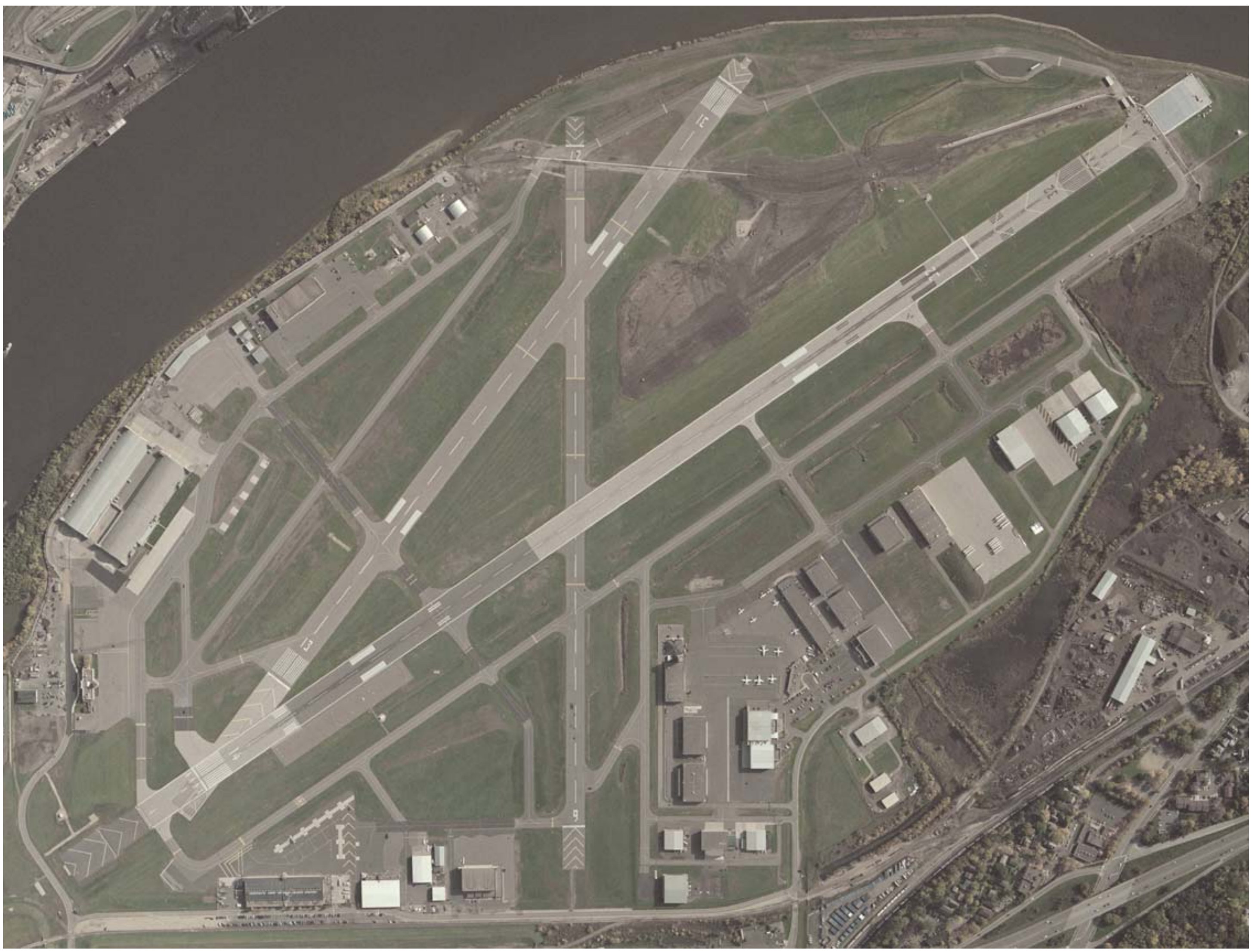
Metropolitan Airports Commission

St. Paul Downtown Airport (STP)

Long-Term Comprehensive Plan



Metropolitan Council Determination April 2010

Final Adoption by MAC June 2010

St. Paul Downtown Airport
Long-Term Comprehensive Plan Update

FINAL – June 2010

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Prepared by the Metropolitan Airports Commission

with assistance from HNTB Corporation

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Executive Summary

The St. Paul Downtown Airport, also known as Holman Field, is one of seven airports owned and operated by the Metropolitan Airports Commission (MAC). The airport identifier, or reference code, is STP. Holman Field has played an important role in the Twin Cities since the City of St. Paul opened the airport in 1926. Located just five minutes from the St. Paul business center and 15 minutes from downtown Minneapolis, STP is considered by the MAC to be the primary reliever airport for the Minneapolis – St. Paul International Airport (MSP). In a 2005 economic report prepared by MAC, its contribution to the local economy has been estimated to be more than $112 million annually.

This comprehensive planning document serves as a frame work for future development activity at the airport. This report follows guidelines set forth by the Federal Aviation Administration (FAA) and the Metropolitan Council. The last long term plan for STP was completed in 1992. Since that time, MAC has completed environmental reviews and implemented recommendations from that plan.

ES.1 Report Organization

This report is organized into the following chapters:

1. Existing Conditions / Inventory
2. Aviation Forecasts
3. Airside and Landside Facility Requirements
4. Plan Recommendations
5. Environmental Considerations
6. Land Use Compatibility
7. Capital Improvement Program Costs
8. Facility Implementation Schedule
9. Public Information Process

The inventory of existing conditions is used to establish a baseline of facilities and services available at the airport. The forecasts are used to determine the type of activity likely to occur at the airport and at what projected levels. Facility requirements use the forecasts to determine what facilities will be required to support the level of activity indicated by the forecast. The projected facility needs are compared to the existing infrastructure to determine if additional facilities at the airport will be needed in the future.

The plan recommendations chapter identifies improvements considered for the airport. The environmental considerations and land use sections discuss the existing conditions and plan recommendations in relation to environmental issues, such as noise, and surrounding land use compatibility.

The last sections identify the plan recommendation costs and the proposed timeline for implementation. The final section outlines the public information program that was followed, and summarizes any comments received during the document development process.

ES.2 Forecasts

This document includes aviation forecasts for based aircraft and the projected number of operations for STP. Forecasts are presented for an approximate 20-year time horizon, and include 2010, 2015, 2020, and 2025 as noted in Table ES-1. The forecasts are unconstrained and assume that the necessary facilities will be in place to accommodate demand.

Table ES-1
Forecast Summary

Year	Baseline	High Forecast	Low Forecast
OPERATIONS			
2007	125,254	125,254	125,254
2010	111,870	133,953	85,858
2015	117,399	149,365	95,934
2020	130,056	156,458	103,613
2025	137,310	156,431	112,869
BASED AIRCRAFT			
2007	93	93	93
2010	105	105	102
2015	117	125	112
2020	128	132	115
2025	132	132	120

Source: Aviation Forecasts – Technical Report, April 2009

The existing and projected economic conditions in the area and current general aviation activity are used to prepare the assumptions that form the foundation of the forecasts. Based aircraft forecasts for the MAC-owned airports are calculated and then allocated among the individual airports. Operations and peak activity forecasts for STP are derived from the based aircraft forecasts. The analysis also includes a set of high and low activity scenarios for the airport in addition to the baseline forecasts.

The assumptions inherent in the forecasts are based on data provided by the MAC, federal and local sources, and professional experience. Fuel cost assumptions reflect the recent major increase in oil prices. Forecasting, however, is not an exact science. Departures from forecast levels in the local and national economy and in the aviation industry will have an effect on the forecasts presented herein.

A copy of the full Activity Forecasts - Technical Report is contained in Appendix A of this document.

ES.3 Facility Requirements

The current aircraft approach category assigned to Runway 14-32 at the Airport is “D”. Typical aircraft in this aircraft approach category include business jets such as the Gulfstream V. Both Runways 13-31 and 9-27 are assigned aircraft approach category “B”. Runway 13-31 is designed for aircraft over 12,500 pounds maximum gross take-off weight. Typical aircraft in this approach category and weight include small business jets such as the Cessna Citation III. Runway 9-27 is designed for aircraft less than 12,500 pounds. Typical aircraft in this category are single-engine and twin-engine piston and few turboprops such as the Raytheon Beechcraft King Air B200 and smaller.

The current airplane design group applied to Runway 14-32 is Group III. This means that the runway is designed to accommodate aircraft with wingspans less than 118 feet. Aircraft that fall into this category include most single-engine and twin-piston aircraft, turbo props and business jets. Runways 13-31 and 9-27 can accommodate airplane design Group II aircraft. Group II includes the Raytheon Beechcraft King Air B200 and smaller regional and corporate jets such as the Cessna Citation I, II and III and Gulfstream I.

Airfield capacity is defined as the maximum number of operations that can be accommodated by a particular airfield configuration during a specified interval of time when there is constant demand. Annual service volume (ASV) is one capacity measure and the average hourly capacity is another.

St. Paul Downtown Airport's ASV is currently calculated to be 265,000, which is well above its current and 2025 projected annual operations of 125,254 and 137,310 respectively. It is also well above the high scenario 2025 year forecast of 156,431 annual operations. STP has adequate runway capacity to support all of the forecast scenarios. This means that runway capacity will not be a contributing factor to any airport improvements.

The facility requirements indicate the recommended runway length for the largest critical aircraft is 7,300 feet, and for the group of aircraft weighing more than 60,000 pounds, it is 6,620 feet. For smaller aircraft using STP, a runway length of 3,810 feet is recommended. Runway 14-32 is 6,491-feet, which is only 129 feet short of the recommended 6,620 feet. Runway 13-31 already exceeds the recommendation by 104 feet for small aircraft less than 12,500 pounds. Runway 9-27 is short of the recommended 3,810 feet by 168 feet. The runway safety improvements recently completed required the reduction of runway length for each of the three runways in order to obtain the required runway safety area length. It is not possible to extend the runways given the physical location of the river and the required safety area criteria. Therefore, STP cannot meet the FAA-recommended runway lengths to accommodate 100 percent of the aircraft that fall into the approach categories.

According to the forecasts, the number of based aircraft is anticipated to gradually rise from 93 in 2007 to 132 in the year 2025. The south hangar area expansion was completed in 2000, and still has large corporate hangar sites available. MAC also completed the "Mercury Avenue" hangar area in 2002 on the east side of the airport. It has four small aircraft hangar sites and a site for an 8-aircraft T-hangar still available. With a forecasted growth to132 aircraft by 2025, the airport has enough hangar space to meet the forecasted demand.

It should be noted that if the demand for hangar space begins to exceed the current capacity, it is possible to consider redevelopment in some areas; but for the most part, there is no additional space at the airport for any new hangar areas. It should also be noted that hangar construction in the Mercury Avenue area or anywhere along Bayfield Street on the east side of the airport is subject to specific floodway/floodplain development and construction requirements.

ES.4 Plan Recommendations

As discussed above, there is no demonstrated need for additional runways, runway extensions or new hangar areas at STP at this time. There are, however, various airside and landside improvements that are recommended for implementation. They are itemized below and shown on Figure ES-1. Estimated costs and implementation timelines are listed in Table ES-2.

ES.4.1 Pavement Maintenance Program

It is recommended that MAC continue pavement reconstruction and rehabilitation as part of the on-going pavement maintenance program. For STP, MAC typically carries separate items in the capital improvement program for pavement maintenance. One line item includes pavement rehabilitation or reconstruction proposed for the seven-year program, for which costs are based on specific project locations. The second line item is an on-going every-other-year joint and crack repair item. Given the poor soils and saturation at STP, the pavements tend to move more which results in a more frequent need for repairs.

ES.4.2 Terminal Sub Drain

As discussed in Chapter 3, this project is recommended to improve the drainage around the exterior basement of the administration building. The improved drainage will alleviate subsurface soil and water pressures put on the basement walls during flood conditions.

ES.4.3 Electrical Vault Improvements

Also identified in Chapter 3, upgrades to the electrical vault building are recommended to bring the facility into code compliance. The recommended project includes a new building, HVAC, control panels, regulators, switchgears, etc.

ES.4.4 Floodwall Maintenance

It is recommended that MAC continue to discuss and plan for the on-going maintenance, training, personnel/resources, compensatory excavation monitoring, and review any possible permit requirements for the floodwall.

ES.4.5 Concurrent Use / Development Parcels

It is recommended that MAC continue to research the potential development of concurrent land uses for revenue generating purposes on airport property. There is only one parcel that has been identified to date for this type development. It is located on the cul-de-sac of Ridder Circle on the north end of the airport, adjacent to the Pioneer Press facility. It is shown as Parcel 1R on Figure 1-4, and is highlighted in Figure 4-1.

ES.4.6 Agency Coordination

It is recommended that MAC continue cooperation with the cities surrounding the airport through the existing Downtown Airport Advisory Commission, Joint Airport Zoning Board, and on-going MAC/City staff interaction.

Table ES-2
LTCP Recommendations – Estimated Costs and Timeline

Recommendation	Estimated Cost	Timeline
On-going pavement maintenance and replacement program*	$4,400,000	Continuous throughout planning period
Terminal Sub Drain	$600,000	0 – 5 Years
Electrical Vault Improvements	$700,000	0 – 5 Years
On-going Pavement Joint and Crack Repairs	$100,000 every other year	Continuous throughout planning period
On-going MAC Building Maintenance	$200,000 every other year	Continuous throughout planning period
Concurrent Use / Development Parcels	$0 (developer cost)	0 – 10 Years

* These cost estimates are taken from the previous comprehensive plan. No preliminary engineering has been completed and these projects are not included in MAC's Capital Improvement Program. Project cost estimates will be completed if these projects become necessary, and will include estimated costs for any mitigation identified as part of an environmental assessment.

ES.5 Noise Contours and Land Use

The noise contours presented in this document were developed using INM Version 7.0a. The contours represent predicted levels, or noise contours, of equal aircraft noise exposure on the ground as expressed in DNL. The FAA currently suggests that three different DNL levels (65, 70, and 75 DNL) be modeled. The Metropolitan Council suggests that the 60 DNL contour be included for airports in an urban environment. The methodology utilized the following data: aircraft activity levels, fleet mix, day/night split of operations, flight tracks and runway use.

In the Baseline 2007 noise contours, there are 132 single-family homes and 160 multi-family units located in the 60 DNL contour around St. Paul Downtown Airport. The 60 DNL contour contains approximately 2.14 square miles. The 65 DNL contour contains approximately 0.86 square miles with no residential dwellings in the contour. The 2007 70 and 75 DNL contours contain 0.42 and 0.20 square miles respectively with no residential dwellings in the contours.

The Forecast 2025 noise contours around St. Paul Downtown Airport increase to approximately 2.94 square miles in the 60 DNL contour and approximately 1.09 square miles in the 65 DNL contour. The residential structures within the 60 DNL contour increase to 498 single family homes and 666 multi-family units and no residential units are contained in the 65 DNL and greater contours. The 70 and 75 DNL contours increase to cover 0.52 square miles and 0.26 square miles, respectively.

In summary, there will be a 37.4 percent increase in the 60 DNL contour with an increase of 366 single family homes and 506 multi-family units in the contour. The area within the 65 DNL contour increases 26.7 percent over the same period. The increase in the contours can be attributed primarily to a 9.6 percent increase in total aircraft operations from 2007 to 2025 and a 71.7 percent increase in jet aircraft operations (not including very light jets/microjets).

Planning for the maintenance and development of airport facilities is a complex process. Successfully developing airports requires pragmatic decision-making predicated on various facts that drive the need for the development of additional airport infrastructure. Furthermore, these efforts need to consider surrounding community land uses. Airports cannot be developed in a vacuum; the development effort must consider the needs of the surrounding populations and the land uses in the area surrounding the airport. The success of airport planning is predicated on close consideration and coordination of surrounding land use to ensure compatibility with the community surrounding the airport.

The Metropolitan Council has developed a set of land-use planning guidelines for responsible community development in the Minneapolis-St. Paul Metropolitan Area. The intent is to provide city governments with a comprehensive resource with regard to planning community development in a manner that considers adequacy, quality and environmental elements of planned land-uses.

The State of Minnesota Department of Transportation (Mn/DOT) has established regulations that control the type of development allowed off runway ends in order to prevent incompatible development. These guidelines should be used to establish zoning ordinances to protect areas around an airport. The states zoning areas overlay and extend beyond the RPZs. The most restrictive areas created by Mn/DOT regulations are called State Safety Zones A and B. The safety zones should exist off each runway end and follow the approach zones out to the total length of the runway. As defined by Mn/DOT, the typical length of Safety Zone A is 2/3 of the total runway length; Safety Zone B is 1/3 of the total runway length and extends from Safety Zone A. There is also an area called Safety Zone C which is circular and typically follows the FAA FAR Part 77 horizontal surface.

The St. Paul Downtown Airport is located in Ramsey County, in the City of St. Paul. The airport is bordered by the Mississippi River to the north, south and east and a combination of mixed use commercial, office and industrial/utility land uses to the west. Residential land uses are located northeast and southwest of the airport. The communities of West St. Paul and South St. Paul are located immediately to the south of the airport. In May 2008, a Joint Airport Zoning Board (JAZB) was convened which includes representation from the respective Responsible Governmental Units (RGUs) that control land use development around the St. Paul Downtown Airport. This effort is addressing land uses around St. Paul Downtown Airport in the context of the runway approach zones and may result in modification to the safety zone dimensions and development restrictions outlined in Chapter 6.

The goal of the JAZB is to develop a St. Paul Downtown Airport Zoning Ordinance for review and approval by the Commissioner of Transportation, for subsequent adoption by the Board and then by local municipalities. The Board will determine if the state model zoning ordinance provisions are appropriate for the St. Paul Downtown Airport or if modifications to the model are necessary considering the provisions of Minn. Stat. §360.066, subd. 1. The focus of this discussion has been on the following:

- MnDOT Model Ordinance – Minnesota Rule 8800.2100 and Minnesota Rule 8800.2400 (additional information on the MnDOT Model Zoning Ordinance is available on the Internet at http://www.dot.state.mn.us/aero/avoffice/planning/zoning.html)

- St. Paul Downtown Airport unique characteristics in the context of existing and planned land uses around the airport

- Maintaining a “reasonable standard of safety” while considering the social and financial costs to the community

- Minn. Stat. §360.066, subd. 1, which is especially instructive when addressing the question of balancing the safety with the social and economic impacts in the zoning process.

It is anticipated that a proposed final St. Paul Downtown Airport Zoning Ordinance will be submitted to the Commissioner of Transportation for final approval in 2010.

ES.6 Public Involvement Process

At the onset of this long-term comprehensive plan update process, a public involvement program was developed. It included a specific plan for group meetings, with whom and when. The purpose of the meetings was to inform the airport users and the public about the process and schedule, and offer an opportunity for personal question-and-answer sessions. The goal was to receive informal input as the process advanced, and prior to the formal public comment period that took place upon completion of the full draft document. In addition, MAC held two meetings and corresponded regularly with a technical advisory group, made up of members of MAC staff, the FAA, Mn/DOT Aeronautics, and Metropolitan Council.

Informal comments were accepted at all meetings. The MAC committee meetings were open to the public, and verbal comments were invited at each of them. Meetings with the Downtown Airport Advisory Commission (DAAC) typically involved a short presentation by MAC staff followed by a question and answer period.

During the long-term comprehensive planning drafting process, MAC requested informal written or verbal comments regarding the LTCP Update. Advertisement for the MAC public open house meeting was published in the *Pioneer Press* on June 10, 2009. The meeting was held on June 23, 2009. Not one person attended the public meeting. As of December 2009, MAC had received zero written comments.

The draft LTCP document was completed in December, 2009, and made available for a 30-day written comment period starting December 14, 2009. The comment period ended on January 12, 2010. Advertisements for the 30-day public written comment period on the draft LTCP were published in the *Pioneer Press* and *Star Tribune* newspapers on December 10, 2009.

Upon completion of the written comment period, MAC received two letters. One letter submitted came from the West Side Citizens Organization, and the second letter came from a resident of St. Paul. The letters and MAC's responses to them are included in Appendix B.

In February 2010, MAC submitted the draft LTCP document, along with all written comments received and MAC responses to those comments, to the Metropolitan Council for their review. The Metropolitan Council issued their determination in April 2010, finding the LTCP Update consistent with the Metropolitan Council's development guide. Correspondence from the Metropolitan Council has been included in Appendix B.

In June 2010, the Commission took action to adopt this LTCP as the final plan. MAC is committed to preparing updates to this LTCP on a regular basis.

Chapter 1 Existing Conditions/Inventory

1.1 Airport History and Location

The St. Paul Downtown Airport, also known as Holman Field, is one of seven airports owned and operated by the Metropolitan Airports Commission (MAC). See Figure 1-1. The airport identifier, or reference code, is STP. Holman Field has played an important role in the Twin Cities since the City of St. Paul opened the airport in 1926. Located just five minutes from the St. Paul business center and 15 minutes from downtown Minneapolis, Holman Field is considered by the MAC to be the primary reliever airport for the Minneapolis – St. Paul International Airport (MSP). In a 2005 economic report prepared by MAC, its contribution to the local economy has been estimated to be more than $112 million annually.

The airport is located in Ramsey County, two miles southeast of downtown St. Paul, nine miles east/northeast of the Minneapolis – St. Paul International Airport (MSP), and just over 10 miles southeast of downtown Minneapolis. See Figures 1-2 and 1-3.The airport can be accessed from Trunk Highway 52 and Plato Boulevard. The airport lies just south of Interstate 94 and east of Interstate 35E. The airport sits adjacent to the Mississippi River, which borders the airfield on the north, east and south sides. The west side of the airport is bounded by a railroad and the U.S. Army Corps of Engineers flood control levy. Interior airport access roads include Bayfield Street, Airport Road, and Eaton Street.

The St. Paul Downtown Airport consists of 576 acres. Of that, MAC owns 192 acres. The largest airport parcel makes up the entire northern half of the airport and is approximately 383 acres in size. It is owned in fee title by the City of St. Paul. By statutory right (Minnesota Statute § 473.621), MAC operates and maintains the airport and has jurisdiction to exercise powers with reference to airport property, except for disposal of fee title. In addition to the airfield and approach area properties, MAC also has numerous avigation easements on surrounding properties that limit or restrict land use and/or certain types of development, structures, trees, drainage facilities, etc. In total, MAC holds 96 acres in avigation easements. See Figure 1-4 for the most recent Airport Property Inventory Map.

The first grass strip at STP appeared in 1926. Since then, the airport has seen major modifications, including longer paved runways, expanded and improved hangar facilities, and the dedication of a new air traffic control tower in 2000. In addition, MAC has moved forward with a major floodwall construction project to protect the airport during certain flood events. Now complete, the floodwall will allow for the airport to remain open during flood events, albeit at a reduced runway length. However, protecting the airport and allowing operations will significantly reduce the need for tenants to relocate or the need for the airport to close when waters rise on the Mississippi River.

The military has had a presence at the airport since 1942, and the Minnesota Army National Guard continues to operate a facility at STP. Table 1-1 contains other historical notes as well as major construction items. In addition to these projects, MAC has on-going rehabilitation programs for all of the airfield and perimeter road pavements and the administration building.

There have been a number of previous airport studies completed for the airport. The Metropolitan Council prepared the 1986 *Metropolitan Airports System Plan* and the *Metropolitan Development Guide Aviation Policy Plan*, which was first adopted in 1972. The most recent update to the Policy Plan occurred in January 2009, and was called the 2030 Transportation Policy Plan. MAC prepared the first Master Plan for STP in 1977, which included recommendations for a new runway with a precision instrument approach. In 1983, an Environmental Impact Statement (EIS) was completed for the recommended runway and building area improvements.

Table 1-1
Airfield Development Timeline

Year	Project Description
1926	City of St. Paul acquires property for the Saint Paul Municipal Airport.
1926	First runway constructed (turf) at 3,000 feet.
1928	Two asphalt runways constructed; one east/west at 1,500 feet and one northwest/southeast at 2,000 feet.
1930	First hangar built.
1930	Ordinance enacted to define airport boundary and define obstructions.
1931	Airport renamed Holman Field, in honor of Charles W. (Speed) Holman.
1936	Airfield reconstructed with four paved runways, taxiways (see Figure 1-5).
1936 - 1940	Administration Building, Old Municipal Hangar, Northwest Airlines Hangar built.
1942	U.S. Army Corps takes control of airport; use it as a depot for the modification of B-24 “Liberator” heavy bombers.
1942	Riverside Hangar built.
1943	Metropolitan Airports Commission created.
1945	MAC assumes ownership of the airport.
1960	Northwest Airlines moves to Wold Chamberlain Field (MSP).
1961	Airport name changed to St. Paul Downtown Airport – Holman Field.
1965	Airport closed for 31 days due to flooding.
1969	Airport closed for 31 days due to flooding.
1984 - 1987	Runway 14-32 constructed, south hangar area first phase construction.
1991	Improvements made to the Riverside hangar.
1993	Airport closed for 35 days due to flooding.
1996	Mounds Park Airway Beacon Restoration (see Figure 1-7).
1997	Airport closed for 35 days due to flooding.
1997	Runway 14 ILS Installation.
1998	East Building Area Sanitary Sewer and Water Installation.
1998	Floatplane Harbor officially deactivated
1998 - 2000	South Hangar Area Expansion.
1998 - 1999	FAA constructs new Air Traffic Control Tower.
1999	Runways are renumbered to 14-32, 13-32 and 9-27 due to changes in magnetic declination.
2001	Airport closed for 78 days due to flooding.
2000 - 2001	Eaton Street dike constructed to prevent backwater during floods.
2005	Airfield Subdrain Improvements completed.
2006	Compensatory Excavation as prelude to floodwall construction.
2006 - 2008	Runway safety area improvements completed for all three runways, including EMAS for both ends of Runway 14-32.
2007 - 2008	Perimeter floodwall construction.

