



REGION OF WATERLOO INTERNATIONAL AIRPORT MASTER PLAN

MARCH 2017



TABLE OF CONTENTS

EXECUTIVE SUMMARY	I
CHAPTER A. INTRODUCTION	A-1
1. MASTER PLAN OBJECTIVES AND PURPOSE.....	A-1
2. STRATEGIC VISION.....	A-4
3. AIRPORT ROLE AND HISTORY	A-4
3.1 NEIGHBOURING AIRPORTS	A-7
3.2 CATCHMENT AREA SUMMARY	A-8
3.3 AVIATION MARKET	A-10
4. STUDY APPROACH	A-12
4.1 PROCESS, STEPS, TIMELINE.....	A-12
CHAPTER B. EXISTING CONDITIONS.....	B-1
1. EXISTING CONDITIONS	B-1
1.1 AIRSIDE FACILITIES	B-1
1.1.1 Runway 08-26	B-2
1.1.2 Runway 14-32	B-4
1.1.3 Runway End Safety Areas (RESA)	B-4
1.1.4 Taxiways	B-4
1.1.5 Aprons	B-6
1.2 AIR TERMINAL FACILITIES	B-8
1.3 AIRPORT SUPPORT FACILITIES	B-9
1.3.1 Air Traffic Control Tower	B-9
1.3.2 Airport Operations Centre	B-10
1.3.3 Field Electrical Centre	B-11
1.3.4 Aircraft Refuelling Facilities	B-11
1.3.5 Aircraft Rescue and Firefighting	B-11

- 1.4 LANDSIDE FACILITIES..... B-11
 - 1.4.1 Parking B-11
 - 1.4.2 Approach Road and Access..... B-12
- 1.5 UTILITIES AND SERVICES B-12
 - 1.5.1 Sanitary Service B-12
 - 1.5.2 Water Supply..... B-12
 - 1.5.3 Stormwater Drainage B-12
 - 1.5.4 Gas B-13
 - 1.5.5 Power B-13
 - 1.5.6 Communication B-13
 - 1.5.7 Airfield Lighting..... B-13
 - 1.5.8 Airfield De-icing B-14
- 1.6 AIRPORT LANDS..... B-15
 - 1.6.1 Airside Land Capacity B-15
 - 1.6.2 Groundside Land Capacity..... B-16
- 1.7 SURROUNDING LANDS..... B-16
 - 1.7.1 Airport Neighbours B-16
 - 1.7.2 Grand River Conservation Authority (GRCA)..... B-18
- 1.8 AERONAUTICAL ZONING..... B-18
 - 1.8.1 Airport Zoning..... B-18

CHAPTER C. SWOT ANALYSIS AND FUTURE DEVELOPMENT C-1

- 1. OVERVIEW C-1
 - 1.1 KEY SWOT ELEMENTS C-1
- 2. PUBLIC CONSULTATIONS..... C-3
- 3. DEVELOPMENT OPPORTUNITIES..... C-4
- 4. TRIGGER POINTS AND STAGING OF DEVELOPMENT..... C-6

CHAPTER D. CAPACITY / DEMAND AND FACILITY REQUIREMENTS D-1

- 1. AIRSIDE D-1
 - 1.1 AIRFIELD CAPACITY..... D-1
 - 1.2 FUTURE AIRSIDE REQUIREMENTS..... D-2
 - 1.2.1 New Transport Canada TP 312 5th Edition Compliance..... D-2
 - 1.3 AIRPORT PLANNING DESIGN CRITERIA..... D-4
 - 1.4 AIRCRAFT GROUP NUMBER (AGN)..... D-4
 - 1.5 IDENTIFICATION OF CRITICAL AIRCRAFT AND APPLICABLE RUNWAY/TAXIWAY DESIGN GEOMETRY STANDARDS D-5
 - 1.6 RUNWAYS D-6
 - 1.6.1 Runway 08-26 D-6

1.6.2	Runway 14-32	D-9
1.6.3	Third Runway	D-11
1.7	TAXIWAYS	D-11
1.7.1	Taxiway Alpha	D-11
1.7.2	Taxiway Bravo	D-12
1.7.3	Taxiway Charlie	D-13
1.7.4	Taxiways Echo and Foxtrot	D-13
1.8	APRONS	D-13
1.8.1	Apron I	D-13
1.8.2	Apron II	D-13
1.8.3	Apron III	D-14
1.8.4	Apron IV	D-14
1.8.5	Apron V	D-14
1.8.6	Apron VII	D-14
1.9	AIRPORT ZONING	D-15
1.10	ELECTRONIC PROTECTION AREA AND NAVIGATIONAL AIDS	D-17
1.11	AIRCRAFT FUELING	D-18
1.12	AIRCRAFT DE-ICING AREA	D-18
1.13	AIRCRAFT MAINTENANCE AND REPAIR	D-19
1.14	GENERAL AVIATION	D-19
1.14.1	General Hangar Space	D-20
2	AIR TERMINAL BUILDING	D-20
2.1	FLOW CONSTRAINT EVALUATION	D-20
2.1.1	Airside	D-20
2.1.2	Landside	D-21
2.1.3	Terminal	D-21
2.2	DEVELOPMENT TRIGGERS	D-21
2.3	TERMINAL EXPANSION ALTERNATIVES	D-22
2.4	CURRENT PASSENGER PROCESSING TECHNOLOGIES	D-22
2.5	FUTURE PASSENGER PROCESSING TECHNOLOGIES	D-22
2.6	NON-AERONAUTICAL REVENUE	D-23
2.7	TERMINAL RESERVE	D-23
3	LANDSIDE	D-24
3.1	FUTURE REQUIREMENTS	D-25
3.1.1	Transit	D-25
3.1.2	Entrance Road	D-25
3.1.3	Parking	D-26

