



WINNIPEG
AIRPORTS AUTHORITY



Winnipeg Richardson International Airport

MASTER PLAN 2033

June 19, 2015



*Land Use Plan Approved by
Minister of Transport
September 25, 2015*

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Executive Summary

Winnipeg James Armstrong Richardson International Airport (YWG) is a vital asset to its community and region, by providing connectivity to the world and global markets. YWG is also a significant economic driver in Manitoba. Currently, the airport generates nearly 20,000 jobs and over \$3.6 billion in economic output. With the volume of passengers and cargo at YWG nearly doubling in the next 20 years, additional jobs and businesses will benefit from an increase in aviation activity.

Careful planning is needed to accommodate this growth, as well as delivering appropriate timing of capital expenditures. The organization and sequencing of future investments must also take into account the changing demands of airlines, passengers and cargo supply chains. Faster turnaround time for air carriers, for example, can help sustain more routes through lower-cost and efficient operations. Furthermore, future facilities need to also address a wide range of airport customers – from airlines serving international wide-body flights to emerging ultra-low cost carriers.

To capitalize on future opportunities for YWG, Master Plan 2033 is a strategic-level document based on aviation forecasts including anticipated passenger levels, cargo volumes and aircraft movements. Each airport system (e.g., airfield, terminal ground access) is systematically reviewed against the predicted future direction of the industry and the locality. Support functions such as de-icing and airport maintenance are also included in the analysis.

The updated Master Plan is a guide to direct YWG in future decision-making. The Plan also provides flexibility to respond to changes in the direction of the airline industry when former decisions may need to be re-evaluated. Land development is also guided through the allocation of space on the airport site to meet long-term objectives.

Air Traffic Forecasts

A trend and econometric model was developed to forecast aviation activity over the next 20 years. Risk-based methodologies were then used to develop a “most likely” scenario for YWG. The advantages of this approach included quantification of risk for the factors that could increase or decrease YWG’s growth. The key findings from these air traffic forecasts were:

- Traffic will nearly double to 6 million enplaned/deplaned passengers;
- Cargo will grow by 62% to 282,000 tonnes by 2033;
- Aircraft movements will not increase as quickly due to the presence of larger aircraft, but will still increase 28% over the next 20 years; and
- Peak hour volume of passengers will grow by 52% for domestic/international departures and over 70% for all arrivals.

Overall, YWG’s highest rate of growth will be international and transborder flights, albeit from a smaller base of total activity.

Airside System

Winnipeg Airports Authority (WAA) needs to ensure that the airside system at YWG provides enough capacity to efficiently move aircraft. With aircraft movements forecast to increase to 167,500, there is sufficient airside capacity. However, there are challenges during the peak periods, such as the availability of overnight parking for aircraft. Currently some 23 aircraft need overnight parking and this volume is expected to exceed 30 aircraft by 2033. In addition to handling parking, there are opportunities to improve utilization and reduce the amount of fuel needed by air carriers through airfield improvements. Based on a systematic approach to prioritize airfield improvements, the long-term plan includes a parallel taxiway for the main runway and projects to reduce occupancy time by aircraft. The plan involves 13 recommended changes over the next 20 years, some of which include:

- Short term
 - add 4-6 aircraft parking positions
 - extend Taxiway T to Runway 36 to reduce taxi time and save fuel
 - accommodate cargo aircraft parking
- Medium/long term
 - add an additional 8-10 aircraft parking positions
 - complete a full parallel taxiway for Runway 13/31
 - add dual taxilane near the terminal building

Completing the recommended changes will increase YWG's airfield capacity to approximately 227,000 annual aircraft movements and also deliver improvements for hourly capacity and efficient aircraft circulation.

Terminal Building

Opened in 2011, the terminal building will incur space constraints in the next 20 years based on increasing aircraft size and a relatively narrow holdroom area. Based on a thorough evaluation of space utilization for each terminal system, configuration changes can be implemented to extend the life of the facility. However, greater flexibility is needed to meet additional gating demands and increase the number of operations per gate from an average of 6 today to an estimated 10 by 2033.

Additional air service opportunities will require more space in the terminal. Some of the key recommended changes include:

- Expand the terminal building by:
 - adding a ground-level, four-gate facility to the east of the terminal building
 - building a facility expansion to the west to meet additional gating demand;
- Implement a *Quick Connect* process to facilitate growing domestic-to-U.S. connections;
- Address constraints in the long term for circulation/holdroom space;
- Continue to allocate more post-security retail/concessions space;

- Implement next generation kiosk-based border clearance solutions with CBSA; and
- Work with CBP to improve processing capacity and hours of service.

Ground Access & Parking

The key theme of Master Plan 2033 is to connect the airport to the City of Winnipeg and beyond. Ground access planning depends on collaboration with municipal and provincial governments and is integral to the future success of YWG in connecting goods and people to markets. To achieve this, it is recommended that:

- The road network be improved to facilitate commercial development, including a Cargo Road to Flight Road Connection, Ferry Road extension, Moray Street upgrade and extension, Dublin Avenue extension and a future east-west corridor along Silver Avenue;
- A cellphone lot be developed in the short term; and
- Transit facilities should be reserved for a future rapid bus, light-rail or other rapid transit solution.

A phased parking expansion is also recommended, subject to demand management, as well as integration with commercial developments within the airport terminal campus.

Commercial Development

WAA's Commercial & Economic Development Strategy is intended to provide the highest and best use for land development. Based on market and economic analyses, a review was undertaken for a wide range of businesses and clusters that typically locate adjacent to an airport. Specifically, it will serve at improving the connectivity of the airport and the benefits of the Airport City/Connected City concepts on the five campus locations, including specific types of tenants:

- Airport Campus Centre;
- Integrator & Aerospace Campus;
- Advanced Manufacturing & Intermodal Campus;
- Innovation Campus; and
- Research & Development Testing Campus.

Airport Operations and Support

Safe and efficient operations at YWG depend on support facilities such as maintenance, emergency services and de-icing. Future requirements for the Combined Services Building can be accommodated within the existing land area. Aircraft rescue and firefighting is currently at a Category 7 level of service, with on-demand Category 8. Achieving a higher category level with larger aircraft serving YWG will be needed during the planning period, with some options being reviewed at this time.

De-icing capacity in the Central De-icing Facility is approximately 12 aircraft per hour. A third bay is recommended to meet future peak hour aircraft departures.

Environment

Environmental management encompasses a range of land, water and noise related issues. Overall, a sound process is established to continually assess environmental lands. Specifically, lands that have contaminated and environmentally sensitive features are regularly reviewed. The relevance to master planning is to ensure that future land development is compatible with creeks and is managed with contaminated soils on the airport site.

Noise management is based on a City of Winnipeg Airport Vicinity Development Plan (AVDP). Based on aviation noise modeling, a key conclusion is the need to preserve the AVDP to minimize the noise impact on surrounding areas while maintaining YWG activity levels.

Land Use Plan

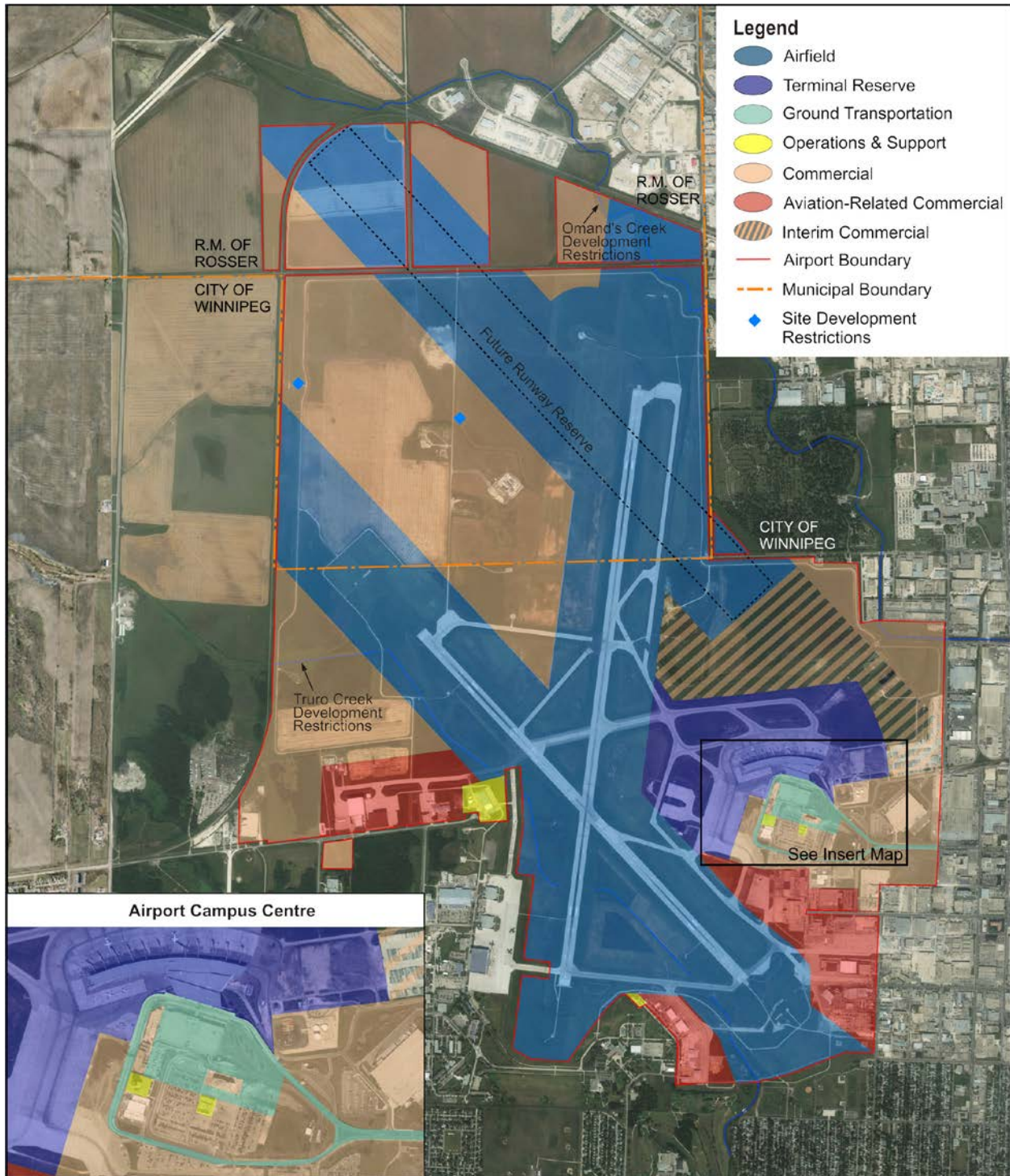
One of the main objectives of Master Plan 2033 is to provide guidance in locating and attracting future developments. The purpose of this section is to integrate the requirements and synthesize the recommendations derived from the findings within this document. The integration process is intended to resolve competing or conflicting requirements, and to achieve an efficient and logical airport development scheme. The results are documented in the Long-Term (2033) Airport Land Use Plan.

Some of the key changes recommended in the Master Plan 2033 are:

- Allowing flexible commercial development via changes in land use designations;
- Implementing the new standards in the draft of the 5th edition of the Transport Canada TP312 Standards; and
- Creating new developable lands within the Innovation Campus.

The Long-Term Airport Land Use Plan was approved by the federal Transport Minister on September 25, 2015. Amendments to the land lease that the WAA has with the Government of Canada are complete, including recent land swaps in the west part of the airport site.

Figure: Long-Term (2033) Airport Land Use Plan



Approved by the Minister of Transport per Amendment No. 10 to the Winnipeg Airport Ground Lease - September 25, 2015

Chapter 1: Introduction

Overview

Master Plan 2033 was developed to provide a strategic roadmap for the Winnipeg James Armstrong Richardson International Airport (YWG). One of the fundamental basics of airport planning is to ensure that the timing of future infrastructure development meets the needs of airport customers. A systematic methodology was used to develop a master plan to forecast needs, assess required capacity and to integrate different functional areas. Input was sought from various departments within the Winnipeg Airports Authority (WAA), surrounding communities, and the tenants and users of the airport.

Key themes emerged during the development of Master Plan 2033:

- YWG must improve its connectivity to the world and the region, including linkages by air to other modes of transportation;
- Existing facilities need to be optimized before spending additional capital on new infrastructure; and
- Revenue generating opportunities within the terminal and in the development of the commercial land need to be carefully coordinated.

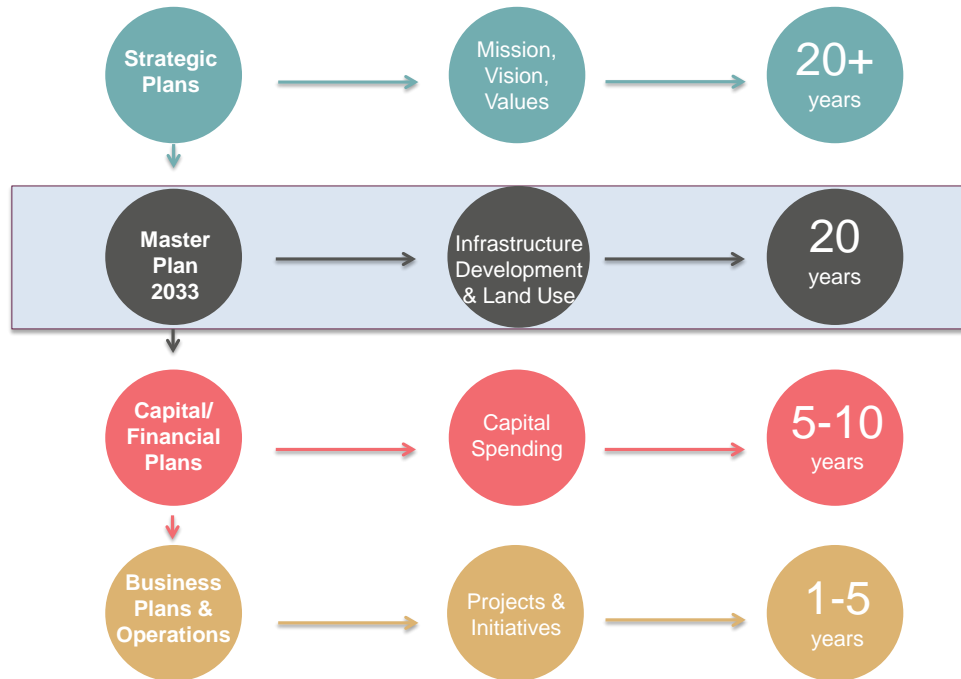
Using the Master Plan

Airport Master Plans are one of several key documents maintained by airport authorities. The plan is guided by the overall business strategy of WAA which establishes the core mission, vision, values and strategic targets for the corporation (see Figure 1-1).

The master plan provides long-term guidance and helps facilitate the more detailed work in capital plans as well as annual business and operational plans. Consequently, the master plan is traditionally designed to project 20 years into the future to adequately plan the long-term investments needed to meet changing markets.

Air carriers, cargo/logistics firms and airport customers will not remain static over the course of the next 20 years. For example, some of the major trends in the aviation industry include the growth of ultra low-cost providers, new international/network opportunities, and technological changes that generate new possibilities in streamlining the flow of passengers on every step of their journey through an airport.

Figure 1-1: Context of Airport Master Plans



Ultimately, Master Plan 2033 serves as the document for WAA to:

- Define future investments in the airport property;
- Ensure that the physical infrastructure of the airport aligns with the business strategy;
- Provide flexibility for changing market conditions; and
- Ensure aviation potential for the community is realized.

With Master Plan 2033, YWG will become:

- A more connected airport to the city, the province and the world;
- An optimized and flexible facility, ready to meet future demands; and
- A major contributor to the community by creating jobs and supporting the economy.

Airport Background

YWG is a source of pride for the community and a major contributor to the socio-economic fabric of the City of Winnipeg, the Province of Manitoba and northern & remote communities. The past decade has seen remarkable development in the airport, including a widely acclaimed terminal building and new services.

Airport History

Winnipeg James Armstrong Richardson International Airport (YWG) has a rich history that is tied to the growth of commercial aviation in Canada.

Located approximately seven kilometres northwest of Downtown Winnipeg, YWG was established in May 1928 by the Winnipeg Aeroplane Club, and was originally named after Manitoban pilot F.J. Stevenson, D.F.C. The airfield was used by private recreational flyers, small commercial companies, and a Royal Canadian Air Force non-permanent squadron. In 1930, the Airport became a Canada Customs port of entry, leading to its position today as Canada's longest-serving international airport.

Commercial services at YWG flourished through the 1930s. Canadian Airways Ltd. established Winnipeg as its operational headquarters. In 1931, Northwest Airlines initiated international airmail, passenger, and freight services to North Dakota. Trans-Canada Airlines started service at YWG in 1939 soon after its founding by the Federal Government, and established its headquarters until moving to Montreal in 1949.

At the outbreak of World War II, operation and maintenance of the field was transferred from Winnipeg Flying Club to the Dominion Government. Between 1958 and 1963, titles to YWG properties were transferred to the federal government.

YWG experienced significant growth in air service since World War II. With the initiation of U.S. Preclearance services in 1959, the Airport has been able to position itself as a key aviation facility, further fuelling growth. To support these activities, the Air Terminal Building used until 2011 was opened in 1964.



In 1994, the Federal Government redefined its role with respect to airport operations and management through the National Airports Policy (NAP). Under the NAP, control of the Airport was transferred to Winnipeg Airports Authority Inc. on January 1, 1997, under the terms of a 60-year lease.



In 2007, construction began on the current terminal building. Inspired by Manitoba's vast prairies and sky, the facility was completed in October 2011 and was the first freestanding airport building in Canada to be LEED certified¹. A new Greyhound Canada bus depot opened in the terminal area in August 2009. The facility serves both passengers and courier services, improving the ease of transportation within Winnipeg².

In addition to the new terminal and bus depot, a state-of-the-art Canada

¹ From CNW Group Ltd., <http://www.newswire.ca/en/story/867989/pelli-clarke-pelli-architects-airport-terminal-opens-in-winnipeg>

² From Winnipeg Airports Authority, <http://www.waa.ca/blog/read,post/477/new-greyhound-terminal-on-the-airport-campus>

Post mail processing plant was opened at the Airport in 2010. Designed with special consideration for employee health and safety, the Airport was selected as the first location for Canada Post's "Postal Transformation" initiative, which aimed to vastly improve the efficiency of Canada's postal service³.

Socio-Economic Profile

Throughout its history, YWG is tied to the socio-economic fabric of Winnipeg and Manitoba. Winnipeg lies at the geographic centre of North America and as a result acts as a hub for transportation from east-west and north-south directions, both domestically and transborder to the United States. A socio-economic profile is outlined below, based on data sources from the City of Winnipeg, Economic Development Winnipeg and the Province of Manitoba.

Population

In 2014, Winnipeg's population was estimated to be 783,000 residents with the Census Metropolitan Area. The Province of Manitoba, by comparison, is about 1.3 million residents⁴. The Manitoba government's priority is to increase the provincial labour force through immigration. Immigration in the last five years experienced the highest levels in decades and represents the bulk of population growth.

Lifestyle & Recreation

Winnipeg is considered the "Cultural Cradle of Canada" for the plethora of festivals, performing arts, museums and galleries active throughout the year, which attracts international performers and audiences. Winnipeg is also culturally diverse, with more than 100 languages spoken in the region.

Economic Industries & Employment

Winnipeg has one of the most diverse economies of any major city in Canada, with key industries being advanced manufacturing, aerospace, agribusiness, creative industries, energy & environment, and more. Tourism and travel are also important sectors, with major historic sites and new investments such as the Canadian Museum for Human Rights and an expanded convention centre in 2016.

Several competitive advantages for businesses in Manitoba include low business costs, a supportive business community, a productive workforce, geographic location, and low electricity rates.

Manitoba's diverse job market boasted a 5.6% unemployment rate in 2014 (seasonally adjusted), lower compared to Canada as a whole. The median family income is over \$74,000 per year, higher than the average Canadian family income.

Manitoba's real GDP grew 2.0% to about \$3.5 billion. According to the Province of Manitoba, it has the third best average annual GDP growth over the last five years (2008- 2013) at 1.9%.

³ From Winnipeg Airports Authority, <http://www.waa.ca/blog/read,post/622/canada-post-opens-new-state-of-the-art-mail-processing-plant>

⁴ From City of Winnipeg, www.winnipeg.ca/cao/pdfs/population.pdf

Air, road and rail transportation make up the second largest source of employment within the transportation and distribution sector. The subsector experienced an overall increase in employment of 9% between 2007-2012.

Economic Engine

Winnipeg Richardson International Airport is one of Manitoba’s most significant economic engines. An economic impact study completed in 2013 reported the airport contributes almost \$3.6 billion in economic output, supports over 19,400 jobs and creates wages in excess of \$810 million.

Table 1-1: Economic Impact of YWG

| Type of Impact | Jobs | Person Years | Wages (\$ millions) | GDP (\$ millions) | Economic Output (\$ millions) |
|----------------|---------------|---------------|------------------------|----------------------|----------------------------------|
| Direct | 9,670 | 9,070 | 390 | 790 | 2,190 |
| Indirect | 5,250 | 4,920 | 220 | 440 | 610 |
| Induced | 4,480 | 4,200 | 200 | 370 | 840 |
| Total | 19,400 | 18,190 | 810 | 1,600 | 3,640 |

Source: Winnipeg Airports Authority 2012 Economic Impact Study

In addition to creating jobs and economic output, YWG provides connectivity for goods and services to global markets. These are vital linkages to help businesses export products as well as bring in tourists. For Winnipeg-area residents, the growth of the airport is important to offer more choices for flight destinations and frequencies.

Investments for Winnipeg and Manitoba

Economic benefits will grow with the anticipated increase in aviation activity for both passenger and cargo operations. Additional ongoing investments will further the efficiencies of the airport and create new revenue sources, such as commercial land development. For example, new businesses can be attracted to the airport to leverage the strong cargo network at the airport. The city and province also benefit through improved supply chain networks for area businesses, and global connections for business travelers.

Objectives of Master Plan 2033

Key Strategic Directions

The Master Plan process reviews the future growth and development of YWG over a 20-year horizon and provides a strategic view of the key infrastructure requirements to be coordinated over the coming years. It is not a mandate to build, but a flexible guide to the most beneficial outcomes. This broad brush stroke approach has proven successful in helping other airports

ensure future possibilities are not overlooked, and to prevent costly rework and reinvestment decisions when future needs change.

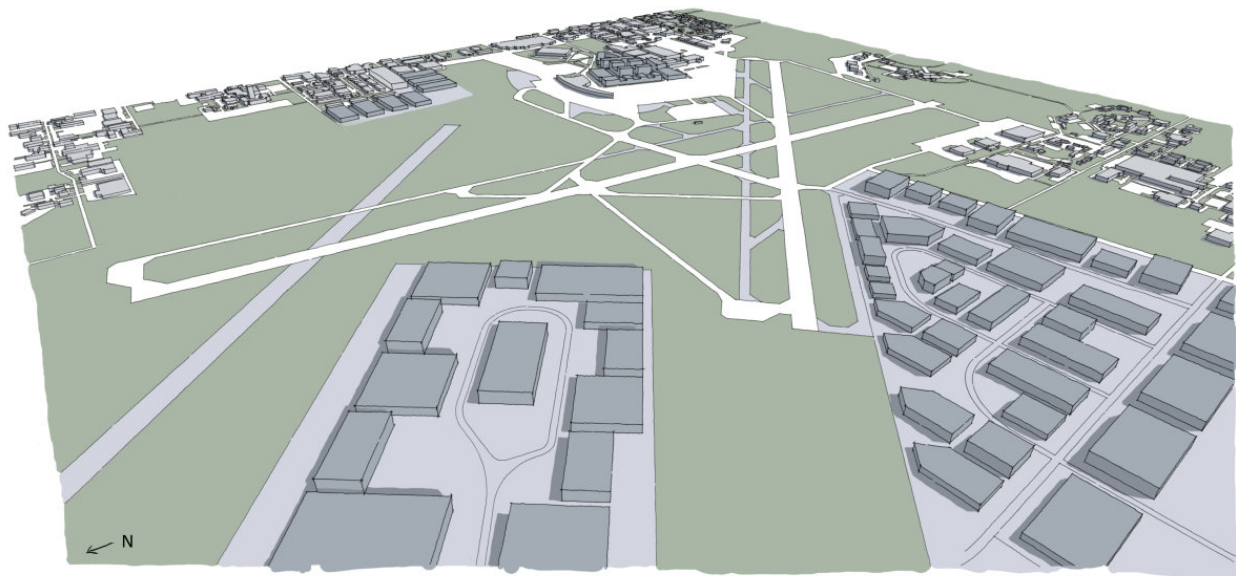
The Master Plan is rooted on key strategic directions of the Winnipeg Airports Authority:

- Enhance customer service and value;
- Operate excellent facilities and deliver excellent services;
- Expand air service to/from Winnipeg;
- Be an effective community partner;
- Develop and realize employee potential; and
- Develop new revenue streams.

Long-Term Vision

A longer-term vision over the next 50-60 years could see the full build-out of the Winnipeg Richardson International Airport as shown in the following artist's rendering in Figure 1-2.

Figure 1-2: Conceptual Overview of Winnipeg Richardson International Airport in 2065



This rendering is a depiction of one of the future scenarios for YWG Airport when it is fully built out. This scenario is well beyond the planning period included in Master Plan 2033.

