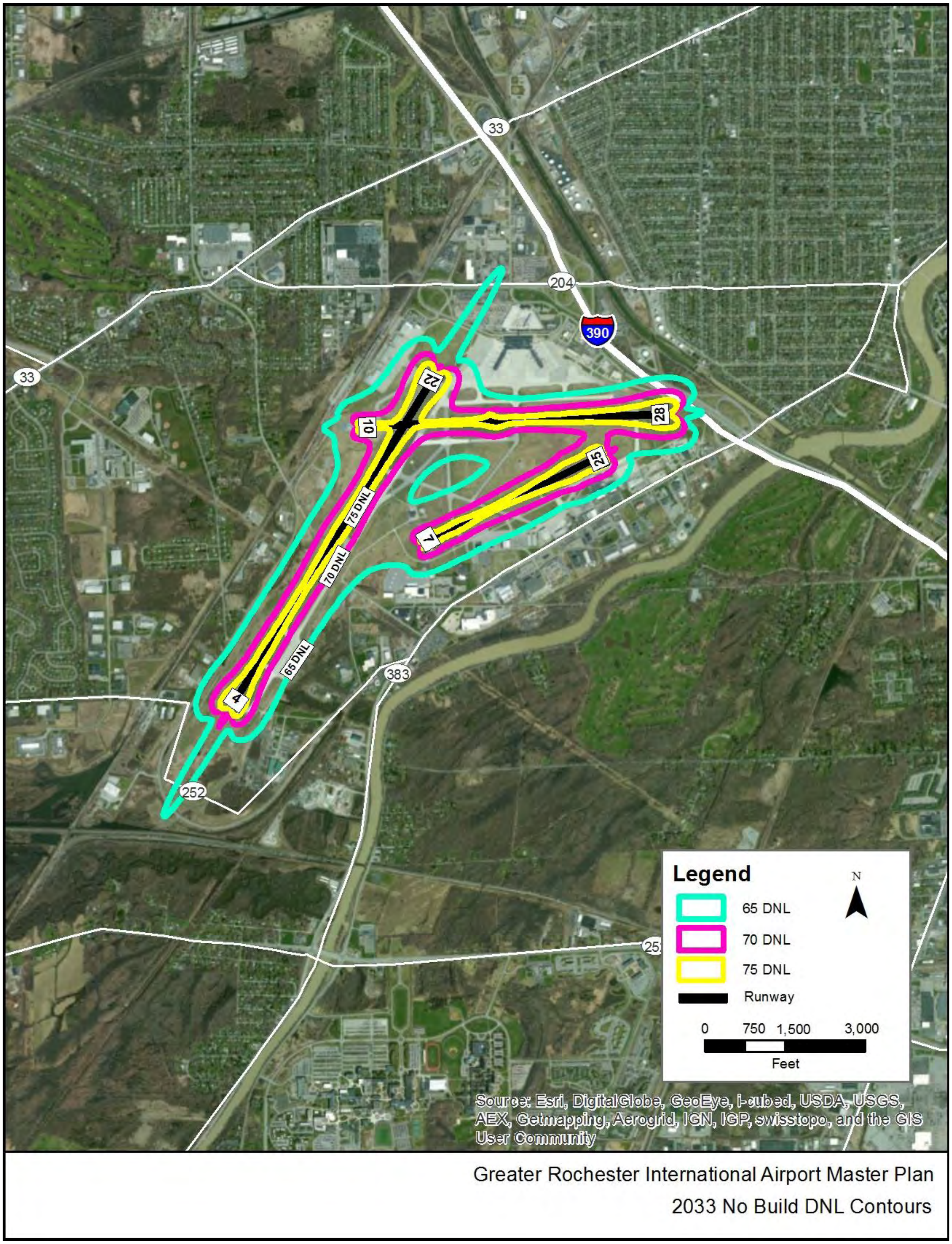
The aircraft noise contours for the 2033 No Build scenario are provided on **Figure 4-1.** **Table 4-3** provides the area, in acres, of each contour interval (i.e., 65-69 DNL, 70-74 DNL, and 75 and greater DNL). As shown, the total area encompassed by the 2033 No Build 65 DNL contour is 672.8 acres. The 2033 No Build 65 DNL contour is slightly larger than the 2012 65 DNL due to the forecasted increase in operations. As with the Existing Conditions, there are no residences or other noise sensitive land uses within the 2033 No Build 65 DNL contour.

Table 4-7. 2033 No Build Noise Contour Areas

DNL (dB(A))	Area (Acres)
65 – 69	391.6
70 – 74	176.1
75 +	105.1
Total	**672.8**

Source: INM 7.0d

Figure 4-1. Future 2033 No Build DNL Contours



SECTION 5

Future Build Alternative (2033)

This section discusses the input data developed for the 2033 Build Alternative and the resulting NEM. The 2033 Build Alternative includes the same aircraft operations and fleet mix as the 2033 No Build scenario. However, the runway layout reflects a proposed 400-foot runway threshold relocation for Runway 28.

5.1 Runway Layout and Use

The airfield configuration for the 2033 Build Alternative included a proposed 400-foot runway threshold relocation for Runway 28. The proposed threshold shift would increase the landing distance available from 5,501 feet to 5,901 feet by moving the arrival threshold 400-feet to the east.

The layout of the other 2 runways, and runway use percentages for all 3 runways, for the 2033 Build Alternative were the same as the 2033 No Build scenario.

5.2 Aircraft Operations

The aircraft operations for the 2033 Build Alternative were the same as the 2033 No Build scenario.