3.1.4 Pedestrian Plaza	D-26
4. AIRPORT SUPPORT FACILITIES	D-27
4.1 AIR TRAFFIC CONTROL TOWER (ATCT).....	D-27
4.2 AIRPORT OPERATIONS CENTRE (AOC)	D-27
CHAPTER E. ENVIRONMENTAL AND SOCIAL IMPACTS	E-1
1. NOISE	E-1
1.1 BACKGROUND	E-1
1.2 CURRENT PLANNING STATUS AND LAND USE CONTROLS	E-3
1.3 2035 NOISE EXPOSURE PROJECTION (NEP).....	E-4
1.3.1 Methodology.....	E-4
1.3.2 Summary of Inputs	E-5
1.3.3 Observations	E-7
1.4 MITIGATIONS	E-7
1.5 CONCLUSIONS	E-10
2. ENVIRONMENTAL CONSTRAINTS.....	E-11
2.1 POLICY CONTEXT	E-11
2.1.1 Federal	E-11
2.1.2 Provincial.....	E-12
2.1.3 Grand River Conservation Authority (GRCA).....	E-13
2.1.4 Waterloo Regional Official Plan (ROP) (2015)	E-14
2.2 FIELD INVESTIGATIONS	E-14
2.2.1 Study Area Overview.....	E-14
2.2.2 Summary of Key Findings	E-15
2.2.3 Species of Conservation Concern.....	E-18
2.2.4 Setbacks and Buffers	E-20
2.3 CONCLUSIONS AND RECOMMENDATIONS	E-20
CHAPTER F. RECOMMENDED AIRPORT LAND USE	F-1
1. RECOMMENDED LAND USE PLAN	F-1
1.1 PLAN APPROACH	F-1
1.2 LAND USE PLAN	F-2
1.2.1 Adjacent Land Use	F-2
1.2.2 Airport Regulations.....	F-2
1.2.3 Land Use in the Vicinity of Airport	F-2
1.2.4 Airport Noise Protection Area.....	F-3
1.2.5 Other Factors Affecting Airport Development.....	F-3
1.2.6 Airport Reserve	F-3

1.2.7 Land Use Districts	F-3
1.3 DEVELOPMENT PLAN OBJECTIVES.....	F-4
2. AIRPORT COMMERCIAL SERVICES AND FACILITIES	F-4
2.1 FUTURE SPACE	F-4
2.1.1 Existing Developments – Serviced Lots	F-5
2.1.2 Proposed Developments – Future Availability.....	F-6
2.1.3 Future Utilities	F-8
CHAPTER G. GOVERNANCE	G-1
1. GOVERNANCE MODELS.....	G-1
2. ANALYSIS OF GOVERNANCE MODELS	G-3
CHAPTER H. IMPLEMENTATION	H-1
1. INTRODUCTION.....	H-1
2. FINANCIAL PLAN STAGING	H-2

APPENDICES

Appendix A		List of Abbreviations
Appendix B		Inputs For The Market Trend Forecasts
Appendix C		Stakeholder Committee & User Survey
Appendix D		Presentation Boards – 2016 Public Information Centre No. 1 & No. 2
Appendix E		Public Information Centre No. 1 & No. 2 Comments
Appendix F		Existing Air Terminal Building Simulation Report
Appendix G		KPMG Waterloo Service Review Report

LIST OF TABLES

Table B-1		Summary of Runway Pavements
Table B-2		Runway Utilization – Aircraft Movements
Table B-3		Declared Distances for Runways 08-26
Table B-4		Declared Distances for Runways 14-32
Table B-5		Taxiway Summary Table
Table B-6		Obstacle Limitation Surfaces Characteristics
Table C-1		Development Stage No. 1 – Pre-Planning for Growth Trigger – Regional Council Approval of Master Plan – Spring 2017
Table C-2		Development Stage No. 2 – Secondary Runway Extension and Terminal Expansion to 500,000 Annual Passengers Trigger – YKF Hits 250,000 Passengers

Table C-3		Development Stage No. 3 – Primary Runway Extension and Terminal Expansion to 1,000,000 Annual Passengers Trigger – YKF Hits 500,000 Passengers
Table C-4		Development Stage No. 4 – Terminal Expansion to 1,500,000 Annual Passengers Trigger - YKF Hits 1,000,000 Passengers
Table C-5		Development Stage No. 5 – New Parking Structure and Terminal Expansion to 2,500,000 Annual Passengers Trigger - YKF Hits 1,500,000 Passengers
Table D-1		Aircraft Approach Speed Category
Table D-2		Aircraft Group Number – Runway Environment
Table D-3		Aircraft Group Number – Taxiway Environment
Table D-4		Summary of Critical Aircraft Data, Existing Fleet and Respective Aircraft Group Number
Table D-5		New Declared Distances for Runway 08-26
Table D-6		Apron Rehabilitation
Table D-7		Proposed Obstacle Limitation Surfaces – Precision Runway 14-32 & 08-26 / AGN IIIB & IV
Table E-1		Community Response Predictions
Table E-2		2035 Peak Planning Day Traffic
Table E-3		2035 Itinerant Runway Distribution
Table E-4		2035 Itinerant Aircraft Power Type Distribution
Table E-5		2035 Projected Local Runway Distribution
Table E-6		2035 Projected Local Aircraft Type Distribution

LIST OF FIGURES

Figure A-1		Airport Location
Figure A-2		Competitive Airport Overview: Non-stop Scheduled Services
Figure A-3		Catchment Area Map
Figure A-4		OD Passengers by Sector and Airport
Figure A-5		Carrier and Capacity by Market
Figure B-1		Existing Airport Site Plan
Figure B-2		Existing Terminal Floor Plan
Figure B-3		Existing Utilities Plan
Figure B-4		Existing Land Use Plan
Figure B-5		Existing Obstacle Limitation Surface Plan
Figure C-1		Development Stage No. 1 – Airport Site Plan
Figure C-2		Development Stage No. 2 – Airport Site Plan