Planning Considerations

Highest and Best Use of Land

The Master Plan prioritizes for highest and best use of airport lands based on their importance for aviation. The hierarchy of uses is based on the following order:

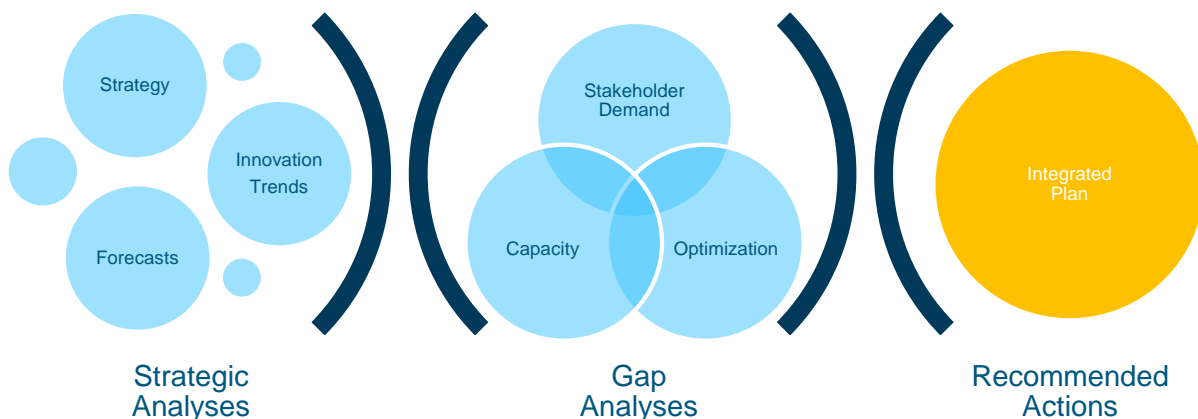
- **Airfield systems** are the most important uses to protect in order to ensure adequate flight operations can be maintained over the next 20 years and beyond;
- **Terminal expansion** reserves are provided to allow for projected growth of passengers and aircraft activity;
- **Commercial development** uses are prioritized to meet the WAA's strategic objectives for new revenue streams and customer service; and
- **Other uses** are assigned as needed to support connectivity to ground transportation and support functions.

This planning hierarchy provides the required protection of operational areas to ensure sufficient flexibility when pursuing a wide range of commercial development opportunities. For YWG, the non-aviation-related developments could be a significant complement to existing airport activities.

Planning Approach

Airport planning has changed in recent years and has become more of an innovative and strategic approach, rather than just a block concept linear approach. Three elements of planning include strategic and gap analyses, followed by recommended actions. Within this dynamic process, future strategic and innovative development supports the forecast growth of the airport. Gaps in terms of capacity, finances and stakeholder demands are reviewed through the consultation process and are all tied together to create an integrated Master Plan.

Figure 1-3: Overview of the Master Plan 2033 Methodology



Consultations

Throughout the Master Plan process, consultations were conducted with key stakeholders to obtain input to planning objectives and recommendations on the implementation of the Master Plan. The consultation processes included engagement with major tenants and stakeholders of the airport including WAA representatives, the Board of Directors, government agencies, tourism and economic development agencies, chambers of commerce, local businesses and the general public. The consultation process also included a public open house held in October 2014 that received a wide range of comments about key aspects of the plan.

Figure 1-4: Master Plan Public Open House October 1, 2014



Chapter 2: Air Traffic Forecasts

Overview

Airport master plans depend on a long-range view of aeronautical activity in order to properly size infrastructure as well as determine the overall demand for different sectors. A 20-year outlook was undertaken using a risk-based methodology developed to use historical and projected activity.

Between 1990 and 2013, total annual passenger traffic grew from 2.25 million passengers in 1990 to 3.48 million passengers in 2013. Taking into account historical activity, forecasting was developed using two approaches: econometric and trend based. Included in this approach was a comprehensive review of overall economic activity as well as the future demand for different types of aviation at YWG. These were then compared and reconciled into a single set of forecasts.

Master Plan 2033 is based on a comprehensive review of trending and econometric modelling to establish a “most likely” scenario for aviation growth.

Risk-Based Methodology

Dependable forecasting practice requires awareness of the uncertainties surrounding the forecasts. As with any prediction, there are uncertainties regarding these factors, such as the outlook for the local and world economies and the structure of the airline industry. A pragmatic and yet systematic approach was used to produce a set of unbiased, aviation-activity forecasts for YWG.

Scope

The forecasts cover the period 2013 to 2033 in 5-year increments, providing estimates for the following:

- Annual enplaned/deplaned (E/D) passenger traffic;
- Annual air cargo volumes;
- Annual aircraft movements;
- Peak hour forecasts; and
- Nominal schedules.

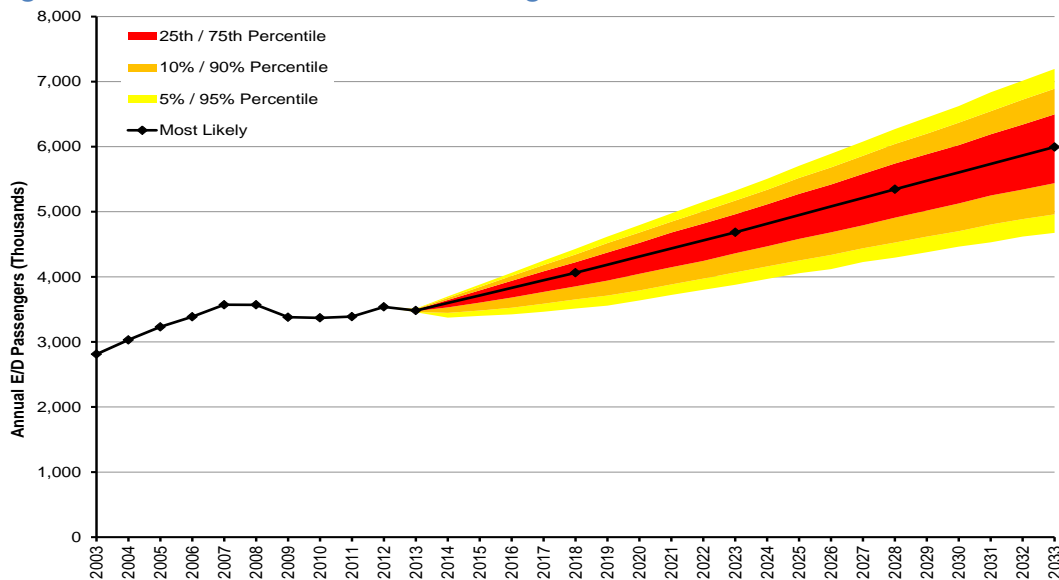
To develop activity volumes over a 20-year period, a range of different possibilities was outlined with the “most likely” forecast developed, along with alternative scenarios established on a percentile basis (e.g., 5th/95th percentile as the lowest probability range).

Air Passenger Forecasts

The air passenger forecasts are displayed in Figure 2-1 and Table 2-1. In 2013, total passenger traffic at YWG was 3.48 million E/D passengers. In the “most likely” forecast, traffic will reach nearly 4.7 million by 2023, and close to 6.0 million by 2033. The average growth rate between 2013 and 2033 is forecast to be 2.8% per annum. Traffic growth is highest at the start and attenuates as the market matures.⁵

Along with the “most likely” forecasts, Figure 2-1 and Table 2-1 show the result of the risk analysis conducted on the traffic projections. These show the range of possible outcomes and the probabilities associated with these outcomes. For example, in 2033 the 5th to 95th percentiles are 4.7 million and 7.2 million respectively, versus a “most likely” estimate of around 6.0 million.

Figure 2-1: Forecast Total E/D Passengers at YWG



The 95th percentile is similar to a high forecast. It is the result of a mix of possible positive factors such as high economic growth, no negative shocks, and the highly successful development of new air service, especially to U.S. and international destinations. However, the probability of this outcome (or better) is fairly low--no more than 5%. Similarly, the 5th percentile is a low forecast. It has a low probability and could result from possible negative factors such as lower than expected economic growth, negative shock events and the failure of a major air carrier.

⁵ The reason for this is that relative growth tends to decrease over the long term. In other words, higher traffic increases are required to achieve the same growth rate, e.g., a 5% increase on a base of 1 million passengers requires twice as much traffic as 5% growth on a base of 2 million passengers.

Table 2-1: Forecast Total E/D Passengers at YWG

| Year | 5 th Percentile | Most Likely | 95 th Percentile |
|--|----------------------------|-------------|-----------------------------|
| 2012 | | 3,538,175 | |
| 2013* | 3,460,000 | 3,475,800 | 3,490,000 |
| 2018 | 3,513,000 | 4,063,000 | 4,430,000 |
| 2023 | 3,878,000 | 4,684,000 | 5,324,000 |
| 2028 | 4,295,000 | 5,345,000 | 6,271,000 |
| 2033 | 4,676,000 | 5,995,000 | 7,195,000 |
| Forecast Annual Passenger Growth Rates | | | |
| 2012-2013 | -2.2% | -1.8% | -1.4% |
| 2013-2018 | 0.3% | 3.2% | 4.9% |
| 2018-2023 | 2.0% | 2.9% | 3.7% |
| 2023-2028 | 2.0% | 2.7% | 3.3% |
| 2028-2033 | 1.7% | 2.3% | 2.8% |

* The traffic figure for 2013 is an estimate based on data for January to November of that year.

Air Cargo

The air cargo forecasts for YWG are highlighted in Figure 2-2 and Table 2-2, along with the results of the risk analysis. Between 2013 and 2018, growth is expected to average 2.7% per annum driven by economic growth and the development of new services. After 2018, the growth rate is estimated to gradually attenuate due to market maturity and the increasing size of traffic. Air cargo volumes are predicted to reach 282,000 tonnes by 2033, an average growth rate of 2.3% per annum between 2013 and 2033.

In 2033, the 5th to 95th percentiles are approximately 198,000 and 362,000 tonnes respectively, versus a “most likely” forecast of 288,000. The 95th percentile is similar to a high forecast, the result of a mix of possible positive factors such as high economic growth and the development of new cargo service and new routes, especially to U.S. and international destinations. However, the probability of this outcome (or better) is fairly low--no more than 5%. Similarly, the 5th percentile is a low estimate, with a low probability associated with it. It would be the result of possible negative factors such as lower than expected economic growth and the loss of a major carrier’s hubbing operations.

Figure 2-2: Forecast Air Cargo at YWG

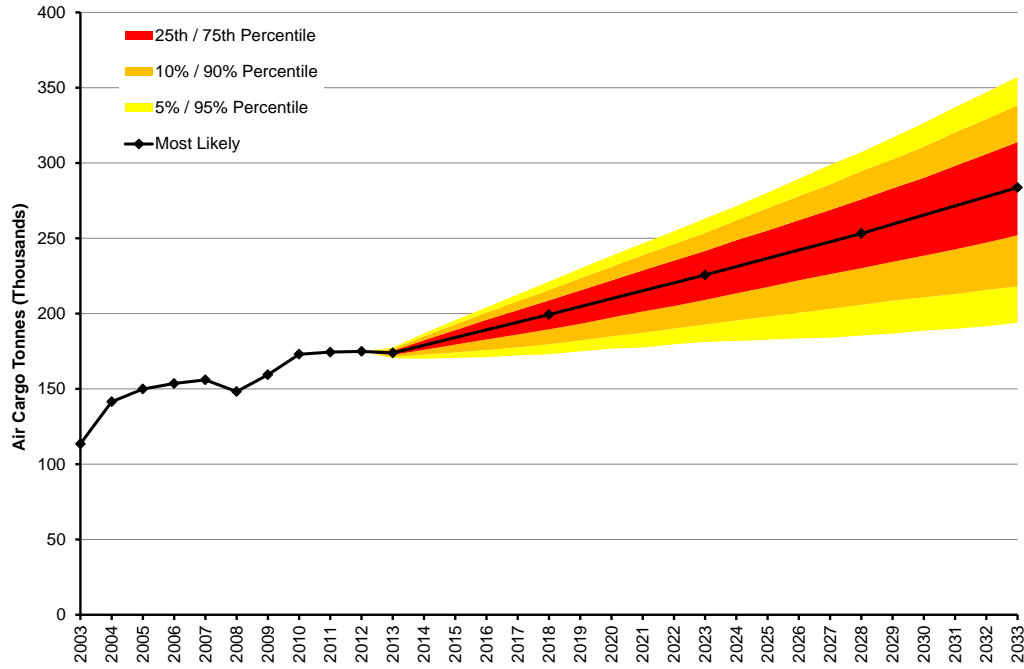


Table 2-2: Forecast Air Cargo at YWG

| Year | 5 th Percentile | Most Likely | 95 th Percentile |
|---|----------------------------|-------------|-----------------------------|
| 2012 | | 174,924 | |
| 2013* | 169,000 | 173,900 | 179,000 |
| 2018 | 173,000 | 199,000 | 221,000 |
| 2023 | 181,000 | 226,000 | 263,000 |
| 2028 | 185,000 | 253,000 | 307,000 |
| 2033 | 193,000 | 282,000 | 356,000 |
| Forecast Annual Cargo Growth Rates | | | |
| 2012-2013 | -0.1% | 1.9% | 3.9% |
| 2013-2018 | 0.3% | 2.6% | 4.4% |
| 2018-2023 | 1.0% | 2.5% | 3.5% |
| 2023-2028 | 0.6% | 2.3% | 3.1% |
| 2028-2033 | 0.6% | 2.2% | 3.0% |

*The air cargo figure for 2013 is an estimate based on data for January-November of that year.

Aircraft Movements

The aircraft movements for YWG are shown in Figure 2-3 and Table 2-3 and highlight the total aircraft movement forecast for YWG, combining the air carrier, government/military, general aviation (GA) and local movements. In 2012, aircraft movements at YWG totaled 131,243. In the “most likely” forecast, aircraft movements at YWG are predicted to grow by an average of 1.3% per annum, reaching 167,500 by 2033. In the low estimate, the average growth rate is 0.6% per annum and in the high forecast it is 2.0% per annum.

Figure 2-3: Forecast Total Aircraft Movements at YWG (Air Carrier, GA, Government/Military and Local Movements Combined)

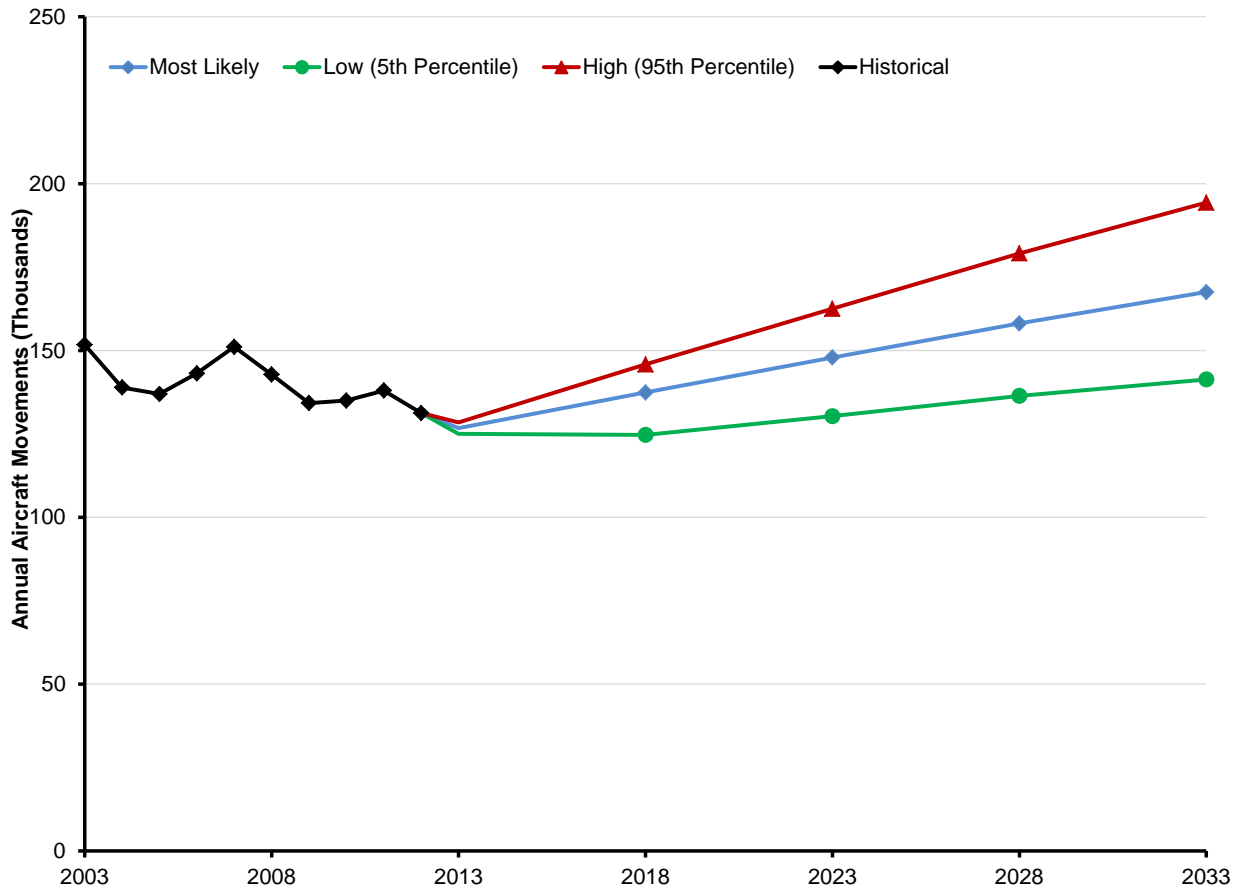


Table 2-3: Forecast Total Aircraft Movements at YWG (Air Carrier, GA, Government/Military and Local Movements Combined)

| Year | Low (5 th Percentile) | Most Likely | High (95 th Percentile) |
|---------------------------------------|----------------------------------|-------------|------------------------------------|
| 2012 | | 131,243 | |
| 2013 | 125,000 | 126,700 | 128,400 |
| 2018 | 124,700 | 137,400 | 145,800 |
| 2023 | 130,300 | 147,900 | 162,500 |
| 2028 | 136,400 | 158,100 | 179,100 |
| 2033 | 141,300 | 167,500 | 194,300 |
| Forecast Annual Movement Growth Rates | | | |
| 2012-2013 | -4.8% | -3.5% | -2.2% |
| 2013-2018 | 0.0% | 1.6% | 2.6% |
| 2018-2023 | 0.9% | 1.5% | 2.2% |
| 2023-2028 | 0.9% | 1.3% | 2.0% |
| 2028-2033 | 0.7% | 1.2% | 1.6% |

Peak Hour Passenger Forecasts

The forecasts for peak hour passengers are shown in Table 2-4. The peak forecasts are for commercial passenger services only and do not include general aviation or any other type of operation.

Some peak spreading is anticipated as carriers fill out their schedules throughout the day. Nevertheless, increases in peak passengers are still expected, albeit at a lower level of growth than annual passengers. As traffic develops and the schedule of traffic fills up during the day, the departures and arrivals peaks are expected to get closer together (in terms of the number of passengers per hour), as has been observed at other airports.

Table 2-4: Peak Hour Passenger Forecasts

| Year | Departures | Arrivals |
|------|------------|----------|
| 2013 | 964 | 850 |
| 2018 | 1,060 | 970 |
| 2023 | 1,170 | 1,100 |
| 2028 | 1,270 | 1,210 |
| 2033 | 1,350 | 1,310 |

A further detailed analysis was completed to breakdown the peak hour passenger forecast by sector in order to conduct terminal planning analysis. These values were used for an in-depth review of the terminal passenger processing areas such as security, check-in, arrivals

carousels, passenger corridors, holdrooms, etc. Further review was conducted on a peak hour volume for unscreened passengers, which was used to determine the need and sizing for a regional terminal. Results of the analyses are presented in Chapter 4 on reviewing the terminal building. The detailed sector breakdown of the peak hour passenger forecast can be found in Table 2-5.

Table 2-5: Peak Hour Passenger by Sector

| Departures | 2013 | 2023 | 2033 |
|-----------------------------|-------------|--------------|--------------|
| Domestic & International | 618 | 793 | 942 |
| Transborder | 277 | 281 | 290 |
| Unscreened | 69 | 96 | 118 |
| Total | 964 | 1,170 | 1,350 |
| Arrivals | 2013 | 2023 | 2033 |
| International & Transborder | 293 | 401 | 460 |
| Domestic | 421 | 563 | 705 |
| Unscreened | 136 | 136 | 145 |
| Total | 850 | 1,100 | 1,310 |

Nominal Schedule

A nominal schedule was produced after the air traffic forecasts to review the implications of combining all operations of the Northern Carriers into the main terminal. This nominal schedule also reviewed the gate scheduling of aircraft plus other functional areas of the terminal and airside components. Chapter 4 contains further details on the analysis of terminal integration.

Nominal schedules were created for the years 2023 and 2033. The nominal schedule analyses were based on the standard approach of the peak hour of the typical day in the busiest month (typically March for YWG).

In developing the nominal schedule the following assumptions were made:

- Airlines will add new flights and routes based on their network and strategy;
- Carriers will generally add frequency to existing routes based on their network value and strategy;
- Airlines will generally increase the frequency of a particular flight to daily, before introducing flights on the same day;

- International flights presently not offering daily service, will likely fly on the typical peak day as their markets mature;
- Carriers serving high-density markets, will likely expand services to other hours before introducing additional flights in the peak period;
- As peak demand increases, peak period traffic will generally spread to the shoulders of the peak period;
- The ratio of peak hour traffic over the planning peak day traffic, may exhibit some downward trending as annual traffic increases;
- Load factors will increase as flight markets reach maturity; and
- Increased services will include the expansion of existing services, recovering of lost services, services to new destinations and expansion by existing/new carriers.

Current Trends

The forecasts for the Master Plan were completed in December 2013 and updated in 2014 to provide a breakdown of regional movements. Overall, the long-range forecasts are still valid for the purpose of airport master planning. While 2013 air traffic levels have declined since the air traffic forecasts were produced, there is a traffic increase of 5.3% for the full year 2014, thus bringing forecast values back on track for 2015 and into the future.

Summary

The overall directions of the Master Plan are driven by anticipated forecasts, based upon a comprehensive, risk-based model. In summary, the model predicts YWG in 20 years will experience the following:

- Passenger traffic will nearly double to 6 million;
- Air cargo is forecast to increase 62% to 282,000 tonnes by 2033;
- Total aircraft movements forecast to increase 28% by end of planning period;
- Domestic passenger traffic will still be dominant at 77%. While transborder (15%) and international (8%) traffic are lower in volume, they will grow at a faster rate than the domestic sector;
- Aircraft movements will grow, but at a slower rate than passengers due to larger aircraft; and
- Peak hour volumes of passengers will grow by 52% for domestic/international departures, and 72% for domestic arrivals.

Chapter 3: Airside System

Overview

The performance of Winnipeg Richardson International Airport (YWG) depends on sufficient capacity in the airside system which includes runways, taxiways and aprons; it also includes the services to support aircraft operations, including navigation and approach aids.

The capabilities, capacity and usability of the airside infrastructure (under a wide range of conditions) must fulfill the operating requirements of the air carrier markets the airport seeks to serve. For example, if aircraft increase in size, it could limit the total movement capacity of the airside system. Construction and maintenance of airside infrastructure is capital intensive, and excess or unused capacity can represent a cost burden for the Winnipeg Airports Authority (WAA).

YWG's runways, taxiways and aprons are capital-intensive infrastructure requiring careful planning to meet demand while limiting excess or unused capacity.

Planning Objectives

The YWG airside system has been assessed using the following objectives:

1. Allows for sufficient capacity in order to meet the 20-year “high” forecast for movements;
2. Develop an optimum, sustainable airside system that is cost-effective and minimizes environmental impact; and
3. Review long-term airside capacity requirements beyond the timeframe of the Master Plan.

The primary airside planning objective is to ensure that sufficient capacity is available to efficiently process the “high” aircraft movement forecast throughout the planning period (see Chapter 2). This can include making airside improvements, such as construction of new taxiways in order to decrease runway occupancy times, or adding full parallel taxiway systems to the runways to improve aircraft flow and increase capacity.

The next objective requires the development of an optimal, sustainable airside system that is cost-effective and minimizes environmental impact. This involves utilizing existing facilities to their maximum potential prior to the use of any greenfield sites. An example of sustainable planning would be to improve existing runways, instead of constructing a whole new runway. These improvements could include the introduction of high-intensity approach lights for Runway 18.

The final planning objective is a review of the long-term airside capacity requirements in conjunction with an assessment of the current area and location of available land reserves.

Demand Analysis

The analyses conducted for Master Plan 2033 included a thorough review of movement forecasts outlined in the previous Chapter as well as a model built around NAV CANADA 2012/13 aircraft movements for YWG.

Comparative analyses based on forecasted fleet mix compared against runway system characteristics was the primary approach to determine hourly and annual throughput values. Industry benchmarks were then used to identify any sustained conditions of airside demand exceeding airside capacity. The application of over 10 years of wind and weather analysis from a previous master plan were used to derive annual airport usability values and aid in the determination of the practical annual capacity.

Based on consultations with air carriers, the planning approach also built in a method to minimize fuel burn by providing an efficient taxiway system. For example, saving two minutes on each aircraft taxi time could result in dramatic cost and operational savings for air carriers.

Finally, the airside planning approach will ensure that the taxiway and apron system supports overnight parking and aircraft movement requirements. The application of the revised standards contained in TP 312, 5th Edition (Draft) were used in the planning of new airside facilities.

Capacity Analyses

The calculation of existing capacity uses weather data and typical capacity assignments to calculate an annual total capacity. This annual capacity is discounted to provide a practical annual capacity value, taking weather and schedule variability into consideration. When compared to the annual forecast, it provides an indicator as to when additional capacity (particularly runways) may be required.

This calculation assumes operations for 16 hours a day, 365 days a year, reduced to 90% to provide the practical annual capacity of 204,146 (see Table 3-1).

Table 3-1: YWG Current Airside Capacity Estimate

| Condition | Runways | % Time | Hourly Capacity | Weight |
|----------------------------------|-------------|--------|-----------------|--------|
| VFR SIRO | 13/31,18/36 | 20 | 44 | 8.80 |
| VFR | 13/31,18/36 | 72 | 40 | 28.80 |
| IFR CAT I to VFR* | 13/31,18/36 | 7 | 38 | 2.66 |
| IFR CAT II | 36 | 1 | 6 | 0.06 |
| Annual Average | | 100 | | 40.32 |
| Practical Annual Capacity | | | 204,146 | |

*Includes a block of weather from 200/0.5 (Ceiling/vis) to 800/2.