In 1992, MAC updated the long-term comprehensive plan/master plan for the airport. That plan update recommended lead-in lights be installed for Runway 32, an instrument landing system (ILS) be installed for Runway 14, and that a designated helicopter landing and takeoff area be established. In addition, the plan suggested a new air traffic control tower, taxiway modifications, a compass calibration pad, and an airport-only vehicle service road. To date, the Runway 14 ILS has been installed, and the air traffic control tower was relocated. Other recommendations have not been implemented for various reasons. Helicopter traffic declined after the U.S. Army Reserve facility was closed in 1996, alleviating the need for a designated heliport location. A vehicle service road is not feasible given site constraints due to the river. It has also been determined that most airport users can utilize the compass calibration pad at the Anoka County – Blaine Airport or the Lake Elmo Airport.

1.2 Airport Role

The definition or “classification” for an airport differs slightly between the MAC, Federal Aviation Administration (FAA), Minnesota Department of Transportation – Aeronautics (Mn/DOT), and the Metropolitan Council.

1.2.1 MAC Classification

As noted above, MAC considers STP to be the primary reliever airport for the Minneapolis – St. Paul International Airport (MSP). In January 2006, MAC accepted the *Recommendations Regarding the Future Operation and Development of the Reliever Airport System* prepared by the MAC Reliever Airports Task Force. That document recommends the St. Paul Downtown Airport be developed as a primary corporate Reliever Airport, along with Flying Cloud Airport and the Anoka County – Blaine Airport, to enhance and support their ability to relieve corporate traffic at MSP. The other three reliever airports, Airlake, Lake Elmo and Crystal, are labeled as “complimentary relievers” in the MAC-owned seven airport system and should continue to serve as general aviation airports with some business jet traffic.

1.2.2 FAA Classification

According to the FAA, airport classification is based on the size and type of aircraft served by the airport and specific characteristics for those planes. STP has an Airport Reference Code of D-III. This means it is designed, constructed and maintained to serve airplanes in that same Airplane Design Group (ADG). The “D” references the aircraft approach category, and includes airplanes with an approach speed of 141 knots or more but less than 166 knots. The “III” relates to the airplane design group with wingspans from 79 feet up to but not including 118 feet. The FAA also names STP as one of the reliever airports to MSP.

Beginning in 1974, STP held a limited FAA Part 139 certificate which allowed for scheduled air service for airplanes carrying fewer than 30 people, and unscheduled operations for larger air carrier aircraft. Since no users have operated or requested new scheduled air service in many years, MAC no longer holds the certificate.

1.2.3 Mn/DOT Classification

Mn/DOT classifies the St. Paul Downtown Airport as a Key System Airport. This means it has a paved runway over 5,000 feet, and is capable of accommodating all single-engine, twin-engine, and most corporate jet aircraft.

1.2.4 Metropolitan Council Classification

The Metropolitan Council classifies the St. Paul Downtown Airport as an Intermediate Airport. Under this definition, the airport has a primary runway length between 5,001 feet and 8,000 feet, with precision approach capability. The airport can accommodate regional/commuter flights, air taxi, corporate/business, general aviation, flight training, personal use and recreational aircraft, and military operations (see Table 1-2).

Table 1-2
Functional and Operational Characteristics of Metropolitan Airport Facilities

Airport Type	System Role	Airport Users	Primary Runway Length	Primary Rwy Instrumen-tation	MAC-Owned
Major	Scheduled Air Service • Minneapolis-St. Paul International	Air Carriers Regional/Commuter Passenger & Cargo Charters Air Cargo Air Taxi Corporate G.A. Military	8,000 feet or more	Precision	Yes
Intermediate	Primary Reliever • St. Paul Downtown	Regional/Commuter Air Taxi Corporate/Business General Aviation Flight Training Personal Use / Recreational Military	5,000 feet to 8,000 feet	Precision	Yes
Minor	Secondary Reliever • Airlake • Anoka County – Blaine • Crystal • Flying Cloud • Lake Elmo • South St. Paul	Air Taxi Business G.A. Flight Training Personal Use / Recreational Military	2,500 feet to 5,000 feet	Precision or Non-Precision	Yes Yes Yes Yes Yes No
Special Purpose	Special Uses • Forest Lake • Rice Lake • Wipline, IGH	All general aviation (grass strip) (seaplane) (seaplane)	Varies	Visual	No No No

Source: Metropolitan Council Aviation Policy Plan, December 1996.

1.3 Existing Airside Facilities

Airside facilities include the operational aircraft areas of runways, taxiways, and aprons. These are areas where vehicular traffic is generally not allowed due to safety concerns related to mixing with aircraft. Airside facilities also include airfield lighting and navigational aids.

1.3.1 Pavement Areas

STP consists of three runways and numerous taxiways. The runways, with their current lengths as of 2008 after the runway safety area improvement projects, are listed in Table 1-3. The taxiway designations are shown in the Airport Diagram, in Figure 1-6.

Most of the airfield pavements are asphalt. They vary in pavement age, thickness and typical section. Over time, pavement overlays, rehabilitation, reconstruction and/or crack repair methods have changed the characteristics of the pavement from section to section. The apron areas in the south hangar area were constructed in 1999 with concrete. A portion of the airport leased by the 3M Company also contains areas made of concrete. Other apron areas at the airport are asphalt.

Table 1-3
Runway/Airfield Data

	14-32	13-31	9-27
Design Critical Aircraft	Gulfstream V	Cessna Citation III	King Air B200
Runway Length (ft)	6,491	4,004	3,642
Runway Width (ft)	150	150	100
Runway Surface	Asphalt	Asphalt	Asphalt
Threshold Location	Displaced (14 & 32)	—	—
Runway Load Bearing Strength (lbs)			
Single Wheel Loading (SWL)	75,000	75,000	12,500
Dual Wheel Loading (DWL)	100,000	100,000	—
Runway Lights	HIRL	HIRL	MIRL
Taxiway Lights	MITL	MITL	MITL
Runway Markings	Precision Instrument	Non-Precision Instrument	Non-Precision Instrument
Visual Approach Aids	MALSR (14) PAPI (14 & 32) REIL (14 & 32)	PAPI (13 & 31) REIL (31)	PAPI (27)
Instrument Approach Procedures	ILS (14 & 32) RNAV GPS (14 & 32) Copter ILS or LOC (32)	NDB (31)	—
Other	Air Traffic Control Tower, ASOS, Lighted Windcone, Lighted Beacon, Airway Beacon		

1.3.2 Lighting and Navigation

Navigational aids (NAVAIDS) and lighting are intended to guide pilots from point to point, increase the visibility of runway features, and control runway activity both on the ground and in the air. Runway and taxiway lighting consist of light fixtures placed near the pavement edge to help identify the limits. This lighting is essential for safe nighttime operations and during periods of low visibility.

Runway 14-32 and 13-31 are lighted with High Intensity Runway Edge Lights (HIRLs) and Runway 9-27 has Medium Intensity Runway Edge Lights (MIRLs). All taxiways are equipped with Medium Intensity Taxiway Lights (MITLs). The intensity of the runway and taxiway lighting can be controlled by air traffic control personnel. When the Air Traffic Control Tower (ATCT) is closed, pilots can turn on and change the intensity of the lights for Runway 14-32 by using the radio transmitter in the aircraft. Runway 13-31 and 9-27 are lighted at night but not radio controlled.

Runways 31 and 32 have runway end identifier lights (REILs). REILs are synchronized flashing lights to help pilots visually acquire the runway end as they approach for landing. Runways 14, 32, 13, 31 and 27 have precision approach path indicators (PAPIs). The PAPI system uses a combination of red and white lights only visible at certain angles that help pilots determine appropriate angles of descent during landings. Runway 14 is also equipped with a Medium Intensity Approach Lighting System with Runway Alignment Indicator lights (MALSR).

There are two Non-Directional Beacons (NDB) located near the airport. Hopey is approximately 6.2 nautical miles (NM) from the airport and the second, Narco ,is approximately 6.7 NM from the field. An NDB transmits radio signals on a designated frequency. This information provides a tool for pilots to navigate within the National Airspace System (NAS). This is particularly useful for low altitude airway vectoring. The signals follow the curvature of the earth so NDB signals can be received at much greater distances at lower altitudes than other systems. However, the NDB signal is affected more by atmospheric conditions, mountainous terrain, coastal refraction and electrical storms, particularly at long range.

In addition to providing navigational assistance to aircraft, NDBs also allow for non-precision approaches, thereby enhancing the capability of the airport. St. Paul Downtown Airport has three non-precision instrument approaches, an NDB approach to Runway 31 and RNAV (GPS) approaches to Runways 14 and 32. There are no on-site navigational aids associated with the RNAV (GPS) approach.

There are two precision instrument approaches at the airport. Navigation aids for these systems include a glide slope and localizer with distance measuring equipment (DME) for each approach. Runway 14 has an Instrument Landing System (ILS) approach with ¾ mile visibility minimums. Runway 32 has an ILS approach with 1 mile visibility minimums. There is also a published precision instrument approach procedure for helicopters with visibility minimums of ½ mile.

The airfield has a lighted airfield beacon, a lighted windcone and a wind tee.

1.3.3 Airway Beacon

In addition to the NAVAIDs listed above, the St. Paul Downtown Airport is also home to the last remaining operational Airway Beacon in the nation (see Figure 1-7). This beacon, located in Mounds Park above the airport on the river bluff, was part of a system of beacons that lighted nighttime airway corridors across the United States. This beacon in particular was a part of the route between St. Paul and Chicago. The airway beacons were primarily used by mail carriers operating around the clock. Radio navigation was being developed in the 1920s and by the mid-1950's VHF and VOR airways were in place. By the mid 1970s, the airway beacon system was no longer being used and was shut down.

The City of St. Paul's Bureau of Bridges designed the beacon, which was originally constructed in 1929. The tower is approximately 110-feet tall, with the 24-inch diameter beacon sitting atop the structure. The beacon light beam flashes in the original historic airway beacon colors: both sides flash white (as compared to a typical airport beacon that flashed one side white and one side green). At some point, the original black and yellow colors on the tower structure were replaced with the typical FAA orange and white colors. In 1995, the beacon was refurbished through a cooperative effort between MAC, the FAA, the State Historic Preservation Office (SHPO), the Indian Affairs Council, the Minnesota State Archeologist, and the City of St. Paul. During the refurbishment, the original black and yellow colors of the tower were restored.

1.3.4 Airspace Management System

The airspace around the airport is defined by FAA classification, air traffic control designation, navigational aids (NAVAIDS), other surrounding airports, and flight rules specific to the St. Paul Downtown Airport. The Federal Aviation Act of 1958 gave jurisdiction of all US airspace to the FAA. The National Airspace System (NAS) was established to manage this system safely and efficiently among commercial, general aviation, military and other competing users. The NAS is a common network of NAVAIDS, airport and landing sites, charting and information, procedures, regulations, technical support, and resources. Figure 1-8 shows the airports, airspace and radio aids for navigation in the vicinity of the St. Paul Downtown Airport.

1.3.5 Airspace Structure

The airspace structure is complex and requires the use of highly technical air traffic control (ATC) procedures. Airspace is either controlled or uncontrolled. Controlled airspace is managed by ground-to-air communications, NAVAIDS and air traffic services. STP is located in what is considered Class D controlled airspace when the Air Traffic Control Tower is open (6:00 am to 10:00 pm Monday through Friday and 7:00 am to 10:00 pm Saturday and Sunday) and Class E airspace during the other times. Class D airspace is under the jurisdiction of a local Air Traffic Control Tower (ATCT). (See Figure I-9). The purpose of the ATCT is to sequence arriving and departing aircraft and direct aircraft on the ground. Aircraft operating within the Class D airspace are required to maintain radio communication with the ATCT. Class D airspace is normally a circular area with a radius of five miles around the airport that extends upward from the surface to about 2,500 feet above ground level (AGL). The ceiling elevation of St. Paul's Class D airspace is 3,200 feet mean sea level (MSL) (2,495 feet above the airport elevation of 705 feet).

It should be noted that STP lies under Minneapolis/ St. Paul International Airport's (MSP) Class B Airspace which consists of controlled airspace extending upward from different floor elevations to a ceiling height of 10,000 feet MSL. There are very specific operating instructions and rules pilots must follow when flying within this airspace. St. Paul Downtown Airport lies under the area where the floor elevation of MSP's Class B airspace is 2,300 or 3,000 feet MSL (depending on the aircraft's location in the vicinity of STP). As long as pilots stay below 2,300 or 3,000 feet, they remain outside this MSP Class B airspace.

When the STP ATCT is not open, the airspace classification is Class E. Class E airspace is a general category of controlled airspace that is intended to provide air traffic service and separation for Instrument Flight Rules (IFR) aircraft from other aircraft. IFR means that the pilot is certified to fly under Instrument Meteorological Conditions (IMC) (less than three miles visibility and/or 1,000 foot ceilings). Pilots rated only for Visual Flight Rules (VFR) can operate in Class E airspace only when visibility is three statute miles and above and cloud heights are 1,000 feet AGL and higher. These pilots are not required to maintain contact with ATC. Class E is a common classification for airports without air traffic control towers (ATCTs). Class E airspace extends to 18,000 feet MSL and generally fills in the gaps between other classes of airspace in the United States.

1.3.6 Delegation of Air Traffic Control Responsibilities

STP has its own Air Traffic Control Tower (ATCT). During the times when it is open, it provides air traffic control services. When the ATCT is closed services are provided by Minneapolis Terminal Radar Approach Control (TRACON) located at Minneapolis-St. Paul International Airport, and assisted by the Flight Service Station (FSS) at Princeton, Minnesota. Aircraft operating at STP when the ATCT is closed are advised to broadcast their intentions and monitor Common Traffic Advisory Frequency (CTAF) frequency, which is also the UNICOM frequency. Pilots making instrument approaches or departures are in contact with the ATCT or Minneapolis TRACON.

1.3.7 Approach Procedures and Traffic Patterns

There are two different types of flight rules set out in FAR Part 91. Visual Flight Rules (VFR) apply in generally good weather conditions based on visibility. Instrument Flight Rules (IFR) come into play when visibility levels fall to less than three statute miles and/or cloud levels go below 1,000 feet.

For STP, the local traffic pattern altitude is 1,905 feet MSL (1,200 feet above the airport elevation). All the runways, except one follow standard left traffic pattern. Runway 27 uses right traffic pattern. The ATCT directs runway use when winds are calm (less than 5 knots).

Aircraft with IFR instrumentation can utilize established approach procedures at STP. IFR flight rules have specific departure and arrival instructions, flight routing, altitude assignment, and communication procedures that are required. As stated, IFR allows a pilot to operate in controlled airspace and operate in poor weather at appropriately-equipped airport facilities such as STP. There are two precision instrument approach procedures and three non-precision instrument approach procedures established for St. Paul Downtown Airport. The ILS or LOC RWY 32, ILS RWY 14, RNAV (GPS) RWY 14, RNAV (GPS) RWY 32 and NDB RWY 31approaches are shown on Figures I-10 to I-14, respectively. There is also an instrument approach for helicopters, COPTER ILS RWY 32, shown on Figure I-15.

1.3.8 Imaginary Surfaces and Obstructions

FAR Part 77 is the guidance used to determine obstructions to navigational airspace. The surfaces are comprised of primary, approach, transitional, horizontal and conical three-dimensional imaginary surfaces. (See Figure 1-16) Their exact configuration varies based upon the approach type of runway. Obstructions are defined as objects that penetrate these imaginary surfaces. Mitigative measures such as obstruction lights, removal or relocation may be required for the obstruction not to be considered a hazard. All obstructions should be catalogued and their disposition noted. The Airport Layout Plan (ALP), published separately from this report, shows the location of obstructions. Critical obstructions are also shown on the approach procedures for the airport.

1.3.9 Runway Protection Zones/State Safety Zones

Runway Protection Zones (RPZs) restrict land use off runway ends to help ensure the safety of people and property on the ground. The Federal Aviation Administration (FAA) recommends that the airport own or have control over all land within the RPZs. Among the land uses prohibited in RPZs are residences and those land uses which may result in public assembly (i.e., schools, hospitals, office buildings, and shopping centers). Although the FAA prefers that RPZs be kept free of all objects, some types of development are allowed within certain portions of the RPZ (provided the development does not attract wildlife or interfere with navigational aids).

The dimensions of RPZs are determined based upon the aircraft approach category and the associated runway approach visibility minimums. According to Table 2-4 of AC 150/5300-13, Airport Design, Runway 14 falls under the approach visibility minimums category not lower than ¾ mile for all aircraft type, Runway 32 falls under visual and not lower than one mile for aircraft approach category C & D; Runways 13 and 31 fall under visual, not lower than one mile for aircraft approach category A & B; and Runways 9 and 27 fall under visual for small aircraft exclusively. The dimensions of RPZs are determined based upon the aircraft approach category and runway approach visibility minimums. For STP, the RPZ dimensions are shown in Table 1-4.

Table 1-4
Runway Protection Zone Dimensions

Runway	RPZ Dimensions (ft)
14	1,000 x 1,700 x 1,510
32	500 x 1,700 x 1,010
13	500 x 1,000 x 700
31	500 x 1,000 x 700
9	250 x 1,000 x 450
27	250 x 1,000 x 450

Dimensions are inner width x length x outer width.

The State of Minnesota Department of Transportation (Mn/DOT) has established regulations that control the type of development allowed off runway ends in order to prevent incompatible development. These guidelines should be used to establish zoning ordinances to protect areas around an airport. The typical state zoning areas overlay and extend beyond the RPZs, following the FAA FAR Part 77 approach and horizontal surfaces. The most restrictive areas created by Mn/DOT regulations are called State Safety Zones A and B. Mn/DOT prefers that airports own all of State Safety Zone A. For land within the area that is not airport-owned, land use protection is recommended by including the safety zones in local zoning codes and zoning maps. Inclusion of the safety zones on community Comprehensive Plans is also strongly encouraged.

More information on RPZs and State Safety Zones can be found in Chapter 6 - Land Use Compatibility. The RPZs and recommended State Safety Zones for STP are shown in Figure 6-1.

1.4 Existing Landside Facilities

Landside facilities include aircraft storage hangar areas, aprons, fixed base operator (FBO) areas, terminal buildings, airport maintenance equipment storage areas, roadway access to the airport, and vehicle parking areas.

1.4.1 Fixed Base Operators (FBOs)

STP currently has two fixed base operators (FBOs) open for business and one additional FBO area currently vacant. Table 1-5 indicates their airfield locations and the services they provide to their customers and clients.

Table 1-5
Fixed Base Operators

FBO Name	Airport Building Area Location	Services	Fuel Type
Avitat / St. Paul Flight Center	West	Fueling, maintenance, aircraft charter, aircraft storage and line service, aircraft rental, avionics, pilot accessory sales	Jet A 100 LL
Signature Aviation	South	Fueling, maintenance, aircraft charter, aircraft storage and line service, aircraft rental, avionics, pilot accessory sales	Jet A 100LL
Former Jet Choice Site	East	Space currently vacant	Jet A
Wings Aviation	East	Flight training, aircraft rental	N/A

Source: MAC lease documents

The FBOs provide indoor storage for aircraft. On a limited basis, they may park aircraft outside on their apron areas but generally, airplanes are housed indoors and away from Minnesota elements such as ice, snow, wind, hail, and rain. Table 1-6 outlines the estimated available indoor space for each FBO.

Table 1-6
FBO Storage Areas

FBO	Number of Indoor Spaces Available	Number of Outdoor Spaces Available
Avitat/St. Paul Flight Center	15	12
Signature Aviation	56	20
Former Jet Choice	7	0
Wings Aviation	10	0
TOTAL	88	32

Source: Estimated by MAC using visual survey and aerial photos

1.4.2 Hangar Storage Areas

The St. Paul Downtown Airport has limited hangar storage areas around the airport that are not a part of existing FBO facilities. (See Figures 1-17 through 1-20.)

The east side of the airport is what MAC calls "Mercury Avenue". This is a relatively new hangar area, and still has space available for additional general aviation hangar construction (small in size, approximately 50 feet x 50 feet). A group of tenants cooperatively built the largest hangar which houses seven aircraft in individual stalls within one building structure. There is also space in this building area for MAC to construct an eight unit T-hangar. The 3M Company owns a large private storage hangar in this area of the airport. The twin barrel-roof hangar is known as the Riverside Hangar, and was originally built in 1942.

The west building area contains only an FBO and military operations. There is no space for individual storage hangars in this part of the airfield. The south hangar area was constructed entirely for corporate jet storage. While the FBO consumes a great deal of space here, there is existing space for additional private corporate aircraft storage.

1.4.3 Aircraft Space Utilization

Aircraft space utilization is a calculation completed to estimate the existing number of spaces on the airport that would be available for aircraft parking. This is then compared to the forecasted demand in Chapter 3 – Facility Requirements to determine if a need exists for additional hangar space at an airport.

MAC allows tenants to sublease space within their hangar if they choose. However, not all tenants do this. For hangars that are large enough to hold two or more aircraft, MAC discounted the number of available spaces by 10% to account for tenants who do not sublease extra space. MAC also assumed a 10% discount on large FBO hangars to account for any variance in operator choices for how many aircraft they house at one time. This discounting does not have a significant impact on the available number of hangar spaces, and is very reasonable given the current status of most leases at the airport today.

Table 1-7 summarizes the maximum indoor storage available, with the discounted numbers shown. Taking the military out of the equation, the maximum possible number of indoor storage spaces for civilian aircraft at STP is approximately 149. This is down from previous long-term comprehensive documents because some T-hangars were removed in 2000 to allow for the expansion of the St. Paul Flight Center FBO facility. While there is additional outdoor space available at STP, most operators will choose to store aircraft indoors for their customers for the reasons noted above in Section 1.4.1. In addition, these operators need their ramp space for maneuvering aircraft, and prefer not to clutter the ramp with parked aircraft unless absolutely necessary.

1.4.4 MAC Administration Building

The MAC-owned administration building was constructed in 1939. It houses offices, conference rooms, vending machines, and restrooms. It previously had and still maintains space for a restaurant facility. It also maintains a small but unused space for ticketing and baggage handling for scheduled passenger service. The former air traffic control tower (ATCT) was located in this facility. When the new ATCT opened across the field in 1999, the old tower cab structure was removed from the administration building.

1.4.5 Maintenance and Equipment Areas

MAC owns four maintenance and equipment storage buildings at STP. One building is located across the parking lot from the main airport terminal building. The other three buildings are located in the south hangar area near the airfield beacon. These three buildings each have a primary use: equipment and parts building, snow management materials storage, and flood wall component storage. Two of the four buildings contain office space, a break room, restrooms and shower facilities for the MAC maintenance crew.

There is a fuel farm located south of the equipment building, which contains diesel and unleaded fuel for MAC equipment. There is also a contained recycling area on the north side of the equipment building for tenants to dispose of used aircraft oil.

Table 1-7
Indoor Aircraft Storage Summary

	Number of Buildings	Number of Spaces	Discount Percent	Subtracted Spaces	Total Spaces
EAST					
Wings Aviation	3	10	-2%	0	10
Former Jet Choice	1	8	-10%	1	7
Storage – Riverside Hangar	1	10	-10%	0	10
Storage – Mercury Avenue	10	23	-2%	0	23
WEST					
Avitat / St. Paul Flight Center	5	15	-10%	1	14
Military (*includes helicopters)	1	10		0	10
SOUTH					
Signature	12	56	-10%	6	50
Storage – 1987 Area	4	9	-10%	1	8
Storage – 1999 Area	9	30	-10%	3	27
TOTALS	46	174		12	159
TOTAL without Military	45	164		12	149

Source: MAC visual survey and review of aerial maps

1.4.6 Roadway Access

The airport lies just south of Interstate 94 and east of Interstate 35E, and can be accessed using Trunk Highway 52 to Plato Boulevard. These main roads link the airport to the metropolitan area and the entire region. Robert Street, a main thoroughfare in downtown St. Paul, connects with Fillmore Street and Plato, both of which connect directly to Bayfield Street. Interior airport access roads include Bayfield Street, Airport Road, and Eaton Street.

1.4.7 Vehicle Parking Areas

A large parking lot exists in front of the main terminal building. It can accommodate more than 200 vehicles. Each FBO has parking for their customers. The number varies for each facility. The Minnesota Army National Guard also has a large parking lot across Airport Road from their building that contains more than 300 spaces. Note, however, that many of these spaces are located on railroad right-of-way, and not on MAC property, and most are just gravel, not paved.

All privately owned hangars are accessed via the taxilanes, with tenants parking inside or adjacent to their individual hangars.

1.5 Airport Environment

This section highlights briefly the airport environment, including available utilities, drainage, and local services provided.

1.5.1 Utilities and Local Services

Most tenants at the airport have either electric or natural gas service, or both, as well as telephone service. The electrical lines are above ground in some locations at the airport, and below ground in others. The tenants are billed directly by the utility companies. Qwest provides telephone service, and Xcel provides natural gas and electric service to the airport.

The City of St. Paul offers emergency services for the airport, including police, fire and rescue. This is achieved through agreements between MAC and the City.