Figure C-3		Development Stage No. 3 – Airport Site Plan
Figure C-4		Development Stage No. 4 – Airport Site Plan
Figure C-5		Development Stage No. 5 – Airport Site Plan
Figure D-1		Proposed Airport Site Plan
Figure D-2		Proposed Runway 08-26 Extension Plan
Figure D-3		Proposed Runway 14-32 Extension Plan
Figure D-4		Proposed Third Runway Zoning Plan
Figure D-5		Proposed Obstacle Limitation Surfaces Plan
Figure D-6		Proposed Aircraft De-Icing Area Plan
Figure D-7		Existing Terminal Constraints Assessment
Figure D-8		Proposed Terminal Expansion
Figure D-9		Proposed Terminal Reserve Plan
Figure D-10		Linking YYZ to YKF – Building Southern Ontario’s Airport Network
Figure D-11		Future Terminal Development Plan
Figure D-12		Functional Landside Concept
Figure E-1		Existing 2000 Master Plan Noise Contour Plan
Figure E-2		Proposed 2035 Noise Contour Plan
Figure E-3		Composite Noise Contour Plan
Figure E-4		Noise Complaint Distribution Map
Figure E-5		Noise Abatement Procedure as Published in the Canada Air Pilot
Figure E-6		Natural Heritage Features and Constraints Plan
Figure E-7		Recommended Greenlands Network and Development Constraint Plan
Figure F-1		Proposed Land Use Plan
Figure F-2		Sample Development Plan – Apron IV
Figure F-3		Sample Development Plan – Apron VII
Figure F-4		Sample Development Plan – Proposed Apron VI
Figure F-5		Sample Development Plan – Proposed Apron VIII
Figure F-6		Proposed Utilities Plan

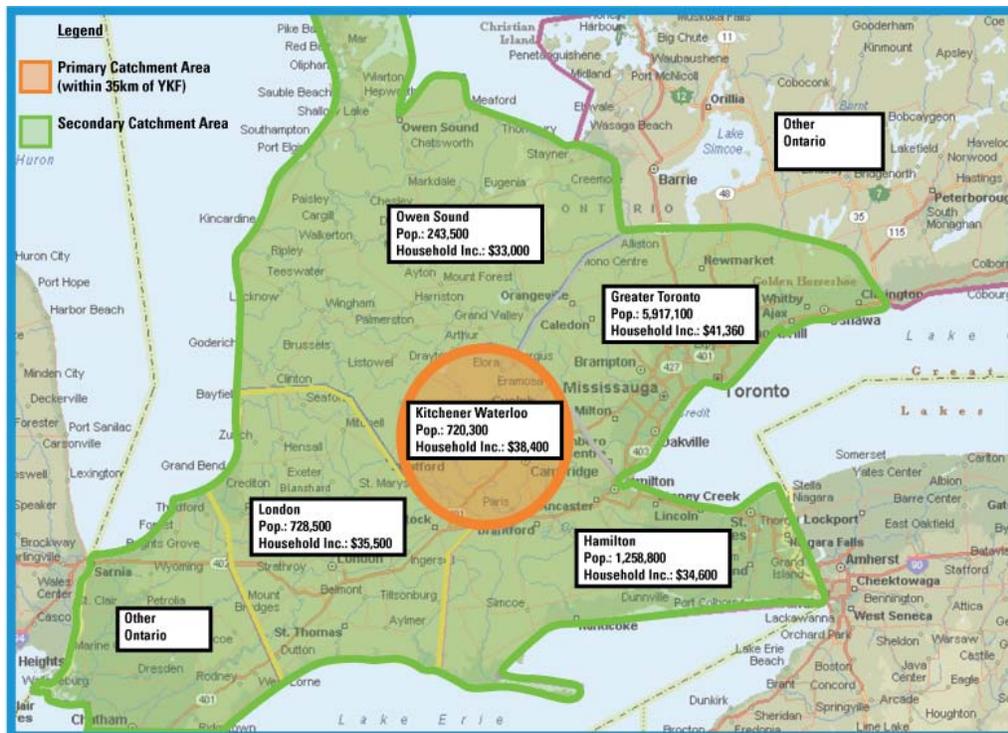


EXECUTIVE SUMMARY

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The Region of Waterloo International Airport (YKF) Master Plan presents a vision and strategy to make the most of the Airport's existing assets to support improved air service, customer experience and business development over the next 20 years. The Airport sits on approximately 1,000 acres of land in southern Woolwich Township, and is directly across the Grand River from Kitchener. Over decades of investment, the Airport has built outstanding infrastructure (runway, terminal and operations facilities). This infrastructure supports a vibrant aviation cluster with one of Canada's busiest flight training schools, a number of rotorcraft businesses, as well as charter, maintenance and service operations. It has also helped the airport attract limited scheduled service to this community and the 35 kilometre catchment area of 730,000 people. However, this only comprises about 5 percent of the 2,500,000 passengers that are generated from the catchment area, with the remaining flying from Toronto Pearson International Airport (TPIA) and other neighbouring airports. In 2015, the Region of Waterloo International Airport's net economic impact on the regional economy was an estimated \$90 million.

Figure 1 | YKF Catchment Area Map



CONTEXT

The demand for air travel in southern Ontario has been increasing dramatically. TPIA has been growing at approximately 8 percent or 2,500,000 passengers annually. This continued growth in demand will result in TPIA reaching its capacity limit of 70,000,000 passengers by the mid-2030s. Beyond that timeframe, there will be an increasing gap in the demand for air services and the capacity of southern Ontario airports to accommodate them.

Conditions are also changing in the Canadian aviation industry. In November 2016, the Government of Canada announced its intention to eventually increase the foreign ownership limits for all Canadian airlines. In advance of this legislative change and in order to give new low-cost carriers access to a larger capital market to support the launch of services, the Government of Canada granted immediate exemptions to the rule for two new start-up carriers, Canada Jetlines and Enerjet. The intent of this policy change was to increase the level of competition in the Canadian airline business, improving services and reducing costs for customers. YKF is a desirable regional airport for this new class of low-cost carrier, given its proximity to a significant, affluent and underserved market.

