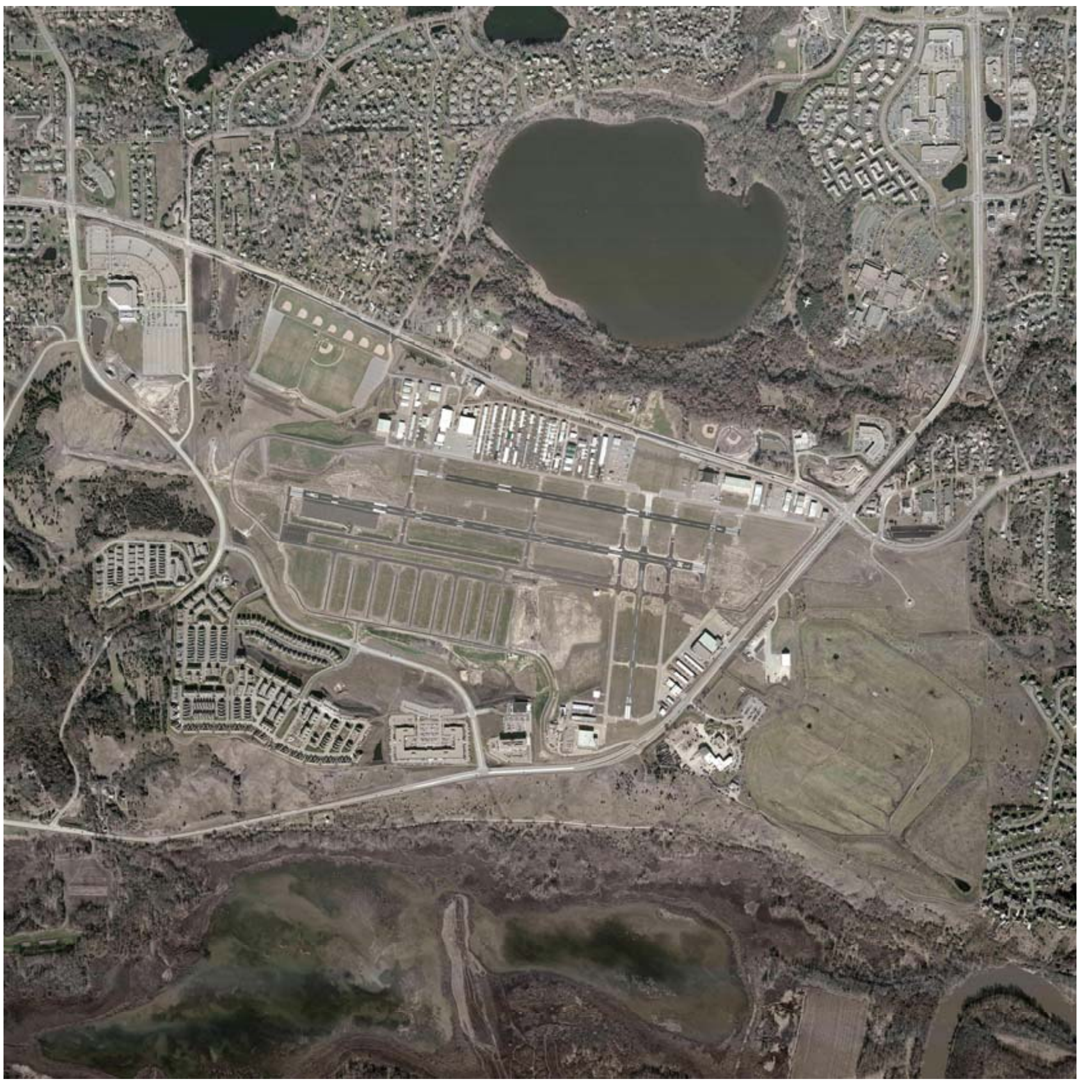
Metropolitan Airports Commission

Flying Cloud Airport (FCM)

Long Term Comprehensive Plan



Metropolitan Council Determination April 2010
Final Adoption by MAC October 2010

Flying Cloud Airport
Long Term Comprehensive Plan Update

FINAL – October 2010

Metropolitan Council Determination April 2010

Final Adoption by MAC October 2010

Prepared by the Metropolitan Airports Commission

with assistance from HNTB Corporation

Table of Contents

Appendix B – Correspondence/Comments

List of Tables

List of Figures

All figures for a specific chapter are located at the end of the chapter.

Executive Summary

The Flying Cloud Airport is one of seven airports owned and operated by the Metropolitan Airports Commission (MAC). The airport identifier, or reference code, is FCM. Flying Cloud has played an important role in the Twin Cities since the airport opened in 1943. Located approximately 14 miles from downtown Minneapolis, the airport is considered by the MAC to be a primary reliever airport for the Minneapolis – St. Paul International Airport (MSP). Due to its location in the southwest suburbs, businesses consider it an important part of their local operations. In a 2005 economic report prepared by MAC, its contribution to the local economy was estimated to be more than $80 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 previous long term plan for Flying Cloud 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. Alternatives and Plan Recommendations
5. Environmental Considerations
6. Land Use Compatibility
7. Capital Improvement Program Costs
8. Facility Implementation Schedule
9. Public Informational 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 alternatives section identifies and analyzes the concepts considered for the airport, and indicates whether each alternative meets the needs of the airport as identified in the facility requirements chapter. In addition, the preferred alternative recommended for the airport is identified. The environmental considerations and land use sections discuss the existing and preferred alternative in relation to environmental issues, such as noise, and surrounding land use compatibility.

The last sections identify the preferred alternative project items, 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 report includes aviation forecasts for based aircraft and the projected number of operations at the Flying Cloud Airport. 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 MAC-owned airports are calculated and then allocated among the individual airports. Operations and peak activity forecasts for Flying Cloud 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 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.

Table ES-1
Forecast Summary

Year	Baseline	High Forecast	Low Forecast
OPERATIONS			
2007	124,569	124,569	124,569
2010	99,540	127,443	69,757
2015	97,154	113,062	69,710
2020	106,030	145,273	74,776
2025	113,876	157,204	78,944
BASED AIRCRAFT			
2007	421	421	421
2010	420	426	416
2015	411	435	395
2020	406	442	372
2025	401	452	354

Source: Aviation Forecasts – Technical Report, April 2009

ES.3 Facility Requirements and Concepts Analyzed for Development

The current aircraft approach category assigned to the Airport is “B”. Typical aircraft in this aircraft approach category are the Beechcraft Baron, Raytheon Beechcraft King Air and Cessna Citation Jets (see Figure 3-1). 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 category “B” aircraft continue to be applied.

The current airplane design group applied to the Airport is group II. This means that the airport is designed to accommodate aircraft with wingspans less than 79 feet. Aircraft that fall into this category include most single engine and twin piston aircraft, the Raytheon Beechcraft King Air and smaller regional and corporate jets such as the Cessna Citation II, III, IV and V.

As shown in the forecasts for 2007, the number of based aircraft registered for FCM in 2007 was 421 aircraft, as identified in the base year of the forecasts in Chapter 2. Chapter 3 indicated that there is an estimated 508 actual indoor hangar spaces at the airport with development of the new south hangar area. This means the current landside use equates to about 83% of capacity.

According to the Chapter 2 forecasts, the number of based aircraft is anticipated to decline from 421 in 2007 to 420 in 2010, and down to 401 by 2025. The forecasts also show a drop in operations by the single and multi-engine piston aircraft. This is due to a number of different factors such as fuel prices and the economy. Under the high forecast, the based aircraft would reach 452, or approximately 89% capacity. Therefore, the airport currently has enough hangar capacity available through the planning period.

The number of operations at Flying Cloud in 2007 was 124,569. In Chapter 3, the maximum number of operations the airport can handle, the annual service volume, was identified as 355,000 operations based on the existing three runway configuration. Therefore, from an airside standpoint, the airport is currently at 35% capacity.

The baseline 2025 forecast number of operations is lower than 2007. Under the high scenario, the 157,204 forecasted number of operations in 2025 would result in 44% capacity. None of these figures trigger the need to study additional runways at FCM.

Chapter 3, Section 3.2.2 discusses the FAA recommendations for runway length. A runway length of 5,000 feet accommodates all small aircraft weighing less than 12,500 pounds, and some large aircraft weighing less than 60,000 pounds. As described in Chapter 1, Runway 10R-28L is 5,000 feet long. The parallel Runway 10L-28R is 3,900 feet long and accommodates 100% of the small airplanes weighing less than 12,500 pounds. These figures are determined based on wet and slippery runway conditions, when more runway length is typically needed for operations. A runway length of 5,000 feet is the maximum allowed under Minnesota State law for a Minor Use Airport such as FCM.

The crosswind runway, 18-36, is currently 2,691 feet long but does not meet the recommended standard according to the FAA runway length tables. Also, as discussed in Chapter 3, Section 3.2.5, the runway safety area and runway object free area are deficient for the Runway 36 end. The alternatives reviewed for this LTCP update focus on this runway, and are discussed briefly below, and in Section 4.2.

An analysis of runway lengths and wind coverage needs was completed for a variety of aircraft known to use Runway 18-36. The need for a crosswind runway is easily justified by the existing wind coverage, especially for smaller aircraft operating at the airport. Aircraft weighing less than 12,500 pounds are typically more susceptible to crosswind conditions.

As discussed in Chapter 3, the runway safety area (RSA) and runway object free area (OFA) for the Runway 36 end do not meet current FAA standards. The deficiency is approximately 63-feet; however, with some minor fence modifications, the deficiency can be reduced to 58-feet. In order for the FAA to provide federal funding for projects related to Runway 18-36, MAC must address the RSA and OFA issues.

ES.3.1 No Build Alternative

A “no build” alternative would include no runway improvements and no changes to the airfield within the 20 year planning period except for reconstruction of the south end of Runway 18-36 and construction of a north perimeter road.

The no-build alternative also does not address the RSA and OFA issues. Therefore, the no-build alternative does not meet the needs of the airport.

ES.3.2 Shorten Runway 18-36

This alternative shortens the crosswind runway to create a compliant runway safety area (RSA) and object free area (OFA). The runway would be shortened by 58-feet. The current length is 2,691-feet; the ultimate length would be 2,633-feet.

This alternative addresses the RSA and OFA issue but does not address the fact that the runway length does not meet the FAA-recommended length for the type of aircraft using the airport.

ES.3.3 Shift Runway 18-36

This alternative shifts the crosswind runway to the north by 58-feet to create a compliant RSA and OFA. In addition to reducing pavement length at the Runway 36 end, new pavement would be constructed to extend the existing end of Runway 18. The runway length would be maintained at 2,691-feet.

This option meets the RSA and OFA correction needs, but maintaining the existing runway length does not meet the recommended FAA runway length for the type of aircraft at the airport.

ES.3.4 Shift and Extend Runway 18-36

(The Preferred Alternative)

As discussed in Chapter 3, the FAA recommends a runway length of 2,800 feet to accommodate 75% of the fleet of aircraft weighing less than 12,500 pounds. Those aircraft most susceptible to crosswinds are virtually all in the 75% category.

This alternative shifts the crosswind runway to the north by 58-feet to create a compliant runway safety area and object free area and then adds an additional 109 feet of pavement for a total runway length of 2,800 feet.

This alternative would correct both the RSA/OFA deficiency and enhances the runway use by providing additional length. This option, however, would be the most expensive because of the pavement construction costs and potential for increased obstruction removal requirements. See Section ES.6 for more information.

ES.3.5 Runway 18-36 North Perimeter Road

All of the Runway 18-36 alternatives show a new road north of the runway end, connecting the east and west sections of the north hangar area. This perimeter road is being considered at the request of the FAA to provide an east-west landside route for vehicles, fuel trucks, and MAC maintenance vehicles so they do not have to drive on or cross airfield pavements. The intention is to reduce the risk for runway incursions related to Runway 18-36. Note that unlike the two perimeter roads constructed at each end of the Runway 10-28 runways, this particular road is proposed to be constructed such that it can be used by both airport tenants and visitors.

ES.4 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 no single-family homes located in the 60 DNL contour around Flying Cloud Airport. The 60 DNL contour contains approximately 0.87 square miles. The 65 DNL contour contains approximately 0.36 square miles and no single-family homes. The entire 70 and 75 DNL contours are contained on the airport property, essentially overlying the areas immediately adjacent to the runways. The 2007 70 and 75 DNL contours contain 0.18 and 0.07 square miles respectively.

The Forecast 2025 60 DNL noise contour around Flying Cloud Airport decreases to approximately 0.85 square miles while the 65 DNL contour increases to approximately 0.37 square miles. The residential structures within the 60 DNL contour increases to one single family home. The 65, 70 and 75 DNL contours cover 0.37, 0.17 and 0.05 square miles, respectively, with no residential structures in the contours.

In summary, there will be a 2.3 percent decrease in the 60 DNL contour, however 2 single family homes are located in the contour. The area within the 65, 70 and 75 DNL contours remains relatively unchanged with no single family homes located in these contours. The decrease in the overall size of the 60 DNL contour can be attributed primarily to an 8.6 percent decrease in total aircraft operations from 2007 to 2025. The increase in single family homes located in the 60 DNL contour can be attributed to the extension of Runway 10R/28L, which locates the departure end of Runway 10R closer to residential areas immediately southwest of the airport.

The 2025 noise contours are shown in Chapter 5.

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.

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. The recommended 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.

Chapter 6 details the land use compatibility for both the existing and preferred alternative runway protection zones and state safety zones. For each runway end, the number of acres and types of land use are summarized. In addition, there is a discussion on the status of the Joint Airport Zoning Board (JAZB).

ES.5 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 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 LTCP 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. 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 Flying Cloud Airport Advisory Commission typically involved a short presentation by MAC 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. Advertisements for the MAC public open house meeting were published in the *Eden Prairie News* and the *Sun Current* on June 11, 2009. The meeting was attended by six people. As of July 2009, two verbal and one written comment have been received supporting the shortening of Runway 36. Two verbal comments have been received asking that no runway length be lost. All correspondence received prior to the 30-day written public comment period are included in Appendix B.

Prior to August 2009, there were only two alternatives under considerations for Runway 18-36 (shortening the runway, or shifting the runway but maintaining the existing runway length). It was those two options that were presented at the LTCP public informational meeting and to the MAC Commissioners in July 2009. During the review and analysis of runway usage that occurred about the same time, it was determined that the crosswind Runway 18-36 is used very regularly – much more than the approximate 5% of the time there is a strong crosswind component. Based on this information, combined with FAA runway length design recommendations, staff began reviewing the possibility of not only maintaining the existing length, but also extending it to make the runway more effective in safely accommodating the traffic using it. In September 2009, MAC brought this new shift-and-extend alternative to the Finance Development and Environment (FD&E) Committee requesting it be adopted as the preferred alternative for the LTCP document. The full Commission ratified the decision on September 21, 2009.

The addition of the shift-and-extend alternative for Runway 18-36 was added to the document prior to the start of the formal written comment period. The draft LTCP document was completed in November, 2009, and made available for a 30-day written comment period starting November 23, 2009.

Upon completion of the written comment period on December 22, 2009, MAC received only one letter. The letter from the City of Eden Prairie and MAC's responses to that letter are included in Appendix B. One of the comments triggered a modification to Exhibit 6-3. The revised graphic is now included in this document. The Executive Summary and Figure 4-4 graphics were also modified as a result of a MAC staff request.

In February 2010, MAC submitted the draft LTCP document, along with the 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, staff requested the Commission take action to adopt this LTCP as the final plan. The action was tabled at that meeting due to questions related to an FBO's proposed development concepts. It was taken back to the Commission in September 2010 where it was further tabled due to questions until the October 2010 meeting cycle. Staff returned to the Commission in October 2010, where 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.

ES.6 Preferred Alternative and Other Plan Recommendations

Based on the analysis discussed above, it is recommended that Runway 18-36 be shifted north and lengthened to 2,800 feet to create a compliant RSA and OFA. The FAA will likely not provide federal funding for projects associated with Runway 18-36 unless a compliant runway safety and object free areas are achieved. The runway extension will better serve aircraft using the runway, especially during critical cross-wind operations. It is justified by both the FAA runway length curves and by the crosswind component at Flying Cloud. The recommended runway length is tied to the type of aircraft using the runway; not the number of operations by those aircraft (as long as the number of operations exceeds 500 per year). This is definitely the case at FCM.

It is recommended that with the 18-36 runway shift and extension, the south end pavement be reconstructed as currently planned in the MAC capital improvement program. It is also recommended that the existing FAA-owned VASIs be replaced with PAPIs. Obstructions related to Runway 18-36 should be identified and removed. It is also recommend that the north perimeter road be constructed as a part of the Runway 18-36 improvements.

The runway extension and perimeter road construction may have impacts on two existing FBO facilities at the approach end of Runway 18. MAC will review any necessary lease changes and/or parking modifications with the businesses prior to any construction implementation.

This preferred alternative may require environmental review. MAC will review the State Environmental Assessment Worksheet (EAW) requirements and the Federal FAA categorical exclusion checklist to identify the appropriate type of environmental review documentation.

As discussed above, there is no demonstrated need for additional runways or new hangar areas at the Flying Cloud Airport at this time. There are, however, various airside and landside improvements that are recommended for implementation in addition to the Runway 18-36 preferred alternative. They are itemized below:

1. MAC should continue pavement reconstruction and rehabilitation as a part of the on-going pavement maintenance program, including reconstruction of the south end of Runway 18-36 as a part of implementing the preferred alternative.

2. Completion of the south hangar area utilities shall be completed as new leases are executed and lot assessment fees are collected. Utilities include the installation of sanitary sewer, water, electric and/or natural gas services, and telephone.

   Figure ES-1 shows a boxed out area adjacent to the south hangar area. This box identifies a potential expansion to the building area, should forecasts in future LTCPs identify a need for additional hangar space. As noted in this document, there is no demonstrated need at this time. However, if at some point additional space is needed, this location near midfield would work well.

3. MAC should take steps to provide a clear Taxiway Alpha object free area. Some of the 1950's vintage hangars along the north side of Taxiway A actually lie within the taxiway object free area. MAC will work with these tenants over time as they plan on hangar redevelopment to eliminate obstructions to the taxiway.

4. MAC should continue discussions with the FAA relative to the ultimate relocation of the Air Traffic Control Tower to a location in the new south hangar area. The ATCT is not owned by the MAC. Its relocation will require the cooperation and assistance of the FAA.

5. MAC should continue the research the potential development of concurrent land uses for revenue generating purposes on airport property.

6. MAC should pursue continued cooperation with the City of Eden Prairie through the existing MAC/City agreements, the Flying Cloud Airport Advisory Commission, and on-going MAC/City staff interaction.

The plan recommendations are highlighted in Figure ES-1. Estimated costs and timelines for implementation are shown in Table ES-2.

Table ES-2
LTCP Recommendation Estimated Costs and Implementation Timeline

Recommendation	Estimated Cost	Timeline
Reconstruct Runway 18-36 south end, shift and extend runway to 2,800 feet, upgrade runway lights and circuit	$1,700,000	0 – 5 Years
Construct North Perimeter Road	$300,000	0 – 5 Years
Replace Runway 18-36 VASIs with PAPIs	$100,000 - 200,000	0 – 5 Years
Obstruction Removal	$100,000	0 – 5 Years
On-going pavement maintenance and replacement program*	$2,000,000	Continuous throughout planning period
South Hangar Area Utilities	$2,100,000	0 – 5 Years
Concurrent Use / Parcel Development	$0 (developer cost)	0 – 10 Years
Clear Taxiway A OFA	$0 (airport tenant cost)	15 – 20 Years
Relocate ATCT**	$6,000,000 -7,000,000	10 – 15 Years

Source: MAC calculation and engineering consultant estimates.

* Includes total cost for projects included in the draft 2010 – 2016 Capital Improvement Program for FCM alleyway rehabilitation and pavement maintenance.
** The Flying Cloud Air Traffic Control Tower is not owned by the MAC. Its relocation will require the cooperation and assistance of the FAA.

Chapter 1 Existing Conditions/Inventory

1.1 Airport History and Location

The Flying Cloud Airport 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 FCM. Flying Cloud has played an important role in the Twin Cities since the airport opened in 1943. Located approximately 14 miles from downtown Minneapolis, the airport is considered by the MAC to be a primary reliever airport for the main Minneapolis – St. Paul International Airport (MSP). Its location in the southwest suburbs allow businesses to consider it an important part of their local operations. In a 2005 economic report prepared by MAC, its contribution to the local economy was estimated to be more than $80 million annually.

The airport is located in Hennepin County, in the south central area of the City of Eden Prairie. See Figures 1-2 and 1-3. The airport can be accessed from Flying Cloud Drive (former Trunk Highway 212), and County-State-Aid-Highway 1, also known as Pioneer Trail. The airport lies southwest of Interstate 494, south of Trunk Highway 5, and just west of Trunk Highway 169. County Road 4 (Spring Road) and Eden Prairie Road bound portions of the airport on the west. The airport sits adjacent to the Minnesota River, which borders the airfield on the south.