1.5.2 Drainage and Water Quality

The following text regarding existing soils is taken from the Water Management Plan prepared for the airport for MAC by Wenck Associates, dated November 1996:

> The natural soils at the airport generally consist of alluvium deposited by the retreating ice of the Wisconsin glacation. The deposit is typically 100 feet deep. Most of the area where the airport lies was originally marsh land. Throughout the history of the airport, several grading operations utilizing river dredge material were completed. It is believed that the river dredge material consisting of predominantly sand has been used for fill material throughout the airport property along with various other fill materials, however, exact locations and volumes are unknown.
>
> The south half of Runway 14-32 was constructed by removing vegetation under the core of the runway and placing fill over the underlying soft soils. The core embankment for the runway consists of sand (select granular) material. The safety areas consist of common fill generally made up of sand, clay, silt, and broken limestone.
>
> Soils classification at the airport fall under the Chaska and Udorthents associations as shown on the General Soils Map contained in the Ramsey County Soil Survey. These soils are generally described as level to very gently sloping. The Chaska soils are present in the southern marshy portions of the site and are poorly drained soils subject to frequent flooding from the Mississippi River consisting of silt loam for approximately the top six inches. The Udorthents soils are present on the majority of the site and consist of variable permeability fill soils consisting of Mississippi River dredging materials and various fill materials as previously described.

In 2005, MAC completed a project to enhance the overall subdrain system at the airport and for specific pavement areas. The project was designed to speed drainage from the subgrade areas of the primary Runway 14-32 and certain taxiways. Inundation by flood waters would impact the weight-bearing capacity of these pavements for as long as water remained present within the subgrade. In addition to enhancing pavement drainage, the project redesigned the main ditch system and included the construction of infiltration basins within airport property for better surface water drainage. Finally, the project rerouted direct drainage to the river, and reduced the number of direct outlets to the Mississippi River from 23 to six. As a result, the discharge of runoff has also been reduced to a much lower rate because of the new storage/infiltration basins. Figure 1-21 shows the general drainage and direction of flows since construction of the subgrade project.

The airport lies within the jurisdiction of the Lower Mississippi River Watershed Management Organization. In 1996, MAC completed a Water Management Plan for the airport, in which the analysis found the existing storm water management system appears to function adequately to convey storm water runoff from the airport. No deficiencies in the system were reported.

There are only a few wetland areas at the airport. The first is a wetland area southwest of the south hangar area. This wetland represents the edge of pre-existing wetland left in place after the fill was completed for the Runway 14-32 and south hangar area construction. A small remnant of this wetland also exists near the south end of Runway 32 between Taxiways A and B. The third wetland area is located near the northeast side of the airport, between the barrel-roof 3M hangar and the river.

The entire airport is located within the floodplain of the Mississippi River. The recent floodwall construction project removed the majority of floodway from the airfield, but a portion of floodway remains at the south end of the airport. While the floodwall can protect the airport up to a 1% event, it does not guarantee the airport will not flood from higher events. Therefore, the airport is still considered to be located within the floodplain.

MAC maintains a Storm Water Pollution Prevention Plan (SWPPP) and a Spill Prevention Control and Countermeasure Plan (SPCC) for MAC-owned facilities at the Airport. MAC has a general storm water discharge permit from the Minnesota Pollution Control Agency (MPCA). In addition, MAC maintains a Water Management Plan for the airport. It includes best management practices for protecting the storm water conveyances, wetlands, and groundwater. Due to the activities performed by the fixed base operators (FBOs), they are required to maintain their own general storm water discharge permit from the MPCA, along with their own SWPPP and SPCC plans.

Chemicals used in deicing activities at airports is of concern because of the potential effects on receiving water bodies. Airport tenants and/or FBOs conduct little aircraft deicing at STP. Most aircraft can be stored inside heated hangars prior to takeoff or cannot fly when icing conditions exist, which eliminates the need for glycol use. MAC may use some minor amounts of urea on the runways during icing conditions. The amount used varies annually. Salt is not used due to its corrosive nature. Sand is used on a limited basis, depending on weather conditions. Given these minor uses, the potential impact on water quality from the airport is minimal.

1.5.3 Sanitary Sewer and Water

The entire St. Paul Downtown Airport is served with sanitary sewer and water. All tenants have the ability to connect to the system, and most have already. Commercial operators and FBOs were required to connect years ago. MAC and FAA facilities are also connected. MAC adopted its Sanitary Sewer and Water Policy in 1998, as well as a subsequent revision in October 2000. Consistent with that policy, no new wells or holding tanks have been allowed at the airport.

1.6 Meteorological Data

The St. Paul Downtown Airport is equipped with an Automated Surface Observing System (ASOS). The ASOS provides computerized weather readings 24-hours a day, with updates every minute, continuously reporting significant weather changes as they occur. The ASOS system reports cloud ceiling, visibility, temperature, dew point, wind direction and speed, altimeter setting (barometric pressure), and density altitude (airfield elevation corrected for non-standard temperature). The recording and monitoring equipment for the ASOS is located in the infield area between Runways 31 and 32 and north of taxiway E (see Figure 1-17). It requires a 1,000-foot radius in which no obstructions or significant amount of pavement exists since they may interfere with the weather readings.

1.7 Area Land Use, Airspace and Zoning

One of the biggest challenges facing airports today is the presence of incompatible land use either adjacent to the airport or in runway flight paths. Working closely with city officials, airport users, developers, and any nearby residents, airports can reduce land use conflicts through the use of zoning regulations that disallow certain types of nearby development.

The City of St. Paul has a well established practice of requiring proposed development around or near the airport to be reviewed by the FAA and MAC. It recommends these agencies review all applications for development to determine if the proposed structure would be a "general obstruction to air navigation" or an "obstruction to a public airport", and to ensure that proper notification to the Commissioner of Transportation is made if so required.

In general, land use around the airport varies. The river bounds the east side of the airfield, as well as a portion of the south. Industrial uses are adjacent to the west. Industrial uses also exist in the areas between the airport and the river on the north and south. There are residential land uses on the bluff areas both across the river to the east and across Highway 52 on the west.

Figures showing the existing land use maps and a discussion on airport zoning are included in Chapter 6 of this report.

1.8 Area Socioeconomic Data

The reliever airport system owned and operated by MAC includes the St. Paul Downtown Airport and five other airports in the metropolitan area. According to the *Economic Analysis of Reliever Airport System*, prepared by Wilder Research in October 2005 for MAC, it is estimated that STP contributes more than $112 million per year to the local economy and supports 853 jobs. This includes on-airport services, fuel sales, and visitor spending in the community.

1.9 Historic Airport Activity

Aircraft based at and using STP includes primarily business jets, but also single-engine, twin-engine piston and turbo props, helicopters and military aircraft (primarily helicopters). It is assumed that flights in and out of STP are of both a business and a recreational nature.

The based aircraft fleet mix currently registered with the State of Minnesota, as of 2007, consists of 23 single-engine planes (25%), 8 multi-engine piston aircraft/light twins (8.5%), 8 turboprops (8.5%), 15 helicopters including military (16%), and 39 jets (42%).

In recent years, the activity at the airport has been declining. This is due to the overall downward trend in aviation since the events of September 11, 2001, primarily in general aviation. It is assumed that the majority of single-engine operations are recreational or of a flight training nature. While single-engine aircraft operations are forecasted to continue declining, jet operations are anticipated to increase at the airport over time. Overall, an increase in aircraft operations is forecasted. See Chapter 2.

Chapter

2 Aviation Forecast

This chapter provides a summary of the aviation activity forecasts prepared for the Long-Term Comprehensive Plan (LTCP) for the St. Paul Downtown Airport-Holman Field (STP). The forecasts are intended for use in subsequent facility requirements analyses for the airside and landside area development. A credible and usable forecast is critical to ensure that the type and size of the planned facilities are appropriate for future conditions. Forecasts are presented for an approximate 20-year time horizon, and include 2010, 2015, 2020, and 2025. The forecasts are unconstrained and assume that the necessary facilities will be in place to accommodate demand except where noted.

The existing and projected socioeconomic conditions in the area and current general aviation activity are used to prepare the assumptions that form the foundation of the forecasts. Based aircraft forecasts for the Metropolitan Airports Commission (MAC) airports are calculated and then allocated among the individual airports. Operations and peak activity forecasts for St. Paul Downtown Airport are derived from the based aircraft forecasts. The analysis includes a set of high and low activity scenarios for the airport.

The assumptions inherent in the following calculations are based on data provided by the MAC, federal and local sources, and professional experience. Fuel cost assumptions reflect the recent major increase in oil prices. Forecasting, however, is not an exact science. Departures from forecast levels in the local and national economy and in the aviation industry could have an effect on the forecasts presented herein.

A copy of the full Activity Forecasts - Technical Report is contained in Appendix A of this document. The report includes background information, socioeconomic data, historical trends, and detailed descriptions of the assumptions for the forecasts. This chapter is a brief synopsis of that report as it pertains to the St. Paul Downtown Airport.

2.1 Aircraft Fleet Mix and Based Aircraft Forecasts

The number of civil based aircraft at STP is expected to increase from 83 in 2007 to 122 in 2025. Jets, including microjets, are expected to increase significantly while piston-powered aircraft are projected to decrease. The number of based aircraft at Holman Field is projected to increase due to the elevated concentration of high-performance aircraft typically used in business. Holman Field currently has 10 military based aircraft which are expected to remain constant during the forecast period.

Table 2-1 shows the results of the based aircraft forecasts for the STP.

2.2 Aircraft Operations Forecasts

The forecasts of aircraft operations were derived from the based aircraft forecasts. Estimates of base year operation levels were obtained from the FAA Air Traffic Activity Data System (ATADS) data base, supplemented by Airport Noise and Operations Monitoring System (ANOMS) data for operations that occur when the Air Traffic Control Tower is not open. Base year operations by aircraft type were based on ANOMS data collected by the MAC. The ANOMS data base misses many of the aircraft flying under Visual Flight Rules. Those were allocated among piston aircraft according to the distribution of based aircraft.

Table 2-1
Based Aircraft Forecast Summary

	2007	2010	2015	2020	2025	Ave Annual Growth Rate
Single Engine Piston	23	23	21	20	19	-1.0%
Multi Engine Piston	8	9	8	8	8	0%
Turboprop	8	9	9	9	9	0.6%
Microjets (VLJs)	0	3	8	13	16	
Other Jets	39	46	54	60	62	2.3%
Helicopter	15	15	17	18	18	0.9%
Other (a)	0	0	0	0	0	0%
TOTAL	93	105	117	128	132	1.8%

(a) Balloons, gliders, and ultralight aircraft.
Source: Appendix A – HNTB Activity Forecasts Technical Report, Table 8, April 2009.

The aircraft operations forecasts assume that average aircraft utilization will change consistent with the adjusted FAA forecasts. In each aircraft category, operations per active aircraft were projected to change at the same rate as hours flown per based aircraft, implicitly assuming that the number of operations per hours flown remain constant. The percentage of touch and go operations in each aircraft category was assumed to remain constant. Total military operations were also assumed to remain constant.

Table 2-2 summarizes the aircraft operations forecasts for STP. The FAA projects average aircraft utilization to increase as a result of increased flying by business and corporate users.

Operations at STP are projected to increase from 125,254 in 2007 to 137,310 in 2025, an average annual increase of 0.5 percent. Decreases are projected in single and multi-engine piston and turboprop categories, with significant increases projected for all the other categories. By 2025, combined jet operations are projected to account for about 31 percent of total operations at Holman Field, compared to about 13 percent currently.

Table 2-2
Aircraft Operations Forecast Summary

	2007	2010	2015	2020	2025
Single Engine Piston	55,485	41,984	37,344	38,263	39,374
Multi Engine Piston	21,938	20,412	15,723	16,014	17,019
Turboprop	7,864	7,510	7,376	7,251	7,227
Microjets (VLJs)	22	2,957	7,601	12,282	15,000
Other Jets	16,448	16,697	22,080	26,123	28,243
Helicopter	23,497	22,310	27,276	30,122	30,448
Other (a)	0	0	0	0	0
TOTAL	125,254	111,870	117,399	130,056	137,310

(a) Balloons, gliders, and ultralight aircraft.
Source: Appendix A – HNTB Activity Forecasts Technical Report, Table 11, April 2009.

The revised 2009 FAA forecasts, published about the end of April 2009, have taken note of recent changes in the very-light-jet (VLJ) industry. While the 2008 forecasts used for this analysis projected about 450 new VLJ aircraft per year (nationally), the 2009 forecasts are projecting 270-300 new VLJ aircraft per year. There was also a more drastic reduction in projected hours flown per aircraft from 1000 per year to 432 per year.

It is possible that the current FAA forecasts are too pessimistic, just like the earlier forecasts were too optimistic. There is great uncertainty in the industry right now, and there are growing pains associated with any new technology. Therefore, the forecasts will not be adjusted at this time. Also, VLJ growth rates are not shown because, with such small base year numbers, the annual percentage growth rate is very high, especially for operations.

2.3 Peak Activity Forecasts

Table 2-3 shows the peak month, average day peak month (ADPM), and peak hour operations forecasts for STP. The relationship between peak activity and annual activity was assumed to remain constant.

Table 2-3 presents the peak activity forecasts for STP and was estimated from FAA air traffic control tower records. Peak hour operations were assumed to be 15 percent of ADPM operations, consistent with the assumptions in the previous STP LTCP. The peak month for the airport is October, and ADPM operations were estimated by dividing by 31 days. Peak hour operations are projected to increase from 60 in 2007 to 65 in 2025.

Table 2-3
Peak Activity Forecast Summary

	2007	2010	2015	2020	2025
Annual Operations (a)	125,254	111,870	117,399	130,056	137,310
Peak Month Operations (b)	12,318	11,002	11,546	12,791	13,504
ADPM Operations (c)	397	355	372	413	436
Peak Hour Operations (d)	60	53	56	62	65

(a) From Table 2-1.
(b) The 2007 percentage of peak month operations based on ATCT counts is assumed to continue through the forecast period.
(c) Average Daily Peak Month - Peak month (October) operations divided by 31 days.
(d) Assumed to be 15 percent of ADPM operations.
Source: Appendix A – Activity Forecasts Technical Report, Table 14, April 2009.

2.4 Forecast Scenarios

General aviation activity has historically been difficult to forecast, since the relationships with economic growth and pricing factors are more tenuous than in other aviation sectors, such as commercial aviation. This uncertainty is likely to carry over into the near future, given the volatility of fuel prices and the anticipated emergence of microjets. To address these uncertainties, and to identify the potential upper and lower bounds of future activity at St. Paul Downtown Airport, detailed high and low fuel price scenarios are presented. These scenarios use the same forecast approach that was used in the base case, but alter the assumptions to reflect either a more aggressive or more conservative outlook towards fuel costs.

2.4.1 High Forecast Scenario

The high forecast activity scenarios for the airport assumes that after the oil price spike in 2008, fuel prices return to the levels that had been originally projected by the Office of Management and Budget (see Table I.1 in Appendix A). Other assumptions, including capacity constraints at MSP, are the same as in the base case.

Table 2-4 shows the high forecast scenario for STP. Total operations would be 14 percent higher than under the base case, and jet operations would account for almost 34 percent of total operations.

Table 2-4
High Forecast Scenario

	2007	2010	2015	2020	2025
BASED AIRCRAFT SUMMARY					
Single Engine Piston	23	23	22	19	13
Multi Engine Piston	8	9	8	8	7
Turboprop	8	9	9	9	8
Microjets (VLJs)	0	3	9	12	17
Other Jets	39	46	59	66	69
Helicopter	15	15	18	18	18
Other (a)	0	0	0	0	0
TOTAL	93	105	125	132	132
AIRCRAFT OPERATIONS SUMMARY					
Single Engine Piston	55,485	54,878	52,752	52,094	46,690
Multi Engine Piston	21,938	24,555	19,485	19,760	18,100
Turboprop	7,864	8,829	8,745	8,411	7,344
Microjets (VLJs)	22	3,467	10,062	13,259	18,636
Other Jets	16,448	18,897	27,085	31,575	34,123
Helicopter	23,497	23,327	31,235	31,359	31,537
Other (a)	0	0	0	0	0
TOTAL	125,254	133,953	149,365	156,458	156,431

(a) Balloons, gliders, and ultralight aircraft.
Source: Appendix A – Activity Forecasts Technical Report, Table 17, April 2009.

2.4.2 Low Forecast Scenario

The low forecast scenarios for the airport were prepared assuming that oil prices would continue to increase after 2008, rising to $200 per barrel by 2010, and then remaining at that level (see Table I.2 in Appendix A). Other assumptions, including capacity constraints at MSP, are the same as in the base case.

The low scenario forecast for St. Paul Downtown Airport is presented in Table 2-5. By 2025 total based aircraft are expected to be 9 percent lower than under the base case. Total operations would be 18 percent lower than in the base case by 2025.

Table 2-5
Low Forecast Scenario

	2007	2010	2015	2020	2025
BASED AIRCRAFT SUMMARY					
Single Engine Piston	23	23	22	21	20
Multi Engine Piston	8	9	8	8	8
Turboprop	8	9	9	9	8
Microjets (VLJs)	0	2	5	8	12
Other Jets	39	44	50	51	54
Helicopter	15	15	18	18	19
Other (a)	0	0	0	0	0
TOTAL	93	102	112	115	120
AIRCRAFT OPERATIONS SUMMARY					
Single Engine Piston	55,485	28,004	26,822	28,404	30,283
Multi Engine Piston	21,938	15,771	12,317	12,666	13,571
Turboprop	7,864	5,936	6,012	6,076	5,509
Microjets (VLJs)	22	2,025	4,966	7,941	11,845
Other Jets	16,448	13,337	17,826	19,900	22,474
Helicopter	23,497	20,786	27,990	28,627	29,187
Other (a)	0	0	0	0	0
TOTAL	125,254	85,858	95,934	103,613	112,869

(a) Balloons, gliders, and ultralight aircraft.
Source: Appendix A – Activity Forecasts Technical Report, Table 20, April 2009.

2.5 Summary

The base case forecasts project a moderate growth in based aircraft at St. Paul Downtown Airport. Operations are projected to decline through the 2010-2015 period and then begin to rise again later in the forecast, reflecting anticipated stabilization of oil prices at a new higher level. Although activity by piston powered aircraft is projected to decline, activity by higher performance turboprops and jets favored by business aviation is projected to increase significantly.

The forecast scenarios indicate that future fuel prices will have a major impact on the development of general aviation. Therefore, it is prudent to closely monitor actual aviation activity and modify the phasing of facility improvements if that activity materially departs from forecast levels.

Chapter 3

Airside and Landside Facility Requirements

This chapter describes the facility requirements needed to accommodate the base case and demand forecasts for year 2025. The sections of this chapter are intended to:

- Describe relevant design criteria
- Present airfield requirements in context of the critical aircraft
- Review NAVAID requirements
- Identify general aviation facility requirements
- Review parking and airport access needs
- Review obstructions issues
- Present miscellaneous requirements for the airport

3.1 Airside Requirements

3.1.1 Airport Reference Code

Federal Aviation Administration (FAA) Advisory Circular 150/5300-13 Airport Design outlines airport design guidelines. Primarily aimed at maintaining airport safety and efficiency, these guidelines help ensure that facilities at a given airport will match the requirements of the type of aircraft actually using (or forecast to use) the airport on a regular basis. For example, an airport serving larger aircraft will need wider runways and bigger safety areas than will an airport serving small single-engine aircraft. In addition to aircraft type, airport design is also affected by the existing or planned approach visibility minimums for each runway.

To match aircraft type to the appropriate facility requirements, an Airport Reference Code (ARC) is applied to each runway. An ARC is most often determined based upon the Approach Category (grouping by approach speed) and the Airplane Design Group (ADG - grouping by wingspan and tail height) of aircraft using or expected to use the airport on a regular basis (at least 500 operations a year); though the FAA also considers local characteristics when approving applied criteria.

3.1.2 Approach Category

The current aircraft approach category assigned to Runway 14-32 at the Airport is “D”. Typical aircraft in this aircraft approach category include business jets such as the Gulfstream V. Both Runways 13-31 and 9-27 are assigned aircraft approach category “B”. Runway 13-31 is designed for aircraft over 12,500 pounds maximum gross take-off weight. Typical aircraft in this approach category and weight include small business jets such as the Cessna Citation III. Runway 9-27 is designed for aircraft less than 12,500 pounds. Typical aircraft in this category are single-engine and twin-engine piston and few turboprops such as the Raytheon Beechcraft King Air B200 and smaller. See Figures 3-1 and 3-2.

Given that the role of the airport and types of aircraft operating there is not anticipated to change over the forecast period, the plan recommends the criteria associated with these categories of aircraft continue to be applied. See Table 3-1.

Table 3-1
Aircraft Approach Category

	Knots
A	Speed less than 91 knots.
B	Speed 91 knots or more but less than 121 knots.
C	Speed 121 knots or more but less than 141 knots.
D	Speed 141 knots or more but less than 166 knots.
E	Speed 166 knots or more.

3.1.3 Airplane Design Group

The current airplane design group applied to Runway 14-32 is Group III. This means that the runway is designed to accommodate aircraft with wingspans less than 118 feet. Aircraft that fall into this category include most single-engine and twin-piston aircraft, turbo props and business jets. Runways 13-31 and 9-27 can accommodate airplane design Group II aircraft. Group II includes the Raytheon Beechcraft King Air B200 and smaller regional and corporate jets such as the Cessna Citation I, II and III and Gulfstream I. Table 3-2 shows the thresholds for the airplane design groups.

Table 3-2
Aircraft Design Group

Category	Wingspan Criteria	Tail Height Criteria
I	Up to but not including 49 feet	Up to but not including 20 feet
II	49 feet up to but not including 79 feet	20 feet up to but not including 30 feet
III	79 feet up to but not including 118 feet	30 feet up to but not including 45 feet
IV	118 feet up to but not including 171 feet	45 feet up to but not including 60 feet
V	171 feet up to but not including 214 feet	60 feet up to but not including 66 feet
VI	241 feet up to but not including 262 feet	66 feet up to but not including 80 feet

3.1.4 Wind Coverage

Weather conditions have a significant influence on the operational capabilities at an airport. Wind speed and direction help determine runway orientation. Temperature plays a role in determining runway length. High temperatures in the summer months result in longer runway length requirements. Cloud cover and low visibility are factors used to determine the need for navigation aids and instrument approaches.

Aircraft generally take off and land directly into the wind, or at least as directly into the wind as a given runway alignment allows. Crosswind runways are used when the wind is blowing perpendicular to the primary runway. Because small single-engine aircraft have less power and are lighter than larger aircraft, they often have the most pressing need for crosswind runways.

The FAA prefers that the primary runway supply at least 95% percent wind coverage for the aircraft anticipated to use the airport. If the primary runway does not provide this level of coverage, a crosswind runway may be justified.

Wind and weather data from the National Oceanic and Atmospheric Administration for the St. Paul Downtown Airport Automated Surface Observing Systems (ASOS) for 1996– 2005 was obtained. This data was used to analyze the amount of wind coverage provided by the current runways.

Because larger, heavier and more powerful aircraft need a crosswind runway less often than smaller, lighter and less powerful ones, different wind speeds are used in the crosswind runway analysis for different aircraft. These different wind speeds are called crosswind components. Crosswind components are defined by wind direction and speed taken at a right angle to a runway. The FAA recommends that the criteria depicted in Table 3-3 be applied:

Table 3-3
Crosswind Components

Crosswind Component	Airport Reference Code
10.5 knots	A-I, B-I
13 knots	A-II, B-II
16 knots	A-III, B-III, C-I through D-III
20 knots	A-IV through D-VI

Tables 3-4 and 3-5 summarize the wind coverage of runways for different crosswind components. Table 3-4 includes the data for all of the weather conditions and Table 3-5 includes only the data when the weather is under Instrument Flight Rules (IFR) conditions of less than 1,000 foot ceilings and/or three miles visibility but greater than 200 feet ceilings and half mile visibility (closed conditions).

Table 3-4
All Weather Wind Coverage

Wind Speed	Airport Reference Code	Rwy 14-32	Rwy 13-31	Rwy 9-27	All Runways
10.5	A-I and B-I	95.02%	95.28%	89.59%	98.73%
13	A-II and B-II	97.68%	97.90%	94.83%	99.67%
16	A-III, B-III, and C-I through D-III	99.48%	99.60%	98.85%	99.94%

Source: NOAA National Data Center, US Department of Commerce, St. Paul Downtown Station (WMO: 726584), 01/01/96 to 12/31/05.

Runways 14 and 32 have precision and non-precision instrument approaches, and Runway 31 has a non-precision instrument approach. These allow aircraft to land in a wider range of weather conditions. The data from the St. Paul ASOS indicates that weather conditions are below 1,000 feet ceilings and/or three mile visibility about seven percent of the time. Weather data indicates that during IFR conditions, Runway 14 is favored.

Table 3-5
IFR Weather Wind Coverage

Wind Speed	Airport Reference Code	Rwy 14-32	Rwy 13-31	Rwy 9-27	All Runways
10.5	A-I and B-I	97.12%	97.24%	92.72%	99.33%
13	A-II and B-II	98.47%	98.69%	96.69%	99.81%
16	A-III, B-III, and C-I through D-III	99.71%	99.75%	99.21%	99.95%

Source: NOAA National Data Center, US Department of Commerce, St. Paul Downtown Station (WMO: 726584), 01/01/96 to 12/31/05.

These tables show that the runways at the airport provide good wind coverage.

Another important factor to consider when planning facilities at airports is temperature. Temperature effects aircraft performance. The standard used is the mean daily maximum temperature of the hottest month at the airport. For the St. Paul Downtown Airport, the mean maximum temperature of the hottest month (July) is 83.2 degrees Fahrenheit.

3.2 Airside Capacity Requirements

3.2.1 Annual Service Volume

Airfield capacity is defined as the maximum number of operations that can be accommodated by a particular airfield configuration during a specified interval of time when there is constant demand. Annual service volume (ASV) is one capacity measure and the average hourly capacity is another.

The Annual Service Volume (ASV) for a given airport is the annual level of aircraft operations that can be accommodated with minimal delay. For an airport with annual operations below its ASV, delay is minimal, within one to four minutes per operation. Anything above four minutes of delay per operation can result in increased congestion that can adversely tax airfield capacity.