While its proximity to TPIA has been a challenge for YKF, it has at least one significant advantage over other airports in southern Ontario: YKF is 2.5 km from the Kitchener GO Transit line in the Metrolinx transit system, the same line that TPIA is located on and serviced through the UP Express rail service. TPIA is strongly advocating for a multi-modal hub fed by rail transit to help optimize the entire customer experience as it develops into a global airport. In the long run, this will further support rail transit service expansion to Waterloo Region and position YKF as the logical reliever airport to TPIA.

However, this all depends on the launch of a new carrier(s) at the Region of Waterloo International Airport.

PROCESS

This Plan replaces the 2000 Master Plan that has guided development of the Airport for 17 years. A Steering Committee made up of Regional and Area Municipal Councillors, as well as the Grand River Conservation Authority (GRCA) and senior Region of Waterloo as well as Area Municipal staff led the process over the past four years. WSP Canada Inc. (formerly MMM Group's Aviation Team) provided technical support. YKF engaged the community extensively through two public consultation sessions, an online survey, paid advertising and face-to-face promotion at business and community-facing events. Hundreds of citizens and stakeholders were consulted and many provided written feedback, which was compiled on the Engage Region of Waterloo online platform. YKF considered all feedback in development of this Master Plan. The Plan has been developed in tandem with the Master Environmental Servicing Plan (MESP) for the East Side Lands in north Cambridge and the settlement of outstanding land use policies in the current Regional Official Plan (ROP).

DEVELOPMENT PRINCIPLES

Waterloo Region and surrounding communities need convenient access to affordable aviation and airline services. As one of Canada's most innovative and successful urban regions, Waterloo Region depends on efficient connectivity to national and global economies. YKF's catchment area is an exporting region, driven by creative, capital intensive companies that sell into and pull talent and product from diverse markets. The region's residents travel extensively, both for business and recreation. They currently rely on costly air services located at the other end of an unreliable highway system. The community has demonstrated its interest in local air service through the success of both the current WestJet service to Calgary and former American Airlines service

to Chicago, both of which have been well used by local customers. Passengers who have flown through YKF are passionate about the experience – its speed, efficiency, comfort and cost. However, they have a strong desire for better, cheaper and more frequent service to more destinations.

The challenge is to position YKF to succeed by leveraging its existing assets rather than building additional infrastructure on a speculative basis. YKF will require new infrastructure (runway and terminal capacity) to achieve its potential, however this investment should be made in response to clear signals from the customers, air carriers and the provincial and federal Governments that additional services will be required. This Plan advocates that the Region of Waterloo carefully manage its risk by staging development in response to predetermined trigger points that correspond with the capacity limits of the current air terminal building. As capacity limits are reached, check-in, security and holding areas will become congested and customer experience will deteriorate. These development stages are described below in more detail.

The approach of this Master Plan will:

- ▶ Equip YKF to accommodate the passengers generated within its primary catchment area;
- ▶ Help attract and retain aviation companies to serve the local market;
- ▶ Position YKF as an essential reliever to increasing demand at TPIA;
- ▶ Help the Region of Waterloo manage risk associated with significant capital investments to support improved air service; and
- ▶ Help YKF attract and support a vibrant aeronautics cluster within the airport campus and associated Aviation Business Park.

Traditionally, airport master plans have based their development scenarios and related capital programs on a forecast of incremental growth in passengers and aircraft movements. This forecast is much easier to model for airports that have well established scheduled services to multiple destinations. It is very difficult for an airport like YKF that has little scheduled service and is located close to a major international airport like TPIA.

This Master Plan's approach is to manage risk for YKF and the Region of Waterloo, while positioning the airport to move quickly to support expanded air service if the opportunity presents itself. Each stage in the implementation of the Master Plan is initiated once the airport has achieved a specific level of passenger activity. Meeting these targets provides confidence that YKF will achieve the growth projections of the next stage. In this way, the Master Plan presents a flexible strategy that responds to changing market conditions.

DEVELOPMENT STAGES AND TRIGGERS

YKF's Master Plan anticipates five stages of development leading to the ultimate capacity for 2,500,000 passengers with a diverse airline schedule of destinations. These stages and the corresponding triggers that initiate them are described below.

STAGE I – PLANNING FOR GROWTH

Development Trigger – Council Approval of Master Plan

Regional Council approval of the Master Plan will trigger a number of studies that are necessary to expand airport capacity if required. This planning work will help protect YKF for immediate and future growth scenarios. The planning work will include:

- ▶ Investigate funding partnership opportunities with Federal and Provincial government partners;

- ▶ Begin conceptual, detailed design and environmental assessment for both Runways 08-26 and 14-32 extensions and the airport terminal building expansion to accommodate up to 500,000 passengers;
- ▶ Initiate Federal Aeronautical Zoning Studies for both the existing runways and a potential third runway;
- ▶ Assess land requirements and review environmental constraints for each development stage;
- ▶ Analyze long-term air terminal building location options; and
- ▶ Review opportunities for rail transit connectivity between the future Breslau GO Transit station, the Kitchener GO Transit line and Toronto Pearson International Airport.