The following observations were made with regards to the practical annual capacity estimate:

- Visual Flight Rules (VFR) weather conditions prevail at YWG 92% of the time;
- Simultaneous Intersecting Runway Operations (SIRO) occur about 20% of the time; and
- The average prevailing hourly capacity for the year is 40 operations per hour, leading to an annual total of 204,000 operations.

The calculated annual capacity of 204,000 is sufficient to meet the “most likely” operations forecast in Chapter 2, with typical average busy-period delays not exceeding 5 minutes. If growth approaches the “high” forecast rate, significant and frequent delays beyond 5 minutes would result. Depending on the type of aircraft operating at the airport, these delays are expected to be more frequent as YWG exceeds 175,000 annual movements per year.

Airside Capacity Enhancement

Capacity enhancements for the airside system include changes to increase the usability of the runway/taxiway infrastructure. Best-in-class single runway airports, such as London Gatwick and San Diego, have an optimized runway system. These airports achieve throughputs of over 50 aircraft operations per hour. Accordingly, YWG (with two intersecting runways) is in a strong position to increase capacity and defer the need for an additional runway until well beyond this planning period.

Deferring such a major expenditure, for even a few years, results in substantial savings in financing and operations/maintenance costs. In addition to delaying the need for a major capital expense, an optimized airside configuration conveys other benefits including:

- Reduced delays and fuel burn;
- Shorter taxi distances;
- Reduced emissions; and
- Increased revenues.

The measures proposed in this chapter take into account YWG’s specific operational needs. They include its role as a regional hub with a significant volume of overnighting aircraft. The enhancements also seek to provide the basis for long-term development that will be consistent with a logical pattern of growth as YWG expands in response to regional demand.

Current Airside System Deficiencies

A number of airside deficiencies have been identified in discussions with the WAA, NAV CANADA and airport tenants. Many of these deficiencies were raised in previous master plans, but they are repeated here to confirm their legitimacy and are included in the development phases contained in the recommendations. For reference, existing runway characteristics can be found in Appendix A.

Runways

The key runway system deficiencies are:

- **Runway 13 Exit:** Jet arrivals frequently cannot exit on Taxiway V, resulting in excessive runway occupancy time. Consequently, air traffic control arrival flow separation was increased to 5nm instead of 3nm. With the nature of aircraft fleet mix at YWG, there is a significant loss of capacity from the increased flow separation. Consequently an additional rapid exit on Runway 13 about 1,000 feet beyond Taxiway V could help to mitigate runway occupancy time.
- **Runway 18 Exit:** An additional taxiway exit beyond Taxiway K is desirable in order to minimise runway occupancy time and to avoid a 110 degree turn (onto Taxiway K) necessitating a slow speed;
- **Runway 18 Lighting:** Runway 18 is currently equipped with non-precision approach lighting. A GPS WAAS (Wide Area Augmentation System) based local performance with vertical guidance (LPV) approach is now in place⁶. The GPS WAAS that supports a 250-foot decision height with lower limits is anticipated to be in place in the relatively near future. With the existing centerline lighting along Runway 18, Category (CAT) II or III status should be supported in the future; and
- **Runway 36 Lighting:** CAT II operations are limited to 6 movements per hour due to the lack of illuminated runway stop bars.

Taxiway System

The key taxiway system deficiencies are:

- **Apron I Taxi Lanes:** The apron taxi lanes located at the west end of the terminal on Apron I are congested with a single lane limitation. This restriction is compounded when the Central De-icing Facility (CDF) is in operation. It also complicates towing aircraft from apron parking areas to the terminal;
- **Taxiway H Routing.** There is a long, indirect route to Runway 36. It is estimated that a new parallel taxiway system would save 2 minutes of taxi time from the terminal building gates to the threshold of this runway. Runway 36 is the most used departure runway with 19,400 departures in 2013. With 80% of departures originating from the main terminal building, the fuel and emission savings would be equivalent to 517 hours (21 days) of taxi time; and
- **Taxiway H Replacement.** This taxiway lies adjacent to Apron VII and is a limiting factor in future development of aircraft parking in the apron area. The construction of a replacement taxiway to Taxiway H applying the new TP 312, 5th edition standards would open up the apron areas and increase parking capacity as well as enabling future development options.

⁶ It should be noted that not all air carrier aircraft are equipped for LPV operations.

Aircraft Parking Areas

YWG's mid-continent location results in a passenger demand pattern that places a premium on early morning departures. These early morning flights provide access to points in eastern and western Canada and the United States for those making connections and for business travellers. Furthermore, on-time early morning departures are critical to the airlines maintaining schedules throughout the day.

As a result of this pattern, a significant number of aircraft overnight at YWG. These aircraft must be parked in a logical sequence with the first morning departures at the appropriate gates. The remainder must be distributed to not impede traffic flow. Since sufficient parking areas adjacent to the terminal complex are not available, the current practice is to use a variety of areas to accommodate the overnight parking. This practice involves significant towing distances and times, and it contributes to the taxiway congestion immediately west of the terminal complex. In summary, the current arrangement is inefficient. It is stressful to the operations staff and likely to fail under future increased traffic levels, due to congestion and limited parking area availability.

Given that towing operations take place at night in all weather conditions, it is highly desirable that conflicts with active taxiways be avoided when possible. Consequently, the best practice would be to provide dedicated parking areas in close proximity to the terminal complex with direct access to gates.

Figure 3-1: YWG Dedicated Aircraft Parking Area

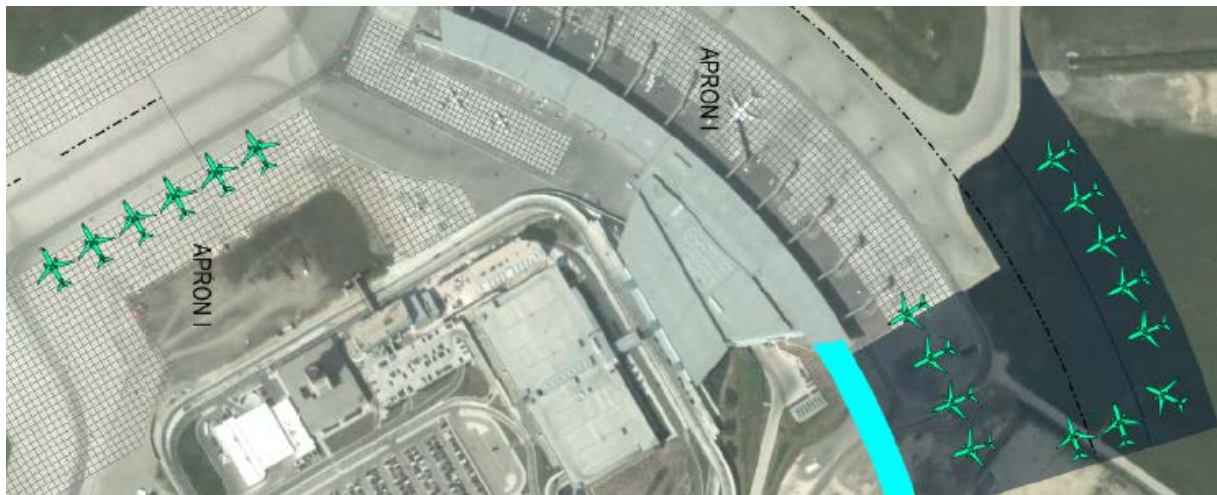


Figure 3-1 provides a conceptual layout of a dedicated parking area. This parking area is located on the eastern portion of Taxiway K with space for approximately 12 Code C size aircraft (approximately 20 in total if Apron I is included). In addition, the existing apron is expanded to the northwest to provide dual taxiways on Apron I and eliminate some of the current flow restrictions generated by pushback operations.

Recommendations

To minimize both the operational and financial impacts, the airside development program has been divided into short, medium and long-term phases with 13 recommendations.

Short Term (+5 Years)

1. New Taxiway Exit

The efficiency and capacity of runway movements could be dramatically enhanced with a new taxiway exit off of Runway 13. Modeling of aircraft taxi time demonstrates a 40% benefit in jet arrival capacity due to closer spacing possible by reduced runway occupancy time.

- **Recommendation:** Construct a new taxiway exit southeast of Taxiway V off of Runway 13.
- **Trigger Point:** Immediate – this recommendation has current value to reduce arrivals delay.

2. New Parking Positions

Over the next 20 years, it is expected the demand for overnight aircraft parking will grow from 23 to 30 aircraft. New parking positions are needed to accommodate this increase.

- **Recommendation:** Incrementally build out the east apron expansion to add parking space for 8 to 10 Code C in the approximate location of the east end of Taxiway K.
- **Trigger Point:** Phasing the project to 4 positions in the short term, and in the medium-term, the addition of 4-6 positions is recommended.

3. Expand Aprons to Meet Cargo Demand

Expand aprons in order to accommodate larger integrator cargo aircraft and the up gauge of existing aircraft to meet air cargo parking demands. It is expected that there will be continued power in/power out configuration with future nose-in configuration implemented by cargo carriers.

- **Recommendation:** Fill-in areas between Aprons VIIA and VII and V.
- **Trigger Point:** Development needs to be coordinated with the growth of new infrastructure in the area and to cargo carrier requirements. Commence in 2017/18 (unless fleet plans for certain key operators change).

4. New Taxiway Exit off Runway 18

This is desired in order to reduce occupancy time and avoid the 110 degree turn to Taxiway K.

- **Recommendation:** In the short term, this exit can be constructed while providing a link from the CDF to Runway 36.
- **Trigger Point:** Commence during the construction of the southern portion of Taxiway T.

5. Taxiway T to Runway 36

Construction of the extension of Taxiway T is to provide a parallel taxiway system for Runway 18/36 and to reduce taxi times to Runway 36 for northern departures.

- **Recommendation:** Can be constructed to reduce taxi time for aircraft to Runway 36 and to provide cost savings in fuel burn.
- **Trigger Point:** Construct as required to improve capacity and as delays increase through formal monitoring. Implement when possible to achieve efficiencies.

6. Upgrade Runway Lighting

Upgrade Runway 18 approach lighting to precision approach Category I standard to improve IFR capacity which would support Category I precision approach levels. As well, Runway 36 CAT II operations are limited to 6 movements per hour due to the lack of illuminated runway stop bars.

- **Recommendation:** Upgrade the approach lighting system to a high-intensity system 2,400 feet in length (code: SSALR). Implement stop bars on Runway 36.
- **Trigger Point:** Immediate implementation to remove limitations on capacity.

7. Instrument Landing System on Runway 18

Install instrument landing system on Runway 18.

- **Recommendation:** NAV CANADA should review with WAA installation of an instrument landing system (ILS) on Runway 18 during the deployment of the current 2009-17 National ILS Replacement Program.
- **Trigger Point:** Pending discussions with airlines and NAV CANADA.

Medium Term (+10 Years)

8. Dual Lane Taxiway Expand Apron I

Improve access to CDF with full two-way flow of aircraft with dual lane taxiway.

- **Recommendation:** Expand Apron I between Taxiway L, W and the CDF to provide 2-way taxi capability.
- **Trigger Point:** Need to adopt formal measure of apron/airfield delay and measure delay during winter operations and impact on runway peak hour capacity. Aircraft congestion and head-to-head conflicts will advance implementation.

9. Full Extension of Taxiway T

Improve runway capacity for Runway 18/36 with full parallel taxiway system.

- **Recommendation:** Construct full parallel taxiway system with extension of Taxiway T.
- **Trigger Point:** Implement when possible to achieve airfield efficiencies and to improve capacity.

10. Partial Parallel Taxiway for Runway 13/31

Improve Runway 13/31 capacity and aircraft circulation from CDF.

- **Recommendation:** The construction of a replacement taxiway parallel to Runway 13/31 applying the new TP 312, 5th edition standards would open up the apron areas and increase parking capacity.
- **Trigger Point:** Dependent on lack of aircraft parking and redevelopment of cargo area.

Long Term (+20 Years)

11. Additional Parking for Cargo Aircraft

Fill-in area located west of Apron VIIA to provide for additional parking for cargo aircraft.

- **Recommendation:** Provide additional aircraft parking to accommodate larger cargo aircraft.
- **Trigger Point:** Dependent on lack of aircraft parking.

12. Full Parallel Taxiway for Runway 13/31

Complete full, parallel taxiway expansion to Runway 13 threshold for improved capacity.

- **Recommendation:** Construct a full parallel taxiway system for Runway 13/31 to improve capacity and efficiency.
- **Trigger Point:** Should be examined once there are 190,000 annual aircraft movements.

13. Decommission Taxiways A and P

Cost savings in removal of infrastructure no longer required.

- **Recommendation:** Decommission Taxiways A and P once the surface is no longer usable; the lifecycle has been exceeded.
- **Trigger Point:** Decommission upon completion of the full parallel taxiway for Runway 13/31.

The following pages highlight the short, medium, long and ultimate terms of phasing recommendations for the airfield depicted in Figures 3-2 to 3-4. Note that the depictions are based on the draft of the 5th edition of the Transport Canada TP312 Standards that is proceeding through regulatory approvals.

Figure 3-2: Short Term (+5 Years) Layout



Figure 3-3: Medium Term (+10 Years) Layout



Figure 3-4: Long Term (+20 Years) Layout



Enhanced Airside Capacity

Once completed, the upgraded airside system is expected to provide the capacity as shown in Table 3-2.

Table 3-2: YWG Enhanced Airside Capacity Estimate

| Condition | Runways | % Time | Hourly Capacity | Weight |
|----------------------------------|-------------|--------|-----------------|--------|
| VFR SIRO | 13/31,18/36 | 20 | 46 | 9.20 |
| VFR | 13/31,18/36 | 72 | 44 | 31.68 |
| IFR CAT I to VFR* | 13/31,18/36 | 7 | 40 | 2.80 |
| IFR CAT II | 36 | 1 | 15 | 0.15 |
| Annual Average | | 100 | | 44.00 |
| Practical Annual Capacity | | | 226,829 | |

*Includes a block of weather from 200/0.5 (Ceiling/vis) to 800/2.

The capacity increase to the approximately 227,000 annual movements would assure that YWG could operate at the forecast 2033 “high” traffic level with minimum delays. At the same time, the upgraded system would reduce taxi distances, provide a significant reduction in emissions as well as slightly reduce ground time to allow airlines turn aircraft around quickly.

Summary

The airside system will need incremental improvements over the next 20 years, aimed to improve efficiencies for air carriers and address potential reduced levels of service during peak periods. The key aspects for Master Plan 2033 in this area are summarized as follows:

| FUTURE DEMAND | KEY MASTER PLAN 2033 DIRECTIONS |
|--|--|
| <ul style="list-style-type: none"> ▪ Aircraft movements forecast to increase to 167,500; ▪ Overnight parking to increase from 23 to 30 aircraft; and ▪ Growing interest from airlines to: <ul style="list-style-type: none"> – reduce delays – decrease fuel burn – have shorter taxi distances, and – reduce emissions. | <ul style="list-style-type: none"> ▪ Systematic three-phase program to address needs to achieve efficient operations; ▪ In the short-term: <ul style="list-style-type: none"> – add 4-6 aircraft positions – extend Taxiway Tango to Runway 36 to reduce taxi times and save on fuel burn – accommodate increase in cargo capacity and cargo aircraft parking; and ▪ In the medium and long term: <ul style="list-style-type: none"> – add additional 8-10 aircraft positions – complete parallel taxiway for Runway 13/31 – add dual taxilane near the terminal building for efficiency. |

Chapter 4: Terminal Building

Overview

Providing sufficient capacity in an air terminal building is one of the main considerations when promoting the commercial growth of airports. Insufficient space leads to congestion affecting both passengers and airline operations, and creates the risk of people and carriers choosing to avoid the Winnipeg airport. The alternative, too much space, creates overcapacity issues that increase the cost of operations.

Although the terminal building at Winnipeg Richardson International Airport (YWG) was opened in 2011, improved capabilities are needed to ensure that new commercial opportunities can be realized. As noted in Chapter 2, air traffic is forecast to nearly double to 6 million enplaned/deplaned passengers.

Technological advancements are creating new ways to process passengers and their checked bags. Facility planning needs to address future trends for building layout, changes in aircraft size and automation.

As the market evolves for air carriers, there needs to also be consideration for emerging opportunities. The potential introduction in Canada of ultra low-cost carriers will increase the pressure on airport authorities to deliver high performance facilities with quick turnaround times. At the same time, YWG needs to be ready to accommodate future wide-body international air services.

Finally, the terminal building is the first and last experience for visitors to Winnipeg. A positive impression will help drive future business. Moreover, the design and allocation of the retail and concession space is another important factor of the passenger experience and can be used to derive new revenues.

YWG's terminal building will need to accommodate nearly double the number of annual passengers over the next 20 years.

Planning Objectives

There are several broad objectives for planning the terminal building:

1. Ensure that sufficient space is provided to efficiently process the passenger numbers forecast throughout the planning period (based on peak hour passenger volumes);
2. Provide for the development of an optimal, sustainable terminal system that is cost-effective, makes the most effective use of existing facilities and minimizes the environmental impact; and

3. Review long-term, terminal space requirements to identify problematic areas that require attention.

Terminal planning has changed substantially over the past twenty years. In prior years, a simple method was used to review space allocation based on the ratios of facility space to the number of peak hour passengers. Now, with automation and new methods to reduce queues, terminals have different parameters to meet a target level of service for passengers. The approaches used by this team to develop Master Plan 2033 include a systematic assessment of each terminal subsystem to identify future gaps based on a nominal schedule forecast.

Demand Analysis

The future demand for the terminal building depends on the anticipated volume of passengers and the types of aircraft utilizing YWG.

Passenger Activity

Between 2013 and 2033, YWG is forecast to grow from 3.5 million to over 6.0 million passengers. Terminal expansion is predicated using peak hour passenger volumes. Table 4-1 below highlights the forecast growth in these peak hour volumes by sector – up to 52% increase for departures and between 73-77% for arrivals.

The analysis shows that there is the greatest variability for future peak hour transborder forecasts. The range of 296-350 passengers will depend on the focus of future flights during the peak morning period and the hours of operation allowed by U.S. Customs and Border Protection.

Table 4-1: Departing and Arriving Peak Hour Passenger Forecast

| Departing Passengers | 2013 | 2033 | % Change |
|-----------------------------|-------------|-------------|-----------------|
| Domestic/International | 618 | 942 | +52% |
| Transborder | 277 | 296 to 350 | +7 to +26% |
| Arriving Passengers | | | |
| International / Transborder | 293 | 518 | +77% |
| Domestic | 421 | 727 | +73% |

The implications of the peak hour forecast are sizable for terminal planning. Continuous flows of arriving passengers can present congestion challenges as the peak hour passenger traffic increases over time. Congestion from high passenger numbers is expected to be most evident in key systems such as escalators to baggage carousels, and at processing facilities such as customs/security. Additional allocation of space is reviewed and incorporated in the expansion plans presented in this chapter.

Aircraft Fleet

Another key factor that affects terminal development at YWG will be an increase in aircraft size. For example, air carriers are introducing larger turboprop (Dash 8-Q400) aircraft with a corresponding reduction in the use of smaller turboprops and jets. Larger Code C aircraft such as the Boeing 737MAX and Airbus 320 NEO are also expected within the planning horizon. The changes to accommodate increasing aircraft size will require better gate utilization, as well as availability of larger holdrooms. Future air carrier activity with larger Code E aircraft (i.e., Boeing 787 or Airbus 330) will significantly increase the gating requirements and holdroom capacity demands during the planning period. However, most of this increase is forecast to occur in the later portion of the 20-year planning period.

Terminal Assessment

The air terminal building was reviewed based on the forecast number of gates required, as well as for space allocation for each functional area (e.g., check-in, security screening, holdrooms, etc.)

Aircraft Gates

Currently there are 18 gates (14 international/domestic and 4 transborder) at YWG to accommodate all sectors. Two gates are dedicated to transborder, and three others have swing capabilities to provide extra capacity for international arrivals and departures. The existing operations could also have 2-3 additional international/domestic gates with US Customs and Border Protection (CBP) closing from 6pm to 4am.

Three key planning strategies were considered in order to meet future requirements:

- **Low utilization of gates today:** By comparison to other airports, the current utilization of aircraft gates is relatively low at YWG. If the current level of 6-7 flights/day handled on average at each gate were to continue, a major expansion of the terminal building or an increase in remote aircraft parking areas would be necessary to accommodate future demand. WAA's change away from a preferential gate model will allow for higher gate utilization;
- **Future opportunity for more flexible gates:** Based on planning analyses with improved gating of aircraft, the optimal gate utilization should reach 10-12 flights/day on average in 2033. Analyses were conducted based on an existing gate schedule for the peak period of 2013, and developed into the 2033 nominal schedule. This adjustment will minimize the requirements to create extra aircraft bridges or remote parking stands to accommodate increases in air traffic growth until later in the planning period; and
- **Continue swing gates to provide important flexibility:** Swing gates do require more operational coordination and security sweeps, but will continue to be needed to accommodate peak demands at different times of the day.

Based on an increase in the utilization of gates, the total number of gates at the terminal building is anticipated to increase by 33% over the planning period. Table 4-2 below highlights the existing number of gates and recommended increases by sector.

Table 4-2: Gate Requirements

| Sector | 2013 | 2033 |
|--------------------------|------|------|
| Domestic / International | 14 | 18 |
| Transborder | 4 | 6 |
| Total | 18 | 24* |

*Dependent on integration of regional carriers with main terminal building, and changes to the handling of Q400 aircraft, swing gates could reduce the total number.

Space Analysis

Based on demand drivers as well as gating requirements, a heat map was developed for each passenger process to identify areas of the terminal building as:

- **Cautionary:** areas with increased degradation of service as the Master Plan moves into the growth period. These service issues are largely manageable by implementing facility optimization solutions or minor facility changes; and
- **Critical:** high probability of a degraded level of service and crowded facilities, particularly in areas of cross-flows, during the planning period.

The results of the terminal heat maps are shown in Figures 4-1 and 4-2 on the following pages. Data is based on analysis of circulation space and processors (e.g., security screening areas.)

The bottleneck depicted at the stairway/escalator leading down to the arrivals carousels stems from the congestion of the circulation corridors during peak periods. At this time, there are no planning issues concerning the single escalator and dual staircase system currently in place. However, as the peak hour arrivals passengers are projected to increase 72% to 727 passengers in 2033, some congestion is likely to occur on the escalator and a second escalator may be required to prevent maintenance issues. While it is not anticipated that the capacity of this escalator would be exceeded within this planning period, monitoring of this area is encouraged to ensure a practical level of service is maintained for existing passenger volume.

Figure 4-1: Departures Level Heat Map

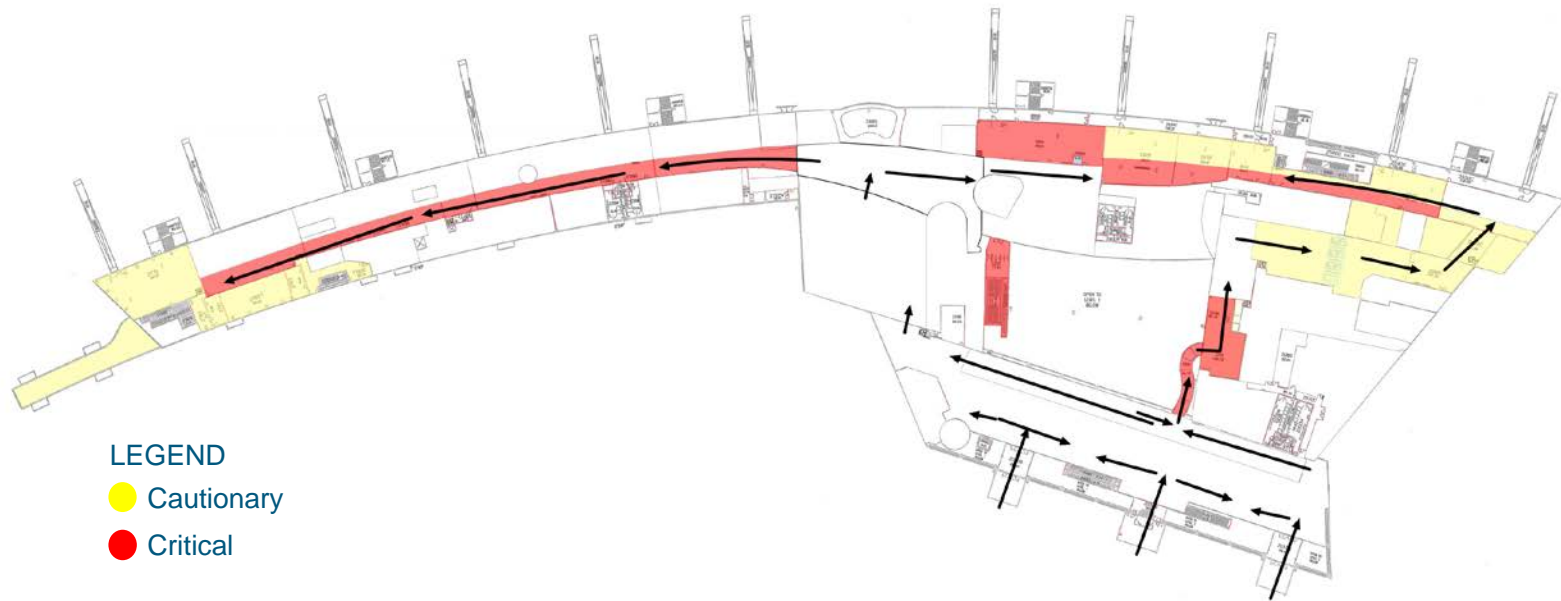
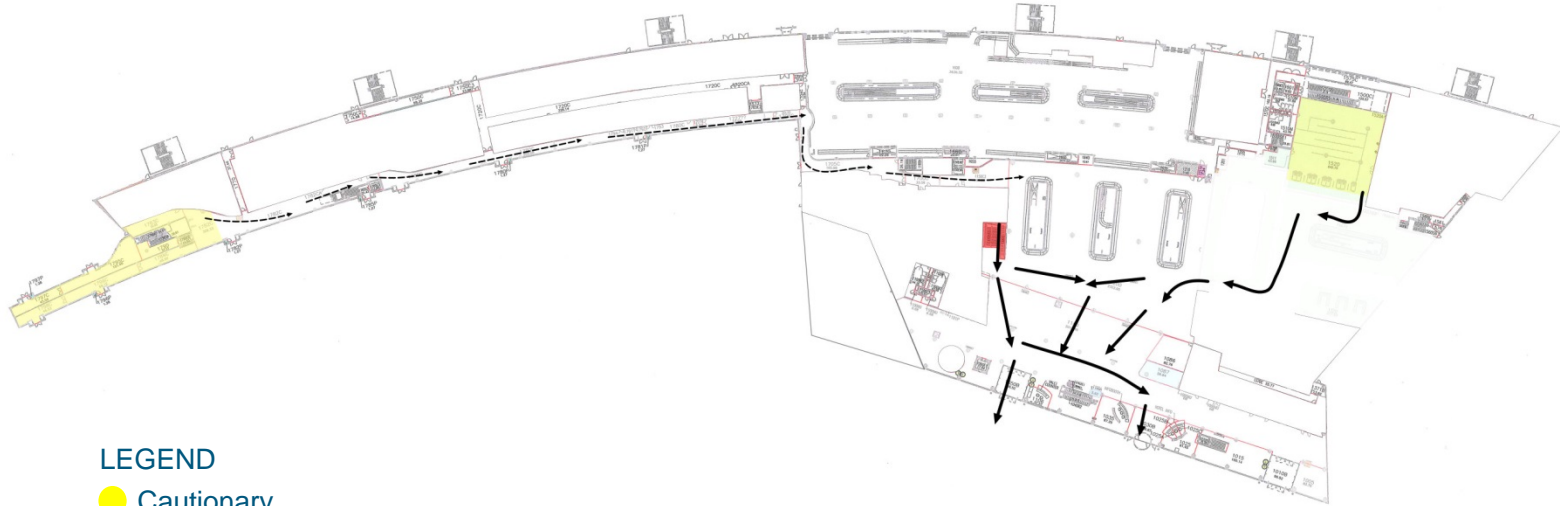


Figure 4-2: Arrivals Level Heat Map



- LEGEND
- Cautionary
 - Critical

Domestic/International Terminal Space

Without any changes made from today's infrastructure, the passenger and operational levels of service will gradually decline as aircraft size increases over the planning period. Table 4-3 below highlights the areas that require attention during the planning period. Note the pre-board screening, baggage make-up, baggage claim and check-in areas of the terminal building are considered as sufficient to handle the peak hour passenger growth over the entire planning period.