An airfield system's capacity is determined by a multitude of factors, including prevailing winds and associated orientation of runways, number of runways, taxiway system, fleet mix, operational characteristics of based aircraft and weather conditions.

St. Paul Downtown Airport's ASV is currently calculated to be 265,000, which is well above its current and 2025 projected annual operations of 125,254 and 137,310 respectively. It is also well above the high scenario 2025 year forecast of 156,431 annual operations. From the FAA Advisory Circular 150/5060-5 (Airport Capacity and Delay), St. Paul Downtown Airport's average hourly capacity was estimated to be 132 operations during VFR conditions and 59 operations during IFR conditions. Peak activity forecasts show 65 peak hour operations for the year 2025. Table 3-6 summarizes these numbers in terms of airside capacity.

Table 3-6
Airside Capacity

	Base/Forecasted Operations	Ops/Year Maximum	% Airside Capacity	Base/Forecasted Peak Hour Ops (VFR)	Ops/Hour Maximum (VFR)	% Airside Capacity
2007	125,254	265,000	47.3	60	132	45.5
2010	111,870	265,000	42.2	53	132	40.2
2015	117,399	265,000	44.3	56	132	42.4
2020	130,056	265,000	49.0	62	132	47.0
2025	137,310	265,000	51.8	65	132	49.2

St. Paul Downtown Airport has adequate runway capacity to support all of the forecast scenarios. This means that runway capacity will not be a contributing factor to any airport improvements.

3.2.2 Runway Length

Runway length requirements are based on the type of aircraft using or expected to use the runway, and are affected by temperature, airport elevation, and runway gradient. In addition, runway surface conditions also impact runway requirements. This last factor is an important consideration for determining runway lengths at airports in northern climates where wet and icy conditions exist.

Runway length analysis was conducted using two similar methods. The first method was the FAA Advisory Circular 150/5325-4B Runway Length Requirements for Airport Design while the second was the FAA Airport Design for microcomputers program.

FAA Advisory Circular (AC) 150/5325-4B, Runway Length Requirements for Airport Design uses a five-step procedure to determine recommended lengths for a list of critical design aircraft or "family grouping of aircraft having similar performance characteristics and operating weights." Although this methodology is general in nature, it recognizes that there is uncertainty about the composition of the airport fleet mix during the forecast period. Determining runway length based on a family of aircraft ensures the greatest measure of flexibility.

The AC provides runway length requirement tables for three groups of aircraft based upon the Maximum Certificated Takeoff Weight (MTOW):

- Airplane Weight Category 12,500 pounds or less;
- Airplane Weight Category over 12,500 pounds but less than 60,000 pounds; and
- Airplane Weight Category 60,000 pounds or more or Regional Jets.

Based on both the existing and future fleet mix at STP the airplanes that will require the longest runway lengths are Airplane Weight Category 60,000 pounds or more or Regional Jets. For these sized aircraft the advisory circular recommends using performance charts from individual aircraft manufactures. The critical aircraft at the airport is the Gulfstream V (G-V), which has a maximum gross take-off weight (MTOW) of 91,000 pounds.

During the recent Engineering Materials Arrestor System (EMAS) project at STP, a runway length analysis was done. Gulfstream was contacted and responded that the G-V requires 7,300 feet balanced field length to take-off at MTOW on an 85 degree day[1].

The runway length for a crosswind runway equals 100% of the recommended runway length determined for the lower crosswind capable airplanes using the primary runway. At STP the Airplane Weight Category 12,500 pounds or less should be considered for the crosswind runway length since these aircraft are impacted by crosswinds. Under this weight range, one of two "percentage of fleet" categories can be used (95 percent or 100 percent).

Figure 2-1 of the advisory circular was used to calculate runway length requirements for this category of aircraft. The calculations consider airport elevation above mean sea level, and mean daily maximum temperature of the hottest month.

To accommodate 95 percent of the fleet, the crosswind runway length should be approximately 3,300 feet. To accommodate 100 percent, the crosswind runway length should be approximately 3,900 feet long.

Another way to calculate runway length requirements is to use the Airport Design for microcomputers program that is part of FAA AC 150/5200-13-Airport Design. This program incorporates Airport elevation, mean daily maximum temperature, length of haul, and runway conditions. The following analysis was done as a cross check. The Airport Design for microcomputers program provides runway length requirement tables for six groups of aircraft:

- Small airplanes with approach speeds of less than 30 knots
- Small airplanes with approach speeds of less than 50 knots
- Small airplanes with less than 10 passenger seats
- Small airplanes with 10 or more passenger seats
- Large airplanes of 60,000 pounds or less
- Airplanes of more than 60,000 pounds

[1] Supporting Information for RSA Determination-St. Paul Downtown Airport, July, 2006.

Based on the above criteria, the category of airplanes of more than 60,000 pounds applies and requires a 6,620-foot runway. For small airplanes with less than 10 passenger seats, the runway length should be approximately 3,200 feet to accommodate 95 percent of these aircraft and 3,810 feet to accommodate 100 percent of these aircraft.

Table 3-7
Recommended Runway Lengths

AIRPORT AND RUNWAY DATA	
Airport elevation	705 feet
Mean daily maximum temperature of the hottest month	83.2 F
Maximum difference in runway centerline elevation	4 feet
Length of haul for airplanes of more than 60,000 pounds	1,200 miles

RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN (for wet and slippery runways)	
Small airplanes with approach speeds of less than 30 knots	320 feet
Small airplanes with approach speeds of less than 50 knots	860 feet
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	2,670 feet
95 percent of these small airplanes	3,200 feet
100 percent of these small airplanes	3,810 feet
Small airplanes with 10 or more passenger seats	4,280 feet
Large airplanes of 60,000 pounds or less	
75 percent of these large airplanes at 60 percent useful load	5,410 feet
75 percent of these large airplanes at 90 percent useful load	7,000 feet
100 percent of these large airplanes at 60 percent useful load	5,500 feet
100 percent of these large airplanes at 90 percent useful load	8,050 feet
Airplanes of more than 60,000 pounds	Approximately 6,620 feet

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

It should be noted that as part of the floodwall construction permitting process with the City of St. Paul, MAC adopted a resolution which contains the following assurance: "MAC will not take any action to increase the length of the runways at the Airport in excess of the current length, unless required to do so by State law, provided that MAC will not initiate, promote, or otherwise support enactment of such law."

3.2.3 Runway Orientation

For optimum runway design, the primary runway should be orientated to capture 95 percent of the crosswind component perpendicular to the runway centerline for any aircraft that is to use the airport. At STP, the primary runway is slightly above 95%. In cases where this criteria cannot be met, a crosswind runway is recommended. A crosswind runway is also recommended when certain aircraft with lower crosswind capabilities are unable to utilize the primary runway, provided they have over 500 annual operations at that airport. According to criteria found in FAA Advisory Circular 150/5325-4B, Runway Length Requirements for Airport Design, dated July 1, 2005, crosswind runway length should be 100% of the recommended runway length for the aircraft with lower crosswind capabilities. If the crosswind runway is designed to accommodate the same aircraft as the primary runway, it should be the same length as the primary. If it is designed for different (typically smaller) aircraft, it should be designed to accommodate the needs of those aircraft. At STP, the crosswind runway should be designed to accommodate smaller aircraft than the primary runway and therefore the recommended length of the crosswind runway is 3,810 feet.

3.2.4 Runway Width and Shoulders

The FAA establishes 100 feet as the required width for a runway supporting D-III ARC and 75 feet for B-II with visibility minimums not lower than ¾ miles. Runways 14-32 and 13-31 at STP are 150 feet wide and Runway 9-27 is 100 feet wide.

Runway shoulders are intended to provide a transition surface between the runway pavement and the adjacent surface, to support aircraft running off the pavement, provide blast protection, and enhance erosion control and drainage. For D-III ARC, the required shoulder width is 20 feet and for B-II, the required shoulder width is 10 feet. The airport meets these requirements.

3.2.5 Runway Safety and Object Free Areas

There have been recent improvements to the Runway Safety Areas (RSAs) at St. Paul Downtown Airport. Runway 14-32 RSA width is 500 feet and the length beyond the end of the runways is 500 feet for Runway 14 and 218 feet for Runway 32. The requirement for a D-III runway is 500 feet wide and 1,000 feet beyond the runway end. An Engineered Material Arresting System (EMAS) bed was installed at each Runway 14-32 end in 2008 because of this deficiency. The material is designed to slow an aircraft skidding off the end of the runway and gently stop it without damage to the aircraft landing gear or passengers. It is an FAA-approved system that meets criteria in lieu of a full-length safety area.

The Runway 13-31 and Runway 9-27 RSA width is 150 feet and the length beyond the end of the runways is 300 feet. These runways meet the safety area requirements for ARC-II with greater than ¾ mile visibility minimums.

The Runway Object Free Area (ROFA) is centered on the runway and should be clear of any above ground objects protruding into the runway safety area edge elevation. An exception to this rule is related to objects necessary for air navigation or aircraft ground movement. The ROFA width is 800 feet for Runway 14-32 and 500 feet for Runways 13-31 and 9-27. The length beyond the end of the runway is the same as the RSA. All runways meet this criterion except for Runway 14. The far corners of the OFA are deficient. A request for modification to design standards for the Runway 14 OFA is pending until the FAA review of the as-built Airport Layout Plan is complete.

The Runway Obstacle Free Zone (OFZ) is a defined airspace centered above the runway and extends 200 feet beyond each runway end. The width varies depending on the characteristics of the runway's critical aircraft. For STP, it is 400 feet wide for Runway 14-32 and 250 feet wide for Runway 13-31 and 9-27. All runways meet FAA requirements.

3.2.6 Taxiway Requirements

ADG III criteria for taxiway width are 50 feet. The parallel taxiways and all connector taxiways are currently 50 feet wide.

For ADG III aircraft and any approach visibility minimums, the recommended runway centerline-to-taxiway centerline separation is 400 feet for approach category C and D aircraft. For ADG II aircraft and approach visibility minimums not lower than ¾ mile, the recommended runway centerline-to-taxiway centerline separation is 240 feet for approach category A and B aircraft. For Runway 14-32, the parallel taxiway separation distance is currently 400 feet. For Runway 13-31, the parallel taxiway separation distance is currently 450 feet. The separation between runway and taxiway for both runways with parallel taxiways meets the FAA criteria for the existing visibility minimums. Runway 9-27 has only a small portion of parallel taxiway near the end of Runway 9, on each side of the runway. The separation between runway and taxiway on the north side is 245 feet and on the south side is 369 feet. All separations meet FAA criteria.

Taxiway turnoffs should be present to facilitate aircraft exit off of the supported runway, to reduce incursions and minimize time on runway. The existing connectors currently provide this functionality and AC 150/5300-13 guidance will be utilized for any future taxiways.

Paved or stabilized shoulders are recommended along taxiways. ADG III aircraft require 20 foot shoulders and ADG II require 10 foot shoulders. STP has 20-foot wide turf shoulders on all taxiways.

The Taxiway Object Free Area (OFA) width for ADG III aircraft is 186 feet and ADG II aircraft is 131 feet. The FAA-recommended taxilane OFA width is 162 feet for D-III and 115 feet for B-II airports. The FAA offers a calculation as an alternative that utilizes the wingspan of a particular aircraft to determine an adequate OFA. The formula takes the wingspan times 1.2, plus 20 feet.

Due to the presence of the sheet pile wall along Taxiway B and southern portion of Taxiway A, a modification to design standards was requested and approved. The Taxiway B connector OFA southwest of connector Taxiway A2 is restricted to aircraft with wingspans no greater than 71 feet. The Taxiway A OFA southeast of Taxiway B connector is restricted to aircraft with wingspans no greater than 100 feet. Pilots are made aware of those restrictions through the Airport/Facility Directory published by the U.S. Department of Transportation, Federal Aviation Administration.

3.3 Landside Requirements

3.3.1 Hangar Facilities

The St. Paul Downtown Airport, like all of the MAC airports, has a variety of hangar sizes. Unlike other MAC Reliever Airports, the hangar areas at STP are constrained with little opportunity to expand. The majority of hangars are sized to house large corporate aircraft, but there are also smaller hangars on the field. As shown in Chapter 1, the airport is estimated to have 149 indoor aircraft storage spaces, or 159 counting military aircraft. This number includes an assumption that some airport tenants sublease extra space for additional aircraft within their hangars, and includes a small discount for those who opt not to lease extra space.

Tenants own their hangars and lease the ground space from MAC. It is currently the policy of the MAC that no tenant can lease more space than they can justify with actual aircraft ownership. This practice has reduced the number of large hangar demands and, subsequently, reduces some of the subleasing opportunities at the airport.

According to the Chapter 2 forecasts, the number of based aircraft is anticipated to gradually rise from 93 in 2007 to 132 in the year 2025. The south hangar area expansion was completed in 2000, and still has large corporate hangar sites available. MAC also completed the “Mercury Avenue” hangar area in 2002 on the east side of the airport. It has four small aircraft hangar sites and a site for an 8-aircraft T-hangar still available. With a forecasted growth to132 aircraft by 2025, the airport has enough hangar space to meet the forecasted demand.

It should be noted that if the demand for hangar space begins to exceed the current capacity, it is possible to consider redevelopment in some areas; but for the most part, there is no additional space at the airport for any new hangar areas. It should also be noted that hangar construction in the Mercury Avenue area or anywhere along Bayfield Street on the east side of the airport is subject to specific floodway/floodplain development and construction requirements.

3.3.2 Fixed Base Operators

At the time of writing this document, the airport has two operating full service FBOs and a third vacant FBO space. The airport also has a commercial operator that provides flight training and small aircraft rental. There is no need or space for any additional FBO facilities.

3.3.3 MAC Administration Building

Aside from on-going maintenance related items, the administration building needs no major improvements. Some HVAC work is needed to improve the heating and cooling in the restaurant space. In addition, a project is programmed in the MAC Capital Improvement Program to install a drain system around the exterior of the basement. This will improve the drainage around the building and alleviate pressures on the basement walls during flood conditions.

3.3.4 Airport Access, Roadway Circulation and Parking

At this time, there are no issues related to airport access or parking. The MAC-owned administration building, the FBOs and hangar areas are all connected to the street system surrounding the airport.

3.3.5 Maintenance and Fuel Storage Areas

At this time, there is no demand or requirement for additional maintenance equipment or fueling capabilities at the airport. The main maintenance building located across the parking lot from the administration building is in need of repair. It has some exterior wall cracking that will continue to be monitored, and if necessary, a project will be pursued to correct it.

3.4 Lighting and Navigation Requirements

3.4.1 Runway and Taxiway Edge Lighting

The runway safety area projects recently completed for all three runways included any necessary runway and taxiway lighting modifications. There are currently no deficiencies on the field. The existing electrical vault building, however, does not meet code and must be brought into compliance.

3.4.2 PAPI

All of the Precision Approach Path Indicator (PAPI) systems on the airfield are new or recently new with the runway safety area improvement projects. A PAPI system is a row of lights normally located on the left side of a runway that provide visual descent guidance information during an approach to a runway. The lights are visible from about five miles during the day and up to 20 miles at night. There is no need for additional or upgraded PAPI systems.

3.4.4 Instrument Approach

As noted in the Chapter 1 inventory, Runway 14 has an Instrument Landing System (ILS) with an approach lighting system (MASLR) and one mile approach visibility. Additionally, Runway 32 has an ILS approach, and both Runway 14 and 32 have RNAV GPS approaches.

The previous long-term comprehensive plan recommended lead-in lights be installed for Runway 32. This was once again reviewed as a part of this update. A medium-intensity approach lighting system (MALSF) was also reviewed because of the benefits it would provide for approach minimums. In both cases, however, the physical location of the river would require Runway 14-32 to be shortened in order to allow the installation of an approach lighting system. The minor incremental benefit of the lighting system would not exceed the benefit of maintaining the existing runway length, and therefore, was dropped from further consideration.

Since the FAA recommends a minimum of 5,000 feet of runway for an ILS, the 4,004-foot Runway 13-31 is too short for such an installation. MAC has previously studied an extension to Runway 13, but it would overlap with the approach to Runway 14, and the resulting configuration would be undesirable from a safety standpoint. Runway 9-27 is shorter than Runway 13-31.

3.5 Security Requirements

The airport is fully surrounded by a perimeter fence. It provides dual functions in providing security as well as help to keep the local deer population outside of the fence and off the airfield. Automatic gates are installed at almost all airport entrances to the airfield. Those that are not power-operated gates are locked to ensure no unauthorized access to the field.

3.6 Utility Requirements

As noted in Chapter 1, all of the hangar areas and buildings are connected to or have the ability to connect to sanitary sewer and water. Other utilities also exist in all locations at the airport. At this time, there is no demand or requirement for additional utilities at the airport.

3.7 Obstruction Related Issues

Obstructions, if any, are typically analyzed when an Airport Layout Plan is prepared. Obstructions will be identified with a proposed disposition for each. In recent years, trees on airport property that were identified as potential obstructions were removed. In 2009, numerous additional trees were removed from airport and non-airport property to clear the runway approaches from such obstructions.

Chapter 4 Plan Recommendations

In this chapter, the different potential development options for the airport are analyzed. While the number of concepts could be infinite, the ones in this chapter have been developed taking into consideration the airport inventories, forecasted growth and facility requirements. In addition, other concepts or ideas arising from public input during the long-term comprehensive plan (LTCP) process also received consideration.

4.1 Airport Expansion - Runways and Hangar Areas

The St. Paul Downtown Airport currently has three runways, as discussed in Chapter 1. Typical alternatives can include additional runways, runway extensions, additional taxiways, and/or hangar areas, depending on existing needs, forecasts, and airfield capacity.

4.1.1 Runways

As shown in Chapter 2, Table 2-2, the number of operations in 2007 was 125,254. In Chapter 3, the maximum number of operations the airport can handle, the annual service volume, was identified as 265,000 operations based on the existing three runway configuration. Therefore, from an airside standpoint, the airport is currently at 47% capacity.

The baseline 2025 forecast number of operations at STP is 137,310 operations, equating to a capacity of about 52%. Under the high scenario, the 156,431 forecasted number of operations in 2025 would result in 59% capacity. None of these figures trigger the need to study additional runway capacity at STP at this time. The airport site is constrained, however, so it is unlikely an additional runway could be constructed. However, an alternative to consider would be re-alignment of one or more runways to increase the capacity when operation volumes trigger such an analysis.

Chapter 3, section 3.2.2 indicates the recommended runway length for the critical aircraft is 7,300 feet, and for the group of aircraft weighing more than 60,000 pounds, it is 6,620 feet. For smaller aircraft using STP, a runway length of 3,810 feet is recommended. As noted in Chapter 1, the primary runway is 6,491-feet, which is only 129 feet short of the recommended 6,620 feet. Runway 13-31 already exceeds the recommendation by 104 feet for small aircraft less than 12,500 pounds. Runway 9-27 is short of the recommended 3,810 feet by 168 feet. The runway safety improvements recently completed required the reduction of runway length for each of the three runways in order to obtain the required runway safety area length. It is not possible to extend the runways given the physical location of the river and the required safety area criteria. Therefore, STP cannot meet the FAA-recommended runway lengths to accommodate 100 percent of the aircraft that fall into the approach categories.

4.1.2 Hangar Areas

The number of based aircraft registered for STP in 2007 was 93 aircraft (including military aircraft), as identified in Table 2-1 in Chapter 2. Chapter 3 indicated that there is an estimated 149 actual indoor hangar spaces at the airport. This means the current landside capacity equates to about 62%.

According to the baseline forecast, the based aircraft would reach 132 including military aircraft, or approximately 89% capacity. As indicated in Chapter 3, the airport has enough capacity to meet the forecasted demand.

4.2 Plan Recommendations

As discussed above and in Chapter 3, there is no demonstrated need for specific airfield improvements at this time. There are, however, various airside and landside improvements that are recommended for implementation. They are itemized below, and shown in Figure 4-1.

4.2.1 Pavement Maintenance Program

It is recommended that MAC continue pavement reconstruction and rehabilitation as part of the on-going pavement maintenance program. For STP, MAC typically carries separate items in the capital improvement program for pavement maintenance. One line item includes pavement rehabilitation or reconstruction proposed for the seven-year program, for which costs are based on specific project locations. The second line item is an on-going every-other-year joint and crack repair item. Given the poor soils and saturation at STP, the pavements tend to move more which results in a more frequent need for repairs.

4.2.2 Terminal Sub Drain

As discussed in Chapter 3, this project is recommended to improve the drainage around the exterior basement of the administration building. The improved drainage will alleviate subsurface soil and water pressures put on the basement walls during flood conditions.

4.2.3 Electrical Vault Improvements

Also identified in Chapter 3, upgrades to the electrical vault building are recommended to bring the facility into code compliance. The recommended project includes a new building, HVAC, control panels, regulators, switchgears, etc.

4.2.4 Floodwall Maintenance

It is recommended that MAC continue to discuss and plan for the on-going maintenance, training, personnel/resources, compensatory excavation monitoring, and review any possible permit requirements for the floodwall.

4.2.5 Concurrent Use / Development Parcels

It is recommended that MAC continue to research the potential development of concurrent land uses for revenue generating purposes on airport property. There is only one parcel that has been identified to date for this type of development. It is located on the cul-de-sac of Ridder Circle on the north end of the airport, adjacent to the Pioneer Press facility. It is shown as Parcel 1R on Figure 1-4, and is highlighted in Figure 4-1.

4.2.6 Agency Coordination

It is recommended that MAC continue cooperation with the cities surrounding the airport through the existing Downtown Airport Advisory Commission, Joint Airport Zoning Board, and on-going MAC/City staff interaction.

Chapter 5 Environmental Considerations

An integral part of the airport planning process focuses on the manner in which the airport and any planned enhancements to the facility pose environmental impacts. This chapter evaluates the environmental implications of the planned operation and development of the St. Paul Downtown Airport.

5.1 Aircraft Noise

5.1.1 Quantifying Aircraft Noise

5.1.1.1 Basics of Sound

Sound is a physical disturbance in a medium, a pressure wave typically moving through air. A sound source vibrates or otherwise disturbs the air immediately surrounding the source, causing variations in pressure above and below the static (at-rest) value of atmospheric pressure. These disturbances force air to compress and expand, setting up a wavelike movement of air particles that move away from the source. Sound waves, or fluctuations in pressure, vibrate the eardrum creating audible sound.

The decibel, or dB, is a measure of sound pressure level that is compressed into a convenient range, that being the span of human sensitivity to pressure. Using a logarithmic relationship and the ratio of sensed pressure compared against a fixed reference pressure value, the dB scale accounts for the range of hearing with values from 0 to around 200. Most human sound experience falls into the 30 dB to 120 dB range.

Decibels are logarithmic and thus cannot be added directly. Two identical noise sources each producing 70 dB do not add to a total of 140 dB. The correct answer is 73 dB. Each time the number of sources is doubled, the sound pressure level is increased 3 dB.

Baseline:	70 dB
2 sources:	70 dB + 70 dB = 73 dB
4 sources:	70 dB + 70 dB + 70 dB + 70 dB = 76 dB
8 sources:	70 dB + 70 dB + 70 dB + 70 dB + 70 dB + 70 dB + 70 dB + 70 dB = 79 dB

The just-noticeable change in loudness for normal hearing adults is about 3 dB. That is, changes in sound level of 3 dB or less are difficult to notice. A doubling of loudness for the average listener of A-weighted sound is about 10 dB.[2] Measured, A-weighted sound levels changing by 10 dBA effect a subjective perception of being "twice as loud".[3]

Figure 5-1 provides the noise levels for various common sources.

[2] A-weighted decibels represent noise levels that are adjusted relative to the frequencies that are most audible to the human ear.
[3] Peppin and Rodman, Community Noise, p. 47-48; additionally, Harris, Handbook, Beranek and Vér, Noise and Vibration Control Engineering, among others.

5.1.1.2 Day-Night Average Sound Level (DNL)

In 1979 the United States Congress passed the Aviation Safety and Noise Abatement Act. The Act required the Federal Aviation Administration (FAA) to develop a single methodology for measuring and determining airport noise impacts. In January 1985 the FAA formally implemented the Day-Night Average Sound Level (DNL) as the noise metric descriptor of choice for determining long-term community noise exposure in the airport noise compatibility planning provisions of 14 C.F.R. Part 150. Additionally, FAA Order 1050.1, *"Environmental Impacts: Policies and Procedures"* and FAA Order 5050.4, *"National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions,"* outline DNL as the noise metric for measuring and analyzing aircraft noise impacts.

As detailed above, the FAA requires the DNL noise metric to determine and analyze noise exposure and aid in the determination of aircraft noise and land use compatibility issues around United States airports. Because the DNL metric correlates well with the degree of community annoyance from aircraft noise, DNL has been formally adopted by most federal agencies dealing with noise exposure. In addition to the FAA, these agencies include the Environmental Protection Agency (EPA), Department of Defense, Department of Housing and Urban Development, and the Veterans Administration.

The DNL metric is calculated by cumulatively averaging sound levels over a twenty four-hour period. This average cumulative sound exposure includes the application of a 10-decibel penalty to sound exposures occurring during the nighttime hours (10:00 PM to 7:00 AM). Since the ambient, or background, noise levels usually decrease at night the night sound exposures are increased by 10 decibels because nighttime noise is more intrusive.

Figure 5-2 provides examples of typical DNL levels in various environments.

The FAA considers the 65 DNL contour line as the threshold of significance for noise impact. As such, sensitive land use areas (e.g., residential) around airports that are located in the 65 or greater DNL contours are considered by the FAA as incompatible structures.