The Flying Cloud Airport consists of 860 acres. When MAC acquired the airport in 1947, the airport had approximately 135 acres. Development in the 1950's included acquisition of an additional 409 acres. Other acquisitions have occurred as recently as 2001 which brought the total to 860 acres. See Figure 1-4 for the most recent Airport Property Inventory Map.

The first grass strip at FCM appeared in 1943. Since then, the airport has seen major modifications, including longer paved runways, expanded and improved hangar facilities, and the dedication of an air traffic control tower in 1963. In 1989, MAC embarked on a planning and environmental study focusing on expanding the airport. The proposal included land acquisition, extension of the longest runway from 3,900 feet to 5,000 feet, and extension of the north parallel runway from 3,600 feet to 3,900 feet. The proposal included land acquisition as well. In 2004, the state environmental process was completed, and in 2008, the Federal Aviation Administration issued their Record of Decision approval for the project. Construction began in 2008, and was substantially complete in November 2009. Table 1-1 outlines some historical notes and major construction projects that have occurred over the years. In addition to these projects, MAC has on-going rehabilitation program for all of the airfield and perimeter road pavements.

An article written by Mr. Bob Palmby[1], Manager of the Flying Cloud air traffic control tower in 1986 is the source of some of the historical notes below. In his article, he indicated that between 1966 and 1970, Flying Cloud was the second busiest tower in the FAA's Central Region, second only to Chicago's O'Hare Airport. At that time, it was ranked the 15th busiest in the nation, and held a record 446,198 operations in 1968. It peaked as the ninth busiest tower in the nation. Figure 1-5 shows the Airport Diagram from 1947, and Figure 1-6 shows the 2009 Airport Diagram. Figure 1-7 is an aerial photo of the airport from fall 2009 when construction was ending.

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.

[1] Bob Palmby, "Flying Cloud Airport – From 1943 Grass Strips to One of the Busiest Today", <u>Great Lakes Intercom</u>, February 1, 1986, page 9.

Table 1-1
Airfield Development Timeline

Year	Project Description
Prior to 1943	Navy uses existing grass strip for practice approaches
1943	Private use of grass strip and adjacent acres begins after WWII
1943 – 1947	Terminal building and first two hangars built
1947	MAC acquires airport
1949	North-south runway paved (now Runway 18-36) with a portion of Taxiway D
1952	Lights installed on north-south runway
1956	MAC acquires 196 acres
1956	Lighted east-west runway constructed (now 10L-28R) at 3,600 feet
1958	East-west parallel runway constructed (now south parallel Runway 10R-28L)
1958	North parallel Taxiway A constructed
1958	FAA's VOR constructed (approximate; exact year unknown)
1961	MAC acquires 208 acres
1963	Air Traffic Control Tower commissioned
1966	North-south Taxiway D extended
1966	MAC maintenance/equipment building constructed
1967	South east/west taxiway constructed (Taxiway B)
1969 - 1970	South parallel runway widened to 75-feet and extended to 3,200 feet
1970	North-south Taxiway E constructed
1976	ODALs approach lighting system installed on north parallel runway
1977	MAC maintenance building expansion
1979	South parallel runway extended to 3,900 feet, with runway lights
1979	ODALs removed from north parallel runway
1980	MALSR approach lighting system installed for Runway 9R (now 10R)
1988	Glideslope precision approach system installation for Runway 9R (now 10R)
1999	Parallel runway numbers changed from 9-27 to 10-28 due to magnetic declination
1980's - today	Ongoing pavement rehabilitation and security fence and gate projects
2008	North parallel runway (10L-28R) extended to 3,900 feet
2009	South parallel runway (10R-28L) extended to 5,000 feet and widened to 100 feet
2009	VOR facility relocated across Flying Cloud Drive
2009	Runway 10R glideslope and MALSR systems relocated with runway extension

MAC prepared the first Master Plan for FCM in 1976, which included recommendations for a runway extension for the south parallel runway to 3,900 feet, as well as abandonment of the existing runway end approach lighting systems for the north parallel runway.

In January 1978, MAC adopted Ordinance No. 51, which limited use at FCM to jet aircraft weighing 20,000 pounds or less that meet the noise emission levels of Federal Aviation Regulation (FAR) Part 36. The Flying Cloud Airport Advisory Commission (FCAAC) was formed in July 1978 to promote communication between the City of Eden Prairie and MAC. In 1979, an Environmental Impact Statement Report was prepared for the proposed extension, and the construction was completed in 1979.

In 1987, a feasibility study was completed to determine the type of instrument landing system (ILS) to serve the airport. In 1988, an FAA-owned end-fire glideslope was installed. This system, combined with a localizer antenna, provides both vertical and horizontal guidance for pilots approaching the runway end. The existing approach lighting system (MALSR) enhances the precision approach even further, by improving a pilot's visibility of the runway end.

MAC began an update to the FCM long term comprehensive plan in 1988. In March 1989, MAC held a public hearing on the comprehensive plan, which included recommendations for an extension of the south parallel runway to 5,000 feet, a new south hangar area, and an increase to the allowable aircraft weight to 30,000 pounds.

In 1992, MAC completed an amended long term comprehensive plan and updated airport master plan for the airport. That plan recommended the south parallel runway be extended to 5,000 feet, including a shift of the runway to the west by 1,100 feet; the north parallel runway be extended to 3,900 feet; and a new building area on the south side of the airport. The document analyzed noise contours, land acquisition, and costs.

Between 1989 and 1996, discussions between MAC, the City, the FAA and the Metropolitan Council continued, including mediation sessions for issues raised during the LTCP process. Some of the issues included noise concerns, land acquisition needed for the airport expansion, and FAA's determination that Ordinance No. 51 was inconsistent with federal policy. In April 1996, the Metropolitan Council found the LTCP for Flying Cloud consistent with its Development Guide.

In 1996, MAC and the FAA began preparing the joint Federal/State Environmental Impact Statement (EIS) for the proposed airport improvements. The process extended into 2008 before completion. Along the way, a Part 161 Notice and Analysis of Proposed Restrictions on Nighttime Maintenance Run-ups and Nighttime Stage 2 Aircraft operations was completed and distributed for public comment. Ultimately, MAC and the City of Eden Prairie executed two documents in December 2002 – one was a Memorandum of Understanding which addressed many outstanding concerns and issues between MAC and the City related to roadway and infrastructure improvements for the City, and sanitary sewer and water improvements for the airport; and the second was the Final Agreement enabling expansion of the airport by the City with commitments from MAC and an amendment to Ordinance No. 51.

In December 2002, MAC adopted Ordinance No. 97, which replaced Ordinance No. 51 by eliminating the 20,000-pound maximum takeoff weight restriction at the airport. Ordinance No. 97 includes limitation on nighttime maintenance of aircraft and engine run-ups, and increased the aircraft weight restriction at the airport to 60,000 pounds maximum takeoff weight.

Given concurrence between MAC and the City, the EIS process continued. The Minnesota Environmental Quality Board (EQB) made a determination of adequacy for the Final EIS document (FEIS) in accordance with State law and EQB rules in February 2006. In February 2008, the FAA prepared a written re-evaluation of the FEIS and determined that the FEIS remained applicable, adequate, accurate, and valid with no supplementation of the FEIS or further environmental documentation required. On May 23, 2008, the FAA issued a Record of Decision for the FEIS, indicating that the project is consistent with existing environmental policies and objectives as set forth in the National Environmental Policy Act of 1969.

As noted in the Table 1-1, construction of the airport improvements began in the summer of 2008, and the projects were substantially complete by the end of 2009.

1.2 Airport Role

The classification of 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

MAC considers FCM to be a primary reliever airport for the Minneapolis – St. Paul International Airport. 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 Flying Cloud Airport be developed as a primary Reliever Airport, along with St. Paul Downtown 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 it serves and specific characteristics for those planes. The Flying Cloud Airport has an Airport Reference Code of B-II. This means it is designed, constructed and maintained to serve airplanes in that same Airplane Design Group. The "B" references airplanes with an approach speed of less than 121 knots, the "II" relates to wingspans up to but not including 79 feet.

1.2.3 Metropolitan Council Classification

The Metropolitan Council classifies FCM as a Minor Airport. Under this definition, the airport has a primary runway length between 2,500 and 5,000 feet, with either a precision or non-precision approach. The airport can accommodate personal use and recreational aircraft, business general aviation and air taxi traffic, flight training 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.

1.2.4 Mn/DOT Classification

Mn/DOT classifies FCM as a Key System Airport, meaning it has a paved runway of 5,000 feet or more and is capable of accommodating all sizes of aircraft.

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 of mixing with aircraft. Airside facilities also include airfield lighting and navigational aids.

1.3.1 Pavement Areas

FCM consists of three runways and numerous taxiways. The runways with their current lengths as of 2009 are listed in Table 1-3. The taxiway designations are shown in the Airport Diagram, in Figure 1-6.

All of the MAC-maintained 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 agreement between MAC and the City of Eden Prairie, however, requires no more than a 60,000-pound pavement design strength for the extended 5,000-foot south parallel runway. In 2009, the runway was constructed with a pavement section consisting of 4-inches of asphalt and 6-inches aggregate base on top of a 3-foot granular subbase. This design meets the FAA minimum design criteria, and matches a 60,000-pound design strength for the airport and its design aircraft.

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 10R-28L is lighted with High Intensity Runway Edge Lights (HIRLs) and Runways 10L-28R and 18-36 have Medium Intensity Runway Edge Lights (MIRLs). 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. During the time when the Air Traffic Control Tower (ATCT) is closed, pilots can turn on and change the intensity of the lights for Runway 10R-28L and 18-36 by using the radio transmitter in the aircraft. Runway 10L-28R can be pilot activated only when Runway 10R-28L is closed. The airport also has lighted taxiway guidance signs to assist pilots in way-finding and runway guard lights.

A Medium Intensity Approach Lighting System with Runway Alignment Indicator Lights (MALSR) extends 2,400 feet prior to the Runway 10R threshold. This system consists of a combination of flashing and steady burning lights and gives visual indicators during landing at the facility to transition from instrument flight to visual flight. Runways 28L, 18 and 36 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 18 and 36 have visual approach slope indicators (VASIs). The VASI systems use a combination of red and white lights only visible at certain angles that help pilots determine appropriate angles of descent during landings. The former 10R-28L VASIs were replaced with Precision Approach Path Indicator (PAPI) systems in conjunction with the runway extension to 5,000 feet. Runway 10L-28R also has PAPI systems on each runway end.

Table 1-3
Runway/Airfield Data

	10R-28L	10L-28R	18-36
Design Critical Aircraft	Cessna Citation III	Cessna Citation III	Beech Baron 58
Runway Length (ft)	5,000	3,900	2,691
Runway Width (ft)	100	75	75
Runway Surface	Asphalt	Asphalt	Asphalt
Runway Load Bearing Strength (lbs)			
Single Wheel Loading (SWL)	37,500	30,000	12,500
Dual Wheel Loading (DWL)	60,000	--	—
Runway Lights	HIRL	MIRL	MIRL
Runway Markings	Precision Instrument	Non-Precision Instrument	Non-Precision Instrument
Visual Approach Aids	MALSR (10R) PAPI (10R & 28L) REIL (28L)	PAPI (10L & 29R)	VASI (18 & 36) REIL (18 & 36)
Instrument Approach Procedures	ILS or LOC(10R) RNAV GPS (28L) Copter ILS or LOC (10R) VOR (10R)	RNAV GPS (10L) RNAV GPS (28R)	RNAV GPS (36) VOR (36)*
Other	Air Traffic Control Tower, VOR facility, ASOS, Lighted Windcone, Lighted Beacon		

* The VOR approach to Runway 36 will be decommissioned in February 2010.

En route NAVAIDS utilize ground-based transmission facilities to provide navigational fix information to properly-equipped aircraft. There is one Very High Frequency Omni-Directional Range (VOR) station located on the Airport called Flying Cloud VOR. A VOR transmits radio signals 360 degrees in azimuth on a designated frequency. This information provides a tool for pilots to navigate point-to-point within the National Airspace System (NAS). This is particularly useful for low altitude and high altitude airway vectoring through the airspace surrounding the airport, as well as transition navigation into or out of the en route airspace structure at Flying Cloud Airport. In addition to providing en-route navigational assistance to aircraft, VORs also allow for non-precision approaches thereby enhancing the capability of the airport. Flying Cloud Airport has five published non-precision instrument approaches to the airport [RNAV (GPS) and VOR].

There is a precision instrument approach at the airport. Navigation aids for these systems include a glide slope and localizer with distance measuring equipment (DME). Runway 10R has an ILS or LOC approach with ½ mile visibility minimums. There is also a published precision instrument approach procedure for helicopters with visibility minimums of ¼ mile. See section 1.3.6 for more information on the approaches procedures.

In 1999, MAC updated the designations for both runways due to the shift in magnetic declination. Runways 09L-27R and 09R-27L became Runways 10L-28R and 10R-28L. Lastly, the airport has a lighted airfield beacon and a lighted windcone.

1.3.3 Airspace Management System

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

1.3.4 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. The Flying Cloud Airport is located in what is considered Class D controlled airspace when the Air Traffic Control Tower is open (7:00 am to 10:00 pm April through October and 7:00 am to 9:00 pm November through March) 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 1-9). The purpose of the ATCT is to sequence arriving and departing aircraft and direct aircraft on the ground. Aircraft operating within this area are required to maintain radio communication with the ATCT. It is normally a circular area with a radius of five miles around the airport and extends upward from the surface to about 2,500 feet AGL. The ceiling elevation of Flying Cloud's Class D airspace is 3,400 feet MSL (2,494 feet above the airport elevation of 906 feet).

When the ATCT is not open at Flying Cloud, 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 above ground level (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 typically extends to 18,000 feet mean sea level (MSL) and generally fills in the gaps between other classes of airspace in the United States. At FCM, Class E airspace extends from the surface up to the base of the MSP Class B airspace when the ATCT is closed.

The Flying Cloud Airport also 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 8,000 feet MSL. There are very specific operating instructions and rules pilots must follow when flying within this airspace. Flying Cloud Airport lies under the area where the floor elevation is 3,000 feet MSL. As long as pilots stay below 3,000 feet they remain outside this MSP airspace.

1.3.5 Delegation of Air Traffic Control Responsibilities

Flying Cloud Airport 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 Flying Cloud 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.

1.3.6 Approach Procedures and Traffic Patterns

There are two different types of flight rules set out in Federal Aviation Regulations (FAR) Part 91. Visual Flight Rules (VFR) applies 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.

The local traffic pattern altitude is 1,906 feet MSL (1,000 feet above the airport elevation). All the runways, except 10R and 28R follow standard left traffic pattern all of the time. Runways 10R and 28R use right traffic pattern when the ATCT is open. The ATCT directs runway use when winds are calm (less than 5 knots). Runway 10L-28R is closed when the ATCT is closed.

Aircraft with IFR instrumentation can utilize established approach procedures at the Flying Cloud Airport. IFR flight rules have specific departure and arrival instructions, flight routing, altitude assignment, and communication procedures that are required. As stated, it allows a pilot to operate in controlled airspace and in poor weather at appropriately-equipped airport facilities such as Flying Cloud. There is one precision instrument approach procedure and five non-precision instrument approach procedures established for Flying Cloud Airport. The ILS or LOC RWY 10R, RNAV (GPS) 10L, RNAV (GPS) RWY 28L, RNAV (GPS) RWY 28R, RNAV (GPS) RWY 36, VOR RWY 10R and VOR RWY 36 approaches are shown on Figures 1-10 to 1-16, respectively. There is also an instrument approach for helicopters COPTER ILS or LOC RWY 10R shown on Figure 1-17.

Upon commissioning and charting of the new VOR facility, currently scheduled for February 2010, the VOR approach to Runway 36 will be decommissioned and no longer available. This is due to the location of the new VOR facility.

1.3.7 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 1-18.) 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 and disposition of obstructions. Critical obstructions are also shown on the approach procedures for the airport.

1.3.8 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 10R falls under the approach visibility minimums category lower than ¾ mile for all aircraft type. Runways 28L, 10L and 28R fall under visual and not lower than one mile for aircraft approach category A & B and Runways 18 and 36 fall under visual for small aircraft exclusively (utility runway). The existing recommended standard RPZ dimensions at Flying Cloud Airport are shown on Table 1-4.

Table 1-4
Runway Protection Zone Dimensions

Runway	RPZ Dimensions (ft)
10R	1,000 x 2,500 x 1,750
28L	500 x 1,000 x 700
10L	500 x 1,000 x 700
28R	500 x 1,000 x 700
18	250 x 1,000 x 450
36	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.

More information on Land Use, Development Plans and Zoning can be found in Chapter 1, Section 1.7 and in Chapter 6 – Land Use Compatibility. The RPZs and State Safety Zones for the existing airfield configuration at Flying Cloud Airport are shown in Figure 6-1. A discussion on the State Safety Zones and the zoning effort for the airport is included in Section 6.2.2.2.

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)

FCM currently has six full service fixed base operators (FBOs), and another three commercial operators with specialized leases. Table 1-5 indicates their airfield locations and the services they provide to their customers and clients.

The FBOs provide indoor and outdoor storage for aircraft. While they may park aircraft outside on occasion if necessary, 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.

1.4.2 Hangar Storage Areas

The Flying Cloud Airport has numerous hangar storage areas around the airport that are not a part of existing FBO facilities. (See Figures 1-19 through 1-23.) The southeast hangar area was the first constructed, followed by the remaining south-southeast area where the air traffic control tower is located. After that, the north side filled in as the east-west runways were constructed. The FBOs and storage hangars are spread fairly evenly throughout the hangar areas.

The south hangar area was constructed in 2009, as recommended in the previous long term comprehensive plan. This building area layout has changed from previous years based on the then-current assumptions for hangar needs. It is currently designed for mostly corporate jet storage. This is due to the on-going decline of general aviation, but growing trend of jet and very-light-jet usage as discussed in Chapter 2 of this report. With the relocation of the VOR facility, there is also an expansion area available for FBO development if desired. However, no aircraft spaces (indoor or outdoor) have been allotted for such FBO development.

Table 1-5
Fixed Base Operators

FBO Name	Airport Building Area Location	Services	Fuel Type
ASI Jet Center	Northwest	Fueling, maintenance, aircraft storage and line service, flight training, aircraft management, charter and sales, aviation parts, avionics, pilot accessory sales	100 LL Jet A
Elliott Aviation	Northeast	Fueling, maintenance, aircraft storage and line service, aircraft management, charter and sales, aviation parts, avionics, pilot accessory sales	100 LL Jet A
Executive Aviation	Southeast	Fueling, maintenance, aircraft storage and line service, aircraft management, charter leasing and sales, pilot accessory sales	100 LL Jet A
Hummingbird Helicopters	Northeast	Fueling, maintenance, aircraft storage and line service, flight training, aircraft charter, aerial surveys, pilot accessory sales	100 LL
Modern Aero	Northwest	Fueling, maintenance, aircraft storage and line service, flight training, avionics repair and sales, pilot accessory sales	100 LL
Thunderbird	North Central	Fueling, maintenance, aircraft storage and line service, flight training, aircraft charter and sales, air tours, pilot accessory sales	100 LL Jet A
Airovation	Northwest	Aircraft interior restyling	N/A
Larry Degner	Northwest	Office rental	N/A
PlaneSmith Aircraft Sales	North	Aircraft sales and brokerage services	N/A

Source: MAC lease documents

Table 1-6
FBO Storage Areas

FBO	Estimated Number of Indoor Spaces	Estimated Number of Outdoor Spaces
ASI Jet Center	40	27
Elliott Aviation	37	27
Executive Aviation	27	23
Hummingbird Helicopters	14	16
Modern Aero	7	10
Thunderbird	20	20
TOTAL	145	123

Source: Estimated by MAC Airport Managers

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, but 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 choice for how many aircraft to 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. The total number of indoor spaces equates to 508 after discounting for single use in larger hangars. When added to the estimated 123 outdoor spaces available at the FBOs, the total number of spaces at FCM equals 631. This number is not much higher than the 626 spaces estimated in 2006 as part of a study completed for the Crystal Airport in which landside capacity calculations were completed for all the Reliever Airports. The current calculation is a better representation of existing hangars and incorporates recent changes on the airfield that have changed the maximum number of aircraft. MAC is seeing tenants more interested in demolishing older T-hangars and replacing them with single or double aircraft conventional hangars. The number of aircraft that could possibly be housed in the new south hangar area has been estimated and is included in the summary below. At the time of writing this report, construction of the area was just completing, so no hangars have been constructed in this area yet.