Table 4-3: Assessment of Space to Accommodate Domestic / International Growth

| Domestic / International | 2013 | 2023 | 2033 |
|--------------------------------|------|------|------|
| Pre-board Screening | ● | ● | ● |
| Departure Gates / Waiting Area | ● | ● | ● |
| Baggage Make-Up | ● | ● | ● |
| Circulation Areas | ● | ● | ● |
| Baggage Claim | ● | ● | ● |
| Check-in Area | ● | ● | ● |
| CBSA | ● | ● | ● |

Legend: ● Acceptable ● Cautionary ● Critical

Departure Gates/Waiting Area

The terminal building was constructed with a relatively narrow holdroom and circulation areas as compared to other Canadian airports. While there is about 3.2 m² per peak hour passenger of space available, the narrow configuration of the departures area can lead to congestion at times. With predicted growth to 942 passengers per hour, it is expected that the space available will cause critical issues for operations in the next ten years. Over the course of the planning period, there are several factors to consider when studying this issue:

- **Sufficient space until larger Code C aircraft commence services:** Aircraft such as the Boeing 737MAX (on order by air carriers including Air Canada and WestJet) will start to impact the level of service provided by the existing holdrooms;
- **Cross-flows for passengers** for arriving passengers with other departures, particularly around Gates 7 and 10; and
- **International operations:** Congestion is expected to result when the larger Code E aircraft begin to service the airport later in the planning period.

Other impacts will be experienced at the west end of the terminal building at the regional gate and areas by Gates 11 and 12. This will likely degrade holdroom service levels during peak periods when both Gates 11 and 12 are in use along with regional departures. Current operations have regional passengers waiting on the departures level until the regional aircraft is ready to board, and then descending down to the ground level for boarding. During periods of delays, this area will become congested with cross flows of passengers accessing the gates for departures along with those accessing the retail/food and beverage services in the area.

Circulation Space

The flow standards of the circulation corridor is defined by persons/minute/metre (PPM)⁷ as shown in Table 4-4. YWG currently has a level of service D that is experienced during peak periods which is adequate for these short durations of the day. During non-peak periods passenger circulation corridors are adequate to handle existing passenger traffic.

Table 4-4: Flow Standards

| Type of Passageway | Level of Service Standard (PMM = Persons/Minute/Metre) | | | | | |
|--------------------|---|------|------|----------|------------|--------------|
| | A | B | C | D | E | F |
| | Excellent | High | Good | Adequate | Inadequate | Unacceptable |
| Corridor | 10 | 12.5 | 20 | 28 | 37 | More |
| Stairs | 8 | 10 | 12.5 | 20 | 20 | More |

Source: Based on Airport Systems Planning & Design / RdN

Canada Border Services Agency (CBSA) Arrivals Hall

The CBSA arrivals hall is about 1,500 m², including queuing areas, Primary Inspection Line booths, two baggage claim devices, secondary inspection areas and support offices. At a more detailed level, there is an imbalance in space allocation between the arrivals queue into PIL, as compared to the size of baggage claim devices. As a result, there are several areas of potential chokepoints that could reduce the effectiveness of international arrivals. In the long term, however, the space for the facility can accommodate future demand so long as process modernization is achieved with CBSA.

In 2014, CBSA started consultations with airports and airlines on the results of the Air Traveller Task Force. Specifically, CBSA is looking at changing its process to reduce the reliance on staffed booths used since the 1970's. Instead, a next generation of automated solutions are expected to change the hall to be more free-flowing for passengers from international flights to proceed to automated processing.

























⁷ Source: "Space requirements for passageways" P571, Airport Systems Planning, Design, Management 2nd Ed. 2013. de Neufville & Odoni

Should these advances be implemented at YWG, it is expected that the forecast of a peak hour of 518 passengers in 2033 will be met with the elimination of CBSA Primary Inspection Line queuing requirements. There may be space reallocation required around the baggage carousels to accommodate new mobile enforcement teams that CBSA plans on deploying. In the short term, there may be constraints from time to time to accommodate processing requirements. For example, additional questioning during exceptional circumstances (such as health quarantine), may limit the flexibility of the current CBSA hall configuration to meet processing demands. Current generation Automated Border Clearance or future Primary Integrated Kiosks may help to facilitate short-term gaps.

Transborder Terminal Space

Table 4-5 below highlights the areas that require attention over the planning period for the transborder passenger processing areas of YWG. The check-in, pre-board screening, baggage make-up and baggage claim areas are all indicated as sufficient to handle the peak hour passenger growth over the entire planning period. The remaining areas are discussed in detail below.

Table 4-5: Assessment of Space to Accommodate Transborder Growth

| Transborder | 2013 | 2023 | 2033 |
|----------------------------------|---|---|---|
| PBS |  |  |  |
| Retail / Food & Beverage Airside |  |  |  |
| Departure Gates / Waiting Area |  |  |  |
| Baggage Make-Up |  |  |  |
| Circulation Areas |  |  |  |
| Baggage Claim |  |  |  |
| Check-in Area |  |  |  |
| CBP |  |  |  |

Legend:  Acceptable  Cautionary  Critical

U.S. Customs and Border Protection Preclearance

YWG is integrally related to the history of U.S. Preclearance in Canada through the introduction of the current model of Primary Processing Area in 1974. The current terminal building is one of the newest CBP facilities, with three parts:

- Queuing area to CATSA Pre-board Screening;
- CATSA Pre-board Screening Checkpoint; and
- CBP Primary and Secondary Processing Areas/office space.

The entrance to CATSA's transborder pre-board screening area after check-in has been identified as an area of deficiency. Passengers tend to congregate on the pedestrian bridge leading to pre-board screening after check-in, and before CATSA opens for operations. With future growth it is expected that the frequency of passengers spilling into the check-in area will increase. Operational solutions may be needed to metre flows into the area based on scheduled departure times of the flights to ensure that there is no overloading of walkway with passengers who are too early for their flights. During the planning period, future phases of the Canada-US Beyond the Border Action Plan may provide opportunities to consolidate transborder and domestic/international pre-board screening checkpoints.

There are three double-booths available for CBP to process passengers through the Primary Processing Area. Based on today's processing rates and the future low-growth scenario of 7% for the peak hour, there are no major constraints expected. However, if there is a growth of larger aircraft that produce a 26% growth in peak hour volumes, CBP primary processing will require improvements in processing through automation or other capacity enhancements.

There is a potential risk of flight departures being compressed into the peak hour, or degradation in number of staff assigned by CBP to YWG. Should these risks materialize the current or next generation of Automated Passport Control (APC) kiosks could help alleviate peak hour demand. With the inclusion of all nationalities in APC in the next five years, and the proliferation of mobile phone declarations, there is minimal risk to YWG that the current space available would be insufficient to accommodate future demands. APC can increase throughput per square metre by as much as 25-40%, depending on the makeup of traffic/citizenship.

Connections

The current air terminal building was constructed to facilitate origin-destination flows. Increasing carrier demand for connections (e.g., WestJet Encore to WestJet transborder) may prompt planning a second entrance from the holdroom into CBP, similar to Halifax or Edmonton's Quick Connect. A more detailed plan needs to be developed to assess the feasibility of flows into US Preclearance. Several options were evaluated with the leading option being to construct a new entrance through the existing Starbucks coffee area to provide passengers direct access to connect to the United States (see Figure 4-3).

Figure 4-3: Location of potential pathway to reduce connection time for domestic-to-U.S. connections



Circulation Areas

The circulation area within the transborder sector of the air terminal building will also experience degradation to the passenger level of service. Unlike the domestic side of the air terminal building, the circulation corridor only handles departing passengers and is impeded by the physical structures required for international arriving passengers, which in turn reduces available area for the passenger holdroom.

The current level of service of the circulation corridor along the departure gates is at level D during peak periods. The risk with growth is for the condition to degrade to level E (inadequate). As previously stated, the peak hour passenger demand is forecast to be moderate over the planning period. However, increases in aircraft size serving this sector will have impacts on the corridor. During non-peak periods the corridor is adequate.

Departure Gates

Similar to the domestic/international gates, the transborder departure gate area will experience lower service levels from the middle of the planning period to the end. The transborder departure holdroom is relatively undersized when compared to the domestic/international departure holdroom. This is due to the stairwell/escalator and passenger service corridors for international/ transborder arrivals leading to the CBSA arrivals hall. A similar methodology was used in deriving the space requirements for the transborder holdroom, but the aforementioned physical barriers will make the need for expansion all the more pressing.

Currently, the transborder holdroom experiences congestion when larger Code C aircraft, such as the B737 or A320, are in operation. Additional flights are being declined by U.S. CBP, particularly outside their normal business hours. Aircraft serving the transborder market consist primarily of 75 seat regional jets. The impact to the service levels of the holdroom will be experienced if the growth of the transborder market increases to larger regional aircraft, such as the E190 or similar aircraft types or even larger Code C aircraft in the B737/A320 family.

Retail/Food Beverage

The space allocated for retail/concessions is not sufficient to handle the level of traffic during peak periods. Also relative to other Preclearance facilities, the amount of space available is limited. Currently, there is approximately 400 square metres of space for a restaurant and retail outlet and plans are currently in place to provide additional retail/food beverage options for passengers. The greater use of kiosks to sell high value items (subject to vendor point-of-sale management systems), can increase the amount of sales/square metre.

Future Terminal Building Expansion Concepts

Future terminal building options were reviewed at a macro level to examine the growth required in the terminal as well as the potential for regional air carriers to be consolidated into the terminal building. The analyses were predicated on lease expirations for existing facilities and potential alternate uses for cargo operators. As well, regional carrier forecasts were developed and taken into consideration in this process and are further discussed in Appendix B.

To evaluate the options, four parameters were examined closely and were assigned a high, medium, or low rating:

- Flexibility (space planning);
- Existing assets (maximizing existing facilities);
- Retail/concessions potential; and
- Order of magnitude cost.

The options are illustrated in Figure 4-4, with six potential outcomes to accommodate regional operations:

Figure 4-4: YWG Terminal Expansion Options

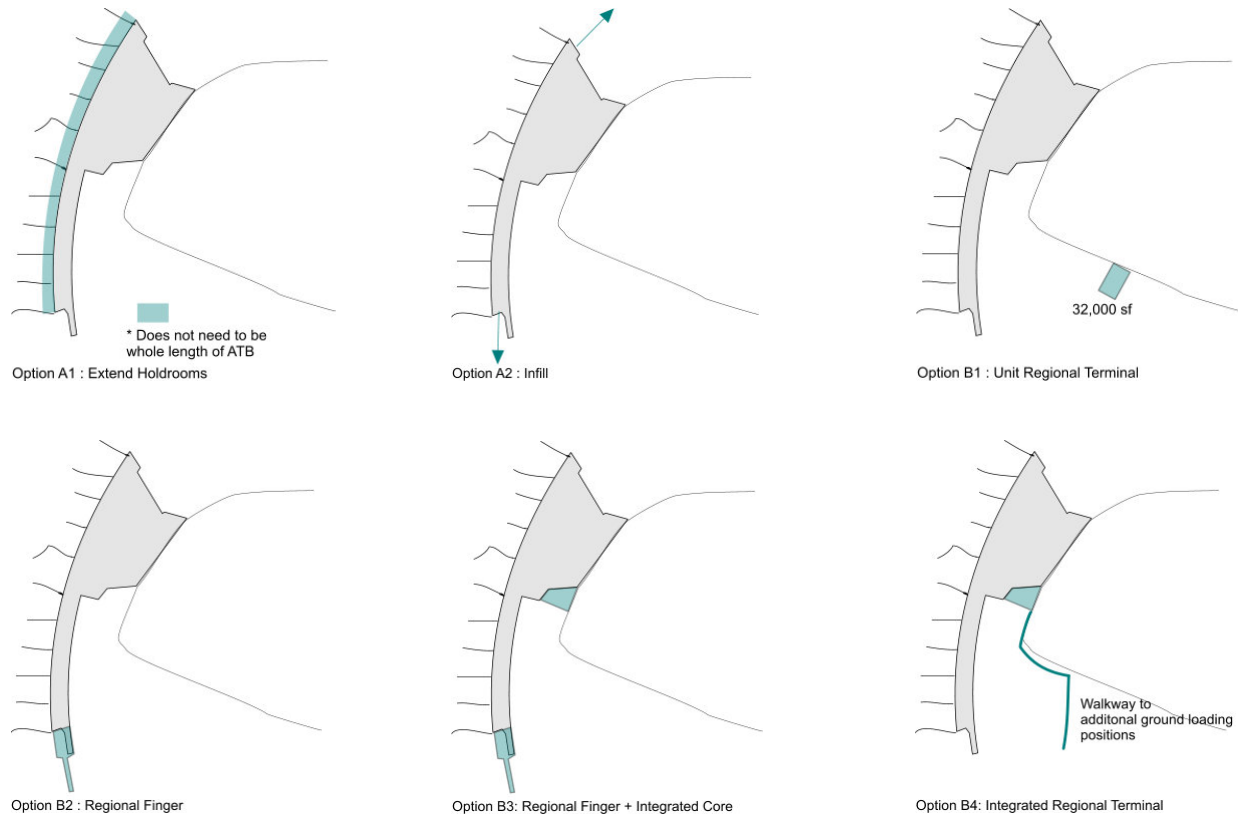


Table 4-6: Terminal Expansion Analyses Results

| Category | Expand Holdroom | Infill | Unit Regional Terminal | Regional Finger | Finger + Core | Integrated Regional Terminal |
|------------------------|-----------------|--------|------------------------|-----------------|---------------|------------------------------|
| Flexibility | ● | ● | ● | ● | ● | ● |
| Use of Existing Assets | ● | ● | ● | ● | ● | ● |
| Retail Potential | ● | ● | ● | ● | ● | ● |
| Cost Minimization | ● | ● | ● | ● | ● | ● |

Legend: ● High ● Medium ● Low

The results concluded that providing an integrated model within the main terminal would be beneficial in terms of an operational, retail and environmental perspective. Similar to larger centres such as Anchorage International Airport, it would also provide integrated operational services to the passengers and air carriers throughout the planning period.

Recommendations

There are 11 recommendations for improvements to the terminal building over the duration of the 20-year planning period.

1. Terminal Expansion

An overall strategy towards providing more space and increased gating for aircraft is the key planning direction. Future terminal expansion to the east can accommodate up to four aircraft gates, while expansion to the west can accommodate up to three gates. The east expansion will benefit all three sectors and creates the opportunity to increase swing gate capabilities, as well as use of transborder gates for domestic/international operations when CBP is closed for operations.

- **Recommendation:** Build an eastern expansion to accommodate four additional gates. Plan for a west expansion in the long term based on increases in peak hour activity of northern or regional flights or integration of regional carriers into the main terminal.
- **Trigger Point:** Demand for peak hour gates starts to approach capacity, such as with securing two additional flights during the peak morning period.

Figure 4-5: East and West Expansion of the Terminal Building



2. Domestic-to-US Quick Connect

Today, passengers connecting to the United States from a domestic flight need to leave the departures holdroom area. Multiple level changes and processes require additional time requirements and hassle factor for customers. Halifax, Edmonton and Vancouver have implemented Quick Connect programs to expedite the transfer from domestic holdrooms into U.S. Preclearance/CATSA security screening.

- **Recommendation:** Implement a Quick Connect program to the United States to facilitate growing domestic-to-U.S. connections.
- **Trigger Point:** Immediate, based on air carrier interest and schedule coordination.

3. Circulation Areas/Holdrooms

As aircraft size increases or long haul international services commence at YWG, the holdroom and circulation areas will quickly degrade to lower passenger services levels.

- **Recommendation:** Review circulation areas and remove any obstacles (such as furniture) or other physical impediments to flow and queuing.
- **Trigger Point:** Immediate optimization of flows can be implemented. Consider widening circulation areas once larger Code C (A320/B737) aircraft come into service.

4. Airside Retail/Concessions

Space for retail/concessions is limited to deliver additional revenues. The opening of a Plaza Premium Lounge will help improve the opportunity for more revenues to be generated. However, the transborder area has limited space and type of concessions.

- **Recommendation:** Continue to develop in-fill retail/concessions opportunities.
- **Trigger Point:** Immediate, and tied in to proposed terminal expansion projects.

5. Canada Border Services Agency (CBSA)

The CBSA area is currently adequate to handle existing passenger volumes. As previously mentioned, improvements in passenger processing technology will decrease the need for space requirements in terms of processing areas and passenger queuing areas.

- **Recommendation:** Work with CBSA to review passenger queuing areas and circulation areas and explore opportunities to implement next generation border processes.
- **Trigger Point:** Review passenger processing areas when peak hour passengers reach forecast volumes or upon commencement of simultaneous long haul international arrivals coinciding with the passenger peak hour for international arrivals. Installation of the next generation of Automated Border Clearance/Primary Integrated Kiosk should be considered at this time.

6. U.S. Customs and Border Protection (CBP)

Although CBP may not be able to staff positions to the maximum levels, the floor space for CBP provides an adequate level of service. Congestion in the pre-board screening area will need to be addressed, as well as the ability for CBP to accommodate additional flights and hours of operation. Improvements in mobile phone and kiosk-based Automated Passport

Control will decrease the need for space requirements in terms of processing areas and passenger queuing areas.

- **Recommendation:** Review passenger queue areas (in particular at the bridge from check-in) and circulation areas upon commencement of new transborder services.
- **Trigger Point:** Review passenger processing areas when the transborder market is serviced by larger Code C aircraft or more regional jets during the peak hour. Installation of updated passenger processing technology should be considered at this time.

7. Baggage Make-up Area

The baggage make-up area currently consists of 3 carousels for domestic/international flights. While the number of carousels in place is sufficient for operations throughout the planning period the current processing floor space may be exceeded by the end of the planning period.

- **Recommendation:** Review processing floor space towards end of planning period unless there is an increase in demand for checked baggage.
- **Trigger Point:** Implementation/construction should take place when floor processing space is greater than 2,800 m² and take into account processing needs of larger aircraft.

8. Sterile Transit Area

A sterile transit area is a facility under the *Canadian Immigration and Refugee Protection Act* that helps to facilitate Fifth Freedom traffic. The availability of fifth freedoms could potentially turn a marginally profitable route into a way for a foreign carrier to sell flights between Canada and a third country.

Rather than leaving passengers in airplanes, a sterile transit area allows transiting to occur without full CBSA clearance and is used in airports such as Halifax and Vancouver. Appropriate visas are still required unless the passenger is part of Transit Without Visa (TWOV). There are a number of advantages to using a sterile transit area for an airport the size of YWG. Subject to local CBSA rules, this includes the ability for passengers to deplane, use restroom facilities and potentially purchase retail in transit.

- **Recommendation:** Implement a sterile transit area inclusive of washrooms to increase the attractiveness of YWG for long-haul international flights.
- **Trigger Point:** Implementation/construction should take place in advance of securing an international widebody flight, and an evaluation of the business case for traffic flowing through YWG.

9. In-transit Preclearance

In-transit Preclearance allows passengers arriving on an international flight connecting to outbound U.S. flights to be cleared into the U.S. without the need for CBSA clearance. Four facilities (Toronto, Montreal, Edmonton, Vancouver) currently have this capability. Of particular relevance to YWG is the introduction of ITPC at Edmonton International Airport. Although no carriers are actively using this process, its availability will serve the facility in the future to connect international passengers directly to U.S. flights through Preclearance. Although the current air terminal building was not designed for in-transit preclearance, some modifications

for a direct linkage from the international holdroom to CBP can be advanced based on physical and operational segregation.

- **Recommendation:** Further review is needed to the full business case for in-transit preclearance implementation.
- **Trigger Point:** Securing an international widebody flight may trigger a potential demand for in-transit preclearance implementation.

10. Regional Terminal

A separate unit terminal for regional unscreened flights was evaluated. Models used in Yellowknife, Anchorage and other cities that require operations with both screened/unscreened flights were also reviewed.

- **Recommendation:** Should there be a demand from the off-site carrier (Perimeter) to be included in the main terminal building, the optimal location would be on the arrivals level.
- **Trigger Point:** Current analyses highlight that both seat capacity and movement have declined over the past two years and forecasted growth is expected to be low to moderate within the regional market. However, as the regional traffic improves there may be the need to review integration further towards the end of the planning period.

11. International-to-Domestic Connections

CBSA has shown interest in allowing airports to have international-to-domestic flights (e.g. United States arrivals, connecting to Saskatoon) to exempt passengers from picking up bags unless they are referred to CBSA Secondary. A set of protocols exist to allow for this to occur and should be considered for implementation as carriers become interested in flowing more connections through YWG.

- **Recommendation:** As carriers become interested to grow connections through YWG, planning should commence with CBSA to evaluate the local business case to implement international-to-domestic connections.
- **Trigger Point:** At the end of 2014, Vancouver and Toronto have trials under way with CBSA for connections improvements. The results of these process improvements will provide more information on the feasibility of implementing changes to YWG connections.

Summary

Over the next 20 years, constraints in the terminal building can be addressed by optimization flows and space allocation. However, new investments will be needed to provide greater flexibility to meet new air service opportunities. Connectivity between flights will need to be further addressed to meet potential market demand and attract new services. The key aspects of Master Plan 2033 for the terminal are summarized below.

| FUTURE DEMAND | KEY MASTER PLAN 2033 DIRECTIONS |
|---|---|
| <ul style="list-style-type: none"> ▪ Passenger growth to nearly double to 6.0 million by 2033; ▪ Peak hour growth varies by sector, with largest growth in arrivals (over 70%) and departures/international (52% increase); and ▪ 24 gates needed. | <ul style="list-style-type: none"> ▪ Expand the terminal building by: <ul style="list-style-type: none"> – adding a ground-level four-gate facility to the east of the terminal building; and – building a facility expansion to the west to meet gating demand; ▪ Implement Quick Connect processes to facilitate growing domestic-to-U.S. connections; ▪ Address constraints in the long term for circulation/holdroom space; ▪ Continue to allocate more airside retail/concessions space; ▪ Implement next generation kiosk-based border clearance solutions with CBSA; and ▪ Work with CBP to improve processing capacity and hours of service. |

Chapter 5: Ground Access and Parking

Overview

The connectivity of Winnipeg Richardson International Airport (YWG) depends not only on air services, but also on the linkages to other forms of transportation, such as trucks and private vehicles. Achieving high quality linkages between all transportation modes – air, road, rail and transit – is a dominant theme in ground access planning at airports.

Efficient ground access to meet future needs must be coordinated with provincial and municipal governments who own the infrastructure that connects YWG with the adjacent urban areas and beyond. Providing good access for current transit users and supporting future forms of rapid transit will ultimately reduce additional infrastructure requirements.

Ground access and parking are not limited to serving the needs of air passengers. Staff, air cargo, trucking and support services are also primary users of the surface transportation network surrounding YWG.

Achieving high quality linkages between transportation modes – air, road, rail and transit – is a dominant theme in ground access planning at airports.

Planning Objectives

Ground transportation and parking encompass multiple planning considerations. Key objectives to consider for the next 20 years include:

- Provide adequate internal road networking and parking infrastructure at YWG;
- Develop facilities to ensure adequate ground transportation services are available to meet customers, tenants and airport user’s needs;
- Create efficient linkages between YWG and municipal/regional road networks;
- Maximize use of existing roadways and parking structures;
- Ensure safe operations by designing to minimize conflicts between vehicles and pedestrians; and
- Continue to pioneer transportation innovation, and do so in a sustainable manner.