5.1.1.3 Integrated Noise Model (INM)

The Federal Aviation Administration's (FAA) Office of Environment and Energy (AEE-100) has developed the Integrated Noise Model (INM) for evaluating aircraft noise impacts in the vicinity of airports. INM has many analytical uses, such as assessing changes in noise impact resulting from new or extended runways or runway configurations and evaluating other operational procedures. The INM has been the FAA's standard tool since 1978 for determining the predicted noise impact in the vicinity of airports. Statutory requirements for INM use are defined in FAA Order 1050.1, *"Environmental Impacts: Polices and Procedures"* and FAA Order 5050.4, *"National Environmental Policy Act (NEPA) Implementing Instructions for Airport Actions,"* and Federal Aviation Regulations (FAR) Part 150, *"Airport Noise Compatibility Planning."*

The model utilizes flight track information, runway use information, operation time of day data, aircraft fleet mix, standard and user defined aircraft profiles, and terrain as inputs. The INM model produces DNL noise exposure contours that are used for land use compatibility maps. The INM program includes built in tools for comparing contours and utilities that facilitate easy export to commercial Geographic Information Systems. The model also calculates predicted noise at specific sites such as hospitals, schools or other sensitive locations. For these grid points, the model reports detailed information for the analyst to determine which events contribute most significantly to the noise at that location. The model supports 16 predefined noise metrics that include cumulative sound exposure, maximum sound level and time-above metrics from both the A-Weighted, C-Weighted and the Effective Perceived Noise Level families.

The INM aircraft profile and noise calculation algorithms are based on several guidance documents published by the Society of Automotive Engineers (SAE). These include the SAE-AIR-1845 report titled *"Procedure for the Calculation of Airplane Noise in the Vicinity of Airports,"* as well as others which address atmospheric absorption and noise attenuation. The INM is an average-value-model and is designed to estimate long-term average effects using average annual input conditions. Because of this, differences between predicted and measured values can occur because certain local acoustical variables are not averaged, or because they may not be explicitly modeled in INM. Examples of detailed local acoustical variables include temperature profiles, wind gradients, humidity effects, ground absorption, individual aircraft directivity patterns and sound diffraction terrain, buildings, barriers, etc.

As detailed previously, INM considers multiple airport and aircraft operational and noise propagation variables. The primary inputs into the model include aircraft activity levels, fleet mix, day/night split of operations, flight tracks and runway use.

5.1.2 Noise Contour Development

The noise contours presented in this document were developed using INM Version 7.0a. The contours represent predicted levels, or noise contours, of equal aircraft noise exposure on the ground as expressed in DNL. The FAA currently suggests that three different DNL levels (65, 70, and 75 DNL) be modeled. The Metropolitan Council suggests that the 60 DNL contour be included for airports in an urban environment and the 55 DNL in cases where airports are located outside the Metropolitan Urban Service Area (MUSA).

The Metropolitan Airports Commission (MAC) owns and operates an Airport Noise and Operations Monitoring System (ANOMS) at Minneapolis/St. Paul International Airport (MSP). In addition to monitoring noise levels at 39 noise monitoring poles located around MSP, the system receives flight track data from the FAA radar located at MSP. The flight track data extends to approximately 40 miles around MSP. St. Paul Downtown Airport is located approximately 7.5 miles from MSP. As such, radar flight track data in the vicinity of St. Paul Downtown Airport was provided by ANOMS to aid in the INM input file development process. ANOMS flight track data from 2007 was utilized in the development of the 2007 Baseline INM Inputs. Due to the distance and geography between the FAA radar at MSP and operations in the vicinity of St. Paul Downtown Airport, data acquisition/availability is reduced. However, for 2007 ANOMS reported 29,400 operations in the vicinity of St. Paul Downtown Airport. This provided an adequate data sample for purposes of contributing to the construction of the INM input variables.

The following details the methodology utilized in developing the data inputs for the INM contour modeling.

5.1.2.1 Aircraft Activity Levels

The total number of St. Paul Downtown Airport operations in 2007 was 125,254. As detailed in Chapter 2 the total number of 2007 operations was developed based on the Federal Aviation Administration's (FAA) control tower counts at the St. Paul Downtown Airport. Supplemental ANOMS operations data was used to account for operations during the non-tower hours.

The 2025 preferred alternative forecast number of total operations at St. Paul Downtown Airport is 137,310. The assumptions that were factored in the determination of the 2025 forecasted operations are detailed in Chapter 2 and Appendix A.

5.1.2.2 Fleet Mix

Using the ANOMS flight track data available in the vicinity of St. Paul Downtown Airport for 2007, various data processing steps were taken to develop an actual 2007 fleet mix. The flight track analysis process began by first excluding all MSP carrier jet flight tracks. Then all flight tracks with a start point or end point that did not fall within a 10km radius and 1km (above ground level) ceiling around St. Paul Downtown Airport were filtered out of the data. If the starting point of a track was within the radius/ceiling criteria around St. Paul Downtown Airport it was considered a departure operation. If the endpoint of a track was within the radius/ceiling criteria around St. Paul Downtown Airport it was considered an arrival operation.

The aircraft type distribution derived from the ANOMS flight track analysis was then applied to the 2007 total number of operations to develop the baseline 2007 fleet mix as detailed in Table 5-1.

The 2025 forecast fleet mix at St. Paul Downtown Airport is provided in Table 5-2. The assumptions that were factored in the determination of the 2025 fleet mix are detailed in Chapter 2 and Appendix A.

5.1.2.3 Day/Night Split of Operations

Based on the ANOMS flight track fleet mix data sample for St. Paul Downtown Airport the split of day and nighttime operations was determined. The daytime hours are defined as 7:00 a.m. to 10:00 p.m. and nighttime hours are 10:00 p.m. to 7:00 a.m.

The day/night operations distribution derived from the ANOMS flight track analysis was then applied to the 2007 total number of operations to develop the baseline 2007 day/night split as detailed in Table 5-1.

The 2025 forecast day/night operations at St. Paul Downtown Airport are provided in Table 5-2.

5.1.2.4 Flight Tracks

The Baseline 2007 INM flight track locations were developed based on the flight track trends established by the ANOMS flight tracks that met the fleet mix data sample criteria for St. Paul Downtown Airport. The 2007 INM flight tracks are provided in Figures 5-3(a-i) and the 2007 flight track use is detailed in Tables 5-3(a-d).

The 2025 INM flight tracks are provided in Figures 5-4(a-i) and the 2025 flight track use is detailed in Table 5-4(a-d).

5.1.2.5 Runway Use

Using the St. Paul Downtown Airport fleet mix ANOMS flight track data set, a runway use analysis was conducted. The analysis first included the development of trapezoids off the end of each runway to determine which runway a flight track was operating on. Each trapezoid ran along the axis of the centerline beginning at the runway endpoint and extending 3km from runway end. The trapezoid was 0.1km wide at the runway end point and 1km wide at the extent furthest from the runway end. For the purpose of the runway use analysis the last five, or first five, radar points of each track in the vicinity of St. Paul Downtown Airport were analyzed relative to the runway trapezoids.

In cases where the last five radar points of a track were in the vicinity of St. Paul Downtown Airport, if any one of the radar points were located within a respective runway trapezoid, the track was assigned as an arrival operation on that runway. Conversely, in cases where the first five radar points were in the vicinity of St. Paul Downtown Airport, if any one of the radar points were located within a respective runway trapezoid, the track was assigned as a departure operation on that runway. An operation was considered a “touch & go” if the track was assigned both an arrival and departure at the airport. The resultant runway use trends were then analyzed and adjusted relative to wind pattern data around St. Paul Downtown Airport.

The 2007 runway use derived from the ANOMS flight track analysis is detailed in Table 5-5.

The 2025 forecast runway use at St. Paul Downtown Airport is provided in Table 5-6.

Table 5-1
St. Paul Downtown Airport Year 2007 Average Daily Flight Operations

Aircraft Group	Aircraft Type	Identifier	INM/ANOMS	Arrivals			Departures			Touch and Gos			Total Operations		
			Group	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
Jets	Canadair Challenger CL-600	CL600	3	0.55	0.01	0.56	0.57	0.01	0.58	0.00	0.00	0.00	1.12	0.02	1.14
	Canadair Challenger CL-601	CL601	3	0.16	0.01	0.17	0.18	0.00	0.19	0.00	0.00	0.00	0.35	0.01	0.36
	Cessna 501 Citation I	CNA501	3	0.15	0.00	0.15	0.14	0.00	0.14	0.00	0.00	0.00	0.28	0.01	0.29
	Cessna Mustang 510 (VLJ)	CNA510	3	0.03	0.00	0.03	0.03	0.00	0.03	0.00	0.00	0.00	0.06	0.00	0.06
	Cessna 551 Citation II	CNA551	3	0.02	0.00	0.02	0.01	0.00	0.02	0.00	0.00	0.00	0.04	0.00	0.04
	Cessna 560 Citation V	CNA560	3	2.79	0.09	2.88	2.62	0.18	2.80	0.00	0.00	0.00	5.41	0.27	5.68
	Cessna 650 Citation VII	CNA650	3	1.17	0.04	1.21	1.10	0.12	1.22	0.00	0.00	0.00	2.27	0.16	2.43
	Cessna 750 Citation X	CNA750	3	0.59	0.02	0.62	0.59	0.02	0.61	0.00	0.00	0.00	1.19	0.05	1.23
	Cessna Citation 500	CNA500	3	0.17	0.00	0.17	0.14	0.01	0.15	0.00	0.00	0.00	0.31	0.01	0.32
	Cessna Citation 525	CNA525	3	0.99	0.02	1.00	0.91	0.04	0.94	0.00	0.00	0.00	1.89	0.06	1.95
	Cessna Citation 550	CNA550	3	1.33	0.12	1.45	1.40	0.09	1.49	0.00	0.00	0.00	2.73	0.21	2.94
	Cessna Citation 550 Bravo	CNA55B	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Dassault Falcon 10	FAL10	3	0.39	0.02	0.42	0.36	0.02	0.39	0.00	0.00	0.00	0.75	0.05	0.80
	Dassault Falcon 200	FAL200	3	1.20	0.09	1.29	1.18	0.06	1.24	0.00	0.00	0.00	2.38	0.15	2.53
	Dassault Falcon 2000	FAL20A	3	0.78	0.03	0.81	0.80	0.02	0.82	0.00	0.00	0.00	1.58	0.06	1.63
	Gulfstream I	GULF1	2	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.02
	Gulfstream II	GII	2	0.87	0.01	0.88	0.82	0.03	0.85	0.00	0.00	0.00	1.69	0.05	1.74
	Gulfstream III	GULF3	2	0.15	0.00	0.15	0.16	0.00	0.16	0.00	0.00	0.00	0.31	0.00	0.31
	Gulfstream IV	GIV	3	0.62	0.02	0.64	0.60	0.01	0.61	0.00	0.00	0.00	1.21	0.03	1.25
	Gulfstream V	GV	3	1.67	0.08	1.75	1.55	0.12	1.68	0.00	0.00	0.00	3.22	0.20	3.42
	Hawker 125 Jet	HS125	3	0.99	0.03	1.03	1.03	0.04	1.07	0.00	0.00	0.00	2.02	0.07	2.09
	IAI 1124 Westwind	IA1124	3	0.11	0.00	0.11	0.12	0.00	0.12	0.00	0.00	0.00	0.23	0.00	0.23
	IAI 1125 Westwind	IA1125	3	0.09	0.01	0.10	0.11	0.00	0.11	0.00	0.00	0.00	0.20	0.01	0.20
	Learjet 24	LEAR24	2	0.01	0.00	0.01	0.02	0.00	0.02	0.00	0.00	0.00	0.03	0.00	0.03
	Learjet 25	LEAR25	2	0.05	0.00	0.05	0.04	0.01	0.04	0.00	0.00	0.00	0.09	0.01	0.10
	Learjet 31	LEAR31	3	0.23	0.01	0.24	0.23	0.01	0.24	0.00	0.00	0.00	0.47	0.02	0.48
	Learjet 35	LEAR35	3	2.09	1.02	3.11	2.68	0.74	3.42	0.00	0.00	0.00	4.77	1.76	6.53
	Learjet 45	LEAR45	3	2.18	0.04	2.22	2.08	0.12	2.20	0.00	0.00	0.00	4.26	0.17	4.42
	Learjet 55	LEAR55	3	0.11	0.00	0.11	0.11	0.00	0.12	0.00	0.00	0.00	0.23	0.00	0.23
	Learjet 60	LEAR60	3	0.15	0.01	0.16	0.15	0.01	0.16	0.00	0.00	0.00	0.31	0.01	0.32
	Mitsubishi Diamond MU-300	MU300	3	0.03	0.00	0.03	0.03	0.00	0.03	0.00	0.00	0.00	0.06	0.00	0.06
	Raytheon Beechjet 400	BEC400	3	1.12	0.02	1.14	1.03	0.05	1.08	0.00	0.00	0.00	2.15	0.07	2.22
	Saberliner 65	SABR65	3	0.02	0.00	0.02	0.02	0.00	0.03	0.00	0.00	0.00	0.05	0.00	0.05
	Sabreliner 75	SABR75	3	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01
	Subtotal			*20.83*	*1.73*	*22.56*	*20.83*	*1.73*	*22.56*	*0.00*	*0.00*	*0.00*	*41.67*	*3.45*	*45.12*
Helicopters	Agusta 109	A109	H	2.94	0.16	3.10	2.97	0.20	3.17	0.64	0.01	0.66	6.55	0.37	6.92
	Bell 206	B206L	H	10.76	1.13	11.89	11.18	1.07	12.25	21.88	0.81	22.69	43.82	3.01	46.83
	Bell 212 Huey	B212	H	0.16	0.00	0.16	0.00	0.00	0.00	0.00	0.00	0.00	0.16	0.00	0.16
	Bell 222	B222	H	1.68	0.06	1.74	1.63	0.09	1.72	0.46	0.02	0.48	3.77	0.18	3.94
	Eurocopter BK-117	EC130	H	0.97	0.12	1.10	1.01	0.12	1.13	1.18	0.02	1.20	3.16	0.27	3.43
	Hughes 500D	H500D	H	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.03
	Robinson R22B	R22	H	0.07	0.00	0.07	0.02	0.00	0.02	0.00	0.00	0.00	0.10	0.00	0.10
	Sikorsky S-70 Blackhawk	S70	H	1.33	0.01	1.34	1.12	0.01	1.12	0.51	0.00	0.51	2.95	0.01	2.96
	Subtotal			*17.94*	*1.49*	*19.42*	*17.94*	*1.49*	*19.42*	*24.67*	*0.87*	*25.53*	*60.54*	*3.84*	*64.38*
Multi-Engine Piston	Beechcraft Baron BE-55	BEC55	P	0.88	0.00	0.88	0.84	0.01	0.85	2.16	0.00	2.16	3.88	0.01	3.89
	Beechcraft Baron BE-58	BEC58	P	2.38	0.01	2.39	2.58	0.04	2.63	3.74	0.00	3.74	8.70	0.06	8.76
	Beechcraft Baron BE-58P	BEC58P	P	0.69	1.42	2.11	0.75	0.95	1.70	0.66	0.56	1.22	2.09	2.94	5.03
	Beechcraft Duchess Twin	BEC76	P	0.11	0.00	0.11	0.08	0.00	0.08	0.00	0.00	0.00	0.19	0.00	0.19
	Beechcraft Duke Twin	BEC60	P	0.11	0.01	0.12	0.18	0.00	0.18	0.00	0.00	0.00	0.29	0.01	0.30
	Beechcraft Queen Air 80	BEC80	P	0.40	0.00	0.40	0.59	0.01	0.60	0.23	0.00	0.23	1.21	0.01	1.22
	Beechcraft Travel Air	BEC95	P	0.07	0.00	0.07	0.04	0.00	0.04	0.00	0.00	0.00	0.11	0.00	0.11
	Cessna 310	CNA310	P	1.08	0.01	1.09	1.23	0.03	1.26	0.33	0.00	0.33	2.63	0.04	2.67
	Cessna 335	CNA335	P	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
	Cessna 337 Super Skymaster	CNA337	P	0.05	0.00	0.05	0.02	0.00	0.02	0.00	0.00	0.00	0.07	0.00	0.07
	Cessna 340	CNA340	P	1.58	0.00	1.58	1.83	0.01	1.84	0.73	0.00	0.73	4.13	0.02	4.15
	Cessna 401	CNA401	P	0.06	0.00	0.06	0.07	0.00	0.07	0.00	0.00	0.00	0.13	0.00	0.13
	Cessna 402	CNA402	P	1.77	0.00	1.77	0.11	0.31	0.42	0.33	0.00	0.33	2.21	0.31	2.52

Table 5-1
St. Paul Downtown Airport Year 2007 Average Daily Flight Operations

Aircraft Group	Aircraft Type	Identifier	INM/ANOMS	Arrivals			Departures			Touch and Gos			Total Operations		
			Group	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
	Cessna 404 Titan	CNA404	P	0.01	0.00	0.01	0.02	0.00	0.02	0.00	0.00	0.00	0.03	0.00	0.04
	Cessna 414 Chancellor	CNA414	P	1.56	0.13	1.69	2.03	0.06	2.10	1.05	0.00	1.05	4.64	0.20	4.84
	Cessna 421 Golden Eagle	CNA421	P	0.53	0.00	0.53	0.70	0.01	0.71	0.00	0.00	0.00	1.23	0.02	1.24
	Cessna Crusader 303	CNA303	P	0.03	0.00	0.03	0.02	0.00	0.02	0.00	0.00	0.00	0.05	0.00	0.05
	Piper Aerostar 600/700	PA60	P	0.21	0.01	0.22	0.18	0.01	0.18	0.00	0.00	0.00	0.38	0.02	0.40
	Piper Apache	PA23AP	P	0.09	0.00	0.09	0.06	0.00	0.06	0.00	0.00	0.00	0.15	0.00	0.15
	Piper Aztec	PA23AZ	P	0.26	0.00	0.26	0.44	0.00	0.44	1.05	0.00	1.05	1.75	0.00	1.75
	Piper Navajo Chieftain	PA31	P	3.32	0.04	3.36	2.66	0.19	2.85	4.41	0.00	4.41	10.40	0.23	10.62
	Piper Seminole	PA44	P	0.72	0.00	0.72	1.03	0.00	1.03	0.39	0.00	0.39	2.15	0.00	2.15
	Piper Seneca	PA34	P	3.90	0.01	3.91	4.36	0.01	4.38	0.98	0.00	0.98	9.24	0.02	9.27
	Piper Twin Comanche	PA30	P	0.09	0.00	0.09	0.08	0.00	0.08	0.00	0.00	0.00	0.17	0.00	0.17
	Swearingen Merlin IV	SAMER4	P	0.17	0.01	0.18	0.17	0.00	0.18	0.00	0.00	0.00	0.34	0.01	0.35
	Subtotal			*20.08*	*1.66*	*21.74*	*20.08*	*1.66*	*21.74*	*16.06*	*0.56*	*16.62*	*56.21*	*3.89*	*60.10*
Single-Engine Piston	Beechcraft F33A Bonanza	BEC33	P	5.74	0.42	6.16	5.34	0.86	6.20	3.48	0.00	3.48	14.56	1.28	15.84
	Beechcraft Sport	BEC24	P	0.25	0.00	0.25	1.40	0.00	1.40	2.09	0.00	2.09	3.74	0.00	3.74
	Bellanca Cruisair	BL14	P	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.03
	Bellanca Super Viking	BL26	P	0.20	0.00	0.20	0.15	0.00	0.15	0.00	0.00	0.00	0.35	0.00	0.35
	Cessna 150	CNA150	P	0.35	0.00	0.35	0.58	0.10	0.67	0.00	0.00	0.00	0.93	0.10	1.02
	Cessna 152	CNA152	P	0.05	0.00	0.05	0.05	0.00	0.05	0.00	0.00	0.00	0.09	0.00	0.09
	Cessna 170	CNA170	P	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.03
	Cessna 205 Super Skywagon	CNA205	P	0.08	0.00	0.08	0.03	0.00	0.03	0.00	0.00	0.00	0.11	0.00	0.11
	Cessna 206H	CNA206	P	1.71	0.00	1.71	1.63	0.10	1.73	3.36	0.00	3.36	6.70	0.10	6.80
	Cessna 207	CNA207	P	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.03
	Cessna Cardinal 177	CNA177	P	0.16	0.00	0.16	0.31	0.00	0.31	0.00	0.00	0.00	0.46	0.00	0.46
	Cessna Centurion 210	CNA210	P	1.53	0.00	1.53	0.94	0.00	0.94	0.52	0.00	0.52	2.99	0.00	2.99
	Cessna Skyhawk 172	CNA172	P	6.04	0.28	6.32	7.14	0.30	7.44	30.14	0.12	30.26	43.32	0.70	44.02
	Cessna Skylane 182	CNA182	P	3.46	0.42	3.88	2.21	0.23	2.44	4.34	0.18	4.52	10.02	0.82	10.84
	Cessna Skywagon 180	CNA180	P	0.38	0.18	0.56	0.13	0.00	0.13	0.00	0.00	0.00	0.51	0.18	0.68
	Cessna Skywagon 185	CNA185	P	0.11	0.00	0.11	0.04	0.00	0.04	0.43	0.00	0.43	0.58	0.00	0.58
	De Havilland DHC-2 Beaver	DHC2	P	0.08	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.00	0.08
	GA Single-Engine Prop Fixed	GASEPF	P	5.24	0.81	6.05	5.29	0.32	5.60	9.53	0.00	9.53	20.06	1.13	21.19
	GA Single-Engine Prop Variable	GASEPV	P	3.35	0.49	3.84	3.87	0.51	4.37	2.33	1.94	4.27	9.54	2.94	12.48
	Grumman American	AA5A	P	0.08	0.00	0.08	0.03	0.00	0.03	0.00	0.00	0.00	0.11	0.00	0.11
	Mooney M20J	M20J	P	2.75	0.09	2.84	2.50	0.10	2.59	3.19	0.00	3.19	8.44	0.18	8.63
	Piper Cherokee 140	PA28CH	P	1.95	0.08	2.03	1.41	0.12	1.52	1.38	0.00	1.38	4.73	0.20	4.93
	Piper Cherokee Arrow II	PA28CA	P	0.57	0.11	0.68	0.56	0.00	0.56	0.43	0.00	0.43	1.56	0.11	1.67
	Piper Cherokee Six	PA32C6	P	1.22	0.00	1.22	1.16	0.20	1.36	1.20	0.00	1.20	3.58	0.20	3.78
	Piper Comanche	PA24	P	0.72	0.11	0.83	0.63	0.10	0.72	0.00	0.00	0.00	1.35	0.21	1.56
	Piper Dakota	PA28DK	P	0.19	0.00	0.19	0.48	0.00	0.48	0.43	0.00	0.43	1.10	0.00	1.10
	Piper Lance	PA32LA	P	0.43	0.20	0.63	0.51	0.29	0.79	0.00	0.00	0.00	0.93	0.49	1.42
	Piper Malibu	PA46	P	0.94	0.00	0.94	0.99	0.00	0.99	0.52	0.00	0.52	2.45	0.00	2.45
	Piper Pawnee	PA25	P	0.00	0.00	0.00	0.25	0.00	0.25	0.00	0.00	0.00	0.25	0.00	0.25
	Piper Warrior	PA28		0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
	Piper Warrior II	PA28WA	P	1.96	0.11	2.07	2.10	0.10	2.19	0.43	0.00	0.43	4.49	0.21	4.69
	Rockwell Aero Commander 112	RWCM12	P	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
	Siai-Marchetti SF260M	SF260M	P	0.03	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.03
	Subtotal			*39.69*	*3.29*	*42.98*	*39.69*	*3.29*	*42.98*	*63.81*	*2.24*	*66.05*	*143.19*	*8.82*	*152.02*
Turboprops	Avions ATR-42	ATR42	T	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	Beechcraft 1900	BEC190	T	0.09	0.01	0.09	0.07	0.01	0.07	0.00	0.00	0.00	0.15	0.01	0.16
	Beechcraft 99	BEC99	T	0.30	0.12	0.42	0.54	0.01	0.55	0.00	0.00	0.00	0.84	0.13	0.97
	Beechcraft King Air 100	BEC100	T	0.12	0.00	0.12	0.16	0.01	0.17	0.00	0.00	0.00	0.28	0.01	0.29
	Beechcraft King Air 200	BEC200	T	5.50	0.29	5.79	4.99	0.43	5.42	0.00	0.00	0.00	10.49	0.72	11.21
	Beechcraft King Air 300	BEC300	T	0.13	0.00	0.13	0.14	0.00	0.14	0.00	0.00	0.00	0.27	0.00	0.27
	Beechcraft King Air 350	BEC30B	T	0.22	0.01	0.23	0.24	0.00	0.25	0.00	0.00	0.00	0.47	0.01	0.48
	Beechcraft King Air C90	BEC90	T	2.09	0.09	2.18	1.92	0.09	2.00	0.00	0.00	0.00	4.00	0.18	4.18
	Cessna 208	CNA208	T	0.77	0.23	1.00	1.25	0.21	1.47	0.00	0.00	0.00	2.02	0.44	2.47
	Cessna 425 Corsair	CNA425	T	0.17	0.00	0.17	0.15	0.00	0.15	0.00	0.00	0.00	0.32	0.00	0.32

Table 5-1
St. Paul Downtown Airport Year 2007 Average Daily Flight Operations

			INM/ANOMS	Arrivals			Departures			Touch and Gos			Total Operations		
Aircraft Group	Aircraft Type	Identifier	Group	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
	Cessna Conquest II	CNA441	T	0.10	0.00	0.10	0.09	0.00	0.09	0.00	0.00	0.00	0.19	0.00	0.19
	Embraer EMB-110	EMB110	T	0.01	0.00	0.02	0.02	0.01	0.03	0.00	0.00	0.00	0.03	0.01	0.04
	Lockheed Orion	P3A	T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	Mitsubishi MU-2	MU2	T	0.07	0.06	0.13	0.06	0.05	0.11	0.00	0.00	0.00	0.13	0.12	0.25
	Piper Cheyenne	PA31T	T	0.17	0.00	0.18	0.18	0.00	0.18	0.00	0.00	0.00	0.35	0.01	0.36
	Piper Cheyenne III	PA42	T	0.06	0.00	0.06	0.06	0.00	0.06	0.00	0.00	0.00	0.11	0.00	0.12
	Rockwell Turbo Commander 690	RWCM69	T	0.09	0.00	0.09	0.04	0.00	0.04	0.00	0.00	0.00	0.13	0.00	0.13
	Shorts SD330	SD330	T	0.02	0.00	0.02	0.03	0.00	0.03	0.00	0.00	0.00	0.06	0.00	0.06
	Swearingen Merlin II	SAMER2	T	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.02
	Swearingen Merlin III	SAMER3	T	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	Subtotal			*9.95*	*0.82*	*10.77*	*9.95*	*0.82*	*10.77*	*0.00*	*0.00*	*0.00*	*19.90*	*1.65*	*21.55*
Total				**108.49**	**8.99**	**117.48**	**108.49**	**8.99**	**117.48**	**104.53**	**3.67**	**108.20**	**321.51**	**21.66**	**343.16**

Source: MAC ANOMS Analysis, 2009.