Table 1-7
Indoor Aircraft Storage Summary

	Number of Buildings	Number of Spaces	Discount Percent	Subtracted Spaces	Total Spaces
ALL HANGAR AREAS					
T-Hangars	43	197	2%	4	193
Single Conventional	27	27	2%	1	26
Double Conventional	28	56	10%	5	51
Triple or More Conv.	35	120	10%	12	108
FBOs	22	145	10%	15	130
TOTAL	155	545		37	508

Source: MAC visual survey and review of aerial maps; includes estimated spaces for new south hangar area that are not yet constructed.

1.4.4 Maintenance and Equipment Areas

MAC owns two maintenance and equipment storage buildings at FCM. One building is connected to the Air Traffic Control Tower building. This combined building is split between the FAA and MAC. MAC previously utilized a small office within this building, however, the FAA has recently taken back the space for their own use. MAC currently has no functional office space for the maintenance crew or airport manager.

The second maintenance building is located just across a parking area from the ATCT. This building contains a restroom and a shower facility for the crew. These buildings hold equipment, parts, and snow management materials. There is a diesel tank in the vicinity of the maintenance building for MAC use only. There is also a contained recycling area for airport tenants to dispose of used aircraft oil.

1.4.5 Roadway Access

The airport is located in Hennepin County, in the south central area of the City of Eden Prairie. It can be accessed from Flying Cloud Drive (former Trunk Highway 212), and County-State-Aid-Highway 1, also known as Pioneer Trail. The airport lies southwest of Interstate 494, south of Trunk Highway 5, and just west of Trunk Highway 169. County Road 4 (Spring Road) and Eden Prairie Road bound portions of the airport on the west. The airport sits adjacent to the Minnesota River, which borders the airfield on the south.   Hangar areas have access to these adjoining roadways.

1.4.6 Vehicle Parking Areas

Each FBO has parking for their customers. The number varies for each facility. There are no public parking spaces available at the airport aside from people visiting the FBO facilities. A small parking area is located at the base of the ATCT for FAA and MAC use. The aviation school has a large parking area for students and staff.

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 Minnegasco provides natural gas. Xcel provides electric service to the airport, and Comcast serves tenants with cable.

The City of Eden Prairie provides emergency services for the Airport, including police, fire and rescue. This is achieved through an agreement between MAC and the city.

1.5.2 Drainage and Water Quality

The Flying Cloud Airport is located on former farmland. According to Hennepin County soil surveys, soils on site are considered mainly Eden Prairie sandy loam categorized as Hydrologic Soil Group A. These soils have high infiltration rates even when thoroughly wetted, and consist chiefly of deep, well to excessively drained sands and/or gravel. These soils have a high rate of water transmission and result in low runoff potential.

The airport site drains primarily to the south, but a small portion drains to the north. Most of the airfield drainage infiltrates into the ground or is routed into ditches. These ditches outlet into infiltration basins. Approximately 96% of the airfield drainage is routed to infiltration basins. Only a small portion is routed to the north into the drainage conveyance for Pioneer Trail. Figure 1-24 shows the general airport drainage patterns.

The airport property and land acquired for the runway extensions and new south hangar area were field reviewed in their entirety as part of the 2008 Federal/State Environmental Impact Statement (EIS) and found to encompass no jurisdictional wetland that would be regulated under state or federal law, no non-jurisdictional wetland or water of the United States or any other wetland. Storm water ponding facilities on the airport were reviewed and found to lie in areas that lacked hydric soils under natural conditions. The National Wetland Inventory (NWI) shows a paulustrine emergent/seasonally flooded (PEMC) wetland off the west end of Runway 10R-28L; however, no wetland was found in this location when field reviewed. Accordingly, the Lower Minnesota River Watershed District (LMRWD) issued a Wetland Conservation Act (WCA) certificate exemption for impacts to storm water ponds to be affected by the airport project. Similarly, the U.S. Army Corps of Engineers provided written concurrence that the airport property encompasses no waters of the Untied States that would be regulated under the Clean Water Act.

The EIS process referenced in the previous paragraph identified only one small designated flood plain area on airport property. This floodplain area is located within the Runway 18-36 RPZ north of Pioneer Trail. A series of infiltration basins exist there to capture drainage prior it to flowing overland down the bluff to Staring Lake.

MAC maintains a Storm Water Spill Pollution Prevention Plan (SWPP) and a Spill Prevention Control and Countermeasure Plan (SPCC) for MAC-owned facilities at the Airport. The 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 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 SWPP 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 very little to no aircraft deicing at Flying Cloud. Most aircraft can be stored inside or in heated hangars prior to takeoff or cannot fly when icing conditions exist, which eliminates the need for glycol use. MAC may use some amount 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, and as supported in the EIS document referenced above, the potential impact on water quality from the airport is minimal.

1.5.3 Sanitary Sewer and Water

The majority of the Flying Cloud Airport is now served with sanitary sewer and water. Two major projects completed in 2002 and in 2008 completed the service to and around the airport. Figure 1-25 identifies the main sewer and water locations, but not each and every service line or connection. There are a few localized areas within the airport where only cold storage hangars exist that do not have the ability to connect at the present time. The new south hangar area will be served with sanitary sewer and water in its entirety as the area develops with hangar construction. The water service to the hangars also includes numerous hydrants for fire protection. The City of Eden Prairie maintains the system, and tenants are responsible for connecting, repairing their own connections and for payment to the City. MAC owned maintenance facilities and the FAA air traffic control tower are all connected to the services, and payments are made by each respective agency.

Existing tenants that have legal wells and septic holding tanks have been allowed to keep them in past years. Tenants with illegal sandpoint wells or drain fields were required to remove or abandon them after MAC adopted its Sanitary Sewer and Water Policy in 1998, and subsequent revision in October 2000. Consistent with that policy, no new wells or holding tanks have been allowed at the airport. Now that services are available, MAC policy allows tenants 24 months to abandon compliant private systems and connect to the new sanitary sewer and water system. MAC is working with tenants and commercial operators to get their connections completed.

1.6 Meteorological Data

The Flying Cloud 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 northwest corner of the airport near the athletic fields (see Figure 1-19). 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 in general 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 these types of conflicts through the use of zoning regulations that disallow certain types of nearby development.

The City has a well-established review process that requires all applications for development be reviewed by MAC and the FAA 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.

Land uses around the airport vary. There are many residential areas not far from the airport boundary. MAC acquired numerous homesteads within the runway approach areas on the west side of the airport as a part of the recent airport expansion to prevent non-compatible residential development within the RPZs or proposed state safety zone areas. Across Pioneer Trail to the north there exists a large City park area, and the City leases a portion of airport property for the use of athletic fields. A closed landfill area is located south-southeast. There are also some agricultural areas spread around the airport, however, many of these have been eliminated as part of the runway extension and new south hangar area.

A more in-depth discussion and figures showing the land uses are included in Chapter 6 of this report.

1.8 Area Socioeconomic Data

The reliever airport system owned and operated by MAC includes the Flying Cloud 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 Flying Cloud contributes more than $80 million per year to the local economy and supports 777 jobs. This includes on-airport services, fuel sales, and visitor spending in the community.

1.9 Historic Airport Activity

Aircraft based at and using the Flying Cloud Airport include single engine, twin-engine piston and turbo props, small business jets, and helicopters. There are no military aircraft based at the airport, but they may fly in on occasion to complete training operations. It is assumed that flights in and out of Flying Cloud 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 336 single engine planes (80%), 37 multi-engine piston aircraft/light twins (9%), 20 turboprops (5%), five helicopters (1%), and 23 jets (5%).

In recent years, the activity at the airport has been declining. This is due to the overall downward trend in aviation since 9-11, primarily in general aviation. It is assumed that the majority of single engine operations are recreational. While single engine aircraft operations are forecasted to continue declining, jet operations are anticipated to increase at the airport over time. 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 Flying Cloud Airport (FCM). 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 Flying Cloud 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 airport.

2.1 Aircraft Fleet Mix and Based Aircraft Forecasts

The number of based aircraft at the Flying Cloud Airport is expected to gradually decline from 421 in 2007 to 401 in 2025. Microjets and other jets based at the airport are expected to increase over the forecast period. Microjets are forecast to increase from 0 in 2007 to 20 in 2025 and other jets from 23 in 2007 to 40 in 2025. The number of turboprop aircraft is expected to remain steady and the number of helicopters is projected to increase.

Most of the decline of based aircraft occurs in the piston engine category. Single-engine piston based aircraft decline from 336 in 2007 to 286 in 2025, and multi-engine piston based aircraft decline from 37 in 2007 to 27 in 2025. FCM is located in Hennepin County, which is projected to be one of the slower growing counties. This is a driving factor in the expected decrease in based aircraft.

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

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's 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 (VFR). 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	336	326	310	296	286	-0.8%
Multi Engine Piston	37	36	32	29	27	-1.6%
Turboprop	20	21	20	20	20	0%
Microjets (VLJs)	0	3	8	15	20	(b)
Other Jets	23	27	34	38	40	2.8%
Helicopter	5	7	7	8	8	2.4%
Other (a)	0	0	0	0	0	0%
TOTAL	421	420	411	406	401	-0.2%

(a) Balloons, gliders, and ultralight aircraft.
(b) VLJ growth rates are not shown because with such small base year numbers, the annual percentage growth rate is very high and likely not representative of long term growth percentages.
Source: Appendix A – HNTB Activity Forecasts Technical Report, Table 7, 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 Flying Cloud. The FAA projects average aircraft utilization to increase as a result of increased flying by business and corporate users.

Table 2-2
Aircraft Operations Forecast Summary

	2007	2010	2015	2020	2025
Single Engine Piston	96,356	70,740	65,531	67,319	70,455
Multi Engine Piston	13,648	10,788	8,345	7,714	7,656
Turboprop	5,926	5,283	4,941	4,858	4,842
Microjets (VLJs)	4	2,631	6,763	12,610	16,682
Other Jets	3,530	3,567	5,058	6,019	6,629
Helicopter	5,104	6,531	6,516	7,510	7,613
Other (a)	0	0	0	0	0
TOTAL	124,569	99,540	97,154	106,030	113,876

(a) Balloons, gliders, and ultralight aircraft.
Source: Appendix A – HNTB Activity Forecasts Technical Report, Table 10, April 2009.

Operations at Flying Cloud are forecast to decrease from 124,569 in 2007 to 97,154 in 2015 and then increase to 113,876 by 2025. Decreases are projected among single- and multi-engine piston and turboprop categories. Substantial increases are projected in microjets and other jets. By 2025, these two categories are projected to account for just over 20 percent of total operations at Flying Cloud, compared to about 3 percent currently.

The revised 2009 FAA forecasts, published about the end of April 2009, have taken note of recent changes in the 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's quite 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.

2.3 Peak Activity Forecasts

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

Peak activity forecasts for Flying Cloud Airport were estimated from FAA air traffic control tower records. Peak hour operations were assumed to be 12.7 percent of ADPM operations, consistent with the assumptions in the previous Flying Cloud Airport LTCP update from 1998. The peak month for the airport is July, and ADPM operations were estimated by dividing by 31 days. Peak hour operations at Flying Cloud are projected to decrease from 55 in 2007 to 43 in 2015 and then increase to 50 in 2025.

Table 2-3
Peak Activity Forecast Summary

	2007	2010	2015	2020	2025
Annual Operations (a)	124,569	99,540	97,154	106,030	113,876
Peak Month Operations (b)	13,424	10,727	10,470	11,426	12,272
ADPM Operations (c)	433	346	338	369	396
Peak Hour Operations (d)	55	44	43	47	50

(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 (July) operations divided by 31 days.
(d) Assumed to be 12.7 percent of ADPM operations based on the 1991 Flying Cloud Airport LTCP.
Source: Appendix A – Activity Forecasts Technical Report, Table 13, 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 Flying Cloud, 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 (OMB) (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 Flying Cloud Airport. By 2025, the number of based aircraft is 13 percent higher than under the base case and the number of jets is 18 percent higher. By 2025, total annual operations would be 38 percent higher than under the base case. Of these operations, almost 20 percent would be jets, mostly microjets.

Table 2-4
High Forecast Scenario

	2007	2010	2015	2020	2025
BASED AIRCRAFT SUMMARY					
Single Engine Piston	336	331	325	319	321
Multi Engine Piston	37	37	33	31	28
Turboprop	20	20	22	23	24
Microjets (VLJs)	0	3	10	18	23
Other Jets	23	28	38	43	48
Helicopter	5	7	7	8	8
Other (a)	0	0	0	0	0
TOTAL	421	426	435	442	452
AIRCRAFT OPERATIONS SUMMARY					
Single Engine Piston	96,356	93,883	92,638	95,448	101,667
Multi Engine Piston	13,648	13,422	10,768	10,265	9,871
Turboprop	5,926	5,915	6,444	6,479	6,639
Microjets (VLJs)	4	3,085	9,948	17,697	22,435
Other Jets	3,530	4,186	6,347	7,484	8,636
Helicopter	5,104	6,952	6,917	7,900	7,956
Other (a)	0	0	0	0	0
TOTAL	124,569	127,443	133,062	145,273	157,204

(a) Balloons, gliders, and ultralight aircraft.
Source: Appendix A – Activity Forecasts Technical Report, Table 16, 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 Flying Cloud Airport is presented in Table 2-5. Microjet and other jet based aircraft categories would be expected to increase, and there would be a decline in fixed-wing piston powered aircraft. Total based aircraft in 2025 would be almost 12 percent lower than under the base case. Total operations would be 31 percent lower than under the base case, and jets would account for 22 percent of the total.

Table 2-5
Low Forecast Scenario

	2007	2010	2015	2020	2025
BASED AIRCRAFT SUMMARY					
Single Engine Piston	336	324	299	273	256
Multi Engine Piston	37	36	32	28	25
Turboprop	20	20	19	18	18
Microjets (VLJs)	0	2	7	12	14
Other Jets	23	27	31	34	34
Helicopter	5	7	7	7	7
Other (a)	0	0	0	0	0
TOTAL	421	416	395	372	354
AIRCRAFT OPERATIONS SUMMARY					
Single Engine Piston	96,356	46,894	43,334	43,895	46,077
Multi Engine Piston	13,648	8,242	6,448	5,816	5,590
Turboprop	5,926	3,977	3,827	3,664	3,737
Microjets (VLJs)	4	1,764	6,056	10,376	12,038
Other Jets	3,530	2,979	4,022	4,827	5,149
Helicopter	5,104	5,901	6,023	6,198	6,352
Other (a)	0	0	0	0	0
TOTAL	124,569	69,757	69,710	74,776	78,944

(a) Balloons, gliders, and ultralight aircraft.
Source: Appendix A – Activity Forecasts Technical Report, Table 19, April 2009.

2.5 Summary

The base case forecasts project a moderate decrease in based aircraft at Flying Cloud 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

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 the Airport is “B”. Typical aircraft in this aircraft approach category are the Beechcraft Baron, Raytheon Beechcraft King Air and Cessna Citation Jets (see Figure 3-1). Given that the role of the airport and types of aircraft operating are not anticipated to change over the forecast period, the plan recommends the criteria associated with category “B” aircraft continue to be applied. See Table 3-1.

3.1.3 Airplane Design Group

The current airplane design group applied to the Airport is group II. This means that the airport is designed to accommodate aircraft with wingspans less than 79 feet. Aircraft that fall into this category include most single engine and twin piston aircraft, the Raytheon Beechcraft King Air and smaller business and corporate jets such as the Cessna Citation II, III, IV and V. Table 3-2 shows the thresholds for the airplane design groups.

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.

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 also 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 Flying Cloud 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 winds 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 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 10R-28L & 10L-28R	Rwy 18-36	All Runways
10.5	A-I and B-I	90.21%	89.95%	99.01%
13	A-II and B-II	94.89%	94.51%	99.80%
16	A-III, B-III, and C-I through D-III	98.86%	98.38%	99.97%

Source: NOAA National Data Center, US Department of Commerce, Minneapolis Flying Cloud Station (WMO: 72657), 01/01/96 to 12/31/05.

Runway 10R has a precision and non-precision instrument approach. Runways 10L, 28R, 28L, and 36 all have non-precision instrument approaches. These allow aircraft to land in a wider range of weather conditions. The data from the Flying Cloud ASOS indicates that weather conditions are below 1,000 feet ceilings and/or 3 mile visibility about 8% of the time. Weather data indicates that during instrument-flight-rule (IFR) conditions, Runway 10R/10L is favored.

Table 3-5
IFR Weather Wind Coverage

Wind Speed	Airport Reference Code	Rwy 10R-28L & 10L-28R	Rwy 18-36	All Runways
10.5	A-I and B-I	92.59%	89.61%	98.93%
13	A-II and B-II	96.20%	94.27%	99.75%
16	A-III, B-III, and C-I through D-III	99.17%	98.49%	99.94%

Source: NOAA National Data Center, US Department of Commerce, Minneapolis Flying Cloud Station (WMO: 72657), 01/01/96 to 12/31/05.

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 Flying Cloud Airport, the mean maximum temperature of the hottest month (July) is 84.0 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 various factors, including prevailing winds and associated orientation of runways, number of runways, taxiway system, fleet mix, operational characteristics of based aircraft and weather conditions.

Flying Cloud Airport's ASV is currently calculated to be 355,000, which is well above its current and projected (2025) annual operations of 124,569 and 113,876 respectively. It is also well above the high scenario 2025 year forecast of 157,204 annual operations. From the FAA Advisory Circular 150/5060-5 (Airport Capacity and Delay), Flying Cloud Airport's average hourly capacity was estimated to be 197 operations during VFR conditions and 59 operations during IFR conditions. Peak activity forecasts show 50 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	124,569	355,000	35.1	55	197	27.9
2010	99,540	355,000	28.0	44	197	22.3
2015	97,154	355,000	27.4	43	197	21.8
2020	106,030	355,000	29.9	47	197	23.9
2025	113,876	355,000	32.1	50	197	25.4

Note: This table assumes that the parallel runways can be used simultaneously by single/multi-engine aircraft during VFR conditions.

Flying Cloud 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's 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 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 the Airplane Weight Category over 12,500 pounds but less than 60,000 pounds is the critical group for the airport. Under this weight range, one of two "percentage of fleet" categories can be used (75 percent or 100 percent). The 75% of fleet was used for this analysis. Typical aircraft are the Cessna Citation I, II, and III, the Learjet 35 and 45 and the Falcon 10 and 20. A complete list of the aircraft that make up this category can be found in the Advisory Circular, page 14, Table 3-1.

Figure 3-1 of the advisory circular was used to calculate runway length requirements. The calculations consider airport elevation above mean sea level, mean daily maximum temperature of the hottest month and critical design aircraft.

Based on the above analysis, to accommodate 75 percent of the fleet at 60% useful load, the runway length should be approximately 5,500 feet (adjusted for wet and slippery conditions). To accommodate 75 percent of the fleet at 90% useful load, the runway length should be approximately 7,000 feet long (adjusted for wet and slippery conditions).

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

Based on the above criteria, the category of large airplanes of 60,000 pounds or less is the critical grouping of aircraft for the Flying Cloud Airport since aircraft of this category will fly in and out of the airport more than 500 times per year; the runway length should be approximately 5,460 feet to accommodate 75 percent of these aircraft at 60% useful load and 7,000 feet to accommodate 75 percent of these aircraft at 90% useful load (each noted by a * in Table 3-7).

Table 3-7
Recommended Runway Lengths

AIRPORT AND RUNWAY DATA	
Airport elevation	906 feet
Mean daily maximum temperature of the hottest month	84.0 F.
Maximum difference in runway centerline elevation	7 feet
Length of haul for airplanes of more than 60,000 pounds	500 miles

Table 3-7 continued

RUNWAY LENGTHS RECOMMENDED FOR AIRPORT DESIGN (for wet and slippery runways)	
Small airplanes with approach speeds of less than 30 knots	330 feet
Small airplanes with approach speeds of less than 50 knots	870 feet
Small airplanes with less than 10 passenger seats 75 percent of these small airplanes 95 percent of these small airplanes 100 percent of these small airplanes	 2,760 feet 3,280 feet 3,890 feet
Small airplanes with 10 or more passenger seats	4,340 feet
Large airplanes of 60,000 pounds or less 75 percent of these large airplanes at 60 percent useful load 75 percent of these large airplanes at 90 percent useful load 100 percent of these large airplanes at 60 percent useful load 100 percent of these large airplanes at 90 percent useful load	 *5,460 feet *7,000 feet 5,510 feet 8,240 feet
Airplanes of more than 60,000 pounds	Approximately 5,330 feet

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

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 Flying Cloud Airport, the crosswind runway should be designed to accommodate smaller aircraft than the primary runway and therefore the recommended length of the crosswind runway is 2,760' to accommodate 75% of these small aircraft up to 3,890' to accommodate 100% of them.

3.2.3 Runway Orientation and Separation

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. This is not always achievable. In cases where this cannot be done, 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. The runways are oriented to achieve the necessary wind coverage for the design aircraft, and a crosswind runway exists to provide coverage for smaller aircraft.