STAGE II – SECONDARY RUNWAY EXTENSION AND EXISTING TERMINAL EXPANSION

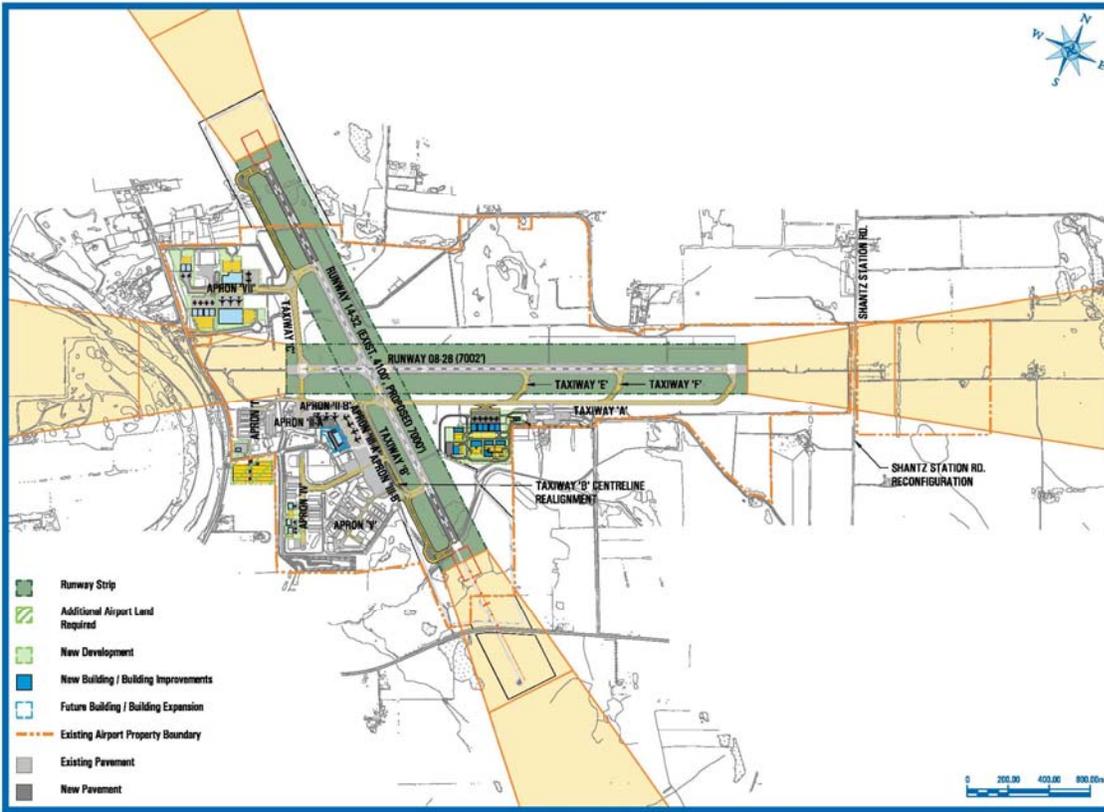
Development Trigger – YKF hits 250,000 annual passengers (approximately 4 Boeing 737 flights daily)

Once YKF achieves scheduled airline service to support 250,000 passengers annually, the airport terminal building will begin to experience periodic congestion and customer experience will deteriorate. It becomes clear that new airline service to YKF is succeeding. At this level of passenger activity, increasing revenues justify the expansion of facilities to support higher levels of activity. Additional runway capacity provided by an extension to Runway 14-32 is necessary as a precision landing alternative to Runway 08-26 in strong crosswind conditions.

Stage II projects include:

- ▶ Tendering and construction of Runway 14-32 extension;
- ▶ Tendering and construction of terminal building expansion for up to 500,000 passengers;
- ▶ Detailed design extension to Runway 08-26 including associated taxiways and lighting;
- ▶ Review options for Shantz Station Road reconfiguration;
- ▶ Expansion of existing serviced industrial lands on airport property; and
- ▶ Initiate planning and design for terminal building expansion for up to 1,000,000 passengers.

Figure 2 | Development Stage No. 2 Airport Site Plan



STAGE III – PRIMARY RUNWAY EXTENSION AND TERMINAL EXPANSION

Development Trigger – YKF Hits 500,000 annual passengers

Increased service by now-established air carriers has gained traction in the primary catchment area. It becomes clear that the convenience and cost associated with flying from YKF gives it a competitive advantage. As congestion grows inside the existing terminal, it becomes necessary to add sufficient space to serve up to 1,000,000 passengers annually. At this level, carriers require larger aircraft and longer runways. Even though air traffic is increasing, the extension of Runway 08-26 will shift the noise contour to the east, moderating the impact on residential areas in Kitchener. Design of the final stages of terminal building expansion to 2,000,000 passengers must also be completed in this stage.

Stage III projects include:

- ▶ Construction of Shantz Station Road configuration;
- ▶ Construction of the extension of the primary Runway 08-26 to approximately 8,737 feet;
- ▶ Construction of terminal building expansion for 1,000,000 annual passengers on the existing or new terminal location; and
- ▶ Design of terminal building for up to 2,000,000 annual passengers.

STAGES IV & V – TERMINAL EXPANSION TO 2,500,000 ANNUAL PASSENGERS

Development Trigger – YKF hits 1,000,000 passengers (approximately 11 Boeing 737 flights daily)

At this point in the evolution of airline service to Waterloo Region, it is clear that YKF has become a strategic piece of transportation infrastructure connecting the regional economy to North America and beyond. The airport terminal building now must be able to serve up to 2,500,000 passengers, approximately the number generated by its primary catchment area in 2012. This volume of passengers begins to justify the integration of the airport into the regional and intercity rail transit system. This stage is likely to coincide with the expansion of two way all day GO Train service to Waterloo Region from Toronto. A direct rail connection between TPIA and YKF becomes possible. Development of the full terminal capacity of YKF would be completed in several stages through the extension of gates at the passenger concourse.

FINANCIAL IMPLICATIONS

Financing for the implementation of each development stage assumes that 50 percent of capital costs will be funded from non-property tax sources. Such recoveries could be in the form of provincial or federal government partnerships and/or regional development charges. At each development trigger, the forecast cost per household is at or below the current cost of \$23 for the airport. YKF will use the current per household cost for the airport as a maximum budget target for future growth outlined in the Master Plan. However, the timing of long-term borrowing and the level of partner investment could bring the cost per household to slightly above the current levels.