Table 5-2
St. Paul Downtown Airport Year 2025 Average Daily Flight Operations

Aircraft Group	Aircraft Type	INM/ANOMS Group	Identifier	Arrivals			Departures			Touch and Gos			Total Operations		
				Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
Jets	Canadair Challenger CL-600	CL600	3	0.94	0.02	0.96	0.98	0.02	0.99	0.00	0.00	0.00	1.92	0.04	1.95
	Canadair Challenger CL-601	CL601	3	0.28	0.01	0.29	0.32	0.01	0.32	0.00	0.00	0.00	0.60	0.02	0.62
	Cessna 501 Citation I	CNA501	3	0.25	0.00	0.26	0.23	0.01	0.24	0.00	0.00	0.00	0.49	0.01	0.49
	Cessna Mustang 510 (VLJ)	CNA510	3	18.98	1.57	20.55	18.98	1.57	20.55	0.00	0.00	0.00	37.95	3.15	41.10
	Cessna 551 Citation II	CNA551	3	0.04	0.00	0.04	0.02	0.01	0.03	0.00	0.00	0.00	0.06	0.01	0.07
	Cessna 560 Citation V	CNA560	3	4.79	0.15	4.94	4.50	0.31	4.81	0.00	0.00	0.00	9.29	0.46	9.75
	Cessna 650 Citation VII	CNA650	3	2.01	0.07	2.08	1.89	0.20	2.10	0.00	0.00	0.00	3.90	0.27	4.17
	Cessna 750 Citation X	CNA750	3	1.02	0.04	1.06	1.02	0.04	1.05	0.00	0.00	0.00	2.04	0.08	2.12
	Cessna Citation 500	CNA500	3	0.29	0.00	0.30	0.25	0.01	0.25	0.00	0.00	0.00	0.54	0.01	0.55
	Cessna Citation 525	CNA525	3	1.69	0.03	1.72	1.55	0.07	1.62	0.00	0.00	0.00	3.25	0.09	3.34
	Cessna Citation 550	CNA550	3	2.28	0.21	2.49	2.41	0.15	2.56	0.00	0.00	0.00	4.69	0.36	5.05
	Cessna Citation 550 Bravo	CNA55B	3	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01
	Dassault Falcon 10	FAL10	3	0.67	0.04	0.71	0.62	0.04	0.66	0.00	0.00	0.00	1.29	0.08	1.38
	Dassault Falcon 200	FAL200	3	2.06	0.16	2.22	2.03	0.10	2.13	0.00	0.00	0.00	4.09	0.25	4.35
	Dassault Falcon 2000	FAL20A	3	1.34	0.06	1.40	1.37	0.04	1.41	0.00	0.00	0.00	2.71	0.09	2.81
	Gulfstream I	GULF1	2	0.02	0.00	0.02	0.02	0.00	0.02	0.00	0.00	0.00	0.04	0.00	0.04
	Gulfstream II	GII	2	1.49	0.02	1.52	1.41	0.06	1.47	0.00	0.00	0.00	2.90	0.08	2.98
	Gulfstream III	GULF3	2	0.26	0.00	0.26	0.27	0.00	0.27	0.00	0.00	0.00	0.52	0.00	0.53
	Gulfstream IV	GIV	3	1.06	0.03	1.09	1.03	0.03	1.05	0.00	0.00	0.00	2.09	0.06	2.15
	Gulfstream V	GV	3	2.86	0.14	3.00	2.67	0.21	2.88	0.00	0.00	0.00	5.53	0.35	5.88
	Hawker 125 Jet	HS125	3	1.71	0.06	1.77	1.76	0.07	1.83	0.00	0.00	0.00	3.47	0.12	3.60
	IAI 1124 Westwind	IA1124	3	0.19	0.00	0.19	0.21	0.00	0.21	0.00	0.00	0.00	0.40	0.00	0.40
	IAI 1125 Westwind	IA1125	3	0.16	0.01	0.17	0.18	0.00	0.18	0.00	0.00	0.00	0.34	0.01	0.35
	Learjet 24	LEAR24	2	0.02	0.00	0.02	0.03	0.00	0.03	0.00	0.00	0.00	0.05	0.00	0.05
	Learjet 25	LEAR25	2	0.09	0.01	0.09	0.06	0.01	0.08	0.00	0.00	0.00	0.15	0.02	0.17
	Learjet 31	LEAR31	3	0.40	0.02	0.42	0.40	0.02	0.41	0.00	0.00	0.00	0.80	0.03	0.83
	Learjet 35	LEAR35	3	3.59	1.75	5.34	4.59	1.28	5.87	0.00	0.00	0.00	8.18	3.03	11.21
	Learjet 45	LEAR45	3	3.74	0.08	3.81	3.57	0.21	3.78	0.00	0.00	0.00	7.31	0.28	7.59
	Learjet 55	LEAR55	3	0.19	0.00	0.20	0.20	0.00	0.20	0.00	0.00	0.00	0.39	0.01	0.40
	Learjet 60	LEAR60	3	0.27	0.01	0.28	0.26	0.01	0.27	0.00	0.00	0.00	0.52	0.02	0.55
	Mitsubishi Diamond MU-300	MU300	3	0.05	0.00	0.05	0.05	0.00	0.05	0.00	0.00	0.00	0.10	0.00	0.10
	Raytheon Beechjet 400	BEC400	3	1.92	0.03	1.95	1.77	0.08	1.85	0.00	0.00	0.00	3.69	0.11	3.81
	Saberliner 65	SABR65	3	0.04	0.00	0.04	0.04	0.01	0.05	0.00	0.00	0.00	0.08	0.01	0.09
	Sabreliner 75	SABR75	3	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.02
	Subtotal			*54.70*	*4.53*	*59.24*	*54.70*	*4.53*	*59.24*	*0.00*	*0.00*	*0.00*	*109.41*	*9.07*	*118.47*
Helicopters	Agusta 109	A109	H	3.86	0.21	4.08	3.91	0.26	4.16	0.81	0.02	0.83	8.58	0.49	9.07
	Bell 206	B206L	H	14.14	1.49	15.63	14.71	1.40	16.11	27.71	1.03	28.75	56.57	3.92	60.49
	Bell 212 Huey	B212	H	0.21	0.00	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.00	0.21
	Bell 222	B222	H	2.21	0.08	2.29	2.14	0.12	2.27	0.58	0.02	0.60	4.93	0.23	5.16
	Eurocopter BK-117	EC130	H	1.28	0.16	1.44	1.33	0.16	1.49	1.49	0.03	1.52	4.10	0.35	4.45
	Hughes 500D	H500D	H	0.04	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.04
	Robinson R22B	R22	H	0.10	0.00	0.10	0.03	0.00	0.03	0.00	0.00	0.00	0.13	0.00	0.13
	Sikorsky S-70 Blackhawk	S70	H	1.75	0.01	1.76	1.47	0.01	1.47	0.64	0.00	0.64	3.86	0.01	3.87
	Subtotal			*23.58*	*1.96*	*25.54*	*23.58*	*1.96*	*25.54*	*31.24*	*1.10*	*32.34*	*78.41*	*5.01*	*83.42*
Multi-Engine Piston	Beechcraft Baron BE-55	BEC55	P	0.68	0.00	0.68	0.65	0.01	0.66	1.69	0.00	1.69	3.02	0.01	3.03
	Beechcraft Baron BE-58	BEC58	P	1.84	0.01	1.85	2.00	0.03	2.03	2.93	0.00	2.93	6.76	0.04	6.81
	Beechcraft Baron BE-58P	BEC58P	P	0.53	1.10	1.63	0.58	0.74	1.31	0.51	0.44	0.95	1.62	2.28	3.90
	Beechcraft Duchess Twin	BEC76	P	0.09	0.00	0.09	0.06	0.00	0.06	0.00	0.00	0.00	0.15	0.00	0.15
	Beechcraft Duke Twin	BEC60	P	0.08	0.01	0.09	0.14	0.00	0.14	0.00	0.00	0.00	0.22	0.01	0.23
	Beechcraft Queen Air 80	BEC80	P	0.31	0.00	0.31	0.46	0.01	0.46	0.18	0.00	0.18	0.94	0.01	0.95
	Beechcraft Travel Air	BEC95	P	0.05	0.00	0.05	0.03	0.00	0.03	0.00	0.00	0.00	0.09	0.00	0.09
	Cessna 310	CNA310	P	0.83	0.01	0.84	0.95	0.02	0.97	0.26	0.00	0.26	2.04	0.03	2.07
	Cessna 335	CNA335	P	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	Cessna 337 Super Skymaster	CNA337	P	0.04	0.00	0.04	0.01	0.00	0.01	0.00	0.00	0.00	0.06	0.00	0.06

Table 5-2
St. Paul Downtown Airport Year 2025 Average Daily Flight Operations

Aircraft Group	Aircraft Type	INM/ANOMS Group	Identifier	Arrivals Day	Arrivals Night	Arrivals Total	Departures Day	Departures Night	Departures Total	Touch and Gos Day	Touch and Gos Night	Touch and Gos Total	Total Operations Day	Total Operations Night	Total Operations Total
	Cessna 340	CNA340	P	1.22	0.00	1.22	1.41	0.01	1.42	0.57	0.00	0.57	3.20	0.01	3.21
	Cessna 401	CNA401	P	0.05	0.00	0.05	0.05	0.00	0.05	0.00	0.00	0.00	0.10	0.00	0.10
	Cessna 402	CNA402	P	1.37	0.00	1.37	0.09	0.24	0.33	0.26	0.00	0.26	1.71	0.24	1.95
	Cessna 404 Titan	CNA404	P	0.01	0.00	0.01	0.02	0.00	0.02	0.00	0.00	0.00	0.03	0.00	0.03
	Cessna 414 Chancellor	CNA414	P	1.21	0.10	1.31	1.57	0.05	1.62	0.82	0.00	0.82	3.60	0.15	3.75
	Cessna 421 Golden Eagle	CNA421	P	0.41	0.00	0.41	0.54	0.01	0.55	0.00	0.00	0.00	0.95	0.01	0.96
	Cessna Crusader 303	CNA303	P	0.02	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.04	0.00	0.04
	Piper Aerostar 600/700	PA60	P	0.16	0.01	0.17	0.14	0.01	0.14	0.00	0.00	0.00	0.30	0.01	0.31
	Piper Apache	PA23AP	P	0.07	0.00	0.07	0.04	0.00	0.05	0.00	0.00	0.00	0.11	0.00	0.12
	Piper Aztec	PA23AZ	P	0.20	0.00	0.20	0.34	0.00	0.34	0.82	0.00	0.82	1.36	0.00	1.36
	Piper Navajo Chieftain	PA31	P	2.57	0.03	2.60	2.06	0.15	2.20	3.45	0.00	3.45	8.08	0.18	8.25
	Piper Seminole	PA44	P	0.56	0.00	0.56	0.80	0.00	0.80	0.31	0.00	0.31	1.67	0.00	1.67
	Piper Seneca	PA34	P	3.01	0.01	3.02	3.38	0.01	3.39	0.77	0.00	0.77	7.16	0.02	7.17
	Piper Twin Comanche	PA30	P	0.07	0.00	0.07	0.06	0.00	0.06	0.00	0.00	0.00	0.13	0.00	0.13
	Swearingen Merlin IV	SAMER4	P	0.13	0.01	0.14	0.13	0.00	0.14	0.00	0.00	0.00	0.26	0.01	0.27
	Subtotal			*15.53*	*1.29*	*16.81*	*15.53*	*1.29*	*16.81*	*12.56*	*0.44*	*13.00*	*43.61*	*3.02*	*46.63*
Single-Engine Piston	Beechcraft F33A Bonanza	BEC33	P	4.07	0.30	4.37	3.79	0.61	4.40	2.47	0.00	2.47	10.33	0.91	11.24
	Beechcraft Sport	BEC24	P	0.18	0.00	0.18	0.99	0.00	0.99	1.48	0.00	1.48	2.65	0.00	2.65
	Bellanca Cruisair	BL14	P	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
	Bellanca Super Viking	BL26	P	0.14	0.00	0.14	0.11	0.00	0.11	0.00	0.00	0.00	0.25	0.00	0.25
	Cessna 150	CNA150	P	0.25	0.00	0.25	0.41	0.07	0.48	0.00	0.00	0.00	0.66	0.07	0.73
	Cessna 152	CNA152	P	0.03	0.00	0.03	0.03	0.00	0.03	0.00	0.00	0.00	0.07	0.00	0.07
	Cessna 170	CNA170	P	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
	Cessna 205 Super Skywagon	CNA205	P	0.06	0.00	0.06	0.02	0.00	0.02	0.00	0.00	0.00	0.08	0.00	0.08
	Cessna 206H	CNA206	P	1.21	0.00	1.21	1.16	0.07	1.22	2.39	0.00	2.39	4.76	0.07	4.82
	Cessna 207	CNA207	P	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
	Cessna Cardinal 177	CNA177	P	0.11	0.00	0.11	0.22	0.00	0.22	0.00	0.00	0.00	0.33	0.00	0.33
	Cessna Centurion 210	CNA210	P	1.09	0.00	1.09	0.67	0.00	0.67	0.37	0.00	0.37	2.12	0.00	2.12
	Cessna Skyhawk 172	CNA172	P	4.28	0.20	4.48	5.07	0.21	5.28	21.39	0.09	21.47	30.74	0.50	31.23
	Cessna Skylane 182	CNA182	P	2.46	0.29	2.75	1.57	0.16	1.73	3.08	0.13	3.21	7.11	0.58	7.69
	Cessna Skywagon 180	CNA180	P	0.27	0.13	0.39	0.09	0.00	0.09	0.00	0.00	0.00	0.36	0.13	0.49
	Cessna Skywagon 185	CNA185	P	0.08	0.00	0.08	0.03	0.00	0.03	0.31	0.00	0.31	0.41	0.00	0.41
	De Havilland DHC-2 Beaver	DHC2	P	0.06	0.00	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.00	0.06
	GA Single-Engine Prop Fixed	GASEPF	P	3.72	0.58	4.29	3.75	0.23	3.98	6.76	0.00	6.76	14.23	0.80	15.04
	GA Single-Engine Prop Variable	GASEPV	P	2.38	0.35	2.72	2.74	0.36	3.10	1.65	1.38	3.03	6.77	2.08	8.86
	Grumman American	AA5A	P	0.05	0.00	0.05	0.02	0.00	0.02	0.00	0.00	0.00	0.08	0.00	0.08
	Mooney M20J	M20J	P	1.95	0.06	2.02	1.77	0.07	1.84	2.26	0.00	2.26	5.99	0.13	6.12
	Piper Cherokee 140	PA28CH	P	1.38	0.06	1.44	1.00	0.08	1.08	0.98	0.00	0.98	3.36	0.14	3.50
	Piper Cherokee Arrow II	PA28CA	P	0.41	0.07	0.48	0.40	0.00	0.40	0.31	0.00	0.31	1.11	0.07	1.18
	Piper Cherokee Six	PA32C6	P	0.87	0.00	0.87	0.83	0.14	0.97	0.85	0.00	0.85	2.54	0.14	2.68
	Piper Comanche	PA24	P	0.51	0.08	0.59	0.45	0.07	0.51	0.00	0.00	0.00	0.96	0.15	1.10
	Piper Dakota	PA28DK	P	0.13	0.00	0.13	0.34	0.00	0.34	0.31	0.00	0.31	0.78	0.00	0.78
	Piper Lance	PA32LA	P	0.30	0.14	0.44	0.36	0.20	0.56	0.00	0.00	0.00	0.66	0.34	1.01
	Piper Malibu	PA46	P	0.67	0.00	0.67	0.70	0.00	0.70	0.37	0.00	0.37	1.74	0.00	1.74
	Piper Pawnee	PA25	P	0.00	0.00	0.00	0.18	0.00	0.18	0.00	0.00	0.00	0.18	0.00	0.18
	Piper Warrior	PA28	P	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
	Piper Warrior II	PA28WA	P	1.39	0.08	1.47	1.49	0.07	1.56	0.31	0.00	0.31	3.18	0.15	3.33
	Rockwell Aero Commander 112	RWCM12	P	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
	Siai-Marchetti SF260M	SF260M	P	0.02	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.02
	Subtotal			*28.17*	*2.33*	*30.50*	*28.17*	*2.33*	*30.50*	*45.28*	*1.59*	*46.87*	*101.61*	*6.26*	*107.87*
Turboprops	Avions ATR-42	ATR42	T	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	Beechcraft 1900	BEC190	T	0.08	0.00	0.08	0.06	0.01	0.07	0.00	0.00	0.00	0.14	0.01	0.15
	Beechcraft 99	BEC99	T	0.28	0.11	0.39	0.50	0.01	0.50	0.00	0.00	0.00	0.77	0.12	0.89
	Beechcraft King Air 100	BEC100	T	0.11	0.00	0.11	0.15	0.01	0.15	0.00	0.00	0.00	0.26	0.01	0.27

Table 5-2
St. Paul Downtown Airport Year 2025 Average Daily Flight Operations

		INM/ANOMS		Arrivals			Departures			Touch and Gos			Total Operations		
Aircraft Group	Aircraft Type	Group	Identifier	Day	Night	Total	Day	Night	Total	Day	Night	Total	Day	Night	Total
	Beechcraft King Air 200	BEC200	T	5.06	0.27	5.32	4.58	0.40	4.98	0.00	0.00	0.00	9.64	0.66	10.30
	Beechcraft King Air 300	BEC300	T	0.12	0.00	0.12	0.13	0.00	0.13	0.00	0.00	0.00	0.25	0.00	0.25
	Beechcraft King Air 350	BEC30B	T	0.21	0.01	0.21	0.22	0.00	0.23	0.00	0.00	0.00	0.43	0.01	0.44
	Beechcraft King Air C90	BEC90	T	1.92	0.08	2.00	1.76	0.08	1.84	0.00	0.00	0.00	3.68	0.16	3.84
	Cessna 208	CNA208	T	0.71	0.21	0.92	1.15	0.20	1.35	0.00	0.00	0.00	1.86	0.41	2.27
	Cessna 425 Corsair	CNA425	T	0.16	0.00	0.16	0.14	0.00	0.14	0.00	0.00	0.00	0.30	0.00	0.30
	Cessna Conquest II	CNA441	T	0.09	0.00	0.09	0.08	0.00	0.08	0.00	0.00	0.00	0.17	0.00	0.18
	Embraer EMB-110	EMB110	T	0.01	0.00	0.01	0.02	0.01	0.02	0.00	0.00	0.00	0.03	0.01	0.04
	Lockheed Orion	P3A	T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	Mitsubishi MU-2	MU2	T	0.06	0.06	0.12	0.06	0.05	0.10	0.00	0.00	0.00	0.12	0.11	0.23
	Piper Cheyenne	PA31T	T	0.16	0.00	0.16	0.16	0.00	0.17	0.00	0.00	0.00	0.32	0.01	0.33
	Piper Cheyenne III	PA42	T	0.05	0.00	0.05	0.05	0.00	0.05	0.00	0.00	0.00	0.10	0.00	0.11
	Rockwell Turbo Commander 690	RWCM69	T	0.08	0.00	0.08	0.04	0.00	0.04	0.00	0.00	0.00	0.12	0.00	0.12
	Shorts SD330	SD330	T	0.02	0.00	0.02	0.03	0.00	0.03	0.00	0.00	0.00	0.05	0.00	0.05
	Swearingen Merlin II	SAMER2	T	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.02
	Swearingen Merlin III	SAMER3	T	0.01	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	Subtotal			*9.14*	*0.76*	*9.90*	*9.14*	*0.76*	*9.90*	*0.00*	*0.00*	*0.00*	*18.28*	*1.52*	*19.80*
Total				**131.12**	**10.87**	**141.99**	**131.12**	**10.87**	**141.99**	**89.08**	**3.13**	**92.21**	**351.33**	**24.87**	**376.19**

Source: MAC ANOMS Analysis, 2009.

Table 5-3a
St. Paul Downtown Airport Year 2007 Departure Flight Track Use

		Jets		Piston		Turboprop	
Runway	Track	Day	Night	Day	Night	Day	Night
09	A	0.0%	0.0%	20.6%	0.0%	0.0%	15.8%
	B	0.0%	0.0%	7.9%	0.0%	8.9%	5.3%
	C	0.0%	0.0%	19.1%	0.0%	0.0%	0.0%
	D	0.0%	0.0%	16.2%	0.0%	14.2%	5.3%
	E	0.0%	100.0%	9.5%	0.0%	17.7%	15.8%
	F	0.0%	0.0%	5.9%	0.0%	0.0%	0.0%
	G	0.0%	0.0%	4.6%	0.0%	10.3%	15.8%
	H	0.0%	0.0%	1.8%	0.0%	19.9%	0.0%
	I	0.0%	0.0%	2.6%	33.3%	7.4%	0.0%
	J	0.0%	0.0%	1.6%	0.0%	0.0%	10.5%
	K	0.0%	0.0%	2.5%	0.0%	13.8%	21.1%
	L	0.0%	0.0%	1.1%	66.7%	7.9%	0.0%
	M	0.0%	0.0%	2.6%	0.0%	0.0%	5.3%
	N	0.0%	0.0%	4.0%	0.0%	0.0%	0.0%
	O	100.0%	0.0%	0.0%	0.0%	0.0%	5.3%
13	A	0.0%	6.9%	8.6%	14.9%	2.4%	0.0%
	B	1.4%	3.4%	1.6%	0.2%	6.7%	2.7%
	C	0.4%	3.7%	9.0%	0.7%	3.2%	0.0%
	D	4.9%	2.6%	11.4%	0.0%	9.5%	1.3%
	E	9.7%	4.2%	6.7%	8.9%	7.7%	1.0%
	F	10.5%	2.3%	4.4%	20.4%	6.5%	1.2%
	G	11.7%	13.0%	4.9%	0.2%	7.9%	3.8%
	H	5.5%	3.4%	11.8%	7.8%	13.8%	8.0%
	I	22.0%	13.9%	15.2%	11.9%	20.0%	9.8%
	J	22.3%	22.7%	13.9%	5.1%	12.7%	16.3%
	K	7.4%	6.9%	7.1%	5.7%	7.1%	18.6%
	L	2.6%	10.3%	2.7%	5.7%	1.7%	32.0%
	M	1.3%	6.9%	1.1%	3.1%	0.0%	4.4%
	N	0.0%	0.0%	0.6%	0.4%	0.7%	0.0%
	O	0.5%	0.0%	0.6%	0.0%	0.0%	0.0%
	P	0.0%	0.0%	0.0%	7.5%	0.0%	0.0%
	R	0.0%	0.0%	0.3%	7.5%	0.0%	0.9%
14	A	0.6%	1.7%	19.6%	1.9%	6.9%	9.4%
	B	2.8%	1.3%	8.1%	0.3%	14.8%	8.7%
	C	13.5%	5.1%	8.5%	0.2%	20.2%	10.4%
	D	17.9%	7.5%	13.6%	2.4%	16.7%	5.8%
	E	18.2%	11.7%	15.8%	10.2%	17.7%	11.6%
	F	29.7%	21.0%	9.2%	9.4%	15.4%	13.1%
	G	11.6%	15.2%	3.6%	18.6%	4.5%	9.6%
	H	2.1%	19.4%	2.0%	18.5%	1.5%	8.1%
	I	2.0%	8.2%	5.6%	10.9%	1.0%	15.3%
	J	1.6%	7.0%	4.2%	16.7%	1.2%	4.5%
	K	0.0%	1.9%	9.8%	10.9%	0.0%	3.6%
27	A	0.0%	100.0%	26.8%	0.0%	0.0%	0.0%
	B	0.0%	0.0%	6.4%	0.0%	0.0%	0.0%
	C	0.0%	0.0%	0.0%	0.0%	66.7%	0.0%
	D	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%
	E	0.0%	0.0%	10.2%	0.0%	0.0%	0.0%
	F	0.0%	0.0%	9.4%	0.0%	0.0%	0.0%
	G	0.0%	0.0%	25.5%	0.0%	0.0%	0.0%
	H	0.0%	0.0%	15.3%	0.0%	0.0%	0.0%
	I	0.0%	0.0%	6.4%	0.0%	0.0%	0.0%
31	A	4.3%	0.0%	4.2%	3.4%	9.1%	16.5%
	B	0.4%	0.0%	0.0%	1.4%	0.0%	4.6%
	C	0.0%	0.0%	0.8%	0.0%	0.0%	13.8%
	D	0.4%	0.0%	0.8%	0.0%	0.0%	0.0%
	E	0.0%	9.9%	10.1%	0.0%	0.0%	6.1%
	F	1.5%	0.0%	10.8%	1.4%	1.5%	0.0%
	G	2.7%	0.0%	2.6%	2.8%	1.4%	0.0%
	H	21.0%	24.8%	3.2%	0.0%	4.9%	6.1%
	I	29.3%	25.5%	13.6%	0.0%	15.1%	5.2%
	J	31.1%	28.3%	9.0%	67.4%	5.8%	4.9%
	K	6.5%	3.7%	5.7%	2.8%	12.8%	0.0%
	L	1.2%	0.3%	7.1%	7.1%	2.9%	9.2%
	M	1.4%	0.0%	9.2%	2.4%	8.0%	15.3%
	N	0.0%	3.7%	7.8%	5.6%	14.5%	9.2%
	O	0.0%	0.0%	3.8%	1.4%	18.7%	4.6%
	P	0.0%	3.7%	11.1%	4.2%	5.2%	4.6%
32	A	0.0%	0.8%	3.3%	0.5%	0.0%	0.0%
	B	1.8%	1.3%	1.9%	2.8%	3.5%	8.6%
	C	1.2%	10.5%	9.9%	6.7%	1.9%	26.3%
	D	2.9%	3.1%	6.5%	7.1%	3.3%	6.0%
	E	29.4%	25.0%	8.0%	18.5%	16.7%	16.1%
	F	21.7%	13.2%	10.7%	6.2%	20.7%	13.3%
	G	10.0%	4.7%	10.3%	15.4%	16.5%	5.4%
	H	27.4%	24.3%	15.9%	12.3%	19.9%	12.6%
	I	4.5%	6.9%	11.3%	7.3%	8.5%	1.1%
	J	0.9%	4.3%	10.5%	7.5%	5.1%	2.4%
	K	0.2%	5.8%	11.7%	15.7%	3.9%	8.2%

Totals may not add up to 100% due to rounding.