The parallel runways are 500 feet apart. This is less than the minimum separation of 700 feet for simultaneous landings and take-offs under Visual Flight Rules. Single engine or multi-engine aircraft landing or departing on the parallel runways can operate simultaneously during VFR conditions, but jet operations must to be staggered. Order JO 7110.65S, Air Traffic Control which describes ATC procedures, says the during simultaneous same direction operation under VFR conditions, the minimum distance between parallel runways is 300 feet for lightweight, single-engine propeller driven aircraft, 500 feet for twin-engine propeller driven aircraft and 700 feet for all others (TBL 3-8-1 of the JO).

3.2.4 Runway Width and Shoulders

The FAA establishes 75 feet as the required width for a runway supporting B-II ARC with visibility minimums not lower than ¾ miles and 100 feet for lower than ¾ mile. Runway 10R-28L is 100' wide and Runways 10L-28R and 18-36 are 75' 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 B-II ARC, the required shoulder width is 10 feet. The airport meets this requirement.

3.2.5 Runway Safety and Object Free Areas

The Runway Safety Area (RSA) for Runway 10R-28L at Flying Cloud meets FAA requirements for ARC II with ½ mile visibility minimums (600 feet beyond the runway end, and 300 feet wide). The RSA for Runway 10L-28R meets FAA requirements for ARC-II with 1 mile visibility minimums (300 feet beyond the runway end, and 150 feet wide). For Runway 18-36, the RSA is 120 feet wide and extends 240 feet beyond the Runway 18 end but only 204 feet beyond the Runway 36 end. This is deficient by 36 feet. This will be addressed in the next chapter.

The Runway Object Free Area (ROFA) is centered on the runway centerline and should be clear of any above ground objects protruding into the runway safety area edge elevation. The only exception to this rule is related to objects necessary for air navigation or aircraft ground movement. The standard ROFA extends 600 feet beyond the runway end and is 800 feet wide for Runway 10R-28L, is 500 feet wide and extends 300 feet beyond the end of Runway 10L-28R, and it is 250 feet wide and extends 240 feet beyond the end of Runway 18-36. There is an airport service road which goes through the Runway 28L OFA. MAC has requested a modification to standards and FAA approval is pending. The ROFA is deficient by 63 feet off the end of Runway 36 due to a fence and a public road. This will be addressed in the next chapter.

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 Flying Cloud, it is 400 feet wide for Runways 10R-28L and 10L-28R and 250 feet wide for Runway 18-36. All runways meet FAA requirements for OFZ dimensions.

3.2.6 Taxiway Requirements

The Airport Design Group (ADG) II criteria for taxiway width is 35 feet. The parallel taxiways and all connector taxiways are currently 40 feet wide. For ADG II aircraft, the recommended runway centerline-to-taxiway centerline separation is 300 feet for approach minimums less than ¾ mile and 240 feet for approach minimums not lower than ¾ mile. For Runway 10R-28L, the parallel taxiway separation distance is 400 feet. Runway-taxiway separation for Runway 10L-28R and Runway 18-36 is 250 feet.

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 proposed future parallel taxiway extensions.

Paved or stabilized shoulders are recommended along taxiways. ADG II aircraft would require 10 foot shoulders. Flying Cloud has 10-foot wide turf shoulders on its taxiways.

The Taxiway Object Free Area (OFA) width for ADG II aircraft is 131 feet, which is met for all taxiways except Taxiway A and a small area near the end of Runway 36. There are numerous hangars within the area along the taxiway. The ALP shows these hangars ultimately being removed.

The FAA-recommended taxilane OFA width is 115 feet for B-II airports. Any new hangar areas should be designed to meet this standard. Many of the existing taxilanes do not meet this standard for B-II aircraft. 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. Based upon this calculation, the taxilanes in the north building area are designed for wingspan group I aircraft (wingspan less than 49'). Most of the aircraft that use those hangars are wingspan group I. The group II aircraft using the airport likely are hangared at FBO facilities or other areas where the adequate taxilane OFA is provided.

3.3 Landside Requirements

3.3.1 Hangar Facilities

The Flying Cloud Airport, like all of the MAC airports, has a wide variety of hangar sizes and hangar ages. In recent years, MAC has tried to standardize the size of hangars within new hangar areas at any of the Reliever Airports. However, aircraft also come in many different sizes, and trying to accommodate everyone leads to variability. As shown in Chapter 1, the airport is estimated to have 508 indoor aircraft storage spaces, including the estimated number of available spaces when hangars are constructed in the new south building area. This number includes an assumption that most airport tenants sublease extra space for additional aircraft within their hangars, but also 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. However, it is feasible that a tenant that owns a 3,600 square foot hangar and two aircraft can sell the hangar to a person who owns only one aircraft. That new tenant then would be allowed to sublet his extra space to house a second aircraft if they so choose.

3.3.2 Fixed Base Operators (FBOs)

At this time no additional space is needed for an FBO. MAC is prepared to reserve space in the proposed south building area since it could easily accommodate an FBO. Currently, however, there is not enough air traffic or business to support more than the existing FBO facilities at the airport.

3.3.3 Airport Access, Roadway Circulation and Parking

Airport access is currently being enhanced by the expansion and widening of County State Aid Highway CSAH 1 (Pioneer Trail) along the northern border of the airport. The project includes wider airport entrances and turn lanes for safer vehicle movements. In the early 2000’s, the City of Eden Prairie completed numerous roadway improvements on the west and south sides of the airport, including reconstruction of CSAH 4/Spring Road and construction of the new Charlson Road (now named Robinson Way). These are primary access corridors for tenants utilizing the airport. The former Trunk Highway 212, now known only as Flying Cloud Drive, also provides access to the airport from the south, and from the east as well.

Combined with the construction of the extended east-west runways is the construction of two airport perimeter roads. One road connects the very east end of the north building area with the southeast hangar area. This road will allow airport maintenance and airport fuel trucks to access the building areas without crossing runway pavements. The same is true for the new west perimeter road, which will connect the west end of the north hangar area to the new south building area.

The existing FBO facilities maintain parking areas for their customers and employees. There is also parking located at the air traffic control tower for FAA employees. The aviation school has a large parking area for students and staff. The MAC maintenance facility includes a few parking areas for visitors and MAC staff.

No additional parking needs have been identified.

3.3.4 Maintenance and Fuel Storage Areas

There is currently no need for additional maintenance vehicle fueling areas. The expanded runway pavement length, taxiways, the new hangar area and perimeter roads have resulted in additional areas that require maintenance and snow plowing efforts. Existing maintenance facilities are undersized for the equipment needed for such activity. Also, airport staff have no office space available for their use. Further, the restroom facilities used jointly by MAC and FAA staff are old and undersized. MAC has identified a need for a new maintenance building for equipment storage, however, funding for a project has not been identified nor has it been listed in MAC's capital improvement program.

3.4 Lighting and Navigation Requirements

3.4.1 Runway and Taxiway Edge Lighting

Runway edge lights are used to outline the edges of runways during periods of reduced visibility or darkness. These light systems are classified according to the intensity they are capable of producing. The airfield modifications occurring with the east-west runway extensions include new runway and taxiway lighting where necessary. The new Taxiway B is lighted with LED blue taxiway lights as part of a sustainable environment initiative. Upgrades to Runway 18-36 lighting will take place when improvements are constructed (see Chapter 4).

3.4.2 Taxiway Guidance Signs

For many years the Flying Cloud Airport has maintained taxiway guidance signs. These signs have been upgraded and modified with the runway extension projects, and assist pilots in way-finding around the airport.

3.4.3 Runway Guard Lights

As part of the on-going airport improvements and runway extensions, runway guard lights will be installed at almost all runway-taxiway intersections. These lights consist of two alternating flashing yellow lights, also called wig-wag lights. The guard lights will be co-located with the runway hold bars, and provide a round-the-clock lighted visual indication to pilots that they are approaching the runway environment.

Similar to the taxiway guidance signs, guard lights are not required by the FAA for the type of airport operations for which Flying Cloud is certified. However, both the guidance sign and guard light installations enhance operational movements around the airport and offer ways to reduce the potential for hazardous conflicts between aircraft or vehicles on the ground with aircraft operating on runway surfaces.

3.4.4 PAPI/VASI

Precision Approach Path Indicator (PAPI) and Visual Approach Slope Indicator (VASI) systems consist 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 5 miles during the day and up to 20 miles at night. Currently there is a PAPI system on Runway 10L and Runway 28R and on Runway 10R and 28L. VASI systems exist on both ends of Runway 18-36. The FAA owns and maintains the PAPI and VASI systems. It is likely that the VASIs on Runway 18-36 will be upgraded to PAPI system as a part of any proposed improvements to that runway (see Chapter 4).

3.4.4 Instrument Approach

As noted in the inventory, Runway 10R has an Instrument Landing System (ILS) with a MASLR approach lighting system. Runways 10L, 28L, 28R and 36 have GPS approaches. Additionally, Runway 10R and Runway 36 have a VOR approach. The existing end-fire glideslope antenna was relocated with the extension of Runway 10R-28L to 5,000 feet. The MALSR system was relocated/replaced along with the extension at that same time. The approach visibility is ½ mile with the relocated ILS system.

The existing airport VOR is being relocated as a part of the 2008-2009 airport improvements. The new location is less than one-half mile away to the east. This existing VOR supports two approaches to Flying

Cloud, but also supports more than 60 approaches to the Minneapolis – St. Paul International Airport (MSP). The relocation of the VOR results in numerous modifications to existing approach procedures. However, the new location will not allow for a VOR approach to Runway 36. That approach procedure will be decommissioned in February 2010. All other approaches to Flying Cloud will be maintained/upgraded with the VOR and ILS relocations.

3.4.5 FAA Owned ATCT and ASR

As noted in Chapter 1, the Flying Cloud Airport has an Air Traffic Control Tower (ATCT). It is located in the southeast building area (see Figure 1-22). This facility is owned and operated by the FAA. It was commissioned in 1963. Since that time, the FAA has replaced and upgraded equipment, but the structure is essentially the same.

The south hangar area lies between the existing ATCT and the extended Runway 10R end. Due to the existing location and height of the ATCT, there are significant height restrictions in the hangar area. The restrictions actually prevent the construction of hangars in some locations. Relocation of the ATCT would benefit both the FAA and MAC. A new ATCT would result in a new facility for the FAA, and could be positioned such that there are no longer height restrictions in the hangar area.

As noted in Chapter 7 and 8 regarding costs and implementation of such a project, relocation of the ATCT would require the cooperation and assistance of the FAA.

The Minneapolis – St. Paul International Airport (MSP) currently has an Airport Surveillance Radar (ASR). This radar provides the MSP ATCT with flight data for aircraft operating within the Twin Cities area. Due to recent development within the City of Bloomington and other construction within the vicinity of the radar, it is partially shadowed by structures. This results in portions of some approach paths not being “seen” by the radar. While the shadowing is nothing more than an inconvenience at this time, additional development is proposed which would more significantly block the signal.

The FAA is currently reviewing the justification and possibility of constructing a second ASR to provide additional and overlapping radar coverage. Potential sites have been identified at MSP and at FCM. MAC continues to discuss the process and status with the FAA.

3.5 Security Requirements

The airport has a full perimeter fence and gate system. The fence and gates have been maintained and upgraded over the years. Gates have historically been left open at the airport, but MAC is planning to close and lock gates on a permanent basis for safety and security purposes. To accomplish that, recent improvements to the gates include full power operation and telephone call boxes for controlled access into the airfield. Airport tenants can punch in a code to open the gates. Airport visitors can call a specific FBO business to get access to their facility.

3.6 Utility Requirements

In 2002, the first phase of sanitary sewer and water was installed at the airport. In 2008, the remaining hangar areas on the airport were served except for the new south hangar area. At this time, there is no demand or requirement for additional utilities to serve the airport. As MAC moves forward with leasing of space in the new south hangar area, MAC will also secure funding and proceed with the installation of services. Installation of utilities will also include electricity, telephone, natural gas, etc.

3.7 Obstruction Related Issues

Obstructions, if any, are typically analyzed when an Airport Layout Plan (ALP) is prepared. Upon completion of this comprehensive plan, the ALP for Flying Cloud will be updated. 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. Please note that the 2008-2009 airport improvements projects and the Hennepin County CSAH 1 project included the removal of many known obstructions around the airfield.

The most recently approved ALP for Flying Cloud identified obstructions (trees) north of Runway 18. MAC is in the process of locating and surveying these trees so the scope of removal can be determined.

Chapter 4 Alternatives and Plan Recommendations

In this chapter the different potential development options are analyzed for the airport. 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 LTCP process also received consideration.

4.1 Airport Expansion – Runways and Hangar Areas

The Flying Cloud Airport currently has three runways, as discussed in Chapter 1. Alternatives for airport runways can include additional runways at an airport or runway extensions, depending on existing needs, forecasts, and airfield capacity.

4.1.1 Additional Runways

As shown in the forecasts for 2007, the number of operations was 124,569. In Chapter 3, the maximum number of operations the airport can handle, the annual service volume, was identified as 355,000 operations based on the existing three runway configuration. Therefore, from an airside standpoint, the airport is currently at 35% capacity.

The baseline 2025 forecast number of operations is lower than 2007. Under the high scenario, the 157,204 forecasted number of operations in 2025 would result in 44% capacity. None of these figures trigger the need to study additional runways at FCM.

4.1.2 Runway Extensions

As identified in the Chapter 1 inventory, Runway 10R-28L was extended to 5,000 feet long in 2009; Runway 10L-28R is 3,900 feet long; and Runway 18-36 is currently 2,691 feet long. A runway length of 5,000 feet is the maximum allowed under Minnesota State law for a Minor Use Airport such as FCM.

Chapter 3, Section 3.2.2 discusses the FAA recommendations for runway length. A runway length of 5,000 feet accommodates all small aircraft weighing less than 12,500 pounds, and some of the large aircraft weighing less than 60,000 pounds. The parallel runway length of 3,900 feet also accommodates 100% of the small airplanes weighing less than 12,500 pounds. These figures are determined based on wet and slippery runway conditions, when more runway length is typically needed for operations.

The crosswind runway, 18-36, does not meet the recommended standard according to these tables. Also, as discussed in Chapter 3, Section 3.2.5, the runway safety area and runway object free area are deficient for the Runway 36 end. The alternatives reviewed for this LTCP update focus on this runway, and are discussed in Section 4.2.

4.1.3 Hangar Areas

The number of based aircraft registered for FCM in 2007 was 421 aircraft, as identified in the base year of the forecasts in Chapter 2. Chapter 3 indicated that there is an estimated 508 actual indoor hangar spaces at the airport, including the new south hangar area. This means the current landside use equates to about 83% of capacity.

According to the Chapter 2 forecasts, the number of based aircraft is anticipated to decline from 421 in 2007 to 420 in 2010, and down to 401 by 2025. This is due to the forecasted drop in operations by the single and multi-engine piston aircraft. Under the high forecast, the based aircraft would reach 452, or approximately 89% capacity.

The airport currently has enough hangar capacity available through the planning period.

Chapter 1 noted that some existing tenants are opting to demolish existing old T-hangars and build new individual hangars for themselves and to sell. MAC expects this trend may continue, and offers a way for new tenants to come to the airfield and house aircraft in privately owned hangars. The new south hangar area is designed to accommodate mostly corporate hangar sizes which cannot fit in the existing building areas even with redevelopment of existing hangar sites. Therefore, the airport is currently positioned very well to accommodate a variety of hangar needs.

4.2 Runway 18-36 Alternatives

An analysis of runway lengths and wind coverage needs was completed for a variety of aircraft known to use Runway 18-36. The need for a crosswind runway is easily justified by the existing wind coverage, especially for the smallest aircraft operating at the airport. Aircraft weighing less than 12,500 pounds are typically more susceptible to crosswind conditions.

As discussed in Chapter 3, the runway safety area (RSA) and runway object free area (OFA) for the Runway 36 end do not meet current FAA standards. The deficiency is approximately 63-feet; however, with some minor fence modifications, the deficiency can be reduced to 58-feet. In order for the FAA to provide federal funding for projects related to Runway 18-36, MAC must address the RSA and OFA issues.

The following alternatives address the RSA and OFA shortage. Costs for each alternative are shown in Chapter 7.

4.2.1 No Build Concept

A “no build” alternative would include no runway improvements and no changes to the airfield within the 20 year planning period. If a no-build alternative was selected for Runway 18-36, the only work that would occur within the planning period is the on-going required pavement maintenance. Runway 18-36 where it intersects with the parallel runways has been reconstructed in recent years as apart of the parallel runway extensions. The pavement at the south end of the runway, however, remains in poor condition. MAC continues to carry a reconstruction project for the south end of Runway 18-36 in the Capital Improvement Program to address the pavement conditions. As noted above, it is unlikely the FAA would fund such a reconstruction project unless the RSA and OFA deficiencies are addressed.

It recommended that the no-build alternative include no changes to Runway 18-36, but that reconstruction of the south end and construction of the north perimeter road be completed within the planning period.

A no-build alternative also does not address the RSA and OFA issues. Therefore, the no-build alternative does not meet the needs of the airport.

4.2.2 Shorten Runway 18-36

This alternative shortens the crosswind runway to create a compliant runway safety area (RSA) and object free area (OFA). The runway would be shortened by 58-feet. The current length is 2,691-feet; the ultimate length would be 2,633-feet. See Figure 4-1.

The change in runway length will require a change in the runway lighting locations. The runway end lights and runway end identifier lights (REILs) would need to be relocated. The existing taxiway connectors would be removed and reconstructed to match with the new runway end. The VASI system for Runway 36 would have to be upgraded to a PAPI and relocated as required by the new runway end location (the existing VASI system cannot be relocated).

In lieu of removing the runway pavement, MAC would pursue approval to leave the pavement in place but mark it as unusable by aircraft. Under this scenario, 58-feet of the runway pavement could not be used on a regular basis, but it would provide a paved section of runway safety area. The runway end lights would not be in-pavement lights so as to prevent any usage of the pavement except in an emergency.

As noted above, some minor modifications to the existing airport property fence can minimize the necessary runway reduction from 63-feet to only 58-feet.

The following summarizes the items to be considered with this alternative:

Alternative Includes:	• Removing 58 feet of pavement, or repainting 58 feet as unusable by aircraft; • Relocating the taxiway connectors to match the new Runway 36 end; • Runway light location adjustments for the new length; • Working with Hennepin County to gain a minor amount of right-of-way to relocate the airport fence; • Relocating the airport fence along Flying Cloud Drive.
Beneficial Considerations:	• Achieves a compliant RSA and OFA for Runway 36; • This is the lowest cost option aside from no-build; • The taxiway configurations remain standard at both ends of the runway; • No environmental process is required.
Negative Considerations:	• The runway length would be reduced by 58-feet; • The runway is already shorter than the recommended runway length for a crosswind runway.

This alternative clearly addresses the RSA and OFA issue. It does not, however, address the fact that the runway length does not meet the FAA-recommended length for the type of aircraft using the airport.

4.2.3 Shift Runway 18-36

This alternative shifts the crosswind runway to the north by 58-feet to create a compliant RSA and OFA. In addition to reducing pavement length at the Runway 36 end, new pavement would be constructed to extend the existing end of Runway 18. The runway length would be maintained at 2,691-feet. See Figure 4-2.

This option, similar to the shorten option, requires the runway lights and taxiway connectors to be relocated. The Runway 36 pavement would also be kept in place and marked for non-use as discussed in the previous option. In this alternative, however, Taxiway A at the north end of the runway also needs to be reconstructed to match with the shifted runway end. Given the relatively short distance, the resulting taxiway configuration of Taxiway A is non-standard. This is clearly a higher cost option because of the added pavement construction.

The runway shift will require upgrade of the existing FAA-owned VASI systems to new PAPI systems since the existing VASIs cannot be relocated due to their age and condition.

As noted in Chapter 3, Section 3.7, there are existing obstructions to Runway 18 (trees). By shifting the runway end to the north, the possibility exists that additional obstructions will be identified for the runway approach slopes.

Alternative Includes:	• Removing 58 feet of pavement, or repainting 58 feet as unusable by aircraft at the Runway 36 end; • Constructing 58 feet of runway length at the Runway 18 end; • Relocating the taxiway connectors to match the new runway end at both ends of the runway; • Runway light adjustments for the new runway location; • Working with Hennepin County to gain a minor amount of right-of-way to relocate the airport fence; • Relocating the airport fence along Flying Cloud Drive.
Beneficial Considerations:	• Achieves a compliant RSA and OFA for Runway 36; • The existing runway length would be maintained.
Negative Considerations:	• The taxiway relocation at the north end results in a curved alignment which may cause confusion to pilots; • This is a higher cost option due to the construction of pavement in addition to other costs; • Moving the runway end to the north has the potential to cause more obstructions to Runway 18 (i.e. Pioneer Trail, existing trees); • An environmental review process may be required; • The incremental benefit of constructing additional pavement is not justified by operator need, and likely not justified by the cost.