Addressing a range of secondary objectives will require close cooperation with neighbouring jurisdictions and stakeholders. For example, streetscape design as well as overall reduction of greenhouse gases will need to be implemented with the assistance of other parties such as service providers, municipalities and non-governmental organizations (e.g., Winnipeg Chamber).

Demand Analysis

User Profile

YWG is a major generator of ground-based trips within the region, based on the number of passengers, meeters/greeters, employers and operators of commercial vehicles. It is estimated that over 12 million trips a year originate from points throughout the region and YWG.

Passengers form the largest trip-generation group, including air and Greyhound bus passengers. In addition to passengers' individual trips, meeters and greeters add to the total volume of airport traffic. Traditionally, the largest origin/destination points for travelers to and from the airport are in the Greater Winnipeg area--specifically Downtown, St. James and Fort Garry.

Airport staff is the second largest group using ground transportation to YWG. As shown in Figure 5-1, the largest concentration of staff travel from an area immediately south of the airport. This concentration is consistent with the residential location of airport employees over the past 20 years.

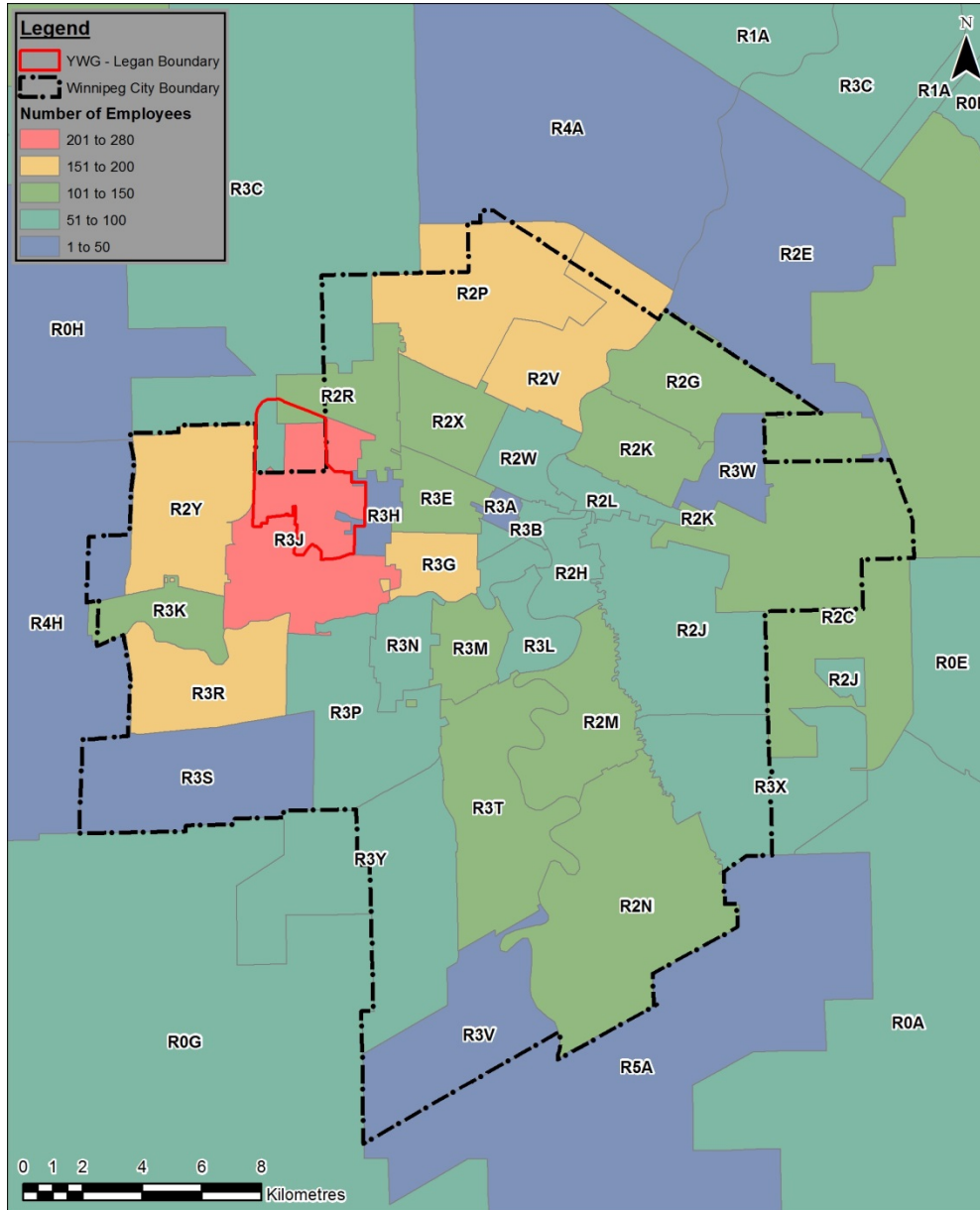
However, several shifts have occurred from the distribution of employees' residential location in 1999:

- A greater number of employees reside in the northern part of Winnipeg (postal codes starting with R2P and R2V);
- A lesser number of employees reside in the southern part of the city (postal codes starting with R3T, R2M, R2N); and
- Slightly more employees reside in Downtown Winnipeg.

Future planning for transit or private-vehicle commutes will need to factor in these changes in population distribution of airport employees.

Commercial vehicles include heavy and light trucks serving passenger and cargo-related businesses at the airport. These include catering, courier, and other delivery and service vehicles. Generally, larger commercial vehicles are destined outside the Winnipeg region and use the main highway system. Lighter, commercial vehicles are destined within the City of Winnipeg, with downtown being their primary destination. Future plans to expand commercial development in the vicinity of the airport are likely to increase commercial traffic levels at a faster rate than previous history.

Figure 5-1: Residential Distribution of Airport Employees



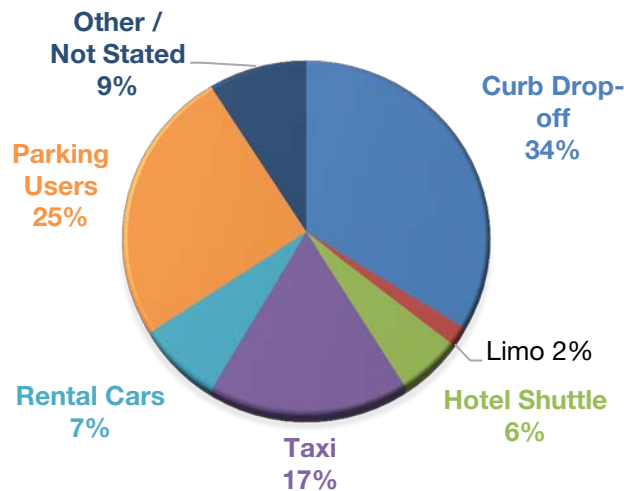
Source: WAA data on airport employee postal codes, 2014

Choice of Transportation Mode

The ease of passenger travel between the airport and the city is an important consideration in facility planning. Figure 5-2 below illustrates the distribution of airport trips by mode, as reported in *Prairie Research Associates' Follow-up Benchmark Survey Report (April 2013)*. As shown in Figure 5-2, almost 60% of the passengers traveling to or from the airport used privately-owned vehicles (parking or curb drop-off). As well, about 60% of passengers use the terminal curb areas (curb drop-off, hotel shuttle bus, limo and taxi). Approximately 1 in 4

passengers reported using one of the parking facilities. This data highlights the importance of the airport's parking facilities and terminal curb areas.

Figure 5-2: Distribution of Passenger Vehicle Modes



Current Road Network

Terminal Road Access

YWG is located 7 kilometers (15 minutes average travel time) west of Downtown Winnipeg. Access to and from the passenger terminal is provided via:

- **Wellington Avenue:** This road is the main east-west access road to enter and exit the terminal building. Upon entering the airport site, Wellington Avenue North leads to the air terminal curb, extending along the alignment of the terminal building, and looping around the parkade building and surface parking lots to Wellington Avenue South. Between the airport and Downtown Winnipeg, north/south routes such as Kenaston Boulevard (Route 90) provide access to other east-west roads, such as Notre Dame Avenue (Route 57) and Portage Avenue (Route 85 and Trans Canada Highway 1) that leads to the Downtown area;
- **Notre Dame Avenue:** Notre Dame provides access to the terminal through a variety of routes from Saskatchewan Avenue or Wellington Avenue and Kenaston Boulevard. Traffic flow on Notre Dame Avenue is acceptable; however, connection to the Airport Campus Centre is not direct and is inefficient;
- **Regional Highways:** Different parts of the City are accessed via Kenaston Boulevard to Perimeter Highway, Portage Avenue, and other regional routes;
- **Portage Avenue (via Kenaston Boulevard):** While located farther south than the other routes described, Portage Avenue is a major arterial road that provides access to Downtown and areas to the south and east;

- **Sargent/Ellice Avenue:** Sargent Avenue and Ellice Avenue also provide east-west connection to the Downtown area. Sargent Avenue is believed to be the primary route used by the majority of taxicab and limousine drivers into the Downtown area;
- **Winnipeg Transit:** Winnipeg Transit currently provides access to/from YWG about 19 hours a day, with service frequency ranging from 15-30 minute intervals on two routes. The transit bus shelter and sign designate the bus stop which is located outside the terminal on the west end of the arrivals level. In 2014, YWG became the first airport in North America to provide an environmentally friendly transit bus rapid charge station that runs from YWG through the city centre to East Kildonan;
- **Greyhound Bus:** Greyhound operates a limited shuttle service to a heated shelter in Downtown Winnipeg. The company also operates regional and long-distance bus services from 6 a.m. to midnight on a daily basis, which includes services to Vancouver: Edmonton: Toronto: Fargo, North Dakota and points in-between; and
- **Curbside Facilities:** Based on recent observations of the airport terminal groundside activity and discussions with airport operations personnel, it appears that the curbside operations and facilities at the terminal building are generally adequate. However, select times were noted when congestion develops on the roadways or at the terminal-area gas station for meeters/greeters who are picking up passengers.

Integrator and Aerospace Campus Access

Access to the Integrator and Aerospace Campus is primarily used by express couriers, regional airlines, cargo, light industrial, and other commercial enterprises. As a result, there is a high volume of truck traffic to and from this area, particularly for the delivery of time-sensitive freight.

Access to this area, is primarily provided via Ellice Avenue and Sargent Avenue – each of which is designated as a truck route by the City of Winnipeg. Two roads offer north/south connections to this campus:

- **Flight Road:** Connects Wellington and Sargent Avenues inside the Integrator and Aerospace Campus. Through connections to Sargent Avenue, Flight Road provides access to the airport's cargo and express courier development areas; and
- **Ferry Road.** Located along the airport boundary, Ferry Road is divided into two separate sections by Apron V. The southern segment links the road north of the Aviation Museum southbound to Silver Avenue, Ness Avenue and Portage Avenue. Ferry Road is also a stub road connecting Sargent Avenue with the developments around Apron V.

Neither Flight Road nor Ferry Road provide direct north/south thoroughfare access from the Airport Campus Centre to the southern portion of the Integrator and Aerospace Campus. As a result, traffic is routed on roads further east through the neighboring industrial areas.

Integrator and Aerospace Campus Access

Roadway access to the south part of the airport where the Integrator and Aerospace Campus is located is via Ness Avenue, Air Force Way and Hangar Line Road. Air Force Way is also the primary access road to the neighboring Department of National Defense (DND).

Advanced Manufacturing and Intermodal Campus Access

Access to the Advance Manufacturing and Intermodal Campus is provided via Saskatchewan Avenue, which runs east-west. Moray Street is the primary north-south route that connects Saskatchewan Avenue to Ness Avenue and Portage Avenue to the south. Moray Street is a 4-lane arterial branching road from the south that veers to the west and services the Murray Industrial Park area. After the branch, the remaining 2-lane section of Moray Street connects to Saskatchewan Avenue as a collector road.

Sturgeon Road also serves as a north-south access as it connects Saskatchewan Avenue to Ness Avenue and Portage Avenue. This road lies to the west of Moray Street and also serves the Murray Industrial Park.

Access to the campus from the north and west is available via the new Sturgeon Road connector which connects Saskatchewan Avenue to the newly constructed CentrePort Canada Way – a 4-lane expressway that provides a key link between the northwest areas of the City to the west Perimeter Highway (PTH 101). Traffic to the Advance Manufacturing and Intermodal Campus from the west previously used Saskatchewan Avenue, which connected directly to PTH 101 west. Truck traffic on this section of Saskatchewan Avenue is restricted to accommodate the adjacent residential area to the south.

Recommendations

Overall Concept

Future development of the ground access system to meet increased demand would serve the following purposes:

- Enhance YWG's connectivity to serve cross-town traffic needs, particularly in the areas to the south of the airport;
- Increase truck-route access to provide sufficient capacity for both passenger terminal and cargo areas;
- Improve connectivity and circulation of adjacent road network to enhance development opportunities on the airport campuses;
- Improve way-finding along the routes by connecting YWG to the Downtown area; and
- Encourage alternative means of transportation to reduce single-occupancy-vehicle trips to the airport. e.g., transit and rideshare programs, or improving pedestrian and cycling accessibility through streetscape design.

Challenges

YWG is a major, regional-trip generator, but has a very small proportion of transit riders (under 2 percent of passengers), even though transit use in Winnipeg is on the rise. The challenge for the airport is to promote transit use and attract more riders. The greatest potential of new transit users appears to be airport employees who live within close proximity to the airport.

Traffic congestion around the airport also poses a challenge for the regional roadway system. Due to the airport's close proximity to urban areas, the effects of increased congestion are important. Should traffic congestion worsen and become less manageable, the efficiency of cargo and passenger movements to the Airport Campus Centre and other airport campuses will deteriorate. Certain roads (Ferry Road, Sargent Avenue, Ellice Avenue and Ness Avenue) will be more susceptible to declining levels of service given their current high traffic volume.

Improvements to Ground Access

Suggested road improvements are shown in Figure 5-3 and Figure 5-4. These include two short-term initiatives recommended for the next five years, and the balance that are tied to medium/long term growth. Trigger points are provided with notional timeframes. However, most developments will be predicated upon potential commercial land developments as outlined in the next Chapter.

1. Cargo Road to Flight Road Connection

A service road currently ends at the midway point between Cargo Road and Flight Road. Extending this road to connect with Flight Road will improve traffic connectivity and circulation in the Integrator and Aerospace Campus.

- **Recommendation:** Extension of existing east-west service road from Cargo Road to Flight Road.
- **Trigger Point:** Time with upcoming changes for new leases in the Integrator and Aerospace Campus.

2. Ferry Road Extension

There is currently a gap on Ferry Road that prevents connection between Ellice and Sargent Avenues. Removing the gap would also improve traffic connectivity in the Integrator and Aerospace Campus. However, this corridor currently facilitates airplane access to Apron V from the surrounding developments. Extending Ferry Road would result in eliminating airplane access to Apron V, unless an elevated structure is put in place to bridge this gap.

- **Recommendation:** Extension of Ferry Road from Aviation Road to Allen Dyne Road.
- **Trigger Point:** Pending further review of the plan around Apron V and existing airside lot access east of Ferry Road.

3. Moray Street Upgrade and Extension

The Advance Manufacturing and Intermodal Campus is a key part of the commercial development strategy (see next Chapter). The growth requires improved access with a main access road, as well as supporting future developments in the northern part of the YWG site. With the CentrePort Canada Way in place, there will be an opportunity to further enhance Moray Street as a north-south corridor by providing a future connection to the CentrePort Canada Way further to the north.

- **Recommendation:** Upgrade the section of Moray Street north of Murray Park Road to the same 4-lane arterial standard that exists to the south. In addition to this upgrade, Moray Street should also be extended north of Saskatchewan Road.
- **Trigger Point:** Tied to the potential near-term opportunities for additional land development on the Advance Manufacturing and Intermodal Campus.

4. Cell Phone Waiting Area

Cell phone waiting areas are becoming increasingly popular for airports to facilitate the pickup of passengers. Some airports have attempted to generate revenues from this infrastructure, with mixed success. WAA staff have observed some vehicles using the 7-11 store/Petro Canada gas station as a cell phone waiting area, which generates congestion for arrivals.

In the long term, automated flight notifications will improve to alert meeters/greeters and allow them to time their journey to pickup arriving passengers.

- **Recommendation:** Evaluate sites for developing a cell phone waiting area subject to availability of a commercial partner to offset operating costs a review of operational impacts.
- **Trigger point:** Near term, with a phasing strategy towards re-use of the cell phone waiting area if demand declines in the future.

5. Dublin Avenue Extension to Airport Road

Dublin Avenue is an east-west road that connects Sherwin Road to Kenaston Boulevard. Sherwin Road is a key link that will provide access to future commercial developments within the Advance Manufacturing and Intermodal Campus. Extending Dublin Avenue to connect with Airport Road to the northwest would enhance connectivity and provide access to the future business park.

- **Recommendation:** Extend Dublin Avenue to connect with Airport Road to the northwest.
- **Trigger Point:** Potential leases associated with lands north of the terminal building in the Innovation Campus.

6. Silver Avenue Corridor

This route would provide east/west access immediately south of YWG. Construction of this route could occur in two stages—from Kenaston Boulevard to Sharp Boulevard, and from Sharp Boulevard to Sturgeon Road. The Silver Avenue corridor would provide additional capacity for east/west trucking routes, open lands east of Apron II for development, and support development of the Advance Manufacturing and Intermodal Campus plus lands west of the airport site.

- **Recommendation:** Complete an east-west connection along Silver Avenue in the long term.
- **Trigger Point:** Future activity and linkages tied to existing users (DND) and requirements for greater connectivity for land development.

7. Transit Facilities

Currently, only about 2% of trips to the airport use transit, although there may be additional demand to use the current facilities since the bus-charging station was constructed in 2014. The City of Winnipeg has identified a future rapid transit link via Portage Avenue, St. James Street, and Wellington Avenue to the airport. While it may be several years before such a rapid transit system is implemented, it is important to preserve and protect a future corridor for rapid transit (either a rapid bus or light rail transportation system.)

- **Recommendation:** Preserve a right-of-way to allow rapid bus, light-rail or another form of rapid transit to access the terminal area and make intermediate stop(s) to serve airport tenants.
- **Trigger Point:** The right-of-way should be preserved, with periodic reviews with the City of Winnipeg and other outside parties as to the probable rapid transit technology likely to be used to connect YWG.

Figure 5-3: Recommended Road Improvements Around YWG

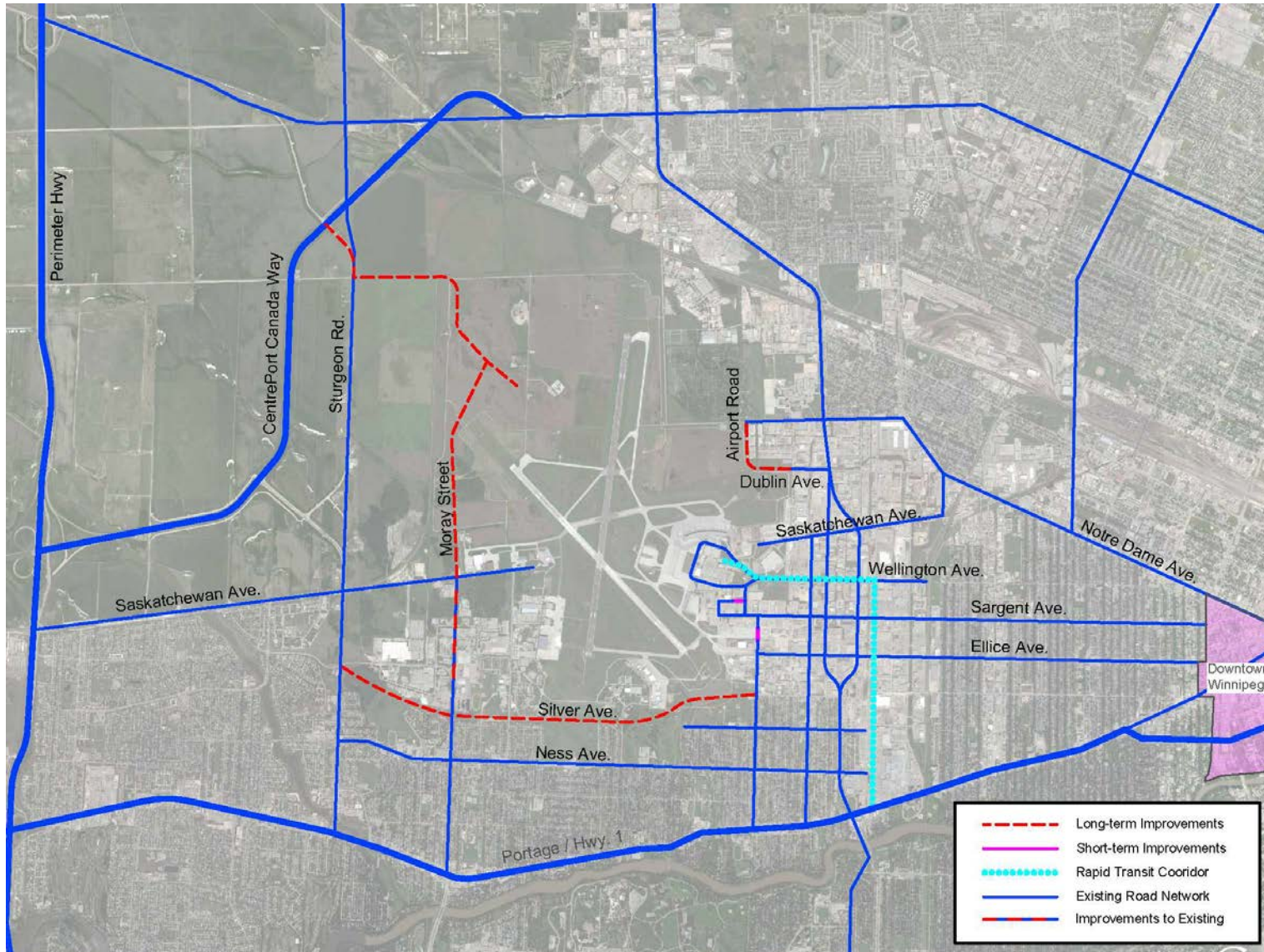
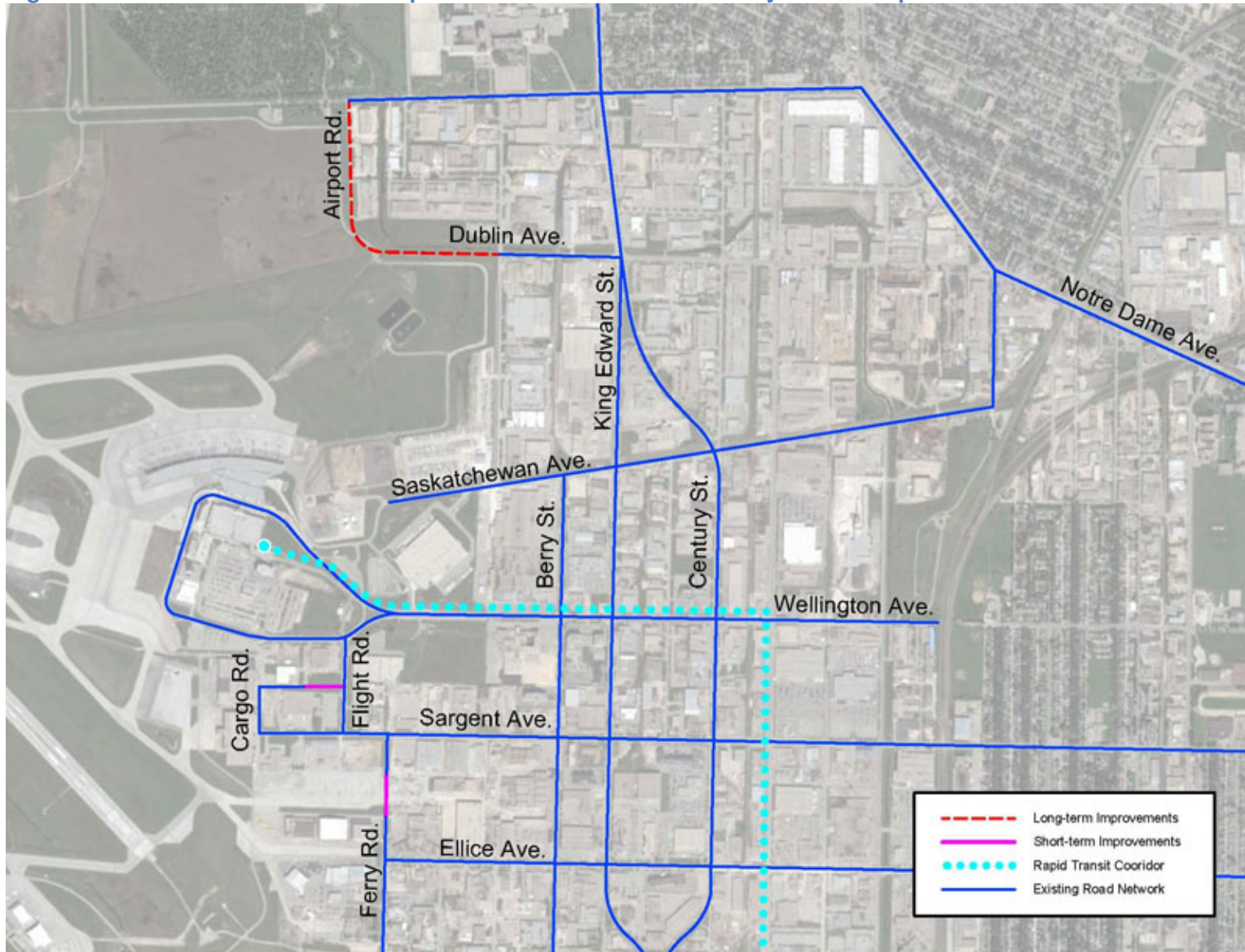


Figure 5-4: Recommended Road Improvements to Terminal and Adjacent Campus Areas



Parking Facilities

Public and employee parking at YWG is currently provided by the parking structure immediately south of the terminal building, and the surface lots to the east of Wellington southbound. The following is an inventory of the current parking situation at YWG.