5.3 Operational Time-of-Day

The time-of-day operations for the 2033 Build Alternative were the same as the 2033 No Build scenario.

5.4 Fleet Mix

The aircraft fleet mix for the 2033 Build Alternative is the same as the 2033 No Build scenario.

5.5 Flight Tracks

The INM flight tracks for the 2033 Build Alternative were reflective of the new threshold location (i.e., arrival tracks to Runway 28 were shifted 400 feet to the east). All other flight tracks remained the same as the Existing Condition.

5.6 Noise Exposure Map

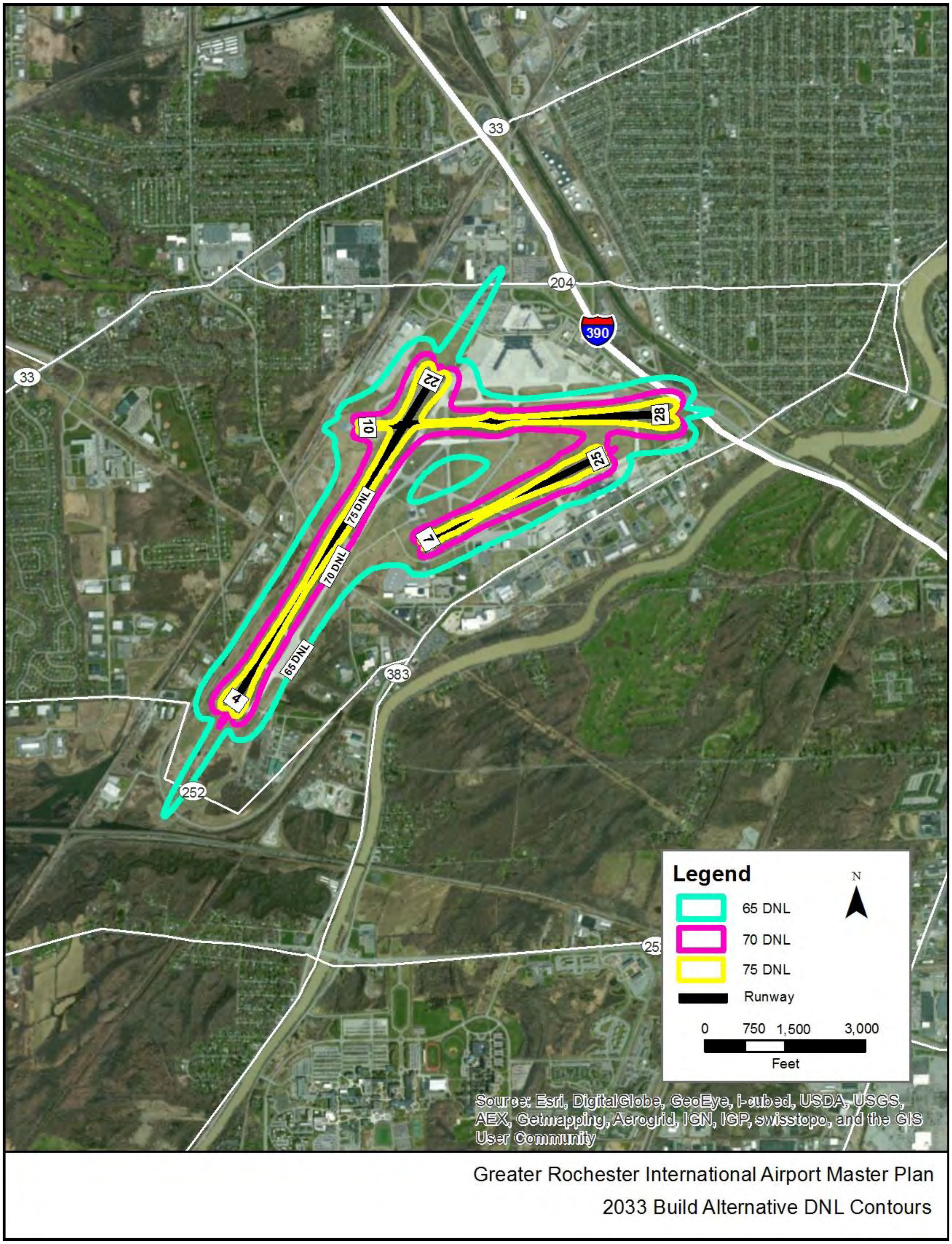
The aircraft noise contours for the 2033 Build Alternative are provided on **Figure 5-4.** **Table 5-1** provides the area, in acres, of each contour interval (i.e., 65-69 DNL, 70-74 DNL, and 75 and greater DNL). As shown, the total area encompassed by the 2033 Build Alternative 65 DNL contour is 673 acres. There are no residences or other incompatible land uses within the 2033 Build Alternative 65 DNL contour.

Table 5-1. 2033 Build Alternative Noise Contour Areas

DNL (dB(A))	Area (Acres)
65 - 69	392.0
70 - 74	176.1
75 +	104.9
Total	**673.0**

Source: INM 7.0d

Figure 5-4. Future 2033 Build Alternative DNL Contours



SECTION 6

Conclusion

Noise Exposure Maps were prepared as part of the Greater Rochester International Airport Master Plan Update. DNL contours were modeled to identify the changes in noise exposure resulting from forecast operations in 2033 and proposed airfield improvements including a runway threshold relocation. Although the Future Build Alternative 65 DNL contour extended beyond the airport property boundary, no incompatible land uses (e.g., residences, schools, places of worship) were within the limits of the 65 DNL contour.

Appendix B

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design/construction solutions