Source: Radar track data, MAC Analysis, 2009.

Table 5-3b
St. Paul Downtown Airport Year 2007
Departure Flight Track Use

Runway	Track	Helicopters Day	Helicopters Night
27H	A	35.3%	20.8%
	B	64.7%	79.2%
31H	C	25.2%	27.1%
	D	23.7%	16.7%
	E	51.1%	56.3%
09H	F	100.0%	100.0%
13H	G	81.0%	0.0%
	H	19.0%	100.0%
14H	I	70.9%	72.0%
	J	16.2%	16.0%
	K	12.8%	12.0%
32H	L	47.1%	19.1%
	M	19.0%	16.2%
	N	33.9%	64.7%

Totals may not add up to 100% due to rounding.

Source: Radar track data, MAC Analysis, 2009.

Table 5-3d
St. Paul Downtown Airport Year 2007
Arrival Flight Track Use

Runway	Track	Helicopters Day	Helicopters Night
09H	A	35.5%	33.9%
	B	64.5%	66.1%
13H	C	27.1%	40.2%
	D	14.6%	19.6%
	E	6.3%	6.5%
	F	10.9%	9.8%
	H	41.1%	23.9%
14H	I	40.4%	60.0%
	J	24.5%	10.0%
	K	35.1%	30.0%
27H	L	100.0%	100.0%
31H	M	100.0%	100.0%
32H	N	44.4%	69.7%
	O	55.6%	30.3%

Totals may not add up to 100% due to rounding.

Source: Radar track data, MAC Analysis, 2009.

Table 5-3c
St. Paul Downtown Airport Year 2007 Arrival Flight Track Use

Runway	Track	Jets Day	Jets Night	Piston Day	Piston Night	Turboprop Day	Turboprop Night
09	A	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
13	A	14.5%	0.0%	35.0%	78.7%	31.9%	80.4%
	B	85.5%	100.0%	65.0%	21.3%	68.1%	19.6%
14	A	5.7%	6.4%	7.1%	0.9%	7.4%	4.5%
	B	74.5%	57.2%	63.5%	84.0%	69.8%	81.8%
	C	19.8%	36.4%	29.4%	15.1%	22.7%	13.7%
27	A	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
31	A	70.5%	0.0%	49.7%	3.4%	70.5%	26.9%
	B	29.5%	0.0%	50.3%	96.6%	29.5%	73.1%
32	A	19.9%	16.2%	25.4%	7.8%	29.6%	21.2%
	B	80.1%	83.8%	74.6%	92.2%	70.4%	78.8%

Totals may not add up to 100% due to rounding.

Source: Radar track data, MAC Analysis, 2009.

Table 5-4a
St. Paul Downtown Airport Year 2025 Departure Flight Track Use

		Jets		Piston		Turboprop	
Runway	Track	Day	Night	Day	Night	Day	Night
09	A	0.0%	0.0%	20.7%	0.0%	0.0%	15.8%
	B	0.0%	0.0%	7.8%	0.0%	8.9%	5.3%
	C	0.0%	0.0%	19.2%	0.0%	0.0%	0.0%
	D	0.0%	0.0%	16.0%	0.0%	14.2%	5.3%
	E	0.0%	100.0%	9.5%	0.0%	17.7%	15.8%
	F	0.0%	0.0%	5.9%	0.0%	0.0%	0.0%
	G	0.0%	0.0%	4.5%	0.0%	10.3%	15.8%
	H	0.0%	0.0%	1.9%	0.0%	19.9%	0.0%
	I	0.0%	0.0%	2.7%	33.3%	7.4%	0.0%
	J	0.0%	0.0%	1.7%	0.0%	0.0%	10.5%
	K	0.0%	0.0%	2.5%	0.0%	13.8%	21.1%
	L	0.0%	0.0%	1.1%	66.7%	7.9%	0.0%
	M	0.0%	0.0%	2.6%	0.0%	0.0%	5.3%
	N	0.0%	0.0%	3.9%	0.0%	0.0%	0.0%
	O	100.0%	0.0%	0.0%	0.0%	0.0%	5.3%
13	A	0.0%	2.0%	8.5%	14.6%	2.4%	0.0%
	B	0.5%	1.0%	1.6%	0.2%	6.7%	2.7%
	C	21.4%	35.2%	8.9%	0.8%	3.2%	0.0%
	D	1.9%	0.7%	11.4%	0.0%	9.5%	1.3%
	E	23.5%	21.1%	6.6%	8.7%	7.7%	1.0%
	F	4.0%	0.7%	4.4%	20.0%	6.5%	1.2%
	G	4.4%	3.8%	4.8%	0.2%	7.9%	3.8%
	H	2.1%	1.0%	11.9%	7.7%	13.8%	8.0%
	I	29.5%	21.1%	15.4%	12.0%	20.0%	9.8%
	J	8.4%	6.6%	14.0%	5.4%	12.7%	16.3%
	K	2.8%	2.0%	7.2%	6.1%	7.1%	18.6%
	L	1.0%	3.0%	2.8%	6.1%	1.7%	32.0%
	M	0.5%	2.0%	1.1%	3.3%	0.0%	4.4%
	N	0.0%	0.0%	0.6%	0.4%	0.7%	0.0%
	O	0.2%	0.0%	0.6%	0.0%	0.0%	0.0%
	P	0.0%	0.0%	0.0%	7.3%	0.0%	0.0%
	Q	0.0%	0.0%	0.3%	7.3%	0.0%	0.9%
14	A	6.7%	6.8%	19.4%	2.0%	6.9%	9.4%
	B	2.0%	1.0%	8.1%	0.3%	14.8%	8.7%
	C	20.5%	12.8%	8.6%	0.2%	20.2%	10.4%
	D	13.0%	5.8%	13.6%	2.5%	16.7%	5.8%
	E	18.5%	13.3%	16.1%	10.0%	17.7%	11.6%
	F	26.7%	20.5%	9.4%	9.8%	15.4%	13.1%
	G	8.4%	11.7%	3.6%	18.8%	4.5%	9.6%
	H	1.5%	15.0%	2.0%	18.7%	1.5%	8.1%
	I	1.4%	6.3%	5.5%	10.8%	1.0%	15.3%
	J	1.2%	5.4%	4.2%	16.2%	1.2%	4.5%
	K	0.0%	1.4%	9.6%	10.7%	0.0%	3.6%
27	A	0.0%	100.0%	26.7%	0.0%	0.0%	0.0%
	B	0.0%	0.0%	6.4%	0.0%	0.0%	0.0%
	C	0.0%	0.0%	0.0%	0.0%	66.7%	0.0%
	D	0.0%	0.0%	0.0%	0.0%	33.3%	0.0%
	E	0.0%	0.0%	10.2%	0.0%	0.0%	0.0%
	F	0.0%	0.0%	9.8%	0.0%	0.0%	0.0%
	G	0.0%	0.0%	25.4%	0.0%	0.0%	0.0%
	H	0.0%	0.0%	15.2%	0.0%	0.0%	0.0%
	I	0.0%	0.0%	6.4%	0.0%	0.0%	0.0%
31	A	1.1%	0.0%	4.1%	3.6%	9.1%	16.5%
	B	0.1%	0.0%	0.0%	1.5%	0.0%	4.6%
	C	0.0%	0.0%	0.8%	0.0%	0.0%	13.8%
	D	0.1%	0.0%	0.8%	0.0%	0.0%	0.0%
	E	0.0%	2.0%	10.2%	0.0%	0.0%	6.1%
	F	0.4%	0.0%	11.0%	1.5%	1.5%	0.0%
	G	0.7%	0.0%	2.6%	3.0%	1.4%	0.0%
	H	5.1%	4.9%	3.2%	0.0%	4.9%	6.1%
	I	31.9%	33.3%	13.7%	0.0%	15.1%	5.2%
	J	33.0%	32.5%	9.0%	65.7%	5.8%	4.9%
	K	1.6%	0.7%	5.7%	3.0%	12.8%	0.0%
	L	25.8%	25.2%	7.2%	7.4%	2.9%	9.2%
	M	0.3%	0.0%	9.0%	2.5%	8.0%	15.3%
	N	0.0%	0.7%	7.9%	5.9%	14.5%	9.2%
	O	0.0%	0.0%	3.7%	1.5%	18.7%	4.6%
	P	0.0%	0.7%	10.9%	4.5%	5.2%	4.6%
32	A	0.0%	0.6%	3.2%	0.6%	0.0%	0.0%
	B	1.4%	0.9%	1.9%	3.0%	3.5%	8.6%
	C	0.9%	7.7%	9.8%	6.7%	1.9%	26.3%
	D	2.2%	2.3%	6.4%	7.1%	3.3%	6.0%
	E	28.4%	25.5%	8.0%	18.4%	16.7%	16.1%
	F	34.5%	29.4%	10.8%	6.2%	20.7%	13.3%
	G	7.6%	3.4%	10.4%	15.2%	16.5%	5.4%
	H	20.8%	17.7%	16.0%	12.3%	19.9%	12.6%
	I	3.4%	5.1%	11.4%	7.3%	8.5%	1.1%
	J	0.7%	3.2%	10.5%	7.5%	5.1%	2.4%
	K	0.1%	4.3%	11.6%	15.9%	3.9%	8.2%

Totals may not add up to 100% due to rounding.

Source: Radar track data, MAC Analysis, 2009.

Table 5-3b
St. Paul Downtown Airport Year 2007
Departure Flight Track Use

		Helicopters	
Runway	Track	Day	Night
27H	A	35.3%	20.8%
	B	64.7%	79.2%
31H	C	25.2%	27.1%
	D	23.7%	16.7%
	E	51.1%	56.3%
09H	F	100.0%	100.0%
13H	G	81.0%	0.0%
	H	19.0%	100.0%
14H	I	70.9%	72.0%
	J	16.2%	16.0%
	K	12.8%	12.0%
32H	L	47.1%	19.1%
	M	19.0%	16.2%
	N	33.9%	64.7%

Totals may not add up to 100% due to rounding.
Source: Radar track data, MAC Analysis, 2009.

Table 5-4d
St. Paul Downtown Airport Year 2025
Arrival Flight Track Use

		Helicopters	
Runway	Track	Day	Night
09H	A	35.5%	33.9%
	B	64.5%	66.1%
13H	C	27.1%	40.2%
	D	14.6%	19.6%
	E	6.3%	6.5%
	F	10.9%	9.8%
	G	41.1%	23.9%
14H	H	40.4%	60.0%
	I	24.5%	10.0%
	J	35.1%	30.0%
27H	K	100.0%	100.0%
31H	L	100.0%	100.0%
32H	M	44.4%	69.7%
	N	55.6%	30.3%

Totals may not add up to 100% due to rounding.
Source: Radar track data, MAC Analysis, 2009.

Table 5-4c
St. Paul Downtown Airport Year 2025 Arrival Flight Track Use

		Jets		Piston		Turboprop	
Runway	Track	Day	Night	Day	Night	Day	Night
09	A	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
13	A	14.5%	0.0%	34.6%	78.6%	31.9%	80.4%
	B	85.5%	100.0%	65.4%	21.4%	68.1%	19.6%
14	A	8.0%	12.7%	7.0%	1.0%	7.4%	4.5%
	B	71.3%	45.0%	63.5%	83.4%	69.8%	81.8%
	C	20.6%	42.3%	29.5%	15.6%	22.7%	13.7%
27	A	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
31	A	70.5%	0.0%	49.4%	3.6%	70.5%	26.9%
	B	29.5%	0.0%	50.6%	96.4%	29.5%	73.1%
32	A	24.6%	22.0%	25.1%	7.8%	29.6%	21.2%
	B	75.4%	78.0%	74.9%	92.2%	70.4%	78.8%

Totals may not add up to 100% due to rounding.
Source: Radar track data, MAC Analysis, 2009.

Table 5-5
St. Paul Downtown Airport Year 2007 Average Annual Runway Use

Aircraft Group	Runway	Arrivals			Departures			Touch and Gos		
		Day	Night	Total	Day	Night	Total	Day	Night	Total
Jets	09	1.2%	2.3%	1.3%	0.1%	0.1%	0.1%	-	-	-
	13	0.5%	1.2%	0.6%	6.5%	5.3%	6.4%	-	-	-
	14	50.6%	37.7%	49.6%	46.7%	57.0%	47.5%	-	-	-
	27	0.1%	0.1%	0.1%	0.0%	0.1%	0.0%	-	-	-
	31	0.4%	0.0%	0.4%	3.5%	2.4%	3.4%	-	-	-
	32	47.2%	58.7%	48.1%	43.3%	35.0%	42.6%	-	-	-
Helicopters	09H	23.5%	22.2%	23.4%	6.9%	1.1%	6.5%	9.3%	2.8%	9.0%
	13H	24.7%	34.6%	25.4%	2.8%	1.1%	2.7%	12.1%	2.5%	11.8%
	14H	26.7%	26.3%	26.7%	15.6%	18.7%	15.8%	15.7%	19.6%	15.9%
	27H	7.3%	2.6%	7.0%	22.2%	17.9%	21.9%	23.4%	19.7%	23.3%
	31H	1.5%	1.9%	1.6%	36.4%	35.8%	36.4%	30.5%	11.6%	29.8%
	32H	16.2%	12.4%	15.9%	16.1%	25.4%	16.8%	9.1%	43.8%	10.3%
Pistons	09	5.0%	2.4%	4.8%	3.9%	0.1%	3.6%	1.4%	0.0%	1.3%
	13	3.5%	8.4%	3.9%	17.3%	25.7%	18.0%	4.1%	6.4%	4.2%
	14	44.3%	36.6%	43.7%	33.5%	28.7%	33.2%	46.9%	89.3%	48.4%
	27	1.3%	0.2%	1.2%	4.1%	0.0%	3.7%	2.1%	0.0%	2.0%
	31	5.6%	5.7%	5.6%	6.2%	3.4%	6.0%	4.1%	4.3%	4.1%
	32	40.2%	46.8%	40.7%	34.9%	42.1%	35.5%	41.4%	0.0%	40.0%
Turboprops	09	2.8%	0.7%	2.6%	1.3%	3.0%	1.5%	-	-	-
	13	1.0%	1.5%	1.1%	11.9%	17.7%	12.3%	-	-	-
	14	52.0%	40.7%	51.2%	39.5%	41.3%	39.6%	-	-	-
	27	1.0%	0.9%	1.0%	0.1%	0.0%	0.1%	-	-	-
	31	1.6%	3.0%	1.7%	4.3%	3.4%	4.3%	-	-	-
	32	41.5%	53.3%	42.4%	42.8%	34.7%	42.2%	-	-	-

Totals may not add up to 100% due to rounding.

Source: MAC ANOMS Analysis, 2009.

Table 5-6
St. Paul Downtown Airport Year 2025 Average Annual Runway Use

Aircraft Group	Runway	Arrivals			Departures			Touch and Gos		
		Day	Night	Total	Day	Night	Total	Day	Night	Total
Jets	09	0.8%	1.5%	0.9%	0.1%	0.1%	0.1%	-	-	-
	13	0.3%	0.8%	0.4%	11.2%	12.0%	11.2%	-	-	-
	14	54.9%	37.9%	53.6%	42.2%	48.4%	42.7%	-	-	-
	27	0.0%	0.1%	0.0%	0.0%	0.1%	0.0%	-	-	-
	31	0.3%	0.0%	0.2%	9.2%	8.1%	9.2%	-	-	-
	32	43.7%	59.8%	44.9%	37.3%	31.4%	36.8%	-	-	-
Helicopters	09H	23.5%	22.2%	23.4%	6.9%	1.1%	6.5%	9.3%	2.8%	9.0%
	13H	24.7%	34.6%	25.4%	2.8%	1.1%	2.7%	12.1%	2.5%	11.8%
	14H	26.7%	26.3%	26.7%	15.6%	18.7%	15.8%	15.7%	19.6%	15.9%
	27H	7.3%	2.6%	7.0%	22.2%	17.9%	21.9%	23.4%	19.7%	23.3%
	31H	1.5%	1.9%	1.6%	36.4%	35.8%	36.4%	30.5%	11.6%	29.8%
	32H	16.2%	12.4%	15.9%	16.1%	25.4%	16.8%	9.1%	43.8%	10.3%
Pistons	09	5.1%	2.4%	4.8%	3.9%	0.2%	3.6%	1.4%	0.0%	1.4%
	13	3.5%	8.1%	3.8%	17.3%	25.6%	18.0%	4.0%	6.2%	4.1%
	14	44.2%	36.3%	43.6%	33.6%	29.1%	33.3%	46.9%	89.6%	48.4%
	27	1.3%	0.2%	1.2%	4.0%	0.0%	3.7%	2.1%	0.0%	2.0%
	31	5.5%	5.6%	5.5%	6.1%	3.4%	5.9%	4.1%	4.2%	4.1%
	32	40.4%	47.4%	41.0%	35.1%	41.8%	35.6%	41.5%	0.0%	40.1%
Turboprops	09	2.8%	0.7%	2.6%	1.3%	3.0%	1.5%	-	-	-
	13	1.0%	1.5%	1.1%	11.9%	17.7%	12.3%	-	-	-
	14	52.0%	40.7%	51.2%	39.5%	41.3%	39.6%	-	-	-
	27	1.0%	0.9%	1.0%	0.1%	0.0%	0.1%	-	-	-
	31	1.6%	3.0%	1.7%	4.3%	3.4%	4.3%	-	-	-
	32	41.5%	53.3%	42.4%	42.8%	34.7%	42.2%	-	-	-

Totals may not add up to 100% due to rounding.

Source: MAC ANOMS Analysis, 2009.

5.1.3 Baseline 2007 Noise Impacts

In the Baseline 2007 noise contours, there are 132 single-family homes and 160 multi-family units located in the 60 DNL contour around St. Paul Downtown Airport. The 60 DNL contour contains approximately 2.14 square miles. The 65 DNL contour contains approximately 0.86 square miles with no residential dwellings in the contour. The 2007 70 and 75 DNL contours contain 0.42 and 0.20 square miles respectively with no residential dwellings in the contours.

The 2007 noise contours are shown in Figure 5-5.

5.1.4 Forecast 2025 Noise Impacts

The Forecast 2025 noise contours around St. Paul Downtown Airport increase to approximately 2.94 square miles in the 60 DNL contour and approximately 1.09 square miles in the 65 DNL contour. The residential structures within the 60 DNL contour increase to 498 single family homes and 666 multi-family units and no residential units are contained in the 65 DNL and greater contours. The 70 and 75 DNL contours increase to cover 0.52 square miles and 0.26 square miles, respectively.

The 2025 noise contours are shown in Figure 5-6.

In summary, there will be a 37.4 percent increase in the 60 DNL contour with an increase of 366 single family homes and 506 multi-family units in the contour. The area within the 65 DNL contour increases 26.7 percent over the same period. The increase in the contours can be attributed primarily to a 9.6 percent increase in total aircraft operations from 2007 to 2025 and a 71.7 percent increase in jet aircraft operations (not including very light jets/microjets).

5.2 Environmental Review

In addition to noise and land use, MAC also reviews projects for other potential environmental concerns. Depending on the type of project, different levels of environmental review may be needed. MAC completes an Assessment of Environmental Effects (AOEE) each year as a part of the Capital Improvement Program. This document identifies projects that have had or require environmental review. For many projects proposed to utilize federal funds, MAC may submit a Categorical Exclusion to the FAA for review and consideration. The environmental topics identified and considered in a “Cat Ex” are listed below. If a project does not meet the requirements for a Cat Ex, a federal environmental assessment (EA) is completed and reviewed/approved by the FAA. Some projects warrant a State Environmental Assessment Worksheet (EAW) as a way to identify and consider any potential environmental impacts. Lastly, projects that involve runway extensions to 5,000 feet at the Reliever Airports require a State and Federal Environmental Impact Statement (EIS).

The type of funding for a project usually dictates what type of review is necessary. For example, projects not using federal funds do not need FAA approval. Also, some projects do not rise to the level of any necessary environmental review.

Specific categories contemplated and/or analyzed in environmental reviews are shown in Table 5-7.

Environmental review for the specific projects listed as recommendations in this LTCP lies outside the scope of a long-term comprehensive planning document and any necessary environmental review will be evaluated as a separate process.

Table 5-7
Environmental Review Categories

Environmental Review Categories	
Air Quality	Historic Structures/Resources
Archaeological	Light Emissions
Biotic Communities	Migratory Birds
Coastal Resources	Natural Resources
Compatible Land Use	Noise Levels
Construction Impacts	Parks, Public Lands, Refuges, Recreational Resources
Endangered Species (flora and fauna)	Relocation Housing
Energy Supply	Social/Socioeconomic Impacts
Environmental Justice	Surface Transportation
Essential Fish Habitat	Water Quality
Farmland	Wetlands
Floodplains	Wild and Scenic Rivers
Hazardous Materials	Other Connected or Cumulative Actions

Chapter 6 Land Use Compatibility

Planning for the maintenance and development of airport facilities is a complex process. Successfully developing airports requires insightful decision-making predicated on various facts that drive the need for the development of additional airport infrastructure. Furthermore, these efforts should consider surrounding community land uses. Airports cannot be developed in a vacuum; the development effort must consider the needs of the surrounding populations and the land uses in the area surrounding the airport. The success of airport planning is predicated on close consideration and coordination of surrounding land use to ensure compatibility with the community surrounding the airport.

Cities and airport operators are both responsible for the ongoing development of public assets. The development of U.S. airports, as well as city infrastructure is within the concept of conducting development predicated on the greater public interest. The responsible development of such community and airport infrastructure requires cooperative efforts on behalf of the airport proprietor and the community.

As city governments are responsible for the development and enhancement of city infrastructure, airport proprietors are responsible for the federally endorsed enhancement of our nation's airport system. Airport operators would be remiss in their duties if such efforts did not consider the land use consequences of decisions made regarding airport development.

This chapter evaluates the land use implications of the planned operation and development of the St. Paul Downtown Airport.

6.1 Land Use Compatibility Criteria

The Federal Aviation Administration has established Land Use Compatibility criteria in 14 C.F.R. Part 150 detailing acceptable land uses around airports considering noise impacts in terms of DNL. In the case of airports located in the Minneapolis/St. Paul Metropolitan Area additional criteria also must be evaluated in relation to noise exposure as established by the Metropolitan Council's Transportation Policy Plan (TPP).

6.1.1 Federal Aviation Administration Land Use Compatibility Guidelines

Federal guidelines for compatible land use that take into account the impact of aviation noise have been developed for land near airports. They were derived through an iterative process that started before 1972. Independent efforts by the FAA, HUD, USAF, USN, EPA and other Federal agencies to develop compatible land use criteria were melded into a single effort by the Federal Interagency Committee on Urban Noise (FICUN) in 1979, and resulted in the FICUN Guidelines document (1980). The Guidelines document adopted DNL as its standard noise descriptor, and the Standard Land Use Coding Manual (SLUCM) as its standard descriptor for land uses. The noise-to-land use relationships were then expanded for FAA's Advisory Circular Airport-Land Use Compatibility Planning. The current individual agency compatible land use criteria have been, for the most part, derived from those in the FICUN Guidelines. Airport environments pertain only to certain categories of these guidelines.[4]

In 1985 the FAA adopted 14 C.F.R. Part 150 outlining land use compatibility guidelines around airports. Table 6-1 provides the land use compatibility guidelines as established by the FAA.

[4] Federal Interagency Committee On Noise (FICON), "Federal Agency Review of Selected Airport Noise Analysis Issues, " (1992), pp. 2-6 to 2-7.