Current Facilities

There are currently over 3,300 parking spaces adjacent to the terminal area. These are broken down as follows:

- Public parking consists of the parkade structure, and surface economy lots;
- Airport staff and tenant parking contains stalls for all terminal building tenants, plus hotel and YWG staff;
- Valet Parking consists of the surface lot south of eastbound Wellington, and overflow capacity at the gravel lot east of the Marriott Hotel;
- Rental cars are contained within the ground level of the parkade structure; and
- Parking is reserved specifically for hotel use within the parkade structure and on surface lots adjacent to the hotels.

In addition to parking adjacent to the terminal building, there is currently a remote parking lot operated by AirPark located on Berry Street. A local shuttle is provided to transport users of this facility to the terminal. The rates for parking at the Airpark facility are discounted from rates in the airport parking facilities.

Based on a review of usage statistics with WAA staff, the challenge for planning parking spots at YWG is a high variation of demand. Parking lots are most full on weekends; weekdays can be about 60% of the weekend demand. Seasonality is also a factor in planning. Spring break vacations generally fill every parking space. During peak times, the demand for parking exceeds the available supply by approximately 100 spaces (see Table 5-1). To accommodate this demand, temporary overflow parking is used. Although there are no precise numbers, during peak times, there are also a range of off-airport parking/hotel lots available for passengers.

Table 5-1: Estimated Requirements for Parking Stalls

| Category | Approximate Number of Stalls | | |
|------------------------|------------------------------|--------------|--------------------|
| | Supply | Demand | Surplus (Shortage) |
| Public Parking | 1,660 | 1,660 | 0 |
| Staff & Tenant Parking | 780 | 780 | 0 |
| Valet Parking | 400 | 500 | (100) |
| Rental Car Parking | 350 | 350 | 0 |
| Hotel & Other Parking | 150 | 150 | 0 |
| Total | 3,340 | 3,440 | (100) |

Future Demand Requirements

As noted above, the estimated 3,300 parking spaces provided within the airport campus currently operate at capacity at peak times. Estimated future parking demand was based on future passenger forecasts in Chapter 2. For the purpose of projecting future parking demand, it was assumed air passenger activity would increase at a rate of 2.7% per year (from 3.6 million passengers per year in 2013 to 6.0 million by 2033). Employee parking was assumed to grow at 50% of the rate for passengers (1.4% per year). This in part reflects the potential for more employees to use transit to access the airport in the future. The overall demand profile in terms of type of user and peak time of demand was assumed to remain the same as today. Based on this information, by 2033 the peak parking demand is expected to exceed the current supply by over 2,000 stalls by 2033. The estimates were based on a 2.7% annual growth rate for all of the parking categories, except staff parking, which was based on a growth rate of 1.4%.

Table 5-2: Forecast of Future Stalls Required

| | Today | 2018 | 2023 | 2028 | 2033 |
|----------------------------|-------|------|------|-------|-------|
| Additional Stalls Required | 100 | 481 | 970 | 1,525 | 2,140 |

Factors likely to affect both the demand for parking and the type of parking utilized over the medium to long-term period are:

- **Forecast Peak Growth:** The demand for parking also depends on the peak periods of aviation activity outlined in Chapter 2. Lower than expected traffic growth or a shift in the peak times for aviation activity could result in a reduced demand for parking facilities;
- **Convenience/Security:** The accessibility of the terminal building from parking areas may affect both passenger and employees propensity to drive to and from the airport. Providing a higher proportion of parking off-site (particularly for employees), may discourage users from driving. Similarly, failure to provide secure attractive and easy to follow pedestrian linkages between parking areas and the terminal, particularly during the winter, may encourage greater use of valet services or curbside drop-offs;

- **Pricing Strategies:** Differentiation of parking products, pricing strategies, and management of demand can affect the incremental number of parking stalls required. The Chantry web-based system has already been implemented at YWG to help manage pricing. This approach is successful at other Canadian airports and should continue to help optimize capacity and revenues;
- **Public and Alternate Transportation Service Improvements:** Enhancements to public transportation options through improved bus schedules, additional ground transportation options (taxi products, shuttles, etc.) and ultimately a rapid transit link to downtown will influence future demand for parking. Ride-share services and smartphone providers (e.g., Uber and Lyft) could also shift demand and potentially provide new revenue sources for YWG, similar to recent roll-outs in Denver, San Francisco and Los Angeles; and
- **Off-site Competition:** The expansion of privately operated off-site parking operations similar to Airpark, in addition to competition from the surrounding hotels, could result in a reduction in the demand for on-site parking requirements.

In the event WAA considers it necessary to develop additional parking structures, land south of the existing parkade and east of the existing hotel is available for additional multi-level parking development to meet demand. However a multi-purpose facility may also be considered combined with a parkade. This would tie into the commercial development plans, see Chapter 9, and could include retail or medical facilities to service a growing medical tourism sector. This would also provide northern residents with onsite medical facilities and could be a similar service to the Northern Connection Medical Centre in Winnipeg.

The overall development of this area would be dependent on the outcomes of the commercial development strategy. A cost-benefit analysis will need to be prepared to support the necessary capital expenditure. Constructing additional structured parking adjacent to the existing parkade will also displace some existing surface parking. This would require a plan to add additional capacity prior to start of construction on a new parking structure.

Recommendations to Parking Facilities

The shortfall in meeting current demand for parking spaces indicates the need for new parking facilities over the short-term. Subject to financial viability, the conceptualized strategy would involve the following elements:

- Phased Parking Expansion;
- Parking Demand Management; and
- Service Improvements.

1. Phased Parking Expansion

A phased parking expansion involves staged construction of new parking facilities to deliver additional capacity in advance of demand. For example, additional surface parking lots could be created prior to beginning construction of a new parkade/multi-purpose facility in order to maintain sufficient capacity during construction. Alternatively, some existing parking that is provided close to the terminal could be moved off-site. There is limited land to construct

additional surface parking within the Airport Campus Centre. This will likely require some existing parking to be moved to an offsite location. Locating the valet parking to a suitable off-site location, and designating the existing valet lot for employee parking will allow capacity to meet forecast demand until 2018. Alternatively, providing a remote parking area for rental car storage would allow a higher proportion of public parking to be provided on-site. This arrangement would not likely affect the demand for valet parking or rental vehicles as drivers would still drop-off and pick-up their vehicles curbside at the terminal building or within the existing parkade. A further advantage of this approach is that parking density for valet parking and remote rental storage can be increased as vehicles can be parked more tightly than in a public facility.

Additional capacity could be created in the green space to the east of the employee parking lot, particularly to provide additional room for rental car operations. In the longer term, construction of a new parkade/multi-purpose facility adjacent to the existing parkade, will likely be necessary to accommodate projected demands. Tied in with the commercial development strategy, the facility could also provide a range of services to connect the Greyhound Bus station, future museum and hotels into a single hub for the airport campus.

Expansion of the surface parking will also be required to accommodate parking displaced during construction of the parkade/multi-purpose facility. In order to ensure demand does not exceed the available capacity, a new parkade/multi-purpose facility with capacity for 1,400 vehicles should be completed by 2024. Ultimately parking capacity within the airport campus will be 5,100 spaces. Alternatively, if construction of a new parkade is not feasible, the option of further consolidating different user groups to an offsite surface parking lot can be investigated.

- **Recommendation:** Phase-in parking facilities and review the development of a 1,400-vehicle facility in the medium term. Consolidate any further parking development in the terminal area campus with a multi-use facility including office, retail and services.

2. Parking Demand Management

There is greater complexity with the future variability of service providers at YWG, and with potential improvements in transit services. Alternate providers (e.g. rideshare, Lyft/Uber) are still their infancy and may have an impact on demand for parking spots in the Airport Campus Centre. Continued parking demand management with an advanced platform (Chantry) requires continued assessment of trigger points for future facility development.

- **Recommendation:** Differentiate products, pricing and levels of services to accommodate increased capacities. Improved transit access may decrease parking demand, particularly for staff parking.

3. Service Improvements

Although ground access is typically governed by a 400 metre walking distance for pedestrians, there are impacts with cold climate conditions that require service improvements. Covered and heated walkways leading farther into the surface economy lots and shuttle service with heated shelters would enhance service for customers and employee/staff for stalls situated at the farthest points from the terminal building.

- **Recommendation:** Continue to monitor and incrementally implement service improvements tied to future development of the Airport Campus Centre.

Summary

Ground access and parking are the main areas of connectivity for goods and people movement to the airport. The quality of connections depends on the future ability to provide services that meet demand, and provide an associated business case for the airport to recoup investments. The following are the key aspects of ground access and parking planning to be addressed over the next 20 years.

| FUTURE DEMAND | KEY MASTER PLAN 2033 DIRECTIONS |
|---|--|
| <ul style="list-style-type: none"> ▪ Increased number of passenger-generated trips to/from YWG; ▪ Growing traffic from commercial development, trucking and service vehicles; and ▪ Up to 2,140 additional parking stalls required in the terminal area. | <ul style="list-style-type: none"> ▪ Road network improvements to facilitate commercial development, including a Cargo Road to Flight Road Connection, Ferry Road extension, Moray Street upgrade and extension, Dublin Avenue extension and a future east-west corridor along Silver Avenue; ▪ A cellphone lot be developed in the short term; ▪ Transit facilities held in reserve for a future rapid bus, light-rail or other rapid transit solution; and ▪ A phased parking expansion, subject to demand management as well as integration with commercial developments, within the airport terminal campus. |

Chapter 6: Commercial Land Development

Overview

One of the most important assets at Winnipeg Richardson International Airport (YWG) is the land available for commercial development. One component of Winnipeg Airports Authority (WAA)'s core strategy is to foster the ability to build non-aeronautical revenue sources. Growth of this commercial development will help diversify revenue sources for WAA, as well as provide space for airport tenants to expand their businesses.

Commercial land development at YWG is guided by the “Airport City” and “Connected City” approaches to optimize economic activity around airports.

WAA's Commercial & Economic Development Strategy is based on generating the highest and best use for airport land development. Using market and economic analyses, key aspects of creating a campus approach emerge, and are an important guide to future land development decisions. This process will also ensure the airport remains connected to current and future customers.

As noted previously, YWG is an economic engine, generating a positive annual economic impact of \$3.6 billion and supporting over 19,400 jobs. Positioned in North America's geographic centre, the airport supports critical sectors in the Winnipeg area including:

- Advanced manufacturing & aerospace;
- Life sciences;
- Logistics & distribution;
- Tourism & destination development;
- Agri-business; and
- Information communication technology.

Planning Objectives

The guiding principles and objectives of the YWG Commercial & Economic Development Strategy embrace the Airport City and Connected City approaches to optimize economic activity. In today's connected world, a community's airport is one of its greatest assets when viewed and used as an economic engine for development and growth. The Airport City/Connected City development model coordinates regional planning to leverage the airport's location, traffic, capacity and connectivity to grow employment through enhanced economic activity.

The Airport City/Connected City approach leverage YWG's air-to-ground network and property assets to accelerate growth of Winnipeg's emerging and existing economic clusters. The primary objectives for the YWG Commercial & Economic Development Strategy are:

- Establish the strategic framework to attract investment and develop assets;
- Grow upstream and downstream supportive industries;
- Develop catalyst projects to trigger economic growth and sustainability;
- Generate non-aeronautical revenues to enable, accelerate and diversify the regional and provincial economy;
- Reinvest into airport improvements;
- Leverage existing infrastructure to support sustainable development; and
- Create more and better jobs.

Airport Campus Land Use & Development Framework

The YWG Commercial & Economic Development Strategy defines five campuses:

- Airport Campus Centre;
- Integrator & Aerospace Campus;
- Advanced Manufacturing & Intermodal Campus;
- Innovation Campus; and
- Research & Development (R&D) Testing Campus.

These areas are highlighted on Figure 6-1 and are discussed in further detail below.

Airport Campus Centre

The Airport Campus Centre functions as the heart of the airport and is comprised of commercial activity relating to passengers, visitors, employees and a range of firms conducting business at the airport. Building on the current success and variety of hotels in the Airport Campus Centre, construction of an integrated and connected walkway linking these hotels to each other and to the terminal building would provide seamless pedestrian mobility and the ability to incorporate retail, restaurant and service amenities into the campus.

The Airport Campus Centre also provides a potential gateway to communities in the northern parts of Manitoba and other provinces/territories. Some of the services that could be viable include offering on-site medical facilities and consolidated government services to facilitate connections between Winnipeg and northern/remote communities.

Target Economic Clusters, Tenants and End Users:

- Hotel, conference & meeting facilities;
- Restaurants & retail;
- Medical services, health, wellness & daycare (people & pets);
- Personal & professional services;
- Educational & government services;
- Offices;
- Fueling station & convenience retail;
- Western Canada Aviation Museum;
- Parking & rental cars; and
- Bus depot & transit station.

Cargo Integrator & Aerospace Campus

Cargo Integrators and advanced manufacturing firms are grouped in and around the southeast area of the airport forming a cluster of logistic and aerospace economic activity.

Leveraging the potential upstream and downstream economic activities associated with logistics and aerospace, this campus provides opportunity for increased value-added services and just-in-time operations, as well as advanced manufacturing assembly operations. Increased functionality is essential for growth and acceleration of logistics and aerospace in the campus, with improved road network, redevelopment and allocation of economic activity into modern building facilities. Additionally, as part of increasing mobility across the campus, the planning and design of a link from the Integrator & Aerospace Campus to Airport Campus Centre increases the overall functionality and integration throughout YWG.

Target Economic Clusters, Tenants & End Users:

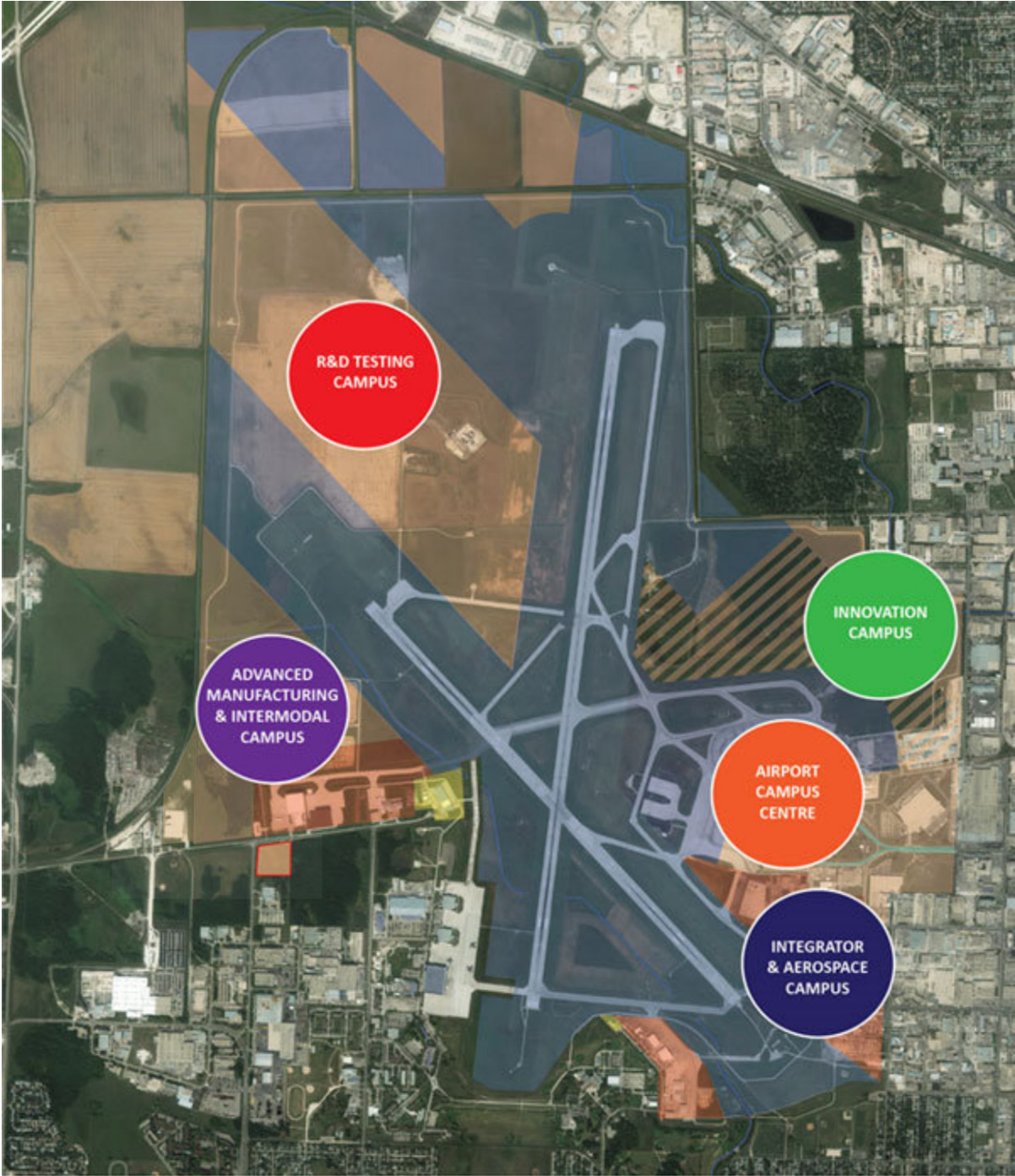
- Courier and parcel logistics & distribution;
- Value-added logistics & distribution;
- Aerospace assembly & manufacturing; and
- Advanced manufacturing.

Advanced Manufacturing & Intermodal Logistics Campus

The Advanced Manufacturing & Intermodal Logistics Campus enables key economic clusters that will stimulate regional growth. The strategic direction for this campus facilitates integration of airport operations and emerging economic clusters that rely on serviced land in close proximity to air, ground and rail multimodal facilities. This campus improves the airside/groundside interface through road improvements to provide businesses immediate access to YWG and the regional road system. In addition, this campus strategy allows for links north to the R&D Testing Campus.

WAA recently acquired and disposed of lands along Saskatchewan Avenue between Sturgeon Road and Moray Street. Contiguous parcels of lands through this change will create improved opportunities for leasing properties to businesses in this campus.

Figure 6-1: Airport Campus Development Plan



The strategic development of a parallel taxiway along Runway 13/31 creates opportunity for airside dependent and related businesses relying on just-in-time operations to flourish at this air-to-ground interface.

Target Economic Clusters, Tenants & End Users:

- Temperature-controlled cold chain & perishables;
- Fast cycle logistics;
- E-commerce & retail distribution;
- Air-truck-rail multimodal logistics hub;
- Advanced manufacturing;
- Agri-business; and
- Air ambulance.

Innovation Campus

Leveraging its proximity to Red River College and access to strategic parcels of land for near-term and long-term development, the Innovation Campus is positioned to function as an area for incubation of entrepreneurial start-ups and for facilitating education and skills training. Within this campus office, distribution and light manufacturing flex space will be integrated which is vital for incubating new businesses and growing existing ones. This integration allows for a variety of stages in economic activity ranging from Research & Development to Manufacturing and Distribution.

Target Economic Clusters, Tenants & End Users:

- Education & skills training;
- Start-ups & entrepreneurial activity;
- Small, medium, micro enterprises;
- Flex & incubator space; and
- Remote parking.

Research & Development (R&D) Testing Campus

The R&D Testing Campus builds on the success of Winnipeg as an optimal location for Cold-Weather Engine Testing and proposes to expand this focus to facilitate alternative fuel testing and maintenance repair/overhaul. Also, recognizing the supreme airside, groundside and rail access, and the secured airport location, opportunities exist to incorporate import/export and value-added economic activities by identifying a potential Foreign Trade Zone (FTZ). In keeping with best practices for airports around the globe, the R&D Testing Campus would facilitate successful FTZ implementation within secured and fenced areas in close proximity to Canada Border Service Agency for coordination.

Target Economic Clusters, Tenants & End Users:

- Engine testing;
- Alternative fuels;
- Export & distribution;
- Foreign Trade Zone;
- Value-add manufacturing; and
- Air-truck-rail multimodal logistics hub.

Summary

YWG has the opportunity to use its land base to create additional streams of revenue to offset the overall cost of aviation. The key directions for land development are summarized as follows.

| FUTURE DEMAND | KEY MASTER PLAN 2033 DIRECTIONS |
|---|--|
| <ul style="list-style-type: none">▪ Increasing demand for on-airport businesses (e.g. manufacturing, distribution and aerospace);▪ Create value for passengers and airport staff within the terminal area; and▪ Increase non-aeronautical revenues. | <ul style="list-style-type: none">▪ Develop YWG in terms of focused development campuses;▪ 5 development campuses include:<ul style="list-style-type: none">– R&D Testing;– Advanced Manufacturing & Intermodal Logistics;– Innovation;– Airport Centre; and– Integrator and Aerospace. |

Chapter 7: Airport Operations and Support

Overview

Airport operations and support services are defined as those services provided by the airport that are required to maintain safe and efficient operations at the Winnipeg Richardson International Airport (YWG). They include:

- Airport maintenance;
- Emergency response services; and
- De-icing.

Airport Maintenance

The airport maintenance functions are housed in the 1.5 hectare Combined Services Building (CSB) area, located southwest of the intersection of Taxiways G and B. This facility has direct airside road access to both runways and the terminal apron, as well as groundside road access. The complex also includes a large airside equipment storage area.

The CSB houses the maintenance garage, various workshops, maintenance supplies, and various employee facilities, as well as the Emergency Response Services. The equipment used for field maintenance activities includes: snow ploughs, sweepers, snow blowers, loaders, graders, material spreaders, tractors, mowers and various other pieces of equipment, all of which are stored in the external secure storage areas.

This facility is currently in good condition and only requires regular maintenance. Any future facility expansion can be accommodated within the area where the CSB is currently located.

Aircraft Rescue and Fire Fighting Services

Winnipeg Airports Authority's (WAA) Fire Department is mandated to provide fire protection services in accordance with Canadian Civil Aviation Regulation CAR 303, in the event of an aircraft incident or accident at YWG.

The airport's Aircraft Rescue and Fire Fighting Services (ARFF) team is available 24 hours/day, 7 days/week. Winnipeg Richardson International Airport has 3 emergency response vehicles, equipped with a total water supply of 28,230 litres and 675 kilograms of dry chemical agent for aircraft fires.

These vehicles meet the minimum requirements for Category 7 ARFF services, including:

- Total Quantity of water: 28,230 litres;
- Total Quantity of complementary extinguishing agents: 675 kilograms; and
- Number of vehicles: 3.

These vehicles are located in the firehall section of the Combined Services Building. There are 16 fully certified firefighters that are trained to Transport Canada Airport Firefighting standards and, are capable of responding to any aircraft incident on or near the airport.

YWG is classified as a designated airport by Transport Canada and provides ARFF services under the Canadian Civil Aviation Regulations Section 303. ARFF services at YWG currently provide Category 7 level of service⁸. The current ARFF equipment located at YWG is able to accommodate a critical category for firefighting up to Category 9. This is suitable for aircraft that are at least 61m but less than 76m in length and have a maximum fuselage width of 7m. Examples of these aircraft types include:

- Airbus 330 and Airbus narrow body family;
- Boeing 777 & 787 (all series);
- Boeing 737 (all series); and
- Embraer 175 and 195.

If the ARFF demand does rise to Category 8⁹, the necessary equipment is currently available and there are options being evaluated to meet human resources to deliver the requisite response standards.

De-icing Operations

De-icing of aircraft is performed for air carriers by a service provider contracted by the WAA at the Central De-icing Facility (CDF), located east of the Taxiway H. As shown in the image below, the CDF consists of approximately 30,000 square meters of concrete, which provides capacity for 2 bays capable of simultaneously handling four mid-size aircraft (A320 or B757, or two B747). Light aircraft de-icing is undertaken on Aprons II and IV, and military aircraft de-icing is completed on Apron VI.

⁸ Category 8 level of service is available 24 hours a day, with 90 minutes prior notice or with a WAA Operational Agreement in place.

⁹ Category 8 is defined in Section 303.05 as aircraft overall length of at least 49m, but less than 61m and 7m maximum fuselage width. Category 8 would be triggered by the aircraft having the maximum number of movements under Section 303.06 for three-months consecutively.

Figure 7-1: Proposed Expansion of the Central De-icing Facility



When aircraft movements increase, future requirements for expansion are to provide for a third CDF bay along with a second entrance. This expansion would alleviate any resulting bottlenecks that occur during the peak period of heavy winter operations. As discussed in Chapter 3, the current throughput capacity of the CDF is approximately 12 aircraft per hour. The existing capacity is able to accommodate current aircraft departures requiring de-icing until such time that demand for aircraft de-icing increases within the peak hour departure time periods.

Summary

Support services and facilities help to ensure that the operations of the airport are efficient and meet/exceed requirements for emergency services. The key demand/directions are summarized in the following table.

| FUTURE DEMAND | KEY MASTER PLAN 2033 DIRECTIONS |
|---|---|
| <ul style="list-style-type: none"> ▪ Increased hourly demand for de-icing by 2033 of 16-18 aircraft. | <ul style="list-style-type: none"> ▪ Extra de-icing bay increases throughput by 50% to 18 per hour; and ▪ Continually review ARFF and CSB services to maintain continuity of services over the planning period. |

Chapter 8: Environment

Overview

Environmental management encompasses a range of land, water and noise related issues. Overall, there is a sound process to continually assess environmental lands. Specifically, the WAA regularly reviews and updates the lands that have contaminated or environmentally sensitive features. The relevance to master planning is to ensure that future land development is compatible with waterways and other sensitive features.

Sustainable management of the environment helps to mitigate impacts of airport operations on neighbouring communities.