This option meets the RSA and OFA correction needs, but maintaining the existing runway length does not meet the recommended FAA runway length for the type of aircraft at the airport.

4.2.4 Shift and Extend Runway 18-36

The recommended runway length is 3,900 feet to accommodate 100% of aircraft weighing less than 12,500 pounds. One physical constraint for such an option, however, is the existence of the Pioneer Trail roadway corridor, which is currently being upgraded by Hennepin County and the City of Eden Prairie to a 4-lane divided highway. There would be no way to route this roadway around a runway extension, and the cost for a tunnel scenario would be prohibitive. The runway end would also lie very close to the edge of Staring Lake, which lies approximately 80-feet lower in elevation than where the runway end would be.

As discussed in Chapter 3, the FAA recommends a runway length of 2,800 feet to accommodate 75% of the fleet of aircraft weighing less than 12,500 pounds. Those aircraft most susceptible to crosswinds are virtually all in the 75% category.

This alternative shifts the crosswind runway to the north by 58-feet to create a compliant runway safety area and object free area and then adds an additional 109 feet of pavement for a total runway length of 2,800 feet. See Figure 4-3.

As with the other two options, the pavement at the Runway 36 end would be maintained but marked for non-use. The runway must physically be extended to the north and a new taxiway connector must be constructed to match the new runway end pavement. The runway lighting would require relocation, and the existing VASIs should be upgraded to PAPI systems.

Alternative Includes:	• Removing 58 feet of pavement, or repainting 58 feet as unusable by aircraft at the Runway 36 end; • Constructing 167 feet of runway length at the Runway 18 end; • Relocating the taxiway connectors to match the new runway end at both ends of the runway; • Runway light adjustments for the new runway location; • Working with Hennepin County to gain a minor amount of right-of-way to relocate the airport fence; • Relocating the airport fence along Flying Cloud Drive.
Beneficial Considerations:	• Achieves a compliant RSA and OFA for Runway 36; • The runway would be lengthened to better serve aircraft that use it and are most affected by crosswinds.
Negative Considerations:	• The taxiway relocation at the north end slightly impacts the FBO; • This is a higher cost option due to the construction of pavement in addition to other costs; • Moving the runway end to the north has the potential to cause more obstructions to Runway 18 (i.e. Pioneer Trail, existing trees); • An environmental review process may be required.

This alternative would correct both the RSA/OFA deficiency and enhances the runway use by providing additional length. This option, however, would be the most expensive because of the pavement construction costs and potential for increased obstruction removal requirements.

4.2.5 Runway 18-36 North Perimeter Road

All three of the Runway 18-36 alternatives show a new road north of the runway end, connecting the east and west sections of the north hangar area. This perimeter road is being considered at the request of the FAA to provide an east-west landside route for vehicles, fuel trucks, and MAC maintenance vehicles so they do not have to drive on or cross airfield pavements. The intention is to reduce the risk for runway incursions related to Runway 18-36. Note that unlike the two perimeter roads constructed at each end of the Runway 10-28 runways, this particular road is proposed to be constructed such that it can also be used by airport tenants and visitors.

The cost for constructing the perimeter road is included in the cost estimates listed in Chapter 7 along with each of the alternatives.

4.2.6 Estimated Costs for Runway 18-36 Alternatives

Table 4-1 itemizes the estimated costs for the alternatives outlined for Runway 18-36. The alternatives include the recommended reconstruction of the south end of Runway 18-36, plus the paving, drainage and utility work needed to shorten, shift, and/or extend the runway. Also included is the electrical work for full replacement of the Runway 18-36 circuit, runway edge lights and runway threshold lights.

The PAPI line item includes costs for purchase of the systems plus anticipated costs for a FAA reimbursable agreement required for relocation/upgrade of their facilities. If the FAA is able to provide the PAPI systems, the amount would decrease. Even though the runway shorten option only physically impacts one VASI system, it is expected that both VASI systems would be replaced under that alternative. A range is provided given the cost difference if the equipment is or is not provided by the FAA.

The north perimeter road line item includes construction costs, security gate installation and fence modifications. All estimates are shown as 2009 dollars.

Table 4-1
Estimated Costs for Runway 18-36 Alternatives

ALTERNATIVE	ESTIMATED COST
No Build / Reconstruct South End Only	$1,000,000
Shorten Runway 18-36	$1,200,000
Shift Runway 18-36	$1,500,000
Shift and Extend 18-36	$1,700,000
Upgrade VASIs to PAPIs	$100,000 - $200,000
North Perimeter Road	$300,000

4.3 Preferred Alternative for Runway 18-36

Runway 36 currently has a non-compliant runway safety area (RSA) and non-compliant object free area (OFA). Three options were reviewed to correct the deficiency.

Based on the analysis of the three alternatives discussed above, it is recommended that Runway 18-36 be shifted north and lengthened to 2,800 feet to create a compliant RSA and OFA. The FAA will likely not provide federal funding for projects associated with Runway 18-36 unless a compliant runway safety and object free areas are achieved. The runway extension will better serve aircraft using the runway, especially during critical cross-wind operations. It is justified by both the FAA runway length curves and by the crosswind component at Flying Cloud. The recommended runway length is tied to the type of aircraft using the runway; not the number of operations by those aircraft (as long as the number of operations exceeds 500 per year). This is definitely the case at FCM.

It is recommended that with the runway shift and extension, the south end pavement be reconstructed as currently planned in the MAC capital improvement program. It is also recommended that the existing FAA-owned VASIs be replaced with PAPIs. Obstructions related to Runway 18-36 should be identified and removed, and the north perimeter road should be constructed as a part of the Runway 18-36 improvements.

The runway extension and perimeter road construction may have impacts on two existing FBO facilities at the end of Runway 18. MAC will review any necessary lease changes and/or parking modifications with the businesses prior to any construction implementation.

This preferred alternative may require environmental review. MAC will review the State Environmental Assessment Worksheet (EAW) requirements and the Federal FAA categorical exclusion checklist to identify the appropriate type of environmental review documentation.

4.4 Other Plan Recommendations

As discussed above, there is no demonstrated need for additional runways or new hangar areas at the Flying Cloud Airport at this time. There are, however, various airside and landside improvements that are recommended for implementation in addition to the Runway 18-36 preferred alternative. Specific items listed below are shown on Figure 4-4.

4.4.1 Pavement Maintenance Program

MAC should continue pavement reconstruction and rehabilitation as a part of the on-going pavement maintenance program, including reconstruction of the south end of Runway 18-36 as a part of implementing the preferred alternative.

4.4.2 South Hangar Area Utilities

Completion of the south hangar area utilities shall be completed as new leases are executed and lot assessment fees are collected. Utilities include the installation of sanitary sewer, water, electric and/or natural gas services, and telephone.

Figure 4-4 shows a boxed out area adjacent to the south hangar area. This box identifies a potential expansion to the building area, should forecasts in future LTCPs identify a need for additional hangar space. As noted in this document, there is no demonstrated need at this time. However, if at some point additional space is needed, this location near midfield would work well.

4.4.3 Taxiway A Object Free Area

MAC should take steps to provide a clear Taxiway Alpha object free area. Some of the 1950's vintage hangars along the north side of Taxiway A actually lie within the taxiway object free area (OFA). MAC will work with these tenants over time as they plan on hangar redevelopment to clear the TOFA.

4.4.4 ATCT Relocation

MAC should continue discussions with the FAA relative to the ultimate relocation of the Air Traffic Control Tower to a location in the new south hangar area. The ATCT is not owned by the MAC. Its relocation will require the cooperation and assistance of the FAA.

4.4.5 Concurrent Use / Development Parcels

MAC should continue the research the development of concurrent land uses for revenue generating purposes on airport property.

4.4.6 Agency Coordination

MAC should pursue continued cooperation with the City of Eden Prairie through the existing MAC/City agreements, the Flying Cloud Airport Advisory Commission, 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 Flying Cloud 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 5050.4B, *“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. Flying Cloud Airport is located approximately 10.5 miles from MSP. As such, radar flight track data in the vicinity of Flying Cloud 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 Flying Cloud Airport, data acquisition/availability is reduced. However, for 2007 ANOMS reported 19,575 operations in the vicinity of Flying Cloud 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 Flying Cloud Airport operations in 2007 was 124,569. 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 Flying Cloud 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 Flying Cloud Airport is 113,876. 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 Flying Cloud 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 Flying Cloud Airport were filtered out of the data. If the starting point of a track was within the radius/ceiling criteria around Flying Cloud Airport it was considered a departure operation. If the endpoint of a track was within the radius/ceiling criteria around Flying Cloud 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 Flying Cloud 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 Flying Cloud 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 Flying Cloud 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 Flying Cloud 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 Flying Cloud 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 Flying Cloud Airport were analyzed relative to the runway trapezoids.

In cases where the last five radar points of a track were in the vicinity of Flying Cloud 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 Flying Cloud 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 Flying Cloud Airport.

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

The 2025 forecast runway use at Flying Cloud Airport is provided in Table 5-6.

Table 5-1
Flying Cloud 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
Jets	Canadair Challenger CL-601	CL601	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
	Cessna 501 Citation I	CNA501	3	0.12	0.00	0.12	0.11	0.00	0.11	0.00	0.00	0.00	0.23	0.00	0.23
	Cessna Mustang 510 (VLJ)	CNA510	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
	Cessna 551 Citation II	CNA551	3	0.02	0.00	0.02	0.03	0.00	0.03	0.00	0.00	0.00	0.06	0.00	0.06
	Cessna 560 Citation V	CNA560	3	2.01	0.10	2.11	2.03	0.11	2.13	0.00	0.00	0.00	4.04	0.21	4.25
	Cessna 650 Citation VII	CNA650	3	0.04	0.00	0.05	0.03	0.00	0.03	0.00	0.00	0.00	0.08	0.00	0.08
	Cessna 750 Citation X	CNA750	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
	Cessna Citation 500	CNA500	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 Citation 525	CNA525	3	0.66	0.02	0.68	0.66	0.02	0.68	0.00	0.00	0.00	1.32	0.04	1.35
	Cessna Citation 550	CNA550	3	0.78	0.05	0.83	0.83	0.02	0.85	0.00	0.00	0.00	1.61	0.08	1.69
	Dassault Falcon 10	FAL10	3	0.12	0.00	0.12	0.12	0.01	0.13	0.00	0.00	0.00	0.23	0.01	0.25
	Dassault Falcon 200	FAL200	3	0.01	0.00	0.01	0.02	0.00	0.02	0.00	0.00	0.00	0.03	0.00	0.03
	Dassault Falcon 2000	FAL20A	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	Hawker 125 Jet	HS125	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
	IAI 1124 Westwind	IA1124	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	Learjet 31	LEAR31	3	0.04	0.00	0.04	0.03	0.00	0.03	0.00	0.00	0.00	0.07	0.00	0.07
	Learjet 35	LEAR35	3	0.02	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.03
	Learjet 45	LEAR45	3	0.02	0.00	0.02	0.02	0.00	0.02	0.00	0.00	0.00	0.04	0.00	0.04
	Learjet 55	LEAR55	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
	Raytheon Beechjet 400	BEC400	3	0.73	0.02	0.75	0.70	0.04	0.74	0.00	0.00	0.00	1.43	0.06	1.49
	Saberliner 65	SABR65	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			*4.64*	*0.20*	*4.84*	*4.64*	*0.20*	*4.84*	*0.00*	*0.00*	*0.00*	*9.28*	*0.40*	*9.68*
Helicopters	Agusta 109	A109	H	0.41	0.02	0.43	0.42	0.02	0.44	0.08	0.00	0.08	0.90	0.04	0.95
	Bell 206	B206L	H	3.06	0.04	3.10	2.96	0.07	3.03	2.67	0.03	2.70	8.69	0.14	8.83
	Bell 222	B222	H	1.30	0.15	1.46	1.39	0.12	1.51	0.71	0.03	0.74	3.40	0.30	3.71
	Eurocopter BK-117	EC130	H	0.12	0.01	0.12	0.12	0.01	0.13	0.00	0.00	0.00	0.23	0.01	0.25
	Hughes 500D	H500D	H	0.04	0.00	0.04	0.05	0.00	0.05	0.03	0.00	0.03	0.12	0.00	0.12
	Robinson R22B	R22	H	0.02	0.00	0.02	0.01	0.00	0.01	0.06	0.00	0.06	0.10	0.00	0.10
	Sikorsky S-70 Blackhawk	S70	H	0.02	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.04	0.00	0.04
	Subtotal			*4.97*	*0.22*	*5.19*	*4.97*	*0.22*	*5.19*	*3.54*	*0.06*	*3.61*	*13.49*	*0.50*	*13.98*
Multi-Engine Piston	Beechcraft 18 Twin	BEC18	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
	Beechcraft Baron BE-55	BEC55	P	0.82	0.00	0.82	0.80	0.02	0.82	0.62	0.00	0.62	2.23	0.02	2.26
	Beechcraft Baron BE-58	BEC58	P	1.92	0.08	2.01	2.03	0.04	2.07	0.92	0.00	0.92	4.88	0.12	5.00
	Beechcraft Baron BE-58P	BEC58P	P	0.30	0.00	0.30	0.28	0.00	0.28	0.31	0.00	0.31	0.88	0.00	0.88
	Beechcraft Bonanza Twin	BEC50	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
	Beechcraft Duchess Twin	BEC76	P	0.02	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.03
	Beechcraft Duke Twin	BEC60	P	0.90	0.04	0.94	0.80	0.07	0.86	2.46	0.00	2.46	4.16	0.11	4.27
	Beechcraft Queen Air 65	BEC65	P	0.03	0.00	0.03	0.01	0.00	0.01	0.00	0.00	0.00	0.04	0.00	0.04
	Beechcraft Queen Air 80	BEC80	P	0.21	0.02	0.23	0.10	0.06	0.16	0.00	0.12	0.12	0.32	0.20	0.51
	Beechcraft Travel Air	BEC95	P	0.07	0.00	0.07	0.03	0.00	0.03	0.15	0.00	0.15	0.26	0.00	0.26
	Cessna 310	CNA310	P	0.75	0.04	0.80	0.80	0.01	0.80	0.77	0.00	0.77	2.32	0.05	2.37
	Cessna 335	CNA335	P	0.01	0.00	0.01	0.01	0.00	0.01	0.15	0.00	0.15	0.18	0.00	0.18
	Cessna 337 Super Skymaster	CNA337	P	0.09	0.00	0.09	0.03	0.00	0.03	0.00	0.00	0.00	0.12	0.00	0.12
	Cessna 340	CNA340	P	1.01	0.02	1.03	1.19	0.03	1.22	0.77	0.00	0.77	2.97	0.05	3.02
	Cessna 401	CNA401	P	0.02	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.03	0.00	0.03
	Cessna 402	CNA402	P	0.06	0.00	0.06	0.09	0.00	0.09	0.00	0.00	0.00	0.15	0.00	0.15
	Cessna 414 Chancellor	CNA414	P	1.13	0.06	1.19	1.02	0.07	1.09	0.92	0.00	0.92	3.07	0.14	3.21
	Cessna 421 Golden Eagle	CNA421	P	0.74	0.11	0.85	0.68	0.07	0.75	0.46	0.00	0.46	1.89	0.17	2.06
	Cessna Crusader 303	CNA303	P	0.03	0.00	0.03	0.03	0.01	0.04	0.00	0.00	0.00	0.06	0.01	0.07
	Cessna Executive Skynight	CNA320	P	0.04	0.00	0.04	0.03	0.00	0.03	0.00	0.00	0.00	0.07	0.00	0.07
	McDonnell Douglas DC3	DC3	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

Table 5-1
Flying Cloud Airport Year 2007 Average Daily Flight Operations

Aircraft Group	Aircraft Type	Identifier	INM/ANOMS Group	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
	Piper Aerostar 600/700	PA60	P	0.14	0.04	0.19	0.20	0.00	0.20	0.00	0.00	0.00	0.34	0.04	0.38
	Piper Apache	PA23AP	P	0.02	0.02	0.04	0.06	0.00	0.06	0.00	0.00	0.00	0.08	0.02	0.10
	Piper Aztec	PA23AZ	P	0.23	0.00	0.23	0.16	0.03	0.19	0.15	0.00	0.15	0.55	0.03	0.58
	Piper Navajo Chieftain	PA31	P	1.25	0.02	1.27	1.40	0.09	1.49	1.23	0.00	1.23	3.88	0.11	3.99
	Piper Seminole	PA44	P	0.42	0.02	0.44	0.43	0.00	0.43	3.08	0.00	3.08	3.92	0.02	3.94
	Piper Seneca	PA34	P	1.32	0.02	1.35	1.39	0.01	1.40	0.46	0.12	0.58	3.17	0.15	3.33
	Piper Twin Comanche	PA30	P	0.12	0.00	0.12	0.08	0.00	0.08	0.31	0.00	0.31	0.50	0.00	0.50
	Subtotal			*11.68*	*0.51*	*12.19*	*11.68*	*0.51*	*12.19*	*12.78*	*0.23*	*13.01*	*36.14*	*1.25*	*37.39*
Single-Engine Piston	Beechcraft F33A Bonanza	BEC33	P	9.26	0.55	9.82	9.53	0.29	9.82	8.18	0.00	8.18	26.97	0.84	27.81
	Beechcraft Musketeer	BEC23	P	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.02
	Beechcraft Sport	BEC24	P	1.29	0.00	1.29	1.03	1.27	2.31	37.21	2.40	39.61	39.53	3.68	43.21
	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	0.18	0.00	0.18	0.10	0.00	0.10	0.00	0.00	0.00	0.28	0.00	0.28
	Cessna 150	CNA150	P	0.33	0.00	0.33	0.59	0.00	0.59	0.79	0.00	0.79	1.71	0.00	1.71
	Cessna 152	CNA152	P	0.16	0.14	0.30	0.18	0.02	0.20	0.53	0.00	0.53	0.87	0.16	1.03
	Cessna 170	CNA170	P	0.10	0.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.10
	Cessna 205 Super Skywagon	CNA205	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 206H	CNA206	P	4.63	0.07	4.70	4.48	0.03	4.51	8.97	0.00	8.97	18.08	0.10	18.19
	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	0.20	0.00	0.20	0.22	0.00	0.22	0.00	0.00	0.00	0.42	0.00	0.42
	Cessna Centurion 210	CNA210	P	4.34	0.07	4.41	4.18	0.10	4.28	4.22	0.06	4.28	12.74	0.23	12.97
	Cessna Skyhawk 172	CNA172	P	5.45	0.28	5.72	5.37	0.02	5.39	40.64	0.03	40.67	51.46	0.33	51.78
	Cessna Skylane 182	CNA182	P	5.27	0.21	5.48	4.80	0.02	4.82	5.81	0.00	5.81	15.88	0.22	16.10
	Cessna Skywagon 180	CNA180	P	0.03	0.00	0.03	0.04	0.00	0.04	0.00	0.00	0.00	0.07	0.00	0.07
	Cessna Skywagon 185	CNA185	P	0.10	0.00	0.10	0.10	0.00	0.10	0.26	0.00	0.26	0.46	0.00	0.46
	GA Single-Engine Prop Fixed	GASEPF	P	6.23	0.14	6.37	6.87	0.20	7.08	7.92	0.00	7.92	21.02	0.34	21.36
	GA Single-Engine Prop Variable	GASEPV	P	5.37	0.35	5.71	5.59	0.25	5.85	3.69	0.00	3.69	14.66	0.60	15.26
	Grumman American	AA5A	P	0.20	0.00	0.20	0.20	0.00	0.20	1.06	0.00	1.06	1.45	0.00	1.45
	Mooney M20J	M20J	P	3.59	0.07	3.66	3.24	0.03	3.28	3.69	0.03	3.73	10.53	0.13	10.66
	Piper Cherokee 140	PA28CH	P	2.35	0.07	2.42	0.83	0.00	0.83	3.17	0.00	3.17	6.35	0.07	6.42
	Piper Cherokee Arrow II	PA28CA	P	0.88	0.14	1.02	0.95	0.05	1.00	2.11	0.00	2.11	3.94	0.19	4.13
	Piper Cherokee Six	PA32C6	P	1.76	0.28	2.04	1.95	0.14	2.08	1.32	0.00	1.32	5.03	0.41	5.44
	Piper Comanche	PA24	P	0.67	0.00	0.67	0.53	0.02	0.54	0.26	0.00	0.26	1.46	0.02	1.48
	Piper Dakota	PA28DK	P	0.03	0.00	0.03	0.04	0.00	0.04	0.00	0.00	0.00	0.07	0.00	0.07
	Piper Lance	PA32LA	P	0.47	0.07	0.54	0.61	0.02	0.63	0.26	0.00	0.26	1.35	0.09	1.43
	Piper Malibu	PA46	P	3.80	0.07	3.87	4.24	0.08	4.32	2.38	0.00	2.38	10.41	0.15	10.57
	Piper Super Cub	PA18	P	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.02
	Piper Tomahawk	PA38	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 Tri-Pacer	PA22TR	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
	Piper Warrior	PA28	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
	Piper Warrior II	PA28WA	P	1.57	0.07	1.64	2.68	0.02	2.69	5.28	0.00	5.28	9.52	0.09	9.61
	Rockwell Aero Commander 112	RWCM12	P	0.51	0.00	0.51	0.53	0.00	0.53	0.53	0.00	0.53	1.56	0.00	1.56
	Rockwell Commander 114	RWCM14	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
	Siai-Marchetti SF260M	SF260M	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
	T-6 Texan	T6	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			*59.03*	*2.56*	*61.59*	*59.03*	*2.56*	*61.59*	*138.28*	*2.53*	*140.81*	*256.34*	*7.65*	*263.99*
Turboprops	Avions ATR-42	ATR42	T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Beechcraft 1900	BEC190	T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Beechcraft 99	BEC99	T	0.06	0.00	0.06	0.05	0.00	0.05	0.00	0.00	0.00	0.11	0.00	0.11
	Beechcraft King Air 100	BEC100	T	0.07	0.00	0.07	0.06	0.00	0.06	0.00	0.00	0.00	0.13	0.00	0.13
	Beechcraft King Air 200	BEC200	T	2.93	0.22	3.15	2.93	0.17	3.10	0.00	0.00	0.00	5.86	0.39	6.25