CONCLUSION

The Region of Waterloo International Airport has the potential to play a critical role in connecting one of Canada's most dynamic regional economies with the world. It has significant infrastructure to support a limited expansion of scheduled service now and, importantly, room to expand. This Master Plan outlines the path forward, should the opportunity to increase airline service present itself. The proposed approach is; however, conservative in that it does not commit the Region of Waterloo to invest further in new capital works until it is clear that such investment is justified by increased scheduled passenger service. If air service increases, then this Plan will position the Region to move quickly to capture the opportunity and support expanding airlines with well-conceived infrastructure.



A. INTRODUCTION

CHAPTER A. INTRODUCTION

1. MASTER PLAN OBJECTIVES AND PURPOSE

An Airport Master Plan (“Master Plan”) presents a concept of the form and structure of the optimal development of an airport. The objective of the Region of Waterloo International Airport Master Plan is to provide a 20-year strategic framework and guidelines for future airport development which will satisfy aviation demand in a financially feasible manner, while simultaneously addressing the community’s aviation, environmental and socio-economic issues and opportunities – and in this case, exploring a unique position for growth.

This Master Plan has been developed with strong direction and commitment from the overall Project Team comprised of Airport / Region of Waterloo staff and representatives including Councillors, other area municipalities and community stakeholders. This Master Plan will provide the Regional Municipality of Waterloo the context in which to make decisions, address new initiatives, and explore new opportunities that will facilitate the long-range development at the Region of Waterloo International Airport (YKF).

This Master Plan process was comprised of two separate phases that have helped shape the direction of the future of the Airport.

In December 2012, the Region of Waterloo Council initiated the development of a new YKF Master Plan, establishing a Project Team consisting of Council and staff representatives from the Region of Waterloo, the cities of Cambridge, Kitchener and Waterloo, the Township of Woolwich, and the Grand River Conservation Authority. Stakeholder meetings with area businesses, aviation associations, airlines, and other stakeholders added valuable and diverse perspectives. Additionally, two public consultation sessions generated input from the community on future options of YKF over the next 20 years.

In late 2014, Regional Council provided interim direction to staff to consider and develop ways to:

- ▶ Optimize the existing capacity of YKF;
- ▶ Attract new air service;
- ▶ Build out the YKF Business Park;
- ▶ Protect for future growth;
- ▶ Increase community awareness about noise mitigation measures; and
- ▶ Develop YKF in conjunction with the adjacent East Side Employment Lands.

A draft Master Plan identifying this direction was completed at that time.

In 2015, two major changes were identified by Regional Council which led to the review of their 2014 direction.

1. As part of the [KPMG WATERLOO SERVICE REVIEW](#), optimization of YKF's commercial value was identified as one of five largest opportunities (refer to report [CAO-IAU-15-06/A32-40/RSR](#) in [Appendix G](#)); and
2. A study ("[GROWTH, CONNECTIVITY, CAPACITY - THE FUTURE OF A KEY REGIONAL ASSET](#)") completed by the Greater Toronto Airports Authority (GTAA) identified that forecasts show that by the mid-2030s Southern Ontario's airports, including Toronto Pearson International Airport (TPIA), will approach a capacity milestone, and upwards of 20 million passengers could ultimately go unserved by 2043.

In late 2015, Regional Council recommended the completion of the YKF Master Plan (as part of the recommendation from the KPMG Service Review) and adopted the following recommendation:

"That the Regional Municipality of Waterloo direct staff to complete the Airport Master Plan and associated Business Plan by the end of 2016, which would include recommendations regarding increasing revenue, managing operational and capital expenses and a net levy target for airport management to budget against to control operating and capital expenditures."

Council recommended an updated Steering Committee be established to guide the completion of the draft YKF Master Plan and the creation of a Business Plan. The Steering Committee would include: the Chair of the Planning and Works Committee; Chair of the Administration and Finance Committee; the Regional Council representative to the Aeronautical Noise Advisory Committee; and a local Council representative from the cities of Cambridge, Kitchener, and Waterloo, and the Township of Woolwich. The Steering Committee would be chaired by the Commissioner of Planning, Development, and Legislative Services and also include the Commissioner of Transportation and Engineering Services, the Commissioner of Corporate Services/Chief Financial Officer, the Director of Corporate Communications, and the General Manager of YKF. Additional staff from the Region of Waterloo, Grand River Conservation Authority (GRCA) and Area Municipalities would serve as a resource to the Steering Committee, which includes:

The Master Plan Steering Committee

Mike Murray	Region of Waterloo	Councillor Murray Martin	Township of Woolwich
Rod Regier	Region of Waterloo	Thomas Schmidt	Region of Waterloo
Rob Horne	Region of Waterloo	Bryan Stortz	Region of Waterloo
Craig Dyer	Region of Waterloo	Councillor Tom Galloway	Region of Waterloo
Chris Wood	Region of Waterloo	Councillor Geoff Lorentz	Region of Waterloo
Councillor Sean Strickland	Region of Waterloo	Councillor Dave Schnider	City of Kitchener
Councillor Donna Reid	City of Cambridge	Councillor Larry Shantz	Township of Woolwich
Councillor Mark Whaley	City of Waterloo	Mayor Sandy Shantz	Township of Woolwich

Staff Support to Steering Committee

Beth Brown	GRCA	Matthew Chandy	Region of Waterloo
Michele Baumgarten	Region of Waterloo	John Hill	Region of Waterloo
Kevin Campbell	Region of Waterloo	John Scarfone	Township of Woolwich
Sandra McAuley	Region of Waterloo		

The Steering Committee consulted with the Airport Business Advisory Committee and the Waterloo Region Economic Development Corporation. Two public consultation sessions provided an update on the status of the

Master Plan and presented a preferred Master Plan approach. These comments were incorporated into the Master Plan and Business Plan, and are included in the final report to Regional Council.