Table 6.1

FAA Aircraft Noise and Land Use Compatibility Guidelines

Land Use	DNL Contour Interval (dB)					
	Less than 65	**65-69**	**70-74**	**75-79**	**80-84**	**Greater than 85**
Residential						
Residential, other than mobile homes and transient lodgings	Y	N(1)	N(1)	N	N	N
Mobile home park,	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)	Y
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

See following page for Table Key and Notes.

Key

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.

Notes

The designations contained in this table do not constitute a federal determination that any use of land covered by the program is acceptable or unacceptable under federal, state, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute locally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

(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 of 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 of 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 noise 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

According to FAA standards, areas with noise levels less than 65 DNL are considered compatible with residential development.

6.1.2 Metropolitan Council Land Use Compatibility Guidelines

The Metropolitan Council has developed a set of land-use planning guidelines for responsible community development in the Minneapolis-St. Paul Metropolitan Area. The intent is to provide city governments with a comprehensive resource with regard to planning community development in a manner that considers adequacy, quality and environmental elements of planned land-uses.

Specifically, the Minnesota State Land Planning Act, the underlying law that requires local units of government to prepare a comprehensive plan and submit it for Metropolitan Council review, was enacted in 1976. By 1980, all community plans had been approved. The 1973 Aviation Chapter of the Metropolitan Development Guide was updated in 1977. In 1983, the Metropolitan Council amended the Aviation Policy Plan to include "Land Use Compatibility Guidelines for Aircraft Noise."

In 1994, the Land Planning Act of 1976 had been amended to require communities to update their comprehensive plans at least every ten years. Therefore, all Metropolitan Development Guide chapters were updated by December 1996.

Under the 1976 legislation, communities designated land uses and defined the zoning applicable to the particular land use parcel; the zoning took precedence. The land use measure was a request that local jurisdictions review existing zoning in Airport Noise Zones to determine their consistency with the regional compatibility guidelines, and rezone the property for compatible development if consistent with other development factors. This policy changed in 1994.

Under the amended Land Planning Act, communities determine the land use designation, and the zoning must be consistent with that designation. Thus, the communities had to re-evaluate designated use, permitted uses within the designation, zoning classifications, and adequacy.

In 2004 the Aviation Policy Plan was incorporated into the Transportation Policy Plan (TPP) of the Metropolitan Development Guide. Land use compatibility guidelines for all metropolitan system airports are included in the TPP. It has since been updated in January 2009.

In the case of airports located in the Minneapolis/St. Paul Metropolitan Area, the Metropolitan Council Development Guidelines in relation to airport noise exposure need to be considered. The TPP provides land use guidelines based on 4 noise zones around an airport. The following provides the Metropolitan Council's description of each noise zone:

- **Zone 1** – Occurs on and immediately adjacent to the airport property. Existing and projected noise intensity in the zone is severe and permanent. It is an area affected by frequent landings and takeoffs and subjected to aircraft noise greater than 75 DNL. Proximity of the airfield operating area, particularly runway thresholds, reduces the probability of relief resulting from changes in the operating characteristics of either the aircraft or the airport. Only new, non-sensitive, land uses should be considered – in addition to preventing future noise problems the severely noise-impacted areas should be fully evaluated to determine alternative land use strategies including eventual changes in existing land uses.[5]

[5] Metropolitan Council 2030 Transportation Policy Plan, Appendix L, January 2009.

- **Zone 2** – Noise impacts are generally sustained, especially close to runway ends. Noise levels are in the 70 to 74 DNL range. Based upon proximity to the airfield, the seriousness of the noise exposure routinely interferes with sleep and speech activity. The noise intensity in this area is generally serious and continuing. New development should be limited to uses that have been constructed to achieve certain exterior-to-interior noise attenuation and that discourage certain outdoor uses.[6]

- **Zone 3** – Noise impacts can be categorized as sustaining. Noise levels are in the 65 to 69 DNL range. In addition to the intensity of the noise, location of buildings receiving the noise must also be fully considered. Aircraft and runway use operational changes can provide some relief for certain uses in this area. Residential development may be acceptable if it is located outside areas exposed to frequent landings and takeoffs, is constructed to achieve certain exterior-to-interior noise attenuation, and is restrictive as to outdoor use. Certain medical and educational facilities that involve permanent lodging and outdoor use should be discouraged.[7]

- **Zone 4** – Defined as a transitional area where noise exposure might be considered moderate. Noise levels are in the 60 to 64 DNL range. The area is considered transitional since potential changes in airport and aircraft operating procedures could lower or raise noise levels. Development in this area can benefit from insulation levels above typical new construction standards in Minnesota, but insulation cannot eliminate outdoor noise problems.[8]

- **Noise Buffer Zones -** Additional area that can be protected at the option of the affected community; generally, the buffer zone becomes an extension of noise zone 4. For example, at MSP, a one-mile buffer zone beyond the DNL60 has been established to address the range of variability in noise impact, by allowing implementation of additional local noise mitigation efforts. A buffer zone, out to DNL55 is optional at those reliever airports with noise policy areas outside the Metropolitan Urban Service Area (MUSA).[9]

The listed noise zones also use the DNL noise exposure metric. The Metropolitan Council Land Use Compatibility Guidelines for Aircraft Noise are provided in Table 6-2.

The Metropolitan Council suggests that the 60 DNL contour be used for planning purposes in areas inside the MUSA.

[6] Ibid.
[7] Ibid.
[8] Ibid.
[9] Ibid.

Table 6.2

Metropolitan Council Land Use Compatibility Guidelines for Aircraft Noise										
	Noise Exposure Zones									
Type of Development	**New Development or Major Redevelopment**					**Infill - Reconstruction or Additions to Existing Structures**				
Land Use Category	1 DNL 75+	2 DNL 74-70	3 DNL 69-65	4 DNL 64-60	BZ	1 DNL 75+	2 DNL 74-70	3 DNL 69-65	4 DNL 64-60	BZ
Residential										
Single/Multiplex, with individual entrance	INCO	INCO	INCO	INCO		COND	COND	COND	COND	
Multiplex/Apartment, with shared entrance	INCO	INCO	COND	PROV		COND	COND	PROV	PROV	
Mobile Home	INCO	INCO	INCO	COND		COND	COND	COND	COND	
Educational, Medical, Schools, Churches, Hospitals, & Nursing Homes	INCO	INCO	INCO	COND		COND	COND	COND	PROV	
Cultural, Entertainment, & Recreation										
Indoor	COND	COND	COND	PROV		COND	COND	COND	PROV	
Outdoor	COND	COND	COND	COND		COND	COND	COND	COMP	
Office, Commercial, Retail	COND	PROV	PROV	COMP		COND	PROV	PROV	COMP	
Services										
Transportation - Passenger Facilities	COND	PROV	PROV	COMP		COND	PROV	PROV	COMP	
Transient Lodging	INCO	COND	PROV	PROV		COND	COND	PROV	PROV	
Other Medical, Health, and Education	COND	PROV	PROV	COMP		COND	PROV	PROV	COMP	
Other Services	COND	PROV	PROV	COMP		COND	PROV	PROV	COMP	
Industrial, Communication, & Utilities	PROV	COMP	COMP	COMP		PROV	COMP	COMP	COMP	
Agriculture, Land/Water Area, & Resource Extraction	COMP	COMP	COMP	COMP		COMP	COMP	COMP	COMP	

Table Key:

- **COMP** – "Compatible" – uses that are acoustically acceptable for both indoors and outdoors.
- **PROV** – "Provisional" – uses that should be discouraged if at all feasible; if allowed, must meet certain structural performance standards to be acceptable according to MS473.192 (metropolitan area Noise Attenuation Act). Structures built after December 1983 shall be acoustically constructed so as to achieve interior noise levels as follows:
  - Residential, Educational and Medical = 45 dBA Interior Sound Level
  - Cultural, Entertainment, Recreational, Office, Commercial, Retail and Services = 50 dBA Interior Sound Level
  - Industrial, Communications, Utility, Agricultural Land, Water Area, Resource Extraction = 60 dBA Interior Sound Level

  Each local governmental unit having land within the airport noise zones is responsible for implementing and enforcing the structural performance standards in its jurisdiction.
- **COND** – "Conditional" – uses that should be strongly discouraged; if allowed, must meet the structural performance standards, and requires a comprehensive plan amendment for review of the project under the Conditional Land Use Review Factors outlined in the Metropolitan Council's 2030 Transportation Policy Plan, Appendix H, Table 5.
- **INCO** – "Incompatible" – land uses that are not acceptable even if acoustical treatment were incorporated in the structure and outside uses restricted.

Source: Metropolitan Council 2030 Transportation Policy Plan, Appendix H – December 15, 2004.

6.1.3 Runway Safety Zones

The State of Minnesota Department of Transportation (Mn/DOT) has established regulations that control the type of development allowed off runway ends in order to prevent incompatible development. These guidelines should be used to establish zoning ordinances to protect areas around an airport. The states zoning areas overlay and extend beyond the Runway Protection Zones (RPZs). The most restrictive areas created by Mn/DOT regulations are called State Safety Zones A and B. The recommended safety zones should exist off each runway end and follow the approach zones out to the total length of the runway. The typical length of Safety Zone A is 2/3 of the total runway length; Safety Zone B is 1/3 of the total runway length and extends from Safety Zone A. There is also an area called Safety Zone C which is circular and typically follows the FAAs FAR Part 77 horizontal surface.

Safety Zone A does not allow any buildings or temporary structures, places of public assembly or transmission lines. Permitted uses include agriculture, livestock, cemeteries and auto parking areas.

Safety Zone B does not allow places of public or semipublic assembly (e.g., churches, hospitals, schools) and is subject to site-to-building area ratios and site population limits. Permitted uses are generally the same as Zone A, plus some low-density developments.

Safety Zone C does not allow use that causes interference with radio or electronic facilities on the airport or interference with radio or electronic communications between the airport and aircraft, lighting that makes it difficult for pilots to distinguish between airport lights and other lights or that results in glare in pilot's eyes, and lighting that impairs visibility in the airport vicinity.

A complete description and copy of the Minnesota Rules Chapter 8800 Department of Transportation Aeronautics Section 2400 Airport Zoning Standards can be found at http://www.dot.state.mn.us/aero/avoffice/planning/zoning.html.

Mn/DOT prefers that airports own all of State Zone A. For land within the area that is not airport-owned, land use protection is recommended by including the safety zones in local zoning codes and zoning maps. Inclusion of the safety zones on community Comprehensive Plans is also strongly encouraged. The RPZs and recommended State Safety Zones for St. Paul Downtown Airport are shown on Figure 6-1.

6.2 Land Use Compatibility Analysis

The St. Paul Downtown Airport is located in Ramsey County, in the City of St. Paul. The airport is bordered by the Mississippi River to the north, south and east and a combination of mixed use commercial, office and industrial/utility land uses to the west. Residential land uses are located northeast and southwest of the airport. The communities of West St. Paul and South St. Paul are located immediately to the south of the airport. In May 2008, a Joint Airport Zoning Board (JAZB) was convened which includes representation from the respective Responsible Governmental Units (RGUs) that control land use development around the St. Paul Downtown Airport. This effort is addressing land uses around St. Paul Downtown Airport in the context of the preferred alternative runway zones and may result in modification to the safety zone dimensions and development restrictions outlined in this chapter.

The following sections detail land use considerations in the context of existing and planned land uses around St. Paul Downtown Airport focusing on airport noise and runway safety zones.

6.2.1 Existing Condition Land Use Compatibility

In general, the area around the airport is primarily water and industrial/utility land uses. The Mississippi River borders airport property to the north, east and south with primarily industrial/utility to the west. A small portion of undeveloped land and retail/commercial also borders airport property to the west.

6.2.1.1 Land Use Compatibility and Airport Noise Considerations

As detailed in Chapter 5, Section 5.1, the 2007 baseline noise contours around St. Paul Downtown Airport contain 132 single-family homes and 160 multi-family units in the 60 DNL.

Figure 6-2 provides the 2007 baseline 60 and greater DNL noise contours around St. Paul Downtown Airport with 2005 land use data provided by the Metropolitan Council. As is detailed on the map, areas of residential use are contained within the 60 DNL noise contour to the north of the airport. The 2007 baseline 65 DNL contour extends off of airport property however, no residential structures are within the contour. The 2007 baseline 70 DNL contour is primarily contained on airport property except for a small portion to the southeast over the Mississippi River and to the northwest over industrial and utility land use areas. The 2007 baseline 75 DNL contour is primarily contained on airport property except for a small portion to the southeast over the Mississippi River.

6.2.1.2 Land Use Compatibility and Existing Runway Protection/Safety Zones

The existing RPZs and State Safety Zones A and B for Runways 14/32, 31/13, and 09/27 at St. Paul Downtown Airport are depicted in Figure 6-3 with the existing land uses around the airport.

The Runway 14 RPZ encompasses 48.9 total acres; 25.5 acres are on airport property, 10.2 acres are undeveloped, 10.0 acres are industrial/utility, 2.3 acres are retail/other commercial and 0.9 acres are water. State Zone A contains 163.7 total acres; 36.8 acres are water, 26.7 acres are park, 26.5 acres are airport property, 22.7 acres are undeveloped, 19.1 acres are industrial/utility, 12.3 acres are retail/other commercial, 10.0 acres are railway and 9.6 acres are major highway. State Zone B contains 130.2 total acres; 33.0 acres are major highway, 26.3 acres are industrial/utility, 17.3 acres are retail/other commercial, 16.8 acres are undeveloped, 14.8 acres are office, 12.2 acres are park, 7.8 acres are railway, 1.1 acres are institutional, 0.5 acres are single family residential, 0.3 acres are multi-family residential and 0.1 acres are mixed use residential. There are 20 single family homes and 14 multi-family units located in State Zone B.

The Runway 32 RPZ encompasses 29.4 total acres; 20.3 acres are water, 5.4 acres are airport property, 2.2 acres are industrial/utility and 1.5 acres are undeveloped. State Zone A contains 163.7 total acres; 63.8 acres are water, 46.6 acres are undeveloped, 23.6 acres are industrial/utility, 19.9 acres are park, 8.6 acres are airport property and 1.2 acres are railway. State Zone B contains 130.2 total acres; 75.4 acres are park, 51.7 acres are water and 3.1 acres are undeveloped.

The Runway 31 RPZ encompasses 13.8 total acres; 10.9 acres are water and 2.9 acres are airport property. State Zone A contains 55.1 total acres; 32.1 acres are industrial/utility, 20.0 acres are water and 3.0 acres are airport property. State Zone B contains 46.0 total acres; 37.3 acres are industrial/utility, 7.5 acres are undeveloped and 1.2 acres are railway.

The Runway 13 RPZ encompasses 13.8 total acres on airport property. State Zone A contains 46.9 total acres; 23.1 acres are airport property, 16.1 acres are industrial, 4.0 acres are undeveloped land and 3.7 acres are mixed use industrial. State Zone B contains 35.8 total acres; 23.9 acres are industrial/utility, 6.0 acres are water, 2.6 acres are undeveloped, 1.7 acres are airport property, 1.4 acres are major highway and 0.2 acres are retail/other commercial.

The Runway 09 RPZ encompasses 8.0 total acres; 2.3 acres are retail/other commercial, 1.8 acres are airport property, 1.7 acres are undeveloped, 1.2 acres are major highway and 1.0 acres are office. State Zone A contains 27.4 total acres; 13.0 acres are industrial/utility, 4.0 acres are undeveloped, 3.3 acres are major highway, 2.3 acres are retail/other commercial, 1.8 acres are airport property, 1.6 acres are office, 0.9 acres are single family residential, and 0.5 acres are institutional. There are 4 multi-family units located in State Zone A. State Zone B contains 23.9 total acres; 6.8 acres are industrial/utility, 6.8 acres are multi-family residential, 3.9 acres are institutional, 3.3 acres are retail/other commercial, 2.8 acres are single family residential and 0.3 acres are undeveloped. There are 13 single family residential structures and 155 multi-family units located in State Zone B.

The Runway 27 RPZ encompasses 8.0 total acres; 6.9 acres are water and 1.1 acres are airport property. State Zone A contains 27.4 total acres; 8.8 acres are water, 7.6 acres are park, 7.2 acres are industrial/utility, 2.7 acres are railway and 1.1 acres are airport property. State Zone B contains 23.9 total acres, all of which are park land.

6.2.2 Preferred Alternative Land Use Compatibility

The preferred development alternative at St. Paul Downtown Airport maintains the existing airport infrastructure and runway lengths. The growth in operations numbers and the forecasted change in fleet mix, primarily an increase in jet operations, results in changes to the noise contour.

6.2.2.1 Forecast Land Use Compatibility and Airport Noise Considerations

As detailed in Chapter 5, Section 5.1, the 2025 preferred alternative forecast 60 DNL noise contour around St. Paul Downtown Airport contains 498 single family homes and 666 multi-family units. The 2025 preferred alternative forecast 65 DNL contour extends off of airport property however, no residential structures are within the contour. The 2025 preferred alternative forecast 70 and 75 DNL contours are almost completely contained on airport property except for small portions that extend to the southeast over the Mississippi River and to the northwest over industrial and utility land use areas.

Figure 6-4 provides the 2025 preferred alternative forecast 60 and greater DNL noise contours around St. Paul Downtown Airport with 2005 land use data provided by the Metropolitan Council. Additional analysis was conducted relative to the planned 2020 land uses around St. Paul Downtown Airport as provided by the Metropolitan Council. Large areas to the south of STP within the 2025 contours is proposed to change from undeveloped to institutional with small areas of industrial and park land use. To the north, industrial and park land uses expand to cover land classified as undeveloped in 2005. West of the airport, there are small changes from industrial/mixed use industrial to commercial and institutional land use types.

The preferred development alternative does not include residential structures in recognized airport noise areas as outlined in the FAA land use guidelines in Table 6-1.

6.2.2.2 Land Use Compatibility and Preferred Alternative Runway Protection/Safety Zones

The preferred alternative RPZs and state safety zones A and B for Runways 14/32, 31/13, and 09/27 at St. Paul Downtown Airport are the same as the 2007 RPZs and zones. They are depicted in **Figure 6-3** with existing land uses around the airport.

Additional analysis was conducted relative to the planned 2020 land uses around St. Paul Downtown Airport as provided by the Metropolitan Council. There is a substantive proposed shift to institutional land use in State Zones A and B for Runways 32 and 31. Large areas of park land, undeveloped land and industrial land change to institutional land use in 2020. Much of the rest of the undeveloped land in State Zones A and B for Runway 32 is proposed to change to park land with the remainder in Zone A changing to industrial land use.

The MAC is in the process of working with a Joint Airport Zoning Board (JAZB) which includes representation from the respective Responsible Governmental Units (RGUs) that control land use development around the St. Paul Downtown Airport. This effort will address land uses around St. Paul Downtown Airport in the context of the Preferred Alternative runway zones and may result in modification to the State Model Safety Zone dimensions and development restrictions. The airport zoning process is spelled out in detail in Minn. Stat. Chap. 360, 360.061 – 360.074 and Minn. Rules Chap. 8800.1200 and 8800.2400. Specifically, Minn. Stat. § 360.062 establishes that "airport hazards" endanger lives, property and airport utility and should be prevented, with consideration given to avoiding the disruption of existing land uses based on social and financial costs. In an effort to prevent the creation or establishment of "airport hazards," the statute states that "the Metropolitan Airports Commission shall request creation of one joint airport zoning board for each airport operated under its authority." The statute states that "A joint board shall have as members two representatives appointed by the municipality owning or controlling the airport and two from the county or municipality, or in case more than one county or municipality is involved two from each county or municipality, in which the airport hazard is located, and in addition a chair elected by a majority of the members so appointed."

The goal of the JAZB is to develop a St. Paul Downtown Airport Zoning Ordinance for review and approval by the Commissioner of Transportation, for subsequent adoption by the Board and then by local municipalities. The Board will determine if the state model zoning ordinance provisions are appropriate for the St. Paul Downtown Airport or if modifications to the model are necessary considering the provisions of Minn. Stat. §360.066, subd. 1. The focus of this discussion has been on the following:

- MnDOT Model Ordinance – Minnesota Rule 8800.2100 and Minnesota Rule 8800.2400 (additional information on the MnDOT Model Zoning Ordinance is available on the Internet at http://www.dot.state.mn.us/aero/avoffice/planning/zoning.html)
- St. Paul Downtown Airport unique characteristics in the context of existing and planned land uses around the airport
- Maintaining a "reasonable standard of safety" while considering the social and financial costs to the community
- Minn. Stat. §360.066, subd. 1, which is especially instructive when addressing the question of balancing the safety with the social and economic impacts in the zoning process.

It is anticipated that a proposed final St. Paul Downtown Airport Zoning Ordinance will be submitted to the Commissioner of Transportation for final approval in 2010.

6.3 Concurrent Use / Development Areas on Airport Property

As described briefly in Chapter 4, MAC is currently analyzing the potential for concurrent use, revenue-generating development at the St. Paul Downtown Airport and all of its Reliever Airports. Any parcels reviewed by MAC at STP will be compatible with the airport and MAC will work with the City of St. Paul to address any concerns. It is anticipated that the northeastern portion of the airport may provide the best opportunities for this type of development.

Chapter

7 Capital Improvement Program Costs

The recommendations included in the 20-year planning period are listed in the table below. The estimated costs are in 2009 dollars, and they include estimated engineering costs.

Table 7-1
LTCP Recommendation Estimated Costs

Recommendation	Estimated Cost
On-going pavement maintenance and replacement program*	$4,400,000
Terminal Sub Drain	$600,000
Electrical Vault Improvements	$700,000
On-going Pavement Joint and Crack Repairs	$100,000 every other year
On-going MAC Building Maintenance	$200,000 every other year
Concurrent Use / Development Parcels	$0 (developer cost)

Source: MAC calculation

* Includes total cost for projects included in the draft 2010 – 2016 Capital Improvement Program for STP pavement rehabilitation or reconstruction.

The recommendation for on-going floodwall maintenance program is not included in the table above. Any costs expended come from the MAC operating budget, and are not Capital Improvement Program (CIP) costs.

Please note that these are recommendations for future airport improvements. Having them listed in this planning document does not guarantee that all or any of them will be completed. Additional engineering and environmental study as necessary will be completed prior to any implementation of projects. This summary provides a guide for MAC when planning the Capital Improvement Program. Costs for Reliever Airport projects must be carefully programmed to ensure all necessary funding is available. Those projects that will be eligible for federal or state funding will be placed in years when the opportunity to receive such funds is greatest. Projects that are not eligible for federal or state funds must have other funding sources identified prior to implementation.

Chapter 8

Facility Implementation Schedule

The items included in the 20-year planning period preferred alternative are listed in the table below. It is expected that these timelines may vary according to the availability of funding sources.

Table 8-1
LTCP Recommendation Implementation Schedule

Recommendation	Estimated Timeline
On-going pavement maintenance and replacement program	Continuous throughout planning period
Terminal Sub Drain	0 – 5 Years
Electrical Vault Improvements	0 – 5 Years
On-going Pavement Joint and Crack Repairs	Continuous throughout planning period
On-going MAC Building Maintenance	Continuous throughout planning period
Concurrent Use / Development Parcels	0 – 10 Years

Chapter 9 Public Information Process

At the onset of this long-term comprehensive plan update process, a public involvement program was developed. It included a specific plan for group meetings, with whom and when. The meetings held as part of this public process are listed in Table 9-1.

The purpose of the meetings was to inform the airport users and the public about the process and schedule, and offer an opportunity for personal question-and-answer sessions. The goal was to receive informal input as the process advanced, and prior to the formal public comment period that took place upon completion of the full draft document. In addition, MAC held two meetings and corresponded regularly with a technical advisory group, made up of members of MAC staff, the FAA, Mn/DOT Aeronautics, and Metropolitan Council.

Informal comments were accepted at all meetings. The MAC committee meetings were open to the public, and verbal comments were invited at each of them. Meetings with the Downtown Airport Advisory Commission (DAAC) typically involved a short presentation by MAC staff followed by a question and answer period.

Table 9-1
LTCP Meeting Schedule

Meeting with:	Date
Downtown Airport Advisory Commission – (DAAC)	January 13, 2009
Airport FBOs	March 5, 2009
Airport Tenants	March 5, 2009
City/County Representatives for communities around STP	March 25, 2009
DAAC	April 14, 2009
Reliever Airport Advisory Committee (RAAC)	April 29, 2009
MAC FD&E Committee Meeting	May 6, 2009
MAC M&O Committee Meeting	May 6, 2009
LTCP Public Informational Meeting	June 23, 2009
MAC FD&E Committee	July 8, 2009
DAAC	July 14, 2009
DAAC	November 10, 2009
MAC FD&E Meeting	February 3, 2010

During the long-term comprehensive planning drafting process, MAC requested informal written or verbal comments regarding the LTCP Update. Advertisement for the MAC public open house meeting was published in the *Pioneer Press* on June 10, 2009. The meeting was held on June 23, 2009. Not one person attended the public meeting. As of December 2009, MAC had received zero written comments.

The draft LTCP document was completed in December, 2009, and made available for a 30-day written comment period starting December 14, 2009. The comment period ended on January 12, 2010. Advertisements for the 30-day public written comment period on the draft LTCP were published in the *Pioneer Press* and *Star Tribune* newspapers on December 10, 2009.

Upon completion of the written comment period, MAC received two letters. One letter submitted came from the West Side Citizens Organization, and the second letter came from a resident of St. Paul. The letters and MAC's responses to them are included in Appendix B.

In February 2010, MAC submitted the draft LTCP document, along with all written comments received and MAC responses to those comments, to the Metropolitan Council for their review. The Metropolitan Council issued their determination in April 2010, finding the LTCP Update consistent with the Metropolitan Council's development guide. Correspondence from the Metropolitan Council has been included in Appendix B.

In June 2010, the Commission took action to adopt this LTCP as the final plan. MAC is committed to preparing updates to this LTCP on a regular basis.