Table 5-1
Flying Cloud Airport Year 2007 Average Daily Flight Operations

Aircraft Group	Aircraft Type	Identifier	INM/ANOMS Group	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
	Beechcraft King Air 300	BEC300	T	0.71	0.00	0.71	0.73	0.03	0.76	0.00	0.00	0.00	1.44	0.03	1.47
	Beechcraft King Air 350	BEC30B	T	0.59	0.02	0.61	0.58	0.02	0.60	0.00	0.00	0.00	1.17	0.04	1.21
	Beechcraft King Air C90	BEC90	T	2.11	0.07	2.18	2.04	0.10	2.14	0.00	0.00	0.00	4.15	0.18	4.32
	Cessna 208	CNA208	T	0.29	0.00	0.30	0.26	0.00	0.26	0.00	0.00	0.00	0.55	0.01	0.56
	Cessna 425 Corsair	CNA425	T	0.14	0.00	0.14	0.16	0.00	0.16	0.00	0.00	0.00	0.31	0.00	0.31
	Cessna Conquest II	CNA441	T	0.42	0.00	0.42	0.44	0.01	0.44	0.00	0.00	0.00	0.85	0.01	0.87
	Mitsubishi MU-2	MU2	T	0.11	0.00	0.11	0.13	0.00	0.13	0.00	0.00	0.00	0.24	0.00	0.25
	Piper Cheyenne	PA31T	T	0.13	0.00	0.13	0.16	0.00	0.16	0.00	0.00	0.00	0.29	0.00	0.29
	Piper Cheyenne III	PA42	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
	Rockwell Turbo Commander 690	RWCM69	T	0.20	0.01	0.21	0.23	0.00	0.23	0.00	0.00	0.00	0.43	0.01	0.44
	Subtotal			*7.78*	*0.34*	*8.12*	*7.78*	*0.34*	*8.12*	*0.00*	*0.00*	*0.00*	*15.56*	*0.68*	*16.24*
Total				**88.10**	**3.82**	**91.93**	**88.10**	**3.82**	**91.93**	**154.60**	**2.83**	**157.42**	**330.81**	**10.48**	**341.29**

Source: MAC ANOMS Analysis, 2009.

Table 5-2

Flying Cloud Airport Year 2025 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
Jets	Canadair Challenger CL-601	CL601	3	0.00	0.00	0.00	0.02	0.00	0.02	0.00	0.00	0.00	0.02	0.00	0.02
	Cessna 501 Citation I	CNA501	3	0.16	0.00	0.16	0.15	0.00	0.15	0.00	0.00	0.00	0.31	0.00	0.31
	Cessna Mustang 510 (VLJ)	CNA510	3	21.90	0.95	22.85	21.90	0.95	22.85	0.00	0.00	0.00	43.80	1.90	45.70
	Cessna 551 Citation II	CNA551	3	0.03	0.00	0.03	0.04	0.00	0.04	0.00	0.00	0.00	0.08	0.00	0.08
	Cessna 560 Citation V	CNA560	3	1.93	0.09	2.02	1.95	0.09	2.03	0.00	0.00	0.00	3.88	0.17	4.05
	Cessna 650 Citation VII	CNA650	3	0.04	0.00	0.04	0.03	0.00	0.03	0.00	0.00	0.00	0.07	0.00	0.08
	Cessna 750 Citation X	CNA750	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
	Cessna Citation 500	CNA500	3	0.05	0.00	0.05	0.03	0.00	0.03	0.00	0.00	0.00	0.08	0.00	0.08
	Cessna Citation 525	CNA525	3	0.89	0.02	0.91	0.86	0.04	0.90	0.00	0.00	0.00	1.75	0.06	1.81
	Cessna Citation 550	CNA550	3	1.05	0.07	1.12	1.09	0.05	1.14	0.00	0.00	0.00	2.14	0.12	2.26
	Dassault Falcon 10	FAL10	3	0.11	0.00	0.12	0.11	0.01	0.12	0.00	0.00	0.00	0.22	0.01	0.23
	Dassault Falcon 200	FAL200	3	0.01	0.00	0.01	0.02	0.00	0.02	0.00	0.00	0.00	0.03	0.00	0.03
	Dassault Falcon 2000	FAL20A	3	0.02	0.00	0.02	0.02	0.00	0.02	0.00	0.00	0.00	0.04	0.00	0.04
	Hawker 125 Jet	HS125	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
	IAI 1124 Westwind	IA1124	3	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.01
	Learjet 31	LEAR31	3	0.04	0.00	0.04	0.03	0.00	0.03	0.00	0.00	0.00	0.06	0.00	0.06
	Learjet 35	LEAR35	3	0.09	0.02	0.11	0.04	0.01	0.05	0.00	0.00	0.00	0.13	0.03	0.15
	Learjet 45	LEAR45	3	0.02	0.00	0.02	0.02	0.00	0.02	0.00	0.00	0.00	0.04	0.00	0.04
	Learjet 55	LEAR55	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
	Raytheon Beechjet 400	BEC400	3	4.24	0.17	4.41	4.27	0.18	4.45	0.00	0.00	0.00	8.52	0.35	8.87
	Saberliner 65	SABR65	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			*30.60*	*1.33*	*31.93*	*30.60*	*1.33*	*31.93*	*0.00*	*0.00*	*0.00*	*61.21*	*2.66*	*63.87*
Helicopters	Agusta 109	A109	H	0.62	0.03	0.65	0.63	0.03	0.66	0.11	0.00	0.11	1.36	0.06	1.42
	Bell 206	B206L	H	4.61	0.06	4.67	4.46	0.10	4.56	3.87	0.05	3.92	12.94	0.20	13.14
	Bell 222	B222	H	1.96	0.23	2.19	2.09	0.19	2.28	1.03	0.04	1.07	5.09	0.46	5.54
	Eurocopter BK-117	EC130	H	0.17	0.01	0.18	0.18	0.01	0.19	0.00	0.00	0.00	0.35	0.02	0.37
	Hughes 500D	H500D	H	0.05	0.00	0.05	0.08	0.00	0.08	0.04	0.00	0.04	0.18	0.00	0.18
	Robinson R22B	R22	H	0.03	0.00	0.03	0.02	0.00	0.02	0.09	0.00	0.09	0.14	0.00	0.14
	Sikorsky S-70 Blackhawk	S70	H	0.03	0.00	0.03	0.02	0.00	0.02	0.00	0.00	0.00	0.06	0.00	0.06
	Subtotal			*7.49*	*0.32*	*7.81*	*7.49*	*0.32*	*7.81*	*5.14*	*0.09*	*5.23*	*20.11*	*0.74*	*20.85*
Multi-Engine Piston	Beechcraft 18 Twin	BEC18	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
	Beechcraft Baron BE-55	BEC55	P	0.46	0.00	0.46	0.45	0.01	0.46	0.35	0.00	0.35	1.25	0.01	1.27
	Beechcraft Baron BE-58	BEC58	P	1.08	0.05	1.13	1.14	0.02	1.16	0.52	0.00	0.52	2.74	0.07	2.81
	Beechcraft Baron BE-58P	BEC58P	P	0.17	0.00	0.17	0.16	0.00	0.16	0.17	0.00	0.17	0.50	0.00	0.50
	Beechcraft Bonanza Twin	BEC50	P	0.01	0.00	0.01	0.01	0.00	0.01	1.38	0.00	1.38	1.40	0.00	1.40
	Beechcraft Duchess Twin	BEC76	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
	Beechcraft Duke Twin	BEC60	P	0.50	0.02	0.53	0.45	0.04	0.48	0.00	0.00	0.00	0.95	0.06	1.01
	Beechcraft Queen Air 65	BEC65	P	0.02	0.00	0.02	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.02
	Beechcraft Queen Air 80	BEC80	P	0.12	0.01	0.13	0.06	0.03	0.09	0.00	0.07	0.07	0.18	0.11	0.29
	Beechcraft Travel Air	BEC95	P	0.04	0.00	0.04	0.02	0.00	0.02	0.09	0.00	0.09	0.14	0.00	0.14
	Cessna 310	CNA310	P	0.42	0.02	0.45	0.45	0.00	0.45	0.43	0.00	0.43	1.30	0.03	1.33
	Cessna 335	CNA335	P	0.01	0.00	0.01	0.01	0.00	0.01	0.09	0.00	0.09	0.10	0.00	0.10
	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	0.56	0.01	0.58	0.67	0.02	0.68	0.43	0.00	0.43	1.66	0.03	1.69
	Cessna 401	CNA401	P	0.01	0.00	0.01	0.01	0.00	0.01	0.00	0.00	0.00	0.02	0.00	0.02
	Cessna 402	CNA402	P	0.03	0.00	0.03	0.05	0.00	0.05	0.00	0.00	0.00	0.08	0.00	0.08
	Cessna 414 Chancellor	CNA414	P	0.63	0.04	0.67	0.57	0.04	0.61	0.52	0.00	0.52	1.72	0.08	1.80
	Cessna 421 Golden Eagle	CNA421	P	0.42	0.06	0.48	0.38	0.04	0.42	0.26	0.00	0.26	1.06	0.10	1.16
	Cessna Crusader 303	CNA303	P	0.02	0.00	0.02	0.02	0.00	0.02	0.00	0.00	0.00	0.04	0.00	0.04
	Cessna Executive Skynight	CNA320	P	0.02	0.00	0.02	0.02	0.00	0.02	0.00	0.00	0.00	0.04	0.00	0.04
	McDonnell Douglas DC3	DC3	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
	Piper Aerostar 600/700	PA60	P	0.08	0.02	0.10	0.11	0.00	0.11	0.00	0.00	0.00	0.19	0.02	0.22

Table 5-2
Flying Cloud Airport Year 2025 Average Daily Flight Operations

Aircraft Group	Aircraft Type	Identifier	INM/ANOMS Group	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
	Piper Apache	PA23AP	P	0.01	0.01	0.02	0.03	0.00	0.03	0.00	0.00	0.00	0.04	0.01	0.06
	Piper Aztec	PA23AZ	P	0.13	0.00	0.13	0.09	0.02	0.11	0.09	0.00	0.09	0.31	0.02	0.32
	Piper Navajo Chieftain	PA31	P	0.70	0.01	0.71	0.78	0.05	0.83	0.69	0.00	0.69	2.17	0.06	2.24
	Piper Seminole	PA44	P	0.23	0.01	0.24	0.24	0.00	0.24	1.73	0.00	1.73	2.20	0.01	2.21
	Piper Seneca	PA34	P	0.74	0.01	0.75	0.78	0.01	0.79	0.26	0.07	0.33	1.78	0.09	1.86
	Piper Twin Comanche	PA30	P	0.06	0.00	0.06	0.05	0.00	0.05	0.17	0.00	0.17	0.28	0.00	0.28
	Subtotal			*6.55*	*0.28*	*6.83*	*6.55*	*0.28*	*6.83*	*7.18*	*0.13*	*7.31*	*20.28*	*0.70*	*20.98*
Single-Engine Piston	Beechcraft F33A Bonanza	BEC33	P	6.77	0.41	7.18	6.97	0.21	7.18	5.98	0.00	5.98	19.72	0.62	20.34
	Beechcraft Musketeer	BEC23	P	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01
	Beechcraft Sport	BEC24	P	0.94	0.00	0.94	0.76	0.93	1.69	27.21	1.76	28.96	28.91	2.69	31.59
	Bellanca Cruisair	BL14	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
	Bellanca Super Viking	BL26	P	0.13	0.00	0.13	0.07	0.00	0.07	0.00	0.00	0.00	0.21	0.00	0.21
	Cessna 150	CNA150	P	0.24	0.00	0.24	0.43	0.00	0.43	0.58	0.00	0.58	1.25	0.00	1.25
	Cessna 152	CNA152	P	0.12	0.10	0.22	0.13	0.01	0.15	0.39	0.00	0.39	0.64	0.11	0.75
	Cessna 170	CNA170	P	0.07	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.07
	Cessna 205 Super Skywagon	CNA205	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 206H	CNA206	P	3.39	0.05	3.44	3.28	0.02	3.30	6.56	0.00	6.56	13.22	0.08	13.30
	Cessna 207	CNA207	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 Cardinal 177	CNA177	P	0.14	0.00	0.14	0.16	0.00	0.16	0.00	0.00	0.00	0.31	0.00	0.31
	Cessna Centurion 210	CNA210	P	3.17	0.05	3.22	3.05	0.07	3.13	3.09	0.05	3.13	9.31	0.17	9.48
	Cessna Skyhawk 172	CNA172	P	3.98	0.20	4.19	3.93	0.01	3.94	29.72	0.02	29.74	37.63	0.24	37.86
	Cessna Skylane 182	CNA182	P	3.85	0.15	4.00	3.51	0.01	3.53	4.25	0.00	4.25	11.61	0.16	11.77
	Cessna Skywagon 180	CNA180	P	0.02	0.00	0.02	0.03	0.00	0.03	0.00	0.00	0.00	0.05	0.00	0.05
	Cessna Skywagon 185	CNA185	P	0.07	0.00	0.07	0.07	0.00	0.07	0.19	0.00	0.19	0.34	0.00	0.34
	GA Single-Engine Prop Fixed	GASEPF	P	4.56	0.10	4.66	5.02	0.15	5.17	5.79	0.00	5.79	15.37	0.25	15.62
	GA Single-Engine Prop Variable	GASEPV	P	3.92	0.25	4.18	4.09	0.19	4.28	2.70	0.00	2.70	10.72	0.44	11.16
	Grumman American	AA5A	P	0.14	0.00	0.14	0.15	0.00	0.15	0.77	0.00	0.77	1.06	0.00	1.06
	Mooney M20J	M20J	P	2.62	0.05	2.67	2.37	0.02	2.40	2.70	0.02	2.72	7.70	0.10	7.79
	Piper Cherokee 140	PA28CH	P	1.72	0.05	1.77	0.61	0.00	0.61	2.32	0.00	2.32	4.64	0.05	4.69
	Piper Cherokee Arrow II	PA28CA	P	0.64	0.10	0.75	0.70	0.04	0.73	1.54	0.00	1.54	2.88	0.14	3.02
	Piper Cherokee Six	PA32C6	P	1.29	0.20	1.49	1.42	0.10	1.52	0.96	0.00	0.96	3.68	0.30	3.98
	Piper Comanche	PA24	P	0.49	0.00	0.49	0.39	0.01	0.40	0.19	0.00	0.19	1.07	0.01	1.08
	Piper Dakota	PA28DK	P	0.02	0.00	0.02	0.03	0.00	0.03	0.00	0.00	0.00	0.05	0.00	0.05
	Piper Lance	PA32LA	P	0.35	0.05	0.40	0.44	0.01	0.46	0.19	0.00	0.19	0.98	0.06	1.05
	Piper Malibu	PA46	P	2.78	0.05	2.83	3.10	0.06	3.16	1.74	0.00	1.74	7.61	0.11	7.73
	Piper Super Cub	PA18	P	0.00	0.00	0.00	0.01	0.00	0.01	0.00	0.00	0.00	0.01	0.00	0.01
	Piper Tomahawk	PA38	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 Tri-Pacer	PA22TR	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	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	1.14	0.05	1.20	1.96	0.01	1.97	3.86	0.00	3.86	6.96	0.06	7.02
	Rockwell Aero Commander 112	RWCM12	P	0.37	0.00	0.37	0.39	0.00	0.39	0.39	0.00	0.39	1.14	0.00	1.14
	Rockwell Commander 114	RWCM14	P	0.05	0.00	0.05	0.04	0.00	0.04	0.00	0.00	0.00	0.09	0.00	0.09
	Siai-Marchetti SF260M	SF260M	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
	T-6 Texan	T6	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
	Subtotal			*43.16*	*1.87*	*45.03*	*43.16*	*1.87*	*45.03*	*101.11*	*1.85*	*102.96*	*187.43*	*5.60*	*193.03*
Turboprops	Avions ATR-42	ATR42	T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Beechcraft 1900	BEC190	T	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Beechcraft 99	BEC99	T	0.05	0.00	0.05	0.04	0.00	0.04	0.00	0.00	0.00	0.09	0.00	0.09
	Beechcraft King Air 100	BEC100	T	0.06	0.00	0.06	0.05	0.00	0.05	0.00	0.00	0.00	0.11	0.00	0.11
	Beechcraft King Air 200	BEC200	T	2.39	0.18	2.57	2.40	0.14	2.53	0.00	0.00	0.00	4.79	0.32	5.11
	Beechcraft King Air 300	BEC300	T	0.58	0.00	0.58	0.60	0.02	0.62	0.00	0.00	0.00	1.18	0.02	1.20
	Beechcraft King Air 350	BEC30B	T	0.48	0.02	0.50	0.47	0.01	0.49	0.00	0.00	0.00	0.96	0.03	0.99

Table 5-2
Flying Cloud Airport Year 2025 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
	Beechcraft King Air C90	BEC90	T	1.72	0.06	1.78	1.66	0.09	1.75	0.00	0.00	0.00	3.39	0.14	3.53
	Cessna 208	CNA208	T	0.24	0.00	0.24	0.21	0.00	0.21	0.00	0.00	0.00	0.45	0.01	0.46
	Cessna 425 Corsair	CNA425	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
	Cessna Conquest II	CNA441	T	0.34	0.00	0.34	0.36	0.01	0.36	0.00	0.00	0.00	0.70	0.01	0.71
	Mitsubishi MU-2	MU2	T	0.09	0.00	0.09	0.11	0.00	0.11	0.00	0.00	0.00	0.20	0.00	0.20
	Piper Cheyenne	PA31T	T	0.11	0.00	0.11	0.13	0.00	0.13	0.00	0.00	0.00	0.24	0.00	0.24
	Piper Cheyenne III	PA42	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
	Rockwell Turbo Commander 690	RWCM69	T	0.16	0.01	0.17	0.19	0.00	0.19	0.00	0.00	0.00	0.35	0.01	0.36
	Subtotal			*6.36*	*0.28*	*6.63*	*6.36*	*0.28*	*6.63*	*0.00*	*0.00*	*0.00*	*12.71*	*0.55*	*13.27*
Total				**94.16**	**4.09**	**98.24**	**94.16**	**4.09**	**98.24**	**113.43**	**2.07**	**115.50**	**301.74**	**10.25**	**311.99**

Source: MAC ANOMS Analysis, 2009.