Based upon the study completed by the GTAA, a rare opportunity is now available which could see an “integrated multi-airport system for Southern Ontario” that could help offload demand from Toronto Pearson to other airports in the region in a complementary fashion. The Region of Waterloo International Airport is one of several facilities that could, over the planning period of the next 20 years, play a significant role meeting regional aviation demands. According to a study commissioned by the GTAA, “by 2043, a staggering 90 million people will be looking to travel through Southern Ontario by air; yet the planned for capacity across the region’s airports is currently estimated to be around 70 million passengers per year. With no plan in place to increase the region’s air travel capacity, that is a gap of more than 20 million passengers by 2043.”

This new dynamic has been reviewed and considered as part of this Master Plan, and veers away from the traditional master planning process which considers the standard low-, medium- and high-forecast scenarios based on incremental and indigenous growth. It is challenging to “Master Plan” for this type of scenario without carefully factoring in both YKF and ultimately GTAA’s growth strategies as they can potentially align with the development options put forward. Billy Bishop Toronto City Centre Airport experienced a similar non-traditional growth (i.e. 8,000 percent growth) in passenger traffic which will be examined further in this document.

This Master Plan is intended to be an action-oriented, working document that identifies the future development of the Airport in a practical, environmentally-sustainable manner. A staged approach with defined development triggers and supporting actions proposes a clear response and will enable YKF to grow as the current and future demands dictate. These development stages will only be implemented when measured criteria are achieved and growth at the Airport is warranted. Each “go forward step” will be reviewed and approved by Regional Council as part of the development process. A summary of the specific development stages is shown in **Chapter C** of this report.

To guide the future of YKF over the next 20 years, these Master Plan principles address elements that will guide the long-range infrastructure investments required at the Airport:

- ▶ Identify and evaluate a range of development stages to serve as growth opportunities for the Airport;
- ▶ Include stakeholder consultation and additional Public Information Centres (PICs);
- ▶ Present a comprehensive progression plan that is flexible and will allow for rapid changes in both demand and opportunities (including becoming a reliever type for GTAA) available within the next 10-20 years;
- ▶ Position YKF to support opportunities for Commercial Carrier Service to support existing and future carrier service at YKF and anticipated future community need;
- ▶ Support development of the Airport Business Park and East Side Employment Lands, and further examine the creation of employment opportunities through the development of leased lands for aviation- and aerospace-related industrial and commercial initiatives. In the northwest corner of YKF, there is an opportunity to commercialize 35 acres of land to complement the future development of the East Side Employment Lands;
- ▶ Develop an associated Business Plan to link the Master Plan with an efficient and effective financial plan, and address the recommendations from the Service Review ([KPMG FINAL REPORT, SEPTEMBER 3, 2015](#)). A Business Plan is being presented with the Master Plan to ensure the Region of Waterloo has the ability to manage the operating, capital and financial requirements of forecast growth;
- ▶ Support the local economy by ensuring current and future demand from area businesses are being met, and identifying opportunities to align the future of YKF with future needs of emerging sectors in Waterloo Region; and
- ▶ Optimize YKF’s response to changes in the aviation industry as they will affect the future growth of YKF. Canadian low-cost carriers that specifically target regional airports are trying to become reality in 2017. Currently, Toronto Pearson International Airport (TPIA) is reviewing its existing capacity and future growth

demands. As part of that review, neighbouring airports, including YKF, are being considered as potential options for spill-over service.

2. STRATEGIC VISION

The Steering Committee for this Master Plan developed and updated the “strategic vision” for the Airport that can serve the community and the Airport moving forward. Breakout groups and brainstorming sessions provided valuable input and culminated with a final roundtable session to identify all the key factors of this vision, which will be instrumental in shaping the identity of the Airport for the next 20 years:

“The Region of Waterloo International Airport will contribute to the economic prosperity and competitive advantage of Waterloo Region by connecting this innovative community to the world. This will be achieved through managed growth, customer service excellence, passenger convenience and community responsiveness.”

Ultimately, the Airport will provide the residents and businesses of the Waterloo Region and surrounding communities with access to convenient and cost-effective air transportation services in a socially, environmentally and fiscally responsible manner, while progressively promoting, developing and upgrading the Airport’s lands and facilities. The Region of Waterloo International Airport aspires to support the volume of air passenger traffic that is generated by its catchment area.

3. AIRPORT ROLE AND HISTORY

The Region of Waterloo International Airport is centrally located in southwestern Ontario, 85 km west of Toronto, north of Highway 401 in the Township of Woolwich and bordered by the cities of Cambridge, Guelph, Kitchener and Waterloo, Ontario.

The Region of Waterloo International Airport is a key feature in the Region’s infrastructure and economic landscape, contributing an estimated \$90 million to the Region’s economy in 2015ⁱ. With approximately 1000 acres of land, YKF is home to over 250 private and charter aircraft, 25 businesses, and over 300 employees. In 2015, YKF was identified as one of the top 20 busiest airports in Canada, and is home to one of the leading flight training schools in the country, the Waterloo Wellington Flight Centre.

With a record 153,963 passengers in 2015 enplaning / deplaning at the facility, the Airport generates benefits for Waterloo Region and the surrounding communities. Yet, where there is