This chapter also covers aircraft noise and the relationship established between the WAA and the community in terms of dealing with aircraft noise management. The current airport vicinity development plan continues to remain in effect and is a key element in protecting future airport growth and development.

WAA Environmental Policy

As an integral part of the community, WAA is committed to the sustainable management of the environment and to avoid or mitigate the impacts YWG operations may have on neighbouring communities.

WAA has adopted an Environmental Policy to meet the needs of the present community, without compromising the ability of future generations to meet their own needs. In order to achieve the goals of the environmental policy, WAA adheres to the following practices:

- Environmental Management System;
- Education and promotion;
- Prior assessment;
- Emergency preparedness;
- Environmental audits; and
- Reporting.

Environmental Characteristics

Land Areas

YWG sits on approximately 1,370 ha of land, which has less than a two meter change in elevation from the north to the south of the property (4.4 km); notwithstanding isolated changes in elevation, such as waterways. The site can be divided into four areas that are distinguished by type of land use. Each area contains environmental sensitivities that can be a concern either in terms of impacts created by current or former land use, or limitations imposed on land uses as the result of an environmental condition.

Runways, Taxiways, Aprons and Adjacent Grassed Areas

The operational area of the airfield contains flat, hard-surfaced areas of either pavement (runways, taxiway, and apron surfaces) or grass coverage (areas adjacent to runways and other paved surfaces). Aviation-related activities on these paved surfaces have the potential to result in environmental impacts. Grassed areas, composed of non-native grasses and hardy native forbs (asters, anemones, and prairie rose), are maintained in a manner consistent with airport operational requirements.

Built Areas (WAA Buildings and Commercial Land)

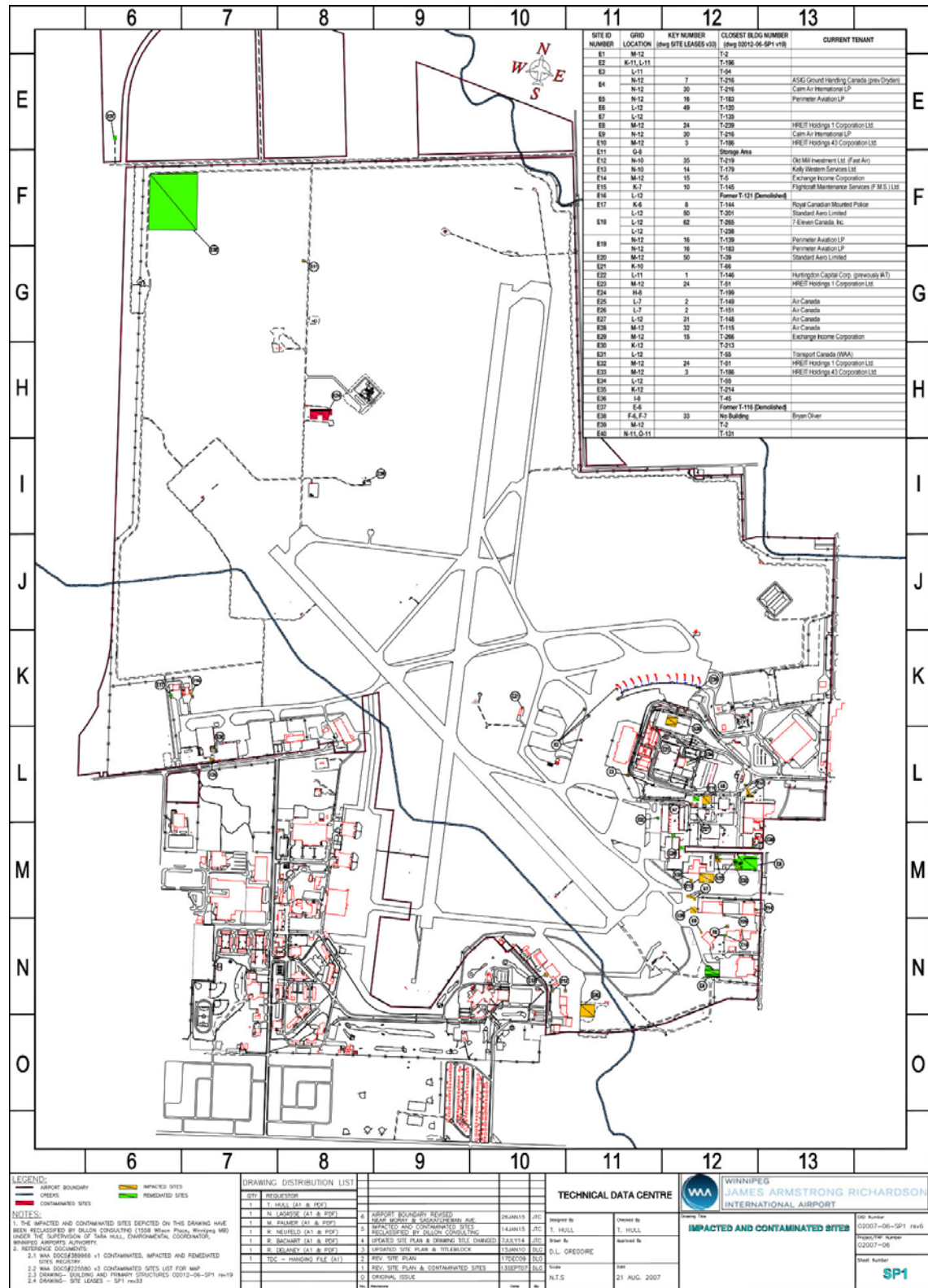
Most of YWG's built areas are located along the southern and southeastern boundaries of the airport property. These areas contain buildings used for passenger and cargo processing, aircraft maintenance, airport operational support, commercial tenants, and associated road and utility corridors. Construction, renovation, and/or demolition of these facilities can pose environmental challenges. Activities undertaken at these facilities (such as those used for maintenance or operations that store and use fuels, oils, and other chemicals), can be another potential source of environmental impact.

Fields and Wooded Areas

Agricultural lands and wooded parcels are located in the northern and southwestern portions of the airfield. Large areas continue to be cultivated or hayed through lease agreements with local farmers. These lease agreements are intended to ensure that agricultural activities do not attract wildlife to minimize the risk of strikes with aircraft. Wooded areas in the southwest corner of the airfield are representative of aspen woodlands found throughout the region. The wooded areas are dominated by trembling aspen, interspersed with elm, green ash, Manitoba maple, and bur oak. Common native shrub species such as dogwoods, snowberry, and other varieties, fill out the understory. The fields and wooded areas provide habitat, as food or shelter, for a diverse mix of wildlife. The airport woodlands are considered sensitive environmental areas because they are part of a larger avian habitat west of the airport. Occasional woodland alteration may be necessary to manage wildlife habitat or maintain airport safety.

Some remnant prairie may also be scattered throughout the airfield in areas not affected by past agricultural or airfield development. Invasion by more aggressive, non-native species is likely to have negatively affected the quality of any remaining stands. Because significant portions of the site have been modified, no stands have been specifically identified, and the quality of any remaining prairie is suspect. These areas have not been identified as being environmentally sensitive.

Figure 8-1: Map of Contaminated and Environmentally Sensitive Areas



Waterways

Surface water bodies are protected by extensive water quality and aquatic species protection legislation. Omand's and Truro Creeks receive most of the airport's surface water drainage through a series of sub-surface drains and ditches. Omand's Creek, which passes along the northern boundary of the site, is the larger of the two watersheds in drainage area and flow. Truro Creek, which traverses the southern portion of the airfield, is a far smaller watershed, classified as an intermittent stream. It may experience high flows during spring runoff, and may occasionally dry up during the late summer. Both creeks flow into the Assiniboine River, located approximately 1.5 kilometers (km) south of the airport property. These creeks are designated as environmentally sensitive areas and are subject to specific developmental guidelines.

Environment Issues Relevant to Land Development

Environmentally Sensitive Sites

The location and condition of environmentally sensitive sites as of 2007¹⁰ are illustrated in Figure 8-1. The previous environmental baseline studies and audits have identified approximately 44 individual sites that are contaminated to some extent. These sites have been identified by one or more of the following:

- Exceeded site contamination standards for commercial or industrial land uses based on criteria established by the Canadian Council of Ministers of the Environment (CCME);
- Met levels for CCME Commercial/Industrial land-use criteria, but site impacts may not be fully characterized;
- Have been remediated to CCME Commercial/Industrial land-use criteria, but may still contain pockets exceeding criteria;
- Have not been fully assessed; or
- Require significant site preparation to prepare land for redevelopment because of pre-transfer land-use activities.

Noise

Noise is a concern for communities neighbouring YWG. Sources of noise include aircraft operations and trucking activities that support the airport's 24-hour cargo and courier activities.

¹⁰ An update of the impacted and contaminated sites' site-plans will be provided in the next version of the Master Plan document.

Aircraft Noise

To fulfill its role as a gateway airport and because of its central east-west location, YWG maintains 24-hour operations. Although night-time activities provide considerable economic benefit to the region, they also lead to concerns about noise in surrounding neighborhoods. WAA is sensitive to the need to minimise and manage the effects of aircraft noise.

The Airport Environmental Advisory Committee addresses environmental issues and guides WAA's comprehensive Noise Management Program. Program initiatives include:

- Pursuing modification of aircraft-operation regulations and monitoring flight tracks for regulatory compliance;
- Providing a 24-hour Noise Line for the public to report concerns; and
- Community planning to ensure new developments are noise-compatible.

Airport Vicinity Development Plan

The Airport Vicinity Development Plan (AVDP) boundaries are related directly to Noise Exposure Forecasts (NEF) contours. The 25 NEF contour approximates the outer limit of the AVDP area. The NEF configuration reflects the ultimate traffic volume at YWG. Clear boundaries were chosen to avoid confusion whenever possible. Major rights-of-way and individual property lines are selected in determining the location of the AVDP area.

The AVDP continues to be best-in-class in Canada for management of noise compatible issues. The analyses for the Master Plan was undertaken to review noise contours for the expected level of activity. The Airport Vicinity Development Plan Areas I and II (see Figure 8-2) continues to be a valid tool to help offset the potential incompatibilities between surrounding land uses.

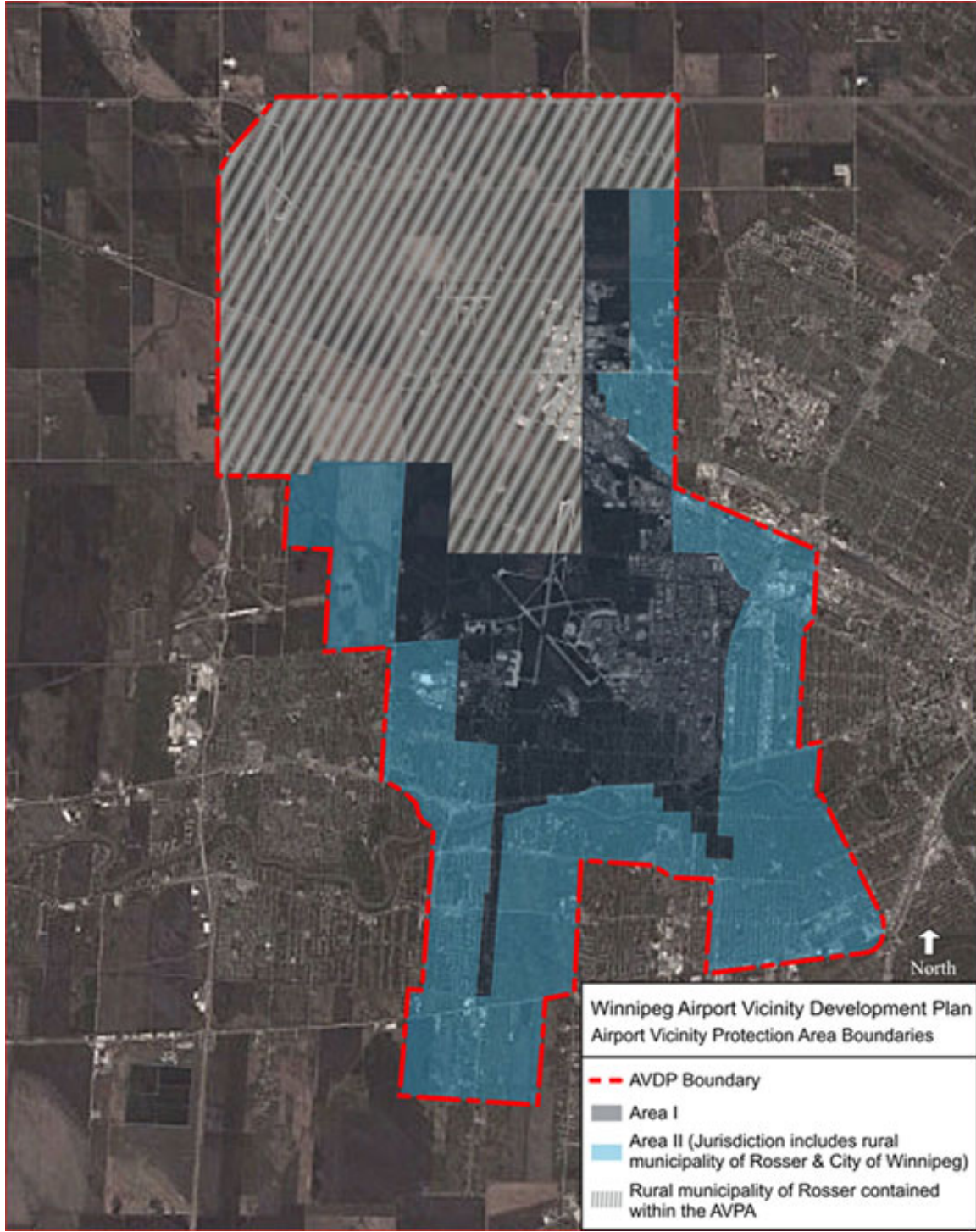
In addition to WAA's Noise Management Program, the WAA continues to adopt Night-time Operating Restrictions between 11:00 p.m. and 7:00 a.m. During these hours, depending on wind conditions, most arrivals and departures occur to and from the north, primarily over farmland and industrial parks in order to minimize local disturbances.

Figure 8-2 highlights the Winnipeg Airport Vicinity Development Plan and the Protection Area Boundaries.

Water Quality

Surface and water sampling for a wide range of water quality parameters occur at a number of sites located both on and off airport property during the spring and summer months. Sampling stations are located along Omand's Creek and Truro Creek. Sample results generally indicate that airport operations are not negatively affecting the creeks.

Figure 8-2: Winnipeg Airport Vicinity Development Plan



The primary chemical additives in aircraft de-icing fluids, ethylene and propylene glycols, plus associated by-products may reach the creeks through rainwater and snowmelt runoff, or via subsurface melting. However, mitigation measures have been implemented to contain contaminants within guidelines. The Central De-icing Facility (CDF) continues to allow WAA to increase the capture and recovery of spent glycol fluid and reduce the potential for accidental release of de-icing fluids. In 2009, WAA constructed an 11 million litre Glycol Retention Pond to provide additional storage capacity and treatment opportunities for glycol contaminated effluent. The pond is equipped with bird-deterrent wiring to discourage waterfowl from landing, wading or nesting within the pond. The pond is also equipped with aerators to enhance the glycol degradation process. Water quality has drastically improved in both Omand's Creek and Truro Creek since the installation of the Central De-icing Facility in 2005.

Wildlife

WAA's habitat and wildlife management program was developed in consultation with Transport Canada's *Land Use in the Vicinity of Airports* guidelines and Canadian Aviation Regulations Standards. The presence of wildlife at an airport poses a risk of aircraft strikes. Grassed areas, agricultural fields, wooded areas, and water bodies at YWG represent potential habitat and can attract a wide range of wildlife species, if not managed properly. Several species of birds will use paved surfaces or adjacent grassed areas as resting grounds after feeding. Species such as gulls will gravitate to areas adjacent to paved surfaces after heavy rains to feed on worms that come to the surface. Rodents and hares may take up residence in fenced, grassed and other sheltered areas. These animals attract predator species (such as birds-of-prey and foxes), to the airport. Ungulates, such as deer, have been known to take up residence in the woodlands on YWG grounds. Water bodies attract nesting ducks and staging waterfowl. Any species representing a strike risk to aircraft, or attracting such species to the airport, requires management of the species or manipulation of its preferred habitat.

Environmentally Sensitive Planning

Environmentally sensitive planning employs planning tools to minimise potential negative environmental impacts that might otherwise arise from land use, development, and construction activities.

The following provides a brief overview of some of WAA's environmental guidelines and the planning processes used to evaluate development projects and YWG activities.

Environmental Impact Assessment (EA) and Development Review

WAA has an EA protocol designed to review the potential environmental impacts arising from individual developments to ensure that appropriate mitigation and monitoring measures are implemented to meet/exceed Government of Canada regulations. The EA protocol is integrated into the development review process and identifies those projects with a reasonable likelihood of creating short- or longer-term environmental impacts.

Compatible Community Land Use Planning

Transport Canada's guideline *Land Use in the Vicinity of Airports* specifies recommended compatible land uses within various noise exposure contour zones. In particular, Transport Canada recommends no new residential construction in areas situated within noise exposure

contours of 30 or higher¹¹. Most of these recommendations have been adopted in the City of Winnipeg's *Airport Vicinity Protection Area* zoning by-laws.

Watershed Planning

WAA has an on-going program to test surface water for contaminants that might arise from airport operations. Development requirements (such as oil/water separators in areas where refueling or oil changing may occur), continue to evolve to promote positive surface water quality.

Habitat Management

In some cases, environmentally sensitive areas such as creek banks and woodlands may be altered to reduce wildlife management hazards and to ensure safe airport operation.

Proposed WAA and tenant activities and land development projects are evaluated in the context of WAA's habitat and wildlife management program, and Transport Canada's *Land Use in the Vicinity of Airports* guidelines.

Recommendations

There is one recommendation for environmental issues over the duration of the Master Plan period.

1. Continue with AVDP Boundaries

The existing AVDP provides the framework to be best-in-class in Canada for management of noise compatible issues.

- **Recommendation:** The WAA will need to continue to minimise and manage the effects of aircraft noise. This will be achieved through the continual application of the Airport Vicinity Development Plan and ongoing communication and consultation with stakeholders.

¹¹ Land Use in the Vicinity of Airports (TP1247E) 2013/14, Transport Canada

Summary

Environmental stewardship is an important part of the responsibility of airports to surrounding communities. Winnipeg Richardson International Airport is a leader in monitoring and planning in this regard, including leading-edge noise-compatible land-use planning developed in the 1990s. Continuing this path ahead and taking full advantage of improved aircraft technologies, there will be the ability to ensure aeronautical uses are compatible with the environmental footprint of the facility. The following table summarizes the key aspects of planning for the environment in Master Plan 2033.

| FUTURE DEMAND | KEY MASTER PLAN 2033 DIRECTIONS |
|---|--|
| <ul style="list-style-type: none">▪ Ongoing attention to mitigate risks of environmental impacts due to airport operations; and▪ Potential sensitivity within the community towards the growth of aircraft activity. | <ul style="list-style-type: none">▪ Continue to monitor and rehabilitate environmentally sensitive sites;▪ Continue to advance the Noise Management Program;▪ Continue with the 2005 Airport Vicinity Development Plan and Protection Area Boundaries; and▪ Minimize potential negative environmental impacts through environmentally sensitive planning. |

Chapter 9: Airport Land Use Plan

Overview

One of the main objectives of Master Plan 2033 is to provide guidance to identify future developments. The purpose of this section is to integrate the requirements and synthesize the recommendations derived from the findings within the document. The integration process is intended to resolve competing or conflicting requirements, and to achieve an efficient and logical airport development scenario. The results are the Long-Term (2033) Airport Land Use Plan, approved by the Minister of Transport on September 25, 2015.

The Airport Land Use Plan is used as a basis to reflect the strategic objectives and development targets of WAA through specific land use designations.

Guiding Principles

The Airport Land Use Plan places existing airport infrastructure and land reserves into the context of YWG's current operating and market environment, and establishes an approach to meet forecast requirements through the 2033 planning period. The planning principles used as a basis for land-use designations reflect the strategic objectives and development targets of WAA. Specifically, the key principles for land use planning seek to:

- Protect existing operational areas and provide for airfield/apron expansion requirements that may occur over the long-term and beyond;
- Designate sufficient land to allow expansion of passenger facilities and related services;
- Facilitate commercial development strategies through flexible commercial land-use designations; and
- Implement development in a manner that will protect or enhance environmental conditions at YWG and in the community at large.

Strategy for the Future

Land Use Designations

Leasing and development of commercial land continues to substantially add to WAA's revenue base and lower dependency on aeronautical revenues. Broader land use definitions create opportunities to attract new investment because of the flexibility they offer to different commercial and industrial activities, and the flexibility they provide in allowing for potential facility conversion. The Long-Term 2033 Airport Land Use Plan incorporates a strategic approach to future airport land development through a simple and flexible land-use hierarchy.

This hierarchy provides the required protection for operational areas and ensures coordination in pursuing commercial development opportunities on the site, notably both aviation and non-aviation-related developments to complement existing Airport activities. The land use hierarchy is described in Figure 9-2.

Airport Development Concept Plan

Implementation of the recommendations presented in Master Plan 2033 will expand and develop YWG facilities. The goal of the Airport Development Concept Plan (Figure 6-1), is to illustrate potential infrastructure development and key activity areas through the planning period to 2033, and is intended to provide more specific direction with respect to airport development strategies and commercial opportunities.

The concept plan is organised by predominant activity type for each campus. The activity area designations complement land uses by identifying the predominant nature of activities best accommodated in each airport development node. The concept of predominant activities is presented solely for the purpose of guiding development strategies and is not intended to exclude other types of development from occurring in each area. This approach is consistent with comparable development strategies used at airports across Canada.

2033 Airport Land Use Plan

The 2033 Airport Land Use Plan is shown in Figure 9-2. A review was undertaken based on implementing the new standards in the draft of the 5th edition of the Transport Canada TP312 Standards.

Airfield land uses are maintained to provide continuity between the required facilities and future demand. Consistent with previous Land Use Plans, the delimitation of the airfield area is based on Transport Canada's *Aerodrome Standards and Recommended Practices* (1993).

Reflecting the terminal's expansion requirements, the air terminal and ground transportation area has been expanded to the east. The new reserve will provide sufficient area to accommodate future terminal development and apron expansion beyond the planning period.

Sufficient space has been reserved in the Air Terminal and Ground Transportation land use categories to ensure expansion capability beyond the planning period, without limiting design flexibility in future planning stages.

The primary land use change comes within the runway reserve for the parallel runway to the existing Runway 13/31¹². A portion of this area located in the eastern quadrant of the airport is designated as flexible commercial/airfield. This area is planned for conversion from the airfield designation to allow for commercial development opportunities. Airfield capacity analyses have been undertaken and have shown that the need for a third runway at YWG will not be required within this planning period. As a result, there is the opportunity for shorter-term commercial

¹² Note that the parallel runway length and position has not been determined and is not anticipated to come into use during this Master Plan timeframe.

activities, as needed that could be implemented in the interim. A flexible airfield/commercial designation is recommended for these areas.

As development proceeds in the long-term, particularly in the R&D Testing Campus and the Advanced Manufacturing & Intermodal Campus, airside access and ground transportation corridors will be provided in accordance with the specific development requirements. As noted previously in Chapter 6, the WAA recently changed its boundaries for several parcels of land along Saskatchewan Avenue between Sturgeon Road and Moray Street. The expanded lands for the Advanced Manufacturing & Intermodal Campus will benefit future development, with the new boundaries outlined in the 2033 Land Use Plan in Figure 9-2.

The WAA has established a minimum buffer zone around Truro and Omand's Creeks to avoid negative development impacts on surface waters, such as sedimentation from stream bank erosion. Development and activities within buffer zones may be subject to environmental impact assessment, erosion control, re-vegetation requirements, spill containment, or other mitigating measures. In some cases, projects in the buffer zone may also require a Federal Fisheries Act Permit. WAA's waterway buffer zone is 76 meters on either side of the summer normal elevation watermark and is consistent with the City of Winnipeg Building Permit development restrictions.

Additional development restrictions are located around both the transmitter and radar sites at the airport. Development restrictions generally prohibit permanent structures (such as buildings) to be located within these areas, to prevent interference with transmission frequencies. However, developments such as roadways are permitted as long as vehicles do not block transmission signals. Further details on the distances and types of building restrictions around the transmitter and radar sites can be found within *TP 1247E 2013/14 Aviation Land Use in the Vicinity of Aerodromes* as published by Transport Canada.