Table 5-3a
Flying Cloud Airport Year 2007 Departure Flight Track Use

		Stage 3 Jets		Piston		Turboprop	
Runway	Track	Day	Night	Day	Night	Day	Night
18	A	33.3%	0.0%	2.5%	39.6%	0.0%	0.0%
	B	33.3%	0.0%	0.9%	10.6%	0.0%	0.0%
	C	0.0%	0.0%	2.9%	5.3%	0.0%	0.0%
	D	0.0%	0.0%	5.0%	5.3%	0.0%	25.0%
	E	0.0%	0.0%	9.8%	7.9%	5.6%	0.0%
	F	0.0%	0.0%	28.8%	9.1%	36.7%	50.0%
	G	33.3%	0.0%	8.1%	9.1%	7.8%	0.0%
	H	0.0%	0.0%	6.7%	5.3%	16.7%	0.0%
	I	0.0%	0.0%	11.7%	7.9%	22.2%	0.0%
	J	0.0%	0.0%	5.1%	0.0%	3.3%	25.0%
	K	0.0%	0.0%	18.3%	0.0%	7.8%	0.0%
36	A	0.0%	0.0%	18.6%	10.6%	0.0%	0.0%
	B	100.0%	0.0%	16.2%	0.0%	36.4%	0.0%
	C	0.0%	0.0%	19.8%	10.6%	13.6%	0.0%
	D	0.0%	0.0%	15.6%	0.0%	4.5%	0.0%
	E	0.0%	0.0%	4.6%	0.0%	4.5%	0.0%
	F	0.0%	0.0%	2.2%	4.7%	4.5%	0.0%
	G	0.0%	0.0%	1.9%	0.0%	4.5%	0.0%
	H	0.0%	0.0%	2.9%	53.0%	4.5%	0.0%
	I	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%
	J	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%
	K	0.0%	0.0%	0.3%	0.0%	9.1%	0.0%
	L	0.0%	0.0%	2.9%	0.0%	0.0%	0.0%
	M	0.0%	0.0%	12.0%	21.2%	18.2%	0.0%
10L	A	0.0%	0.0%	7.6%	10.1%	3.5%	5.6%
	B	3.1%	0.0%	5.8%	0.0%	2.3%	5.6%
	C	3.1%	0.0%	3.7%	10.1%	0.0%	2.8%
	D	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%
	E	0.0%	0.0%	0.9%	0.0%	0.6%	2.8%
	F	0.0%	0.0%	1.0%	10.1%	1.2%	13.9%
	G	0.0%	0.0%	3.0%	0.0%	3.5%	11.1%
	H	12.5%	66.7%	3.6%	4.4%	5.3%	16.7%
	I	25.0%	33.3%	5.7%	0.0%	19.3%	22.2%
	J	18.8%	0.0%	14.4%	34.8%	24.0%	8.3%
	K	34.4%	0.0%	13.0%	10.1%	22.8%	2.8%
	L	3.1%	0.0%	26.3%	20.2%	12.9%	2.8%
	M	0.0%	0.0%	14.4%	0.0%	4.7%	5.6%
10R	A	0.0%	0.0%	1.6%	0.0%	1.0%	0.8%
	B	0.7%	0.0%	1.4%	2.3%	2.9%	3.9%
	C	0.2%	0.0%	1.4%	23.2%	0.0%	0.8%
	D	0.4%	0.0%	0.8%	4.6%	0.0%	0.0%
	E	0.0%	0.0%	0.1%	2.3%	0.4%	2.3%
	F	0.5%	4.2%	0.5%	0.0%	2.3%	3.1%
	G	1.1%	4.2%	0.4%	2.3%	1.4%	9.4%
	H	1.2%	0.0%	1.1%	1.0%	2.3%	7.8%
	I	2.8%	6.2%	1.8%	3.3%	2.2%	9.4%
	J	28.6%	27.0%	5.2%	6.7%	15.3%	27.3%
	K	31.1%	47.8%	13.8%	18.3%	22.9%	11.7%
	L	28.0%	4.3%	21.4%	14.4%	25.8%	12.5%
	M	4.6%	4.2%	31.6%	13.1%	18.6%	3.1%
	N	0.7%	2.1%	18.8%	8.4%	4.9%	7.8%
28L	A	0.0%	0.0%	3.2%	8.7%	0.0%	0.7%
	B	0.2%	0.0%	3.6%	3.6%	0.2%	0.4%
	C	2.4%	5.6%	11.3%	8.5%	4.5%	3.2%
	D	10.5%	15.5%	12.8%	10.9%	13.4%	8.9%
	E	26.2%	29.0%	16.5%	15.0%	20.0%	18.9%
	F	31.1%	20.0%	17.9%	13.1%	26.6%	13.6%
	G	5.7%	14.4%	4.6%	6.3%	6.3%	9.6%
	H	6.6%	3.3%	2.1%	1.8%	4.7%	5.4%
	I	12.1%	5.6%	8.2%	7.5%	13.6%	13.6%
	J	4.3%	2.2%	10.9%	0.0%	8.5%	10.7%
	K	0.7%	3.3%	5.1%	0.5%	1.7%	9.6%
	L	0.1%	0.0%	3.2%	0.5%	0.4%	4.3%
	M	0.1%	1.1%	0.4%	3.7%	0.0%	1.1%
	N	0.0%	0.0%	0.2%	19.9%	0.0%	0.0%
28R	A	0.0%	0.0%	2.5%	0.0%	0.0%	0.0%
	B	0.0%	0.0%	9.2%	0.0%	2.3%	0.0%
	C	0.0%	0.0%	12.9%	0.0%	11.3%	0.0%
	D	0.0%	0.0%	9.3%	0.0%	15.0%	0.0%
	E	33.3%	0.0%	13.9%	0.0%	15.8%	0.0%
	F	0.0%	0.0%	4.0%	0.0%	7.5%	0.0%
	G	0.0%	0.0%	3.9%	0.0%	4.5%	0.0%
	H	16.7%	0.0%	3.7%	0.0%	2.3%	0.0%
	I	33.3%	0.0%	6.1%	0.0%	9.8%	0.0%
	J	16.7%	0.0%	15.3%	0.0%	23.3%	0.0%
	K	0.0%	0.0%	9.5%	0.0%	5.3%	0.0%
	L	0.0%	0.0%	4.2%	0.0%	1.5%	0.0%
	M	0.0%	0.0%	2.3%	0.0%	0.0%	0.0%
	N	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%
	O	0.0%	0.0%	1.2%	0.0%	0.0%	0.0%
	P	0.0%	0.0%	0.7%	0.0%	1.5%	0.0%

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

Source: Radar track data, MAC Analysis, 2009.

Table 5-3b
Flying Cloud Airport Year 2007 Departure Flight Track Use

Runway	Track	Helicopters Day	Helicopters Night
10LH	A	9.4%	13.8%
	B	7.6%	27.6%
	C	11.8%	6.9%
	D	5.3%	10.3%
	E	15.3%	6.9%
	F	28.8%	10.3%
	G	21.8%	24.1%
10RH	H	27.5%	33.3%
	I	17.4%	50.0%
	J	15.9%	0.0%
	K	39.1%	16.7%
18H	L	27.4%	34.5%
	M	10.6%	3.4%
	N	20.4%	17.2%
	O	24.8%	24.1%
	P	16.8%	20.7%
28LH	Q	9.6%	15.8%
	R	18.4%	26.3%
	S	20.0%	15.8%
	T	23.2%	10.5%
	U	28.8%	31.6%
28RH	V	43.6%	30.8%
	W	23.6%	53.8%
	X	32.7%	15.4%
36H	AA	27.8%	20.0%
	Y	29.3%	20.0%
	Z	42.9%	60.0%

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

Table 5-3d
Flying Cloud Airport Year 2007
Arrival Flight Track Use

Runway	Track	Helicopters Day	Helicopters Night
10LH	A	100.0%	100.0%
18H	B	40.4%	20.0%
	C	26.3%	20.0%
	D	33.3%	60.0%
28LH	E	29.7%	56.8%
	F	15.5%	5.4%
	G	37.8%	27.0%
	H	16.9%	10.8%
28RH	I	22.1%	0.0%
	J	23.2%	40.0%
	K	14.9%	28.0%
	L	24.6%	28.0%
	M	15.2%	4.0%
36H	N	100.0%	100.0%
10RH	O	100.0%	100.0%

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

Table 5-3c
Flying Cloud Airport Year 2007 Arrival Flight Track Use

Runway	Track	Stage 3 Jets Day	Stage 3 Jets Night	Piston Day	Piston Night	Turboprop Day	Turboprop Night
18	A	25.0%	0.0%	29.3%	62.1%	9.0%	0.0%
	B	62.5%	0.0%	38.4%	37.9%	57.7%	0.0%
	C	12.5%	0.0%	32.3%	0.0%	33.3%	100.0%
36	A	0.0%	0.0%	11.1%	0.0%	12.0%	0.0%
	B	100.0%	0.0%	63.9%	43.4%	69.3%	0.0%
	C	0.0%	0.0%	25.1%	56.6%	18.7%	100.0%
10L	A	36.4%	0.0%	29.6%	0.0%	38.6%	0.0%
	B	57.6%	0.0%	55.9%	0.0%	52.6%	0.0%
	C	6.1%	0.0%	14.5%	0.0%	8.8%	0.0%
10R	A	6.9%	5.1%	18.6%	9.1%	10.0%	8.9%
	B	91.5%	93.3%	77.0%	86.3%	85.0%	83.5%
	C	1.7%	1.7%	4.4%	4.6%	5.0%	7.6%
28L	A	2.6%	0.0%	16.2%	6.9%	11.7%	1.7%
	B	86.2%	90.9%	45.6%	63.5%	61.6%	85.0%
	C	11.2%	9.1%	38.2%	29.6%	26.6%	13.3%
28R	A	2.9%	0.0%	35.5%	51.1%	18.8%	14.3%
	B	72.8%	100.0%	31.8%	7.8%	42.5%	85.7%
	C	24.3%	0.0%	32.7%	41.1%	38.6%	0.0%

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

Table 5-4a
Flying Cloud Airport Year 2025 Departure Flight Track Use

		Stage 3 Jets		Piston		Turboprop	
Runway	Track	Day	Night	Day	Night	Day	Night
18	A	33.3%	0.0%	2.5%	39.8%	0.0%	0.0%
	B	33.3%	0.0%	0.9%	10.6%	0.0%	0.0%
	C	0.0%	0.0%	2.9%	5.3%	0.0%	0.0%
	D	0.0%	0.0%	5.1%	5.3%	0.0%	25.0%
	E	0.0%	0.0%	10.0%	8.0%	5.6%	0.0%
	F	0.0%	0.0%	28.5%	8.9%	36.7%	50.0%
	G	33.3%	0.0%	8.0%	8.9%	7.8%	0.0%
	H	0.0%	0.0%	6.7%	5.3%	16.7%	0.0%
	I	0.0%	0.0%	11.8%	8.0%	22.2%	0.0%
	J	0.0%	0.0%	5.1%	0.0%	3.3%	25.0%
	K	0.0%	0.0%	12.8%	0.0%	7.8%	0.0%
	L	0.0%	0.0%	5.6%	0.0%	0.0%	0.0%
36	A	0.0%	0.0%	18.7%	10.7%	0.0%	0.0%
	B	100.0%	0.0%	16.2%	0.0%	36.4%	0.0%
	C	0.0%	0.0%	19.9%	10.7%	13.6%	0.0%
	D	0.0%	0.0%	15.3%	0.0%	4.5%	0.0%
	E	0.0%	0.0%	4.7%	0.0%	4.5%	0.0%
	F	0.0%	0.0%	2.2%	3.6%	4.5%	0.0%
	G	0.0%	0.0%	2.0%	0.0%	4.5%	0.0%
	H	0.0%	0.0%	3.0%	53.6%	4.5%	0.0%
	I	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%
	J	0.0%	0.0%	1.5%	0.0%	0.0%	0.0%
	K	0.0%	0.0%	0.2%	0.0%	9.1%	0.0%
	L	0.0%	0.0%	3.0%	0.0%	0.0%	0.0%
	M	0.0%	0.0%	12.0%	21.4%	18.2%	0.0%
10L	A	0.0%	0.0%	7.6%	10.3%	3.5%	5.6%
	B	3.6%	0.0%	5.8%	0.0%	2.3%	5.6%
	C	3.6%	0.0%	3.8%	10.3%	0.0%	2.8%
	D	0.0%	0.0%	0.8%	0.0%	0.0%	0.0%
	E	0.0%	0.0%	0.9%	0.0%	0.6%	2.8%
	F	0.0%	0.0%	1.0%	10.3%	1.2%	13.9%
	G	0.0%	0.0%	3.0%	0.0%	3.5%	11.1%
	H	12.6%	66.7%	3.6%	3.5%	5.3%	16.7%
	I	25.2%	33.3%	5.8%	0.0%	19.3%	22.2%
	J	19.9%	0.0%	14.2%	34.5%	24.0%	8.3%
	K	32.3%	0.0%	12.8%	10.3%	22.8%	2.8%
	L	2.7%	0.0%	26.2%	20.7%	12.9%	2.8%
	M	0.0%	0.0%	14.6%	0.0%	4.7%	5.6%
10R	A	0.0%	0.0%	1.6%	0.0%	1.0%	0.8%
	B	0.1%	0.0%	1.4%	2.5%	2.9%	3.9%
	C	0.1%	0.0%	1.5%	24.5%	0.0%	0.8%
	D	0.1%	0.0%	0.8%	4.9%	0.0%	0.0%
	E	0.0%	0.0%	0.1%	2.5%	0.4%	2.3%
	F	0.1%	1.4%	0.5%	0.0%	2.3%	3.1%
	G	0.3%	0.4%	0.4%	2.5%	1.4%	9.4%
	H	0.2%	0.0%	1.0%	0.8%	2.3%	7.8%
	I	0.6%	0.9%	1.8%	3.3%	2.2%	9.4%
	J	6.2%	4.4%	5.0%	6.6%	15.3%	27.3%
	K	7.0%	10.8%	13.5%	18.8%	22.9%	11.7%
	L	84.0%	80.5%	21.3%	14.0%	25.8%	12.5%
	M	1.3%	1.4%	31.7%	12.3%	18.6%	3.1%
	N	0.1%	0.2%	19.4%	7.4%	4.9%	7.8%
28L	A	0.0%	0.0%	3.4%	9.2%	0.0%	0.7%
	B	0.1%	0.0%	3.7%	3.5%	0.2%	0.4%
	C	0.9%	2.6%	11.4%	8.7%	4.5%	3.2%
	D	4.3%	3.7%	12.6%	10.9%	13.4%	8.9%
	E	75.8%	75.3%	16.6%	14.9%	20.0%	18.9%
	F	9.9%	6.5%	17.7%	12.7%	26.6%	13.6%
	G	1.8%	2.1%	1.9%	1.7%	4.7%	5.4%
	H	1.9%	6.0%	4.4%	5.7%	6.3%	9.6%
	I	3.9%	2.4%	8.1%	7.0%	13.6%	13.6%
	J	1.1%	0.3%	10.7%	0.0%	8.5%	10.7%
	K	0.2%	0.7%	5.3%	0.4%	1.7%	9.6%
	L	0.0%	0.0%	3.4%	0.4%	0.4%	4.3%
	M	0.0%	0.4%	0.5%	3.9%	0.0%	1.1%
	N	0.0%	0.0%	0.2%	20.9%	0.0%	0.0%
28R	A	0.0%	0.0%	2.6%	0.0%	0.0%	0.0%
	B	0.0%	0.0%	9.3%	0.0%	2.3%	0.0%
	C	0.0%	0.0%	12.9%	0.0%	11.3%	0.0%
	D	0.0%	0.0%	9.3%	0.0%	15.0%	0.0%
	E	43.4%	0.0%	13.9%	0.0%	15.8%	0.0%
	F	0.0%	0.0%	4.0%	0.0%	7.5%	0.0%
	G	0.0%	0.0%	3.9%	0.0%	4.5%	0.0%
	H	35.7%	0.0%	3.7%	0.0%	2.3%	0.0%
	I	15.4%	0.0%	6.0%	0.0%	9.8%	0.0%
	J	5.6%	0.0%	15.1%	0.0%	23.3%	0.0%
	K	0.0%	0.0%	9.5%	0.0%	5.3%	0.0%
	L	0.0%	0.0%	4.2%	0.0%	1.5%	0.0%
	M	0.0%	0.0%	2.3%	0.0%	0.0%	0.0%
	N	0.0%	0.0%	1.4%	0.0%	0.0%	0.0%
	O	0.0%	0.0%	1.3%	0.0%	0.0%	0.0%
	P	0.0%	0.0%	0.7%	0.0%	1.5%	0.0%

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

Source: Radar track data, MAC Analysis, 2009.

Table 5-4b

Flying Cloud Airport Year 2025 Departure Flight Track Use

		Helicopters	
Runway	Track	Day	Night
10LH	A	9.4%	13.8%
	B	7.6%	27.6%
	C	11.8%	6.9%
	D	5.3%	10.3%
	E	15.3%	6.9%
	F	28.8%	10.3%
	G	21.8%	24.1%
10RH	H	27.5%	33.3%
	I	17.4%	50.0%
	J	15.9%	0.0%
	K	39.1%	16.7%
18H	L	27.4%	34.5%
	M	10.6%	3.4%
	N	20.4%	17.2%
	O	24.8%	24.1%
	P	16.8%	20.7%
28LH	Q	9.6%	15.8%
	R	18.4%	26.3%
	S	20.0%	15.8%
	T	23.2%	10.5%
	U	28.8%	31.6%
28RH	V	43.6%	30.8%
	W	23.6%	53.8%
	X	32.7%	15.4%
36H	AA	27.8%	20.0%
	Y	29.3%	20.0%
	Z	42.9%	60.0%

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

Source: Radar track data, MAC Analysis, 2009.

Table 5-4d

Flying Cloud Airport Year 2025 Arrival Flight Track Use

		Helicopters	
Runway	Track	Day	Night
10LH	A	100.0%	100.0%
10RH	B	100.0%	100.0%
18H	C	40.4%	20.0%
	D	26.3%	20.0%
	E	33.3%	60.0%
28LH	F	29.7%	56.8%
	G	15.5%	5.4%
	H	37.8%	27.0%
	I	16.9%	10.8%
28RH	J	22.1%	0.0%
	K	23.2%	40.0%
	L	14.9%	28.0%
	M	24.6%	28.0%
	N	15.2%	4.0%
36H	O	100.0%	100.0%

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

Source: Radar track data, MAC Analysis, 2009.

Table 5-4c

Flying Cloud Airport Year 2025 Arrival Flight Track Use

		Stage 3 Jets		Piston		Turboprop	
Runway	Track	Day	Night	Day	Night	Day	Night
18	A	14.5%	0.0%	29.4%	68.1%	9.0%	0.0%
	B	64.3%	0.0%	38.2%	31.9%	57.7%	0.0%
	C	21.3%	0.0%	32.4%	0.0%	33.3%	100.0%
36	A	0.0%	0.0%	11.2%	0.0%	12.0%	0.0%
	B	100.0%	0.0%	63.7%	44.8%	69.3%	0.0%
	C	0.0%	0.0%	25.1%	55.2%	18.7%	100.0%
10L	A	50.3%	0.0%	29.7%	0.0%	38.6%	0.0%
	B	46.8%	0.0%	55.7%	0.0%	52.6%	0.0%
	C	3.0%	0.0%	14.6%	0.0%	8.8%	0.0%
10R	A	67.9%	57.1%	18.7%	9.5%	10.0%	8.9%
	B	31.3%	42.3%	76.8%	85.7%	85.0%	83.5%
	C	0.9%	0.6%	4.5%	4.8%	5.0%	7.6%
28L	A	0.4%	0.0%	16.5%	7.1%	11.7%	1.7%
	B	97.4%	99.1%	44.9%	63.1%	61.6%	85.0%
	C	2.2%	0.9%	38.6%	29.9%	26.6%	13.3%
28R	A	4.2%	0.0%	35.7%	54.0%	18.8%	14.3%
	B	66.8%	100.0%	31.7%	6.3%	42.5%	85.7%
	C	29.0%	0.0%	32.6%	39.7%	38.6%	0.0%

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

Source: Radar track data, MAC Analysis, 2009.

Table 5-5
Flying Cloud 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	18	1.3%	0.0%	1.3%	0.1%	0.0%	0.1%	-	-	-
	36	0.2%	0.0%	0.2%	0.0%	0.0%	0.0%	-	-	-
	10L	2.0%	0.0%	1.9%	2.4%	1.1%	2.4%	-	-	-
	10R	48.2%	72.0%	49.3%	40.3%	34.4%	40.1%	-	-	-
	28L	41.8%	26.3%	41.1%	56.8%	64.5%	57.1%	-	-	-
	28R	6.5%	1.7%	6.3%	0.3%	0.0%	0.3%	-	-	-
Helicopters	18	20.6%	28.8%	20.9%	12.5%	23.3%	12.8%	15.2%	10.8%	15.2%
	36	6.6%	9.1%	6.6%	23.5%	10.1%	23.1%	1.4%	0.0%	1.4%
	10L	2.6%	2.1%	2.6%	28.2%	32.8%	28.3%	31.3%	36.9%	31.4%
	10R	5.1%	0.8%	4.9%	10.4%	10.5%	10.4%	19.4%	36.9%	19.7%
	28L	19.6%	32.2%	19.9%	17.7%	13.8%	17.6%	4.7%	9.2%	4.7%
	28R	45.6%	27.0%	45.1%	7.7%	9.5%	7.8%	28.0%	6.2%	27.7%
Pistons	18	19.4%	1.1%	18.7%	18.4%	15.6%	18.3%	18.5%	24.8%	18.5%
	36	7.8%	1.6%	7.6%	5.9%	3.2%	5.8%	7.8%	5.1%	7.8%
	10L	8.1%	0.0%	7.8%	18.9%	5.8%	18.5%	19.9%	9.4%	19.8%
	10R	23.6%	55.7%	24.8%	12.4%	23.8%	12.7%	9.5%	13.0%	9.5%
	28L	25.8%	33.5%	26.1%	17.4%	51.5%	18.4%	9.1%	47.7%	9.3%
	28R	15.3%	8.1%	15.0%	27.1%	0.0%	26.2%	35.2%	0.0%	35.0%
Turboprops	18	8.1%	0.7%	7.8%	3.9%	0.4%	3.8%	-	-	-
	36	3.2%	0.7%	3.1%	0.9%	0.0%	0.9%	-	-	-
	10L	4.5%	0.0%	4.3%	7.9%	6.1%	7.8%	-	-	-
	10R	39.9%	53.4%	40.5%	27.3%	29.0%	27.4%	-	-	-
	28L	36.0%	40.7%	36.3%	54.2%	64.5%	54.6%	-	-	-
	28R	8.2%	4.6%	8.0%	5.7%	0.0%	5.4%	-	-	-

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

Source: MAC ANOMS Analysis, 2009.