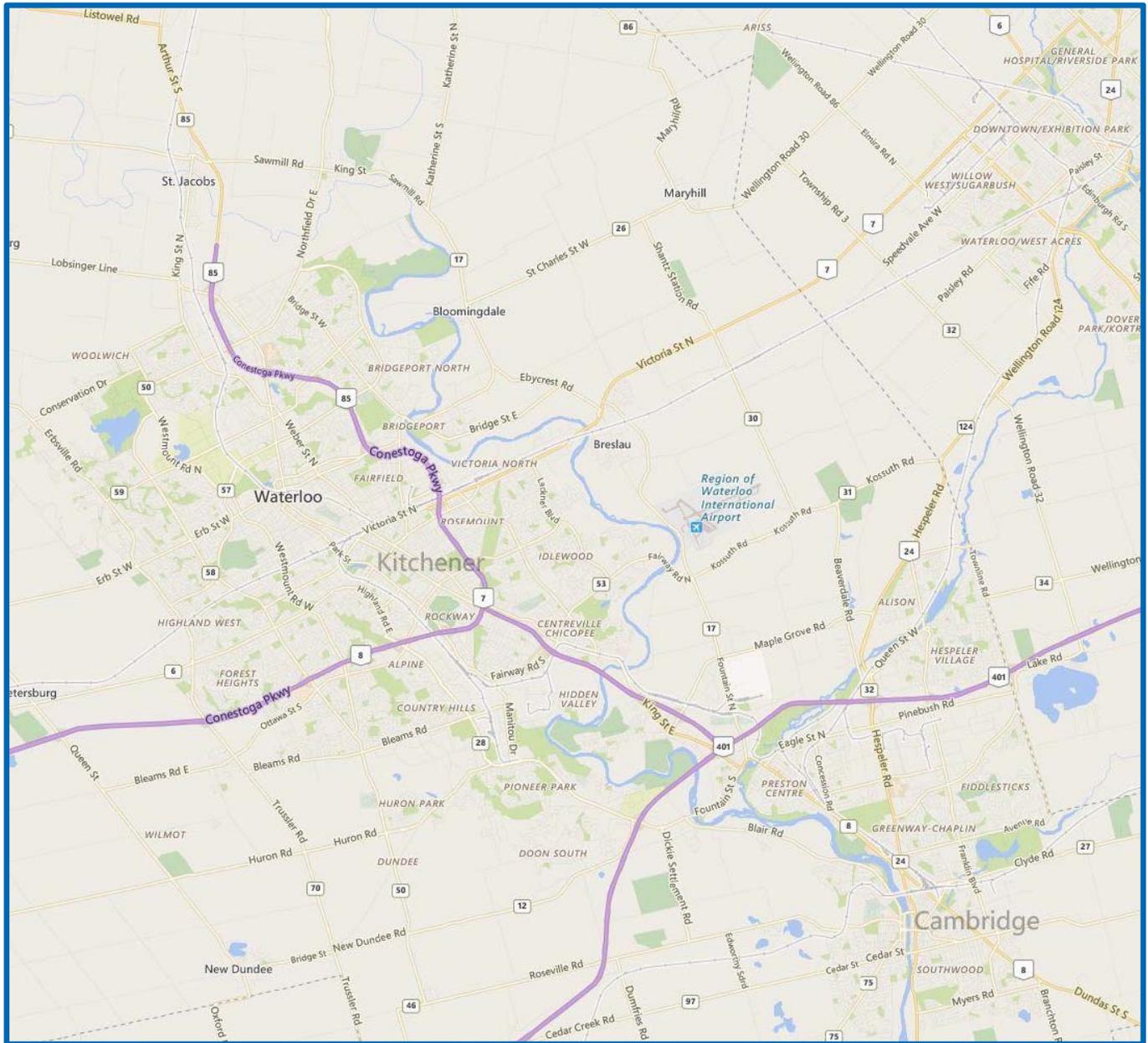


Early Aerial Photo – Construction of YKF (estimated 1950)

i Region of Waterloo International Airport Economic Impact Study 2015, Wilfrid Laurier University, School of Business and Economics, April 22, 2016

airport growth, there is a need to plan for future requirements to meet the needs of the airport, industry and the community.

Figure A-1 | Airport Location



To understand the foundation for the Master Plan, it is first important to understand key dynamics that have shaped the Airport throughout its 80 plus-year history.

In 1929, construction for what was then known as Lexington Airport began on the Heinrich farm on Lexington Road in Waterloo after the towns of Kitchener and Waterloo acquired the land. The airport was completed in 1930; it was mainly used for flight training and was managed and operated by the Kitchener-Waterloo Airport Commission. The Kitchener-Waterloo Flying Club then managed and operated the airport from 1932 to 1951. During World War II, civil aviation was disrupted as the airport was solely used by the R.C.A.F. Empire Air Training Scheme for pilot training.

Post wartime saw a need for larger areas to accommodate both private and commercial aircraft in the surrounding areas. In 1948 the Waterloo-Wellington Airport Commission purchased a larger site in Breslau, Ontario area. A new airfield, 271 hectares in size, was constructed during the 1950s that would serve the communities in the regional area.

During the 1960s, the airport experienced considerable investment and development. Beyond the construction of numerous private hangars, Transport Canada installed a non-directional beacon (NDB), constructed parallel taxiways associated with the two runways, and provided edge lighting. In 1969, the construction of the air traffic control tower elevated the status of the airport to a “controlled” general aviation airport.

Further investment in the airport occurred in the early 1970s with the construction of an air terminal building, and additional private development. During this time, the Regional Municipality of Waterloo was created, which, along with the City of Guelph, assumed operations and responsibility of the airport where it was previously operated by the Waterloo-Wellington Flying Club from 1951 to 1973.

The Airport Master Plan developed in 1983 stated that the role of the airport should be a fully-equipped, general aviation airport. Priority was given to lengthen Runway 07-25 (now designated as 08-26) to 5,200 feet (1,585 metres) and install an Instrument Landing System (ILS) to enhance the airport’s usability. In 1984, additional land was purchased for the airport and Runway 07-25 was extended by 1,500 feet (457.2 metres) to accommodate commercial jet aircraft. The ILS was installed in 1991.

YKF has been owned and operated by the Regional Municipality of Waterloo since 1996, when the City of Guelph surrendered its share in ownership.

2000 Master Plan

In April 2000, The Regional Municipality of Waterloo adopted a Master Plan which identified objectives that would be carried out over the next 20 years. The role of the Waterloo Regional Airport (the name of the Airport at that time) was to be a fully-equipped, certified airport facility to accommodate scheduled / charter passenger and air cargo facilities and services, business charter services, flight training, recreational flying, and aviation-related industrial / commercial business and services facilities. The operation and future development of the airport would balance its role as an aviation service provider and economic development tool sensitive to the needs of the community.

As a result of the 2000 Master Plan, over the last 15 years the Airport achieved numerous developments and improvements, including:

- ▶