Figure 9-1: Land Use Hierarchy

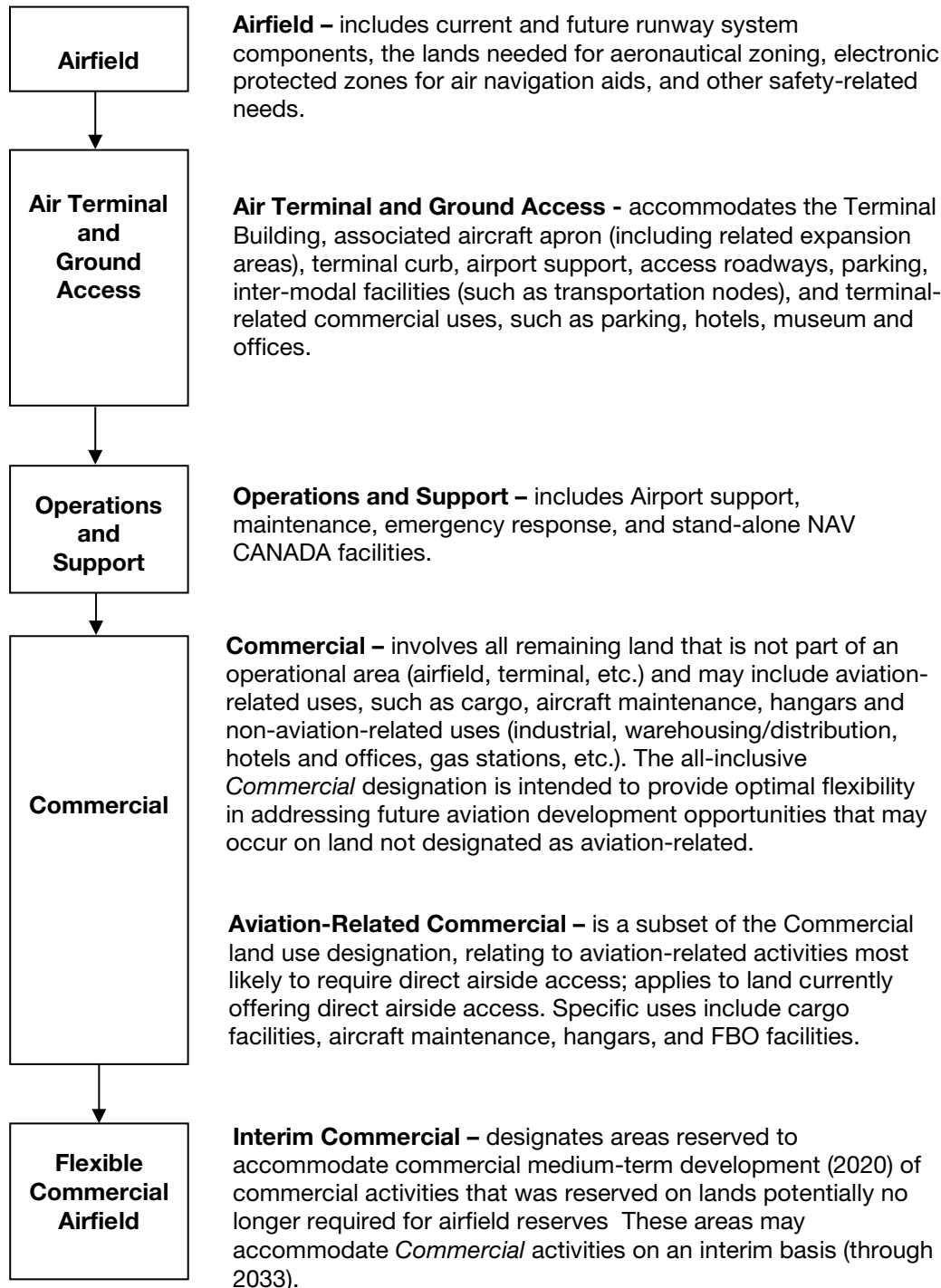
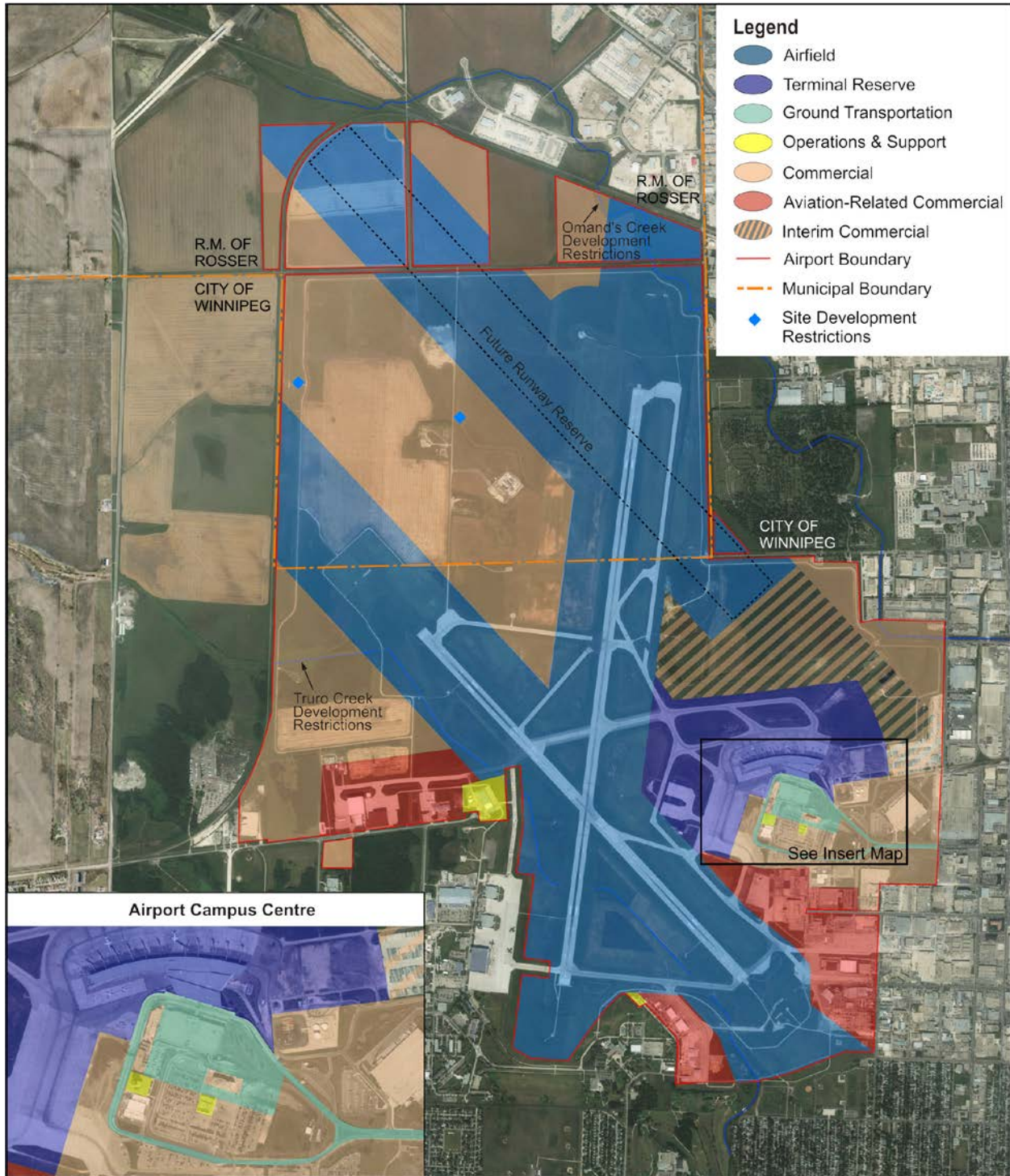


Figure 9-2: 2033 Airport Land Use Plan



Approved by the Minister of Transport per Amendment No. 10 to the Winnipeg Airport Ground Lease - September 25, 2015

Recommendations

There is one recommendation for the land use plan development of YWG.

1. Adopt Changes in Land Use Designation

In order to allow for development flexibility to enhance commercial development, a flexible commercial/airfield designation needs to be implemented.

- **Recommendation:** Adopt the flexible commercial/airfield designation to create an opportunity for shorter-term commercial activities, as needed, that could be used in the interim for revenue generation.

Summary

The land use plan is the most critical aspect of the Master Plan. By designating zones for planned uses, the airport can systematically preserve lands for aeronautical functions (terminal, runways) while enabling other lands to be available for support or revenue generation functions. The following points are the key aspects of the Land Use Plan for Master Plan 2033.

| FUTURE DEMAND | KEY MASTER PLAN 2033 DIRECTIONS |
|---|---|
| <ul style="list-style-type: none">▪ Expansion of airside and terminal facilities (outlined in previous chapters);▪ Reserves needed to provide right-of-way or space for road and transit improvements;▪ Space needed to meet commercial development strategy; and▪ Land needed to meet future support, maintenance and emergency services. | <ul style="list-style-type: none">▪ Allow flexible commercial development via changes in land use designations;▪ Implement the new standards in the draft 5th edition of the Transport Canada TP312 standards; and▪ Create new developable lands within the Innovation Campus to provide better organization of lands. |

Appendix A: Runway Characteristics

| Runway | 13 | 31 | 18 | 36 |
|----------------------------|------------------------------------|------------------------------------|-------------------------------------|-------------------------------------|
| Reference Code | 4E | 4E | 4E | 4E |
| Approach | Precision | Precision | Non-Precision | Precision |
| Runway Dimensions | 2,651m x 60m (8,700ft x 200ft) | 2,651m x 60m (8,700ft x 200ft) | 3,352m x 60m (11,000ft x 200ft) | 3,352m x 60m (11,000ft x 200ft) |
| Landing Distance Available | 2,651m (8,700ft) | 2,651m (8,700ft) | 3,352m (11,000ft) | 3,352m (11,000ft) |
| Takeoff Distance Available | 2,957m (9,700ft) | 2,957m (9,700ft) | 3,658m (12,000ft) | 3,658m (12,000ft) |
| Clearway Dimensions | 300m (984ft) | 300m (984ft) | 300m (984ft) | 300m (984ft) |
| Strip Dimensions | 2,771m x 300m (9,092ft x 984ft) | 2,771m x 300m (9,092ft x 984ft) | 3,472m x 300m (11,396ft x 294ft) | 3,472m x 300m (11,396ft x 294ft) |
| Runway Edge Lights | High Intensity | High Intensity | High Intensity | High Intensity |

Appendix B: Regional Forecast Summary

A regional forecast was developed to assist WAA with the handling of unscreened passengers that travel to and from the northern remote communities of Manitoba. Currently unscreened passengers leave from YWG's Perimeter's facility (south of the ATB) and arrive from Northern regional and remote airports. During the Master Plan process the WAA considered building a terminal dedicated to accommodate some of these passengers. The regional forecast played a role in the determination to keep existing operations as status quo, however, any future considerations would lean towards amalgamating all operations within the main ATB at a future medium- to long-term date as discussed in Chapter 4.

Historical and Current Regional Air Traffic at YWG

In 2013, 14% of total domestic seat capacity was regional and 41% of total domestic movements were regional (see Figure B-1). Load factors in the regional market are considered to be low—on average about 52% at YWG in 2012. The total regional seat capacities declined over the last 2 years (-8% in 2012 and -13% in 2013). Total regional movements declined over the last 2 years at -6% in 2012 and -5% in 2013.

Figure B-1: Total Seat Capacities of regional carriers from 2009 to 2014

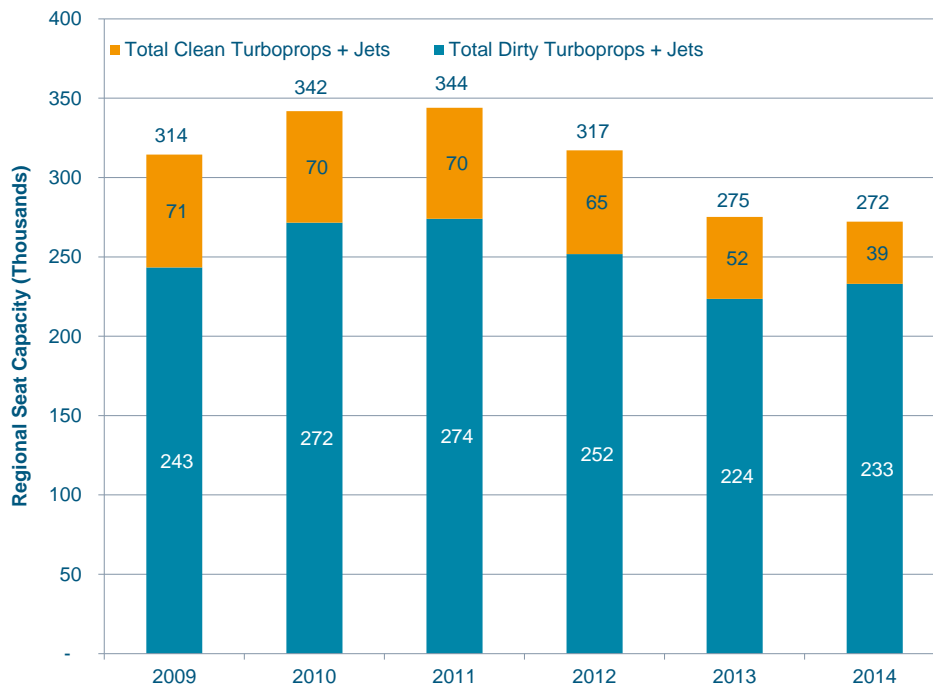
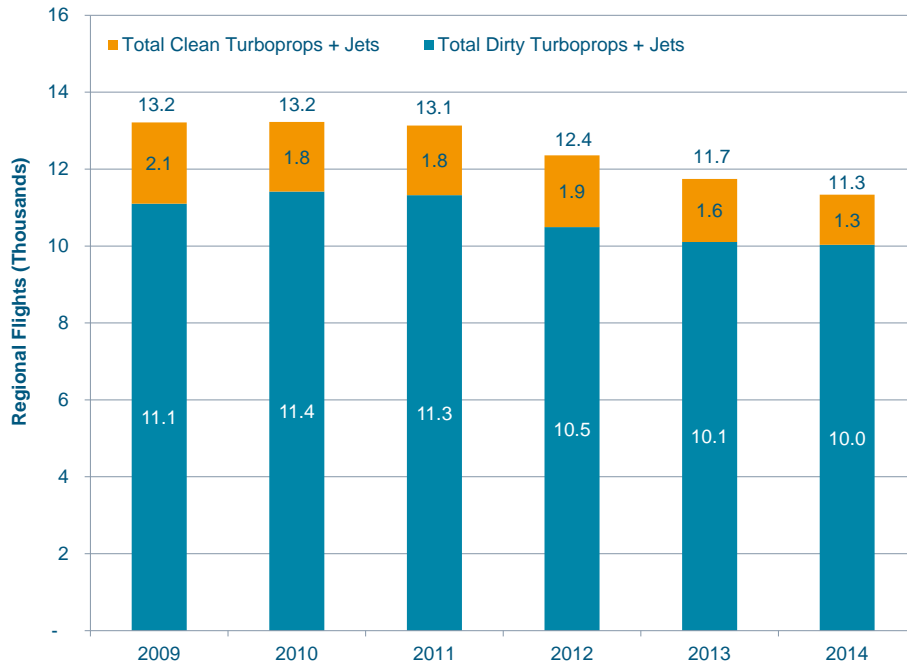


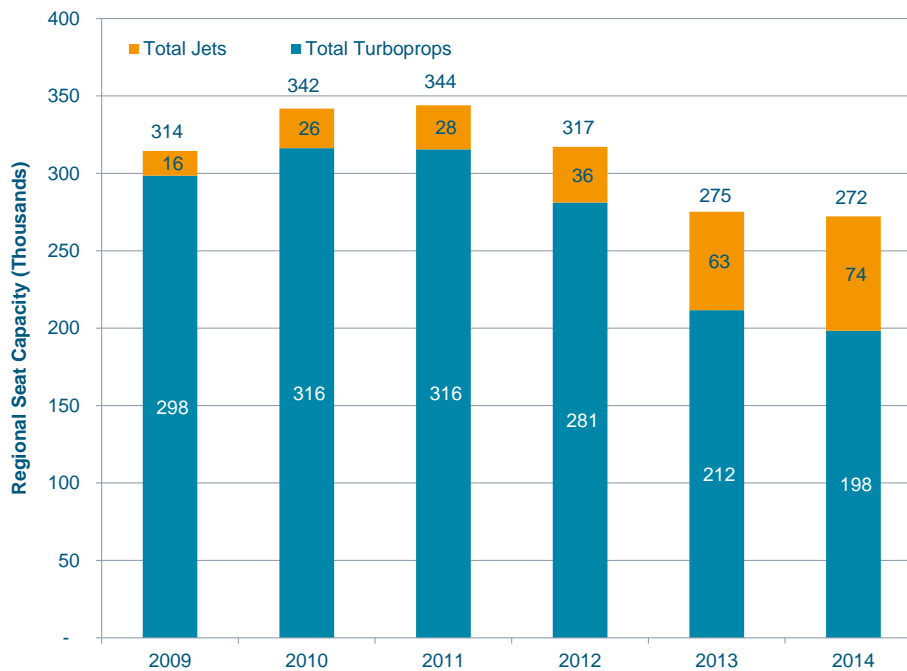
Figure B-2 outlines both the screened and unscreened regional movements declined over the last 4 years at YWG.

Figure B-2: Screened and Unscreened Regional Movements from 2009 to 2014



As highlighted in Figure B-3, the last 3 years regional jet seat capacities have increased significantly, while regional turboprop seats have decreased.

Figure B-3: Regional Jet vs. Turboprop Seat Capacities



Seat capacity by regional air carriers has also declined over the past 3 years. The largest decline was experienced in 2012 vs. 2013 where a 13% decline was experienced. All regional carriers with the exception of First Air and Perimeter Aviation experienced a decrease in seat capacity from 2013 to 2014. The table below illustrates the seat capacities by regional carrier at YWG.

Table B-1: Seat Capacity Changes by Regional Carrier from 2011 to 2014

| Carrier | 2011 | YOY % Change | 2012 | YOY % Change | 2013 | YOY % Change | 2014 | YOY % Change |
|--------------------|----------------|--------------|----------------|--------------|----------------|--------------|----------------|--------------|
| Bearskin Airlines | 47,400 | -1% | 44,900 | -5% | 41,500 | -7% | 37,000 | -11% |
| Calm Air | 137,200 | 3% | 129,900 | -5% | 119,800 | -8% | 117,300 | -2% |
| Kivalliq Air | 8,900 | 0% | 3,100 | -65% | 2,300 | -26% | | -100% |
| Perimeter Aviation | 122,000 | -3% | 103,300 | -15% | 86,000 | -17% | 87,900 | 2% |
| First Air | 28,400 | 10% | 36,000 | 27% | 25,500 | -29% | 30,000 | 18% |
| Total | 343,900 | 1% | 317,200 | -8% | 275,100 | -13% | 272,200 | -1% |

Source: Diio Scheduled Data

Regional Forecasts

The following regional forecast provides an indication of how much regional air traffic (unscreened and screened passengers) is expected to grow over the next 20 years, and therefore was the basis of the analyses in the regional terminal decision making process.

The following tables and graphs cover the planning period from 2013 to 2033 in 5-year intervals. The regional forecasts were produced from:

- Turboprops vs. Jet passenger traffic and movements; and
- Screened vs. Unscreened passenger traffic and movements.

The forecasts were based on the most likely forecasts provided by InterVISTAS in December 2013. The average regional aircraft size (passenger per aircraft) and load factors are expected to increase over the forecast period, thus aircraft movements will grow at a slower rate than passengers. This regional forecast is subject to a number of risks and uncertainties.

Figure B-4 highlights the total regional vs. non-regional passenger forecasts. Forecasted trends indicate that regional passenger air traffic is predicted to grow slower than non-regional passenger traffic over the next 20 years. Figure B-5 highlights the regional movements which are predicted to grow slower than non-regional movements over the next 20 years. Regional movements utilizing jet aircraft are predicted to grow faster than regional turboprop movements.

Figure B-4: Total regional vs. non-regional passenger forecasts.

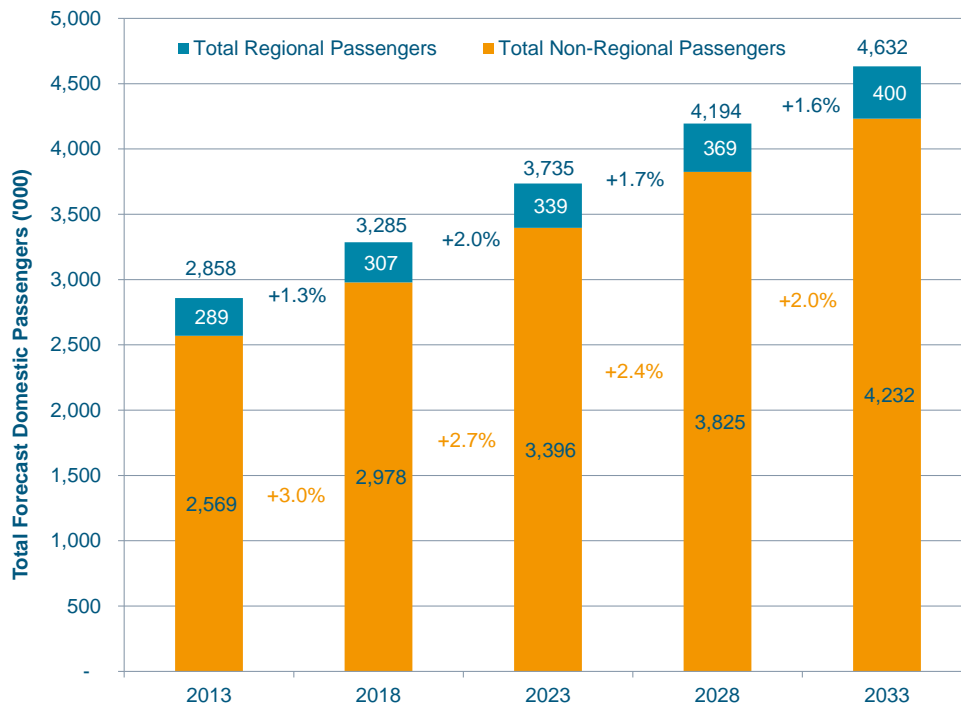
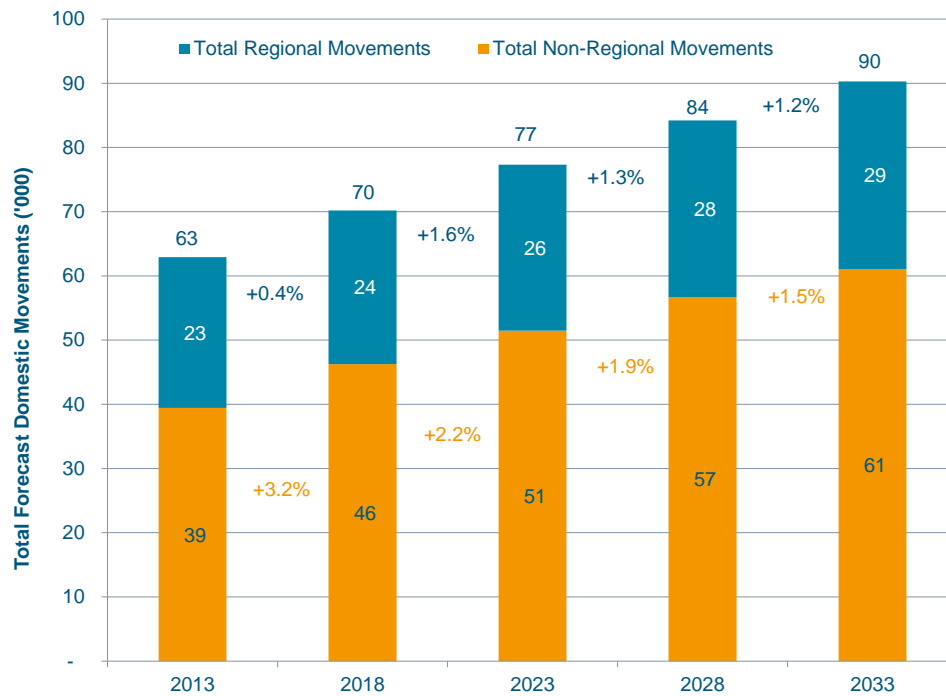


Figure B-5: Total Regional vs. Non-Regional Movements



Results

The study concluded that there are many challenges with Northern Air Services in Manitoba from YWG. Challenges faced within the northern and regional air industry include¹³:

- Canada’s Northern Population accounts for roughly 0.3% of its total population, but it is spread over 39% of Canada’s total land mass;
- Air transportation in northern Canada is essential for passenger and cargo movement;
- 65 northern communities are only accessible by air;
- In total, 570 regional airports in Canada offer scheduled or non-scheduled flights;
- Demand is fairly constant and very price-inelastic;
- Northern air carriers are restricted in the type and size of aircraft they may operate due to insufficient infrastructure (e.g. unpaved runways, runways too short);
- No new-generation aircraft is certified to operate on unprepared surface, which will force air carriers in the future to use older aircraft, thus increasing operating costs;

¹³ Source: One size doesn’t fit all: The future of growth and competitiveness of Canadian Air Travel, April 2013.

- Some airports are not equipped with up-to-date instrument approach systems making it impossible to land in adverse weather conditions and leading to further cancellations;
- Lack of meteorological information because Arctic weather stations have been shut down, leading to further cancellations;
- Northern market is small and growth is limited, so air carriers are particularly vulnerable to competition;
- Lower airfares from competition make air services in northern regions unsustainable in the long run, and can increase prices on routes serving even smaller communities;
- Air transportation policies and regulations do not take special needs and challenges of northern regions into account (e.g. Perimeter wants to upgrade its fleet with glass cockpits (which would increase safety). However, it is difficult to meet certain Transport Canada mandatory standards;
- Permafrost on which many runways are built is softening due to climate changes (also problematic for terminal buildings which are built on steel piles into the permafrost; and
- Many Northern airports are also built close to the water and would not withstand significant rises in sea levels.

Operationally the main ATB can handle the increase in regional traffic should all operations move under one facility. However current recommendations within the Master Plan indicate that current terminal operations should remain at status quo and there is no need or demand for a separate regional terminal.

Appendix C: Consultation Summary

Throughout the Master Plan process consultations are conducted with key stakeholders to obtain input on planning objectives and recommendations on the implementation of the Master Plan. Two employee sessions were held with WAA employees. In addition there were bilateral and public consultations advanced during the course of the Master Plan. A Public Open House was advertised and held on October 1, 2014 and included a range of participants with views provided on comment cards. Key groups invited to comment during the Master Plan process include:

- CargoJet;
- Air Canada;
- WestJet;
- UPS;
- FedEx;
- Purolator;
- Greyhound;
- Exchange Income Corporation;
- CATSA;
- Servisair;
- CBSA;
- CBP;
- SSP Group;
- NAV CANADA;
- Department of Defence;
- Economic Development Winnipeg;
- Northern Air Transport Association;
- CentrePort;
- Standard Aero;
- World Trade Centre Winnipeg;
- City of Winnipeg;
- Rural Municipality of Rosser;
- Province of Manitoba;
- Manitoba Aviation Council; and
- Transport Canada.