Table 5-6
Flying Cloud 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	18	0.3%	0.0%	0.3%	0.0%	0.0%	0.0%	-	-	-
	36	0.1%	0.0%	0.1%	0.0%	0.0%	0.0%	-	-	-
	10L	0.6%	0.0%	0.6%	0.4%	0.3%	0.4%	-	-	-
	10R	36.6%	42.7%	36.8%	46.2%	44.6%	46.2%	-	-	-
	28L	60.4%	55.7%	60.2%	53.2%	55.1%	53.2%	-	-	-
	28R	2.0%	1.6%	2.0%	0.2%	0.0%	0.2%	-	-	-
Helicopters	18H	22.6%	28.8%	22.9%	17.0%	25.9%	17.4%	14.9%	12.5%	14.9%
	36H	8.8%	9.6%	8.9%	20.0%	8.9%	19.5%	2.6%	0.0%	2.5%
	10LH	2.3%	1.0%	2.3%	25.6%	25.9%	25.6%	28.1%	25.0%	28.0%
	10RH	4.8%	1.0%	4.6%	10.4%	10.7%	10.4%	23.0%	45.8%	23.4%
	28LH	21.4%	35.6%	22.0%	18.8%	17.0%	18.7%	5.5%	12.5%	5.7%
	28RH	40.0%	24.0%	39.3%	8.3%	11.6%	8.4%	26.0%	4.2%	25.6%
Pistons	18	21.1%	3.4%	20.3%	19.2%	21.7%	19.3%	20.8%	26.5%	20.9%
	36	8.6%	5.2%	8.5%	6.0%	5.4%	6.0%	8.2%	5.8%	8.1%
	10L	8.8%	0.0%	8.4%	19.8%	5.6%	19.2%	21.8%	2.3%	21.5%
	10R	22.0%	49.4%	23.1%	11.0%	23.4%	11.5%	6.5%	10.4%	6.6%
	28L	23.4%	33.3%	23.8%	16.1%	44.0%	17.2%	7.6%	55.0%	8.5%
	28R	16.2%	8.7%	15.9%	28.0%	0.0%	26.9%	35.1%	0.0%	34.5%
Turboprops	18	8.5%	0.7%	8.2%	4.7%	0.9%	4.6%	-	-	-
	36	3.4%	0.7%	3.3%	1.2%	0.0%	1.1%	-	-	-
	10L	5.1%	0.0%	4.9%	9.0%	8.0%	9.0%	-	-	-
	10R	38.7%	53.4%	39.3%	26.9%	28.6%	27.0%	-	-	-
	28L	35.0%	40.5%	35.2%	51.2%	62.5%	51.7%	-	-	-
	28R	9.3%	4.7%	9.1%	7.0%	0.0%	6.7%	-	-	-

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 no single-family homes located in the 60 DNL contour around Flying Cloud Airport. The 60 DNL contour contains approximately 0.87 square miles. The 65 DNL contour contains approximately 0.36 square miles and no single-family homes. The entire 70 and 75 DNL contours are contained on the airport property, essentially overlying the areas immediately adjacent to the runways. The 2007 70 and 75 DNL contours contain 0.18 and 0.07 square miles respectively.

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

5.1.4 Forecast 2025 Noise Impacts

The Forecast 2025 60 DNL noise contour around Flying Cloud Airport decreases to approximately 0.85 square miles while the 65 DNL contour increases to approximately 0.37 square miles. The residential structures within the 60 DNL contour increase to 1 single family home. The 65, 70 and 75 DNL contours cover 0.37, 0.17 and 0.05 square miles, respectively, with no residential structures in the contours.

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

In summary, there will be a 2.3 percent decrease in the 60 DNL contour, however 2 single family homes are located in the contour. The area within the 65, 70 and 75 DNL contours remains relatively unchanged with no single family homes located in these contours. The decrease in the overall size of the 60 DNL contour can be attributed primarily to an 8.6 percent decrease in total aircraft operations from 2007 to 2025. The increase in single family homes located in the 60 DNL contour can be attributed to the extension of Runway 10R/28L, which locates the departure end of Runway 10R closer to residential areas immediately southwest of the airport.

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 will submit a Categorical Exclusion to the FAA for approval. 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 Flying Cloud 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 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]
- **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]

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

- **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 option of the affected community; generally, the buffer zone becomes an extension of noise zone 4. 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 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.

[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 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. The recommended 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 (i.e. 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 RPZ's and recommended State Safety Zones for Flying Cloud Airport are shown on Figure 6-1.

6.2 Land Use Compatibility Analysis

The Flying Cloud Airport is located in Hennepin County, southwest of the City of Minneapolis. The airport is located in the City of Eden Prairie. The airport is bordered by primarily residential land uses to the southwest of the airport. Park/recreational and/or preserve is located immediately north and south of the airport while industrial/utility and residential land uses are located west of the airport. The airport is bordered by Pioneer Trail to the north and TH 212 to the south. The City of Eden Prairie adopted a Comprehensive Plan Update which addresses planning and development in airport noise and airspace safety zones. Eden Prairie has adopted by reference the Metropolitan Council's *Land Use Compatibility Guidelines for Aircraft Noise* for new development and also uses state safety zones for planning purposes. The City's zoning ordinance contains height limits ranging between 30 and 45 feet, depending on zoning district.

The following sections detail land use considerations in the context of existing and planned land uses around Flying Cloud 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 residential to the west and southwest with park/recreational and/or preserve located to the north and south and industrial/utility/residential land uses to the east. The airport is bordered by Pioneer Trail to the north and TH 212 to the south. Residential uses border portions of airport property to east and northwest. Industrial and utility uses border TH 212 along the east side of the airport. Much of the park/recreational and/or preserve uses in the vicinity of the airport, are located immediately north of the airport along Pioneer Trail and to the south along TH 212.

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 Flying Cloud Airport contains no single-family homes in the 60 DNL.

Figure 6-2 provides the 2007 baseline 60 and greater DNL noise contours around Flying Cloud Airport with 2005 land use data provided by the Metropolitan Council. As is detailed on the map, there are no residential structures located within the 60 and greater DNL noise contours around Flying Cloud Airport.

The 2007 baseline 70 and greater DNL contours are contained on airport property.

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 10R/28L, 10L/28R, and 18/36 at Flying Cloud Airport are depicted in Figure 6-3 with the existing land uses around the airport.

The Runway 10R RPZ encompasses 78.8 total acres; 77.8 acres are on airport property and 1.0 acres are undeveloped. State Zone A contains 83.1 total acres; 81.2 acres are airport property and 1.9 acres are undeveloped. State Zone B contains 59.1 total acres; 53.9 are on airport property and 5.2 are undeveloped.

The Runway 10L RPZ encompasses 13.8 total acres on airport property. State Zone A contains 53.1 total acres; 52.7 acres are airport property and 0.4 acres are undeveloped. State Zone B contains 44.0 total acres; 29.4 acres are airport property, 11.9 acres are undeveloped and 2.7 acres are institutional.

The Runway 28R RPZ encompasses 13.8 total acres on airport property. State Zone A contains 53.0 total acres; 50.1 acres are airport property, 2.3 acres are undeveloped and 0.6 acres are industrial/utility. State Zone B contains 44.0 total acres; 20.6 acres are airport property, 18.2 acres are single family residential, 2.7 acres are undeveloped and 2.5 acres are park. There are 33 single family residential structures located in State Zone B.

The Runway 28L RPZ encompasses 13.8 total acres; 12.9 acres on airport property and 0.9 acres are undeveloped. State Zone A contains 83.1 total acres; 70.1 acres are airport property, 10.4 acres are industrial/utility and 2.6 acres are undeveloped. State Zone B contains 59.1 total acres; 26.7 acres on airport property, 12.4 acres are single family residential, 9.5 acres are undeveloped, 8.3 are industrial/utility and 2.2 acres are park. There are 51 single family residential structures located in State Zone B.

The Runway 36 RPZ encompasses 8.0 total acres; 6.1 acres are on airport property, 1.3 acres are park and 0.6 acres are undeveloped. State Zone A contains 31.7 total acres; 20.3 acres are park, 9.9 acres are on airport property, 1.0 acres are undeveloped and 0.5 acres are industrial/utility. State Zone B contains 24.1 total acres; 19.1 are water and 5.0 acres are park.

The Runway 18 RPZ encompasses 8.02 total acres; 7.70 acres are on airport property, 0.30 acres are park and 0.02 are single family residential. State Zone A contains 31.6 total acres; 21.4 acres are airport property, 5.2 acres are water, 3.9 acres are park and 1.1 acres are single family residential. There is 1 single family residential structure located in State Zone A. State Zone B contains 24.1 total acres, all of which are water.

6.2.2 Preferred Alternative Land Use Compatibility

The preferred development alternative at Flying Cloud Airport maintains the existing airport infrastructure and runway lengths on the parallel runways. The only notable change will be a slight shift of the crosswind runway to the north by 58-feet to create a compliant runway safety area and object free area to the south of the runway with the addition of 109 feet of pavement to the north for a total runway length of 2,800 feet.

The forecasted change in fleet mix, primarily an increase in jet operations, and an overall reduction in forecasted operations results in slight changes to the forecast 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 Flying Cloud Airport contains 1 single family home. The 2025 preferred alternative forecast 65, 70 and 75 DNL contours are contained on airport property.

Figure 6-4 provides the 2025 preferred alternative forecast 60 and greater DNL noise contours around Flying Cloud Airport with 2005 land use data provided by the Metropolitan Council. Additional analysis was conducted relative to the planned 2020 land uses around Flying Cloud Airport as provided by the Metropolitan Council. Much of the undeveloped land to the west and south west of the airport is planned to be converted into single family with some mixed use and park land use. To the east, there is some conversion from undeveloped land to single family and industrial land uses. There is undeveloped land to the southeast of the airport that is planned to be converted to park land.

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 10R/28L, 10L/28R, and 18/36 at Flying Cloud Airport are depicted in Figure 6-5 with existing land uses around the airport.

The Runway 10R RPZ encompasses 78.8 total acres; 63.6 acres are on airport property and 15.2 acres are undeveloped. State Zone A contains 83.1 total acres; 64.5 acres are airport property and 18.6 acres are undeveloped. State Zone B contains 59.09 total acres; 42.62 are undeveloped, 14.02 are agricultural, 2.44 are on airport property and 0.01 are institutional.

The Runway 10L RPZ encompasses 13.8 total acres on airport property. State Zone A contains 53.0 total acres; 52.0 acres are airport property and 1.0 acres are undeveloped. State Zone B contains 44.0 total acres; 25.4 are undeveloped, 11.6 acres are agricultural, 4.0 acres are airport property and 2.9 acres are institutional. There are 28 single family residential structures located in State Zone B.

The Runway 28R RPZ encompasses 13.8 total acres on airport property. State Zone A contains 53.0 total acres; 50.1 acres are airport property, 2.3 acres are undeveloped and 0.6 acres are industrial/utility. State Zone B contains 44.0 total acres; 18.1 acres are single family residential, 16.4 acres are airport property, 6.8 acres are undeveloped and 2.7 acres are park. There are 110 single family residential structures located in State Zone B.

The Runway 28L RPZ encompasses 13.8 total acres; 12.7 acres on airport property and 1.1 acres are undeveloped. State Zone A contains 83.1 total acres; 61.2 acres are airport property, 17.8 acres are industrial/utility and 4.1 acres are undeveloped. State Zone B contains 59.1 total acres; 20.8 acres on airport property, 15.3 acres are undeveloped, 12.4 acres are single family residential, 8.3 are industrial/utility and 2.3 acres are park. There are 49 single family residential structures located in State Zone B.

The Runway 36 RPZ encompasses 8.0 total acres; 6.7 acres are on airport property, 0.8 acres are park and 0.6 acres are undeveloped. State Zone A contains 33.4 total acres; 21.2 acres are park, 10.7 acres are on airport property, 1.0 acres are undeveloped and 0.5 acres are industrial/utility. State Zone B contains 25.7 total acres; 20.9 are water and 4.8 acres are park.

The Runway 18 RPZ encompasses 8.0 total acres; 7.8 acres are on airport property and 0.2 acres are park. State Zone A contains 33.4 total acres; 18.7 acres are airport property, 10.6 acres are water,, 3.2 acres are park, and 0.9 acres are single family residential. State Zone B contains 25.7 total acres, all of which are water.

The total residential units in the RPZs and State A and B Zones with the preferred alternative are 0, 17 and 187 respectively. This represents an increase of 103 total residential units in the State B Zone from the existing airport layout.

Additional analysis was conducted relative to the planned 2020 land uses around Flying Cloud Airport as provided by the Metropolitan Council. Substantive proposed changes in land use are planning in the State Zones off of each end of runways 10L/28R and 10R/28L. Undeveloped land in State Zone B of runway 10R is planned to change to single family residential while undeveloped land in State Zone B of runway 10L changes to institutional land use. In State Zones A and B of runways 28L and 28R, undeveloped land is slated to change to industrial, single family residential, right of way, and park land use. Minor changes in Zone A of runway 36 include the conversion of undeveloped land into right of way, industrial and park land uses.

The MAC is in the process of convening a Joint Airport Zoning Board (JAZB) that will include the respective Responsible Governmental Units (RGUs) that control land use development around the Flying Cloud Airport. This effort will address land uses around Flying Cloud 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 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 will be to develop a Flying Cloud 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 Flying Cloud Airport or if modifications to the model are necessary considering the provisions of Minn. Stat. §360.066, subd. 1. The focus of this discussion is likely to be 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)

- Flying Cloud 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.

6.3 Concurrent Use / Development Areas on Airport Property

MAC is currently analyzing the potential for developing concurrent use, revenue-generating development at the Flying Cloud Airport and all of its Reliever Airports. Any parcels reviewed by MAC at FCM will be compatible with the airport and MAC will work with the City of Eden Prairie to address any concerns.

Chapter 7 Capital Improvement Program Costs

The items included in the 20-year planning period for the Runway 18-36 preferred alternative and other items recommended are listed in the table below. Chapter 4 describes each of the proposed projects itemized.

The estimated costs are in 2009 dollars, and they include estimated engineering costs.

Table 7-1
LTCP Recommendation Estimated Costs

Recommendation	Estimated Cost
Reconstruct Runway 18-36 south end, shift and extend runway to 2,800 feet, upgrade runway lights and circuit	$1,700,000
Construct North Perimeter Road	$300,000
Replace Runway 18-36 VASIs with PAPIs	$100,000 - 200,000
Obstruction Removal	$100,000
On-going pavement maintenance and replacement program*	$2,000,000
South Hangar Area Utilities	$2,100,000
Concurrent Use / Parcel Development	$0 (developer cost)
Clear Taxiway A OFA	$0 (airport tenant cost)
Relocate ATCT**	$6,000,000 -7,000,000

Source: MAC calculation and engineering consultant estimates.

* Includes total cost for projects included in the draft 2010 – 2016 Capital Improvement Program for FCM alleyway rehabilitation and pavement maintenance.

** The Flying Cloud Air Traffic Control Tower is not owned by the MAC. Its relocation will require the cooperation and assistance of the FAA.

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 Runway 18-36 preferred alternative and other recommended items are listed in the table below. These timelines will vary depending on the availability of funds and other parameters. The Flying Cloud Air Traffic Control Tower is not owned by MAC. Its relocation will require the cooperation and assistance of the FAA.

Chapter 4 discussed each of the proposed projects itemized below.

Table 8-1
LTCP Recommendation Implementation Schedule

Recommendation	Timeline
Reconstruct Runway 18-36 south end, shift and extend runway to 2,800 feet, upgrade runway lights and circuit	0 – 5 Years
Construct North Perimeter Road	0 – 5 Years
Replace Runway 18-36 VASIs with PAPIs	0 – 5 Years
Obstruction Removal	0 – 5 Years
On-going pavement maintenance and replacement program	Continuous throughout planning period
Completion of South Hangar Area Utilities	0 – 5 Years
Concurrent Use / Parcel Development	0 – 10 Years
Clear Taxiway A OFA	15 – 20 Years
Relocate ATCT*	10 – 15 Years

* The Flying Cloud Air Traffic Control Tower is not owned by the MAC. Its relocation will require the cooperation and assistance of the FAA.

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 Flying Cloud Airport Advisory Commission typically involved a short presentation by MAC followed by a question and answer period.

Table 9-1
Public Information Program Meetings

Meeting with:	Date
Eden Prairie City Planners	February 17, 2009
Airport FBOs	March 3, 2009
Airport Tenants	March 3, 2009
Reliever Airport Advisory Committee (RAAC)	April 29, 2009
Flying Cloud Airport Advisory Commission (FCAAC)	March 12, 2009
MAC FD&E Committee Meeting	May 6, 2009
MAC M&O Committee Meeting	May 6, 2009
FCAAC	May 14, 2009
FCAAC – Public Informational Presentation / Meeting	May 28, 2009
LTCP Public Informational Meeting	June 18, 2009
MAC FD&E Committee	July 8, 2009
FCAAC	July 9, 2009
MAC FD&E Committee Meeting	September 9, 2009
FCAAC	September 10, 2009
FCAAC	November 12, 2009
LTCP Public Informational Meeting	December 14, 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. Advertisements for the MAC public open house meeting were published in the *Eden Prairie News* and the *Sun Current* on June 11, 2009. The meeting was attended by six people. As of July 2009, two verbal and one written comment has been received supporting the shortening of Runway 36. Two verbal comments have been received asking that no runway length be lost. All correspondence received prior to the 30-day written public comment period are included in Appendix B.

Prior to August 2009, there were only two alternatives under considerations for Runway 18-36 – shortening the runway, or shortening the runway but maintaining the existing runway length (see Chapter 4). It was those two options that were presented at the LTCP public informational meeting and to the MAC Commissioners in July 2009. During the review and analysis of runway usage that occurred about the same time, it was determined that the crosswind Runway 18-36 is used very regularly – much more than approximate 5% of the time there is a strong crosswind component. Based on this information, combined with FAA runway length design recommendations, staff began reviewing the possibility of not only maintaining the existing length, but also extending it to make the runway more effective in accommodating the traffic using it. In September 2009, MAC brought this new shift-and-extend alternative to the Finance Development and Environment (FD&E) Committee requesting it be adopted as the preferred alternative for the LTCP document. The full Commission ratified the decision in September.

The addition of the shift-and-extend alternative for Runway 18-36 was added to the document prior to the start of the formal written comment period. The draft LTCP document was completed in November, 2009, and made available for a 30-day written comment period starting November 23, 2009. The comment period ended on December 22, 2009.

Advertisements for the 30-day public written comment period on the draft LTCP were published in the *Pioneer Press* and *Star Tribune* newspapers on November 19, 2009 and in the *EP News* and *Sun Current* local papers also on November 19, 2009. Advertisements for a second public informational open house meeting were published in the *Pioneer Press, Star Tribune, EP News* and *Sun Current* papers on December 10, 2009.

On December 14, 2009, MAC held a second public informational meeting to address any questions or comments about the revised preferred alternative. The meeting was attended by six people. No written comments were received at the meeting.

Upon completion of the written comment period on December 22, 2009, MAC received only one letter. The letter from the City of Eden Prairie and MAC's responses to that letter are included in Appendix B. One of the comments triggered a modification to Exhibit 6-3. The revised graphic is now included in this document. The Executive Summary and Figure 4-4 graphics were also modified as a result of a MAC staff request.

In February 2010, MAC submitted the draft LTCP document, along with the 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, staff requested the Commission take action to adopt this LTCP as the final plan. The action was tabled at that meeting due to questions related to an FBO's proposed development concepts. The item was first brought back to the Commission in September 2010, but was further deferred for another month due to additional questions. Staff returned to the Commission in October 2010, where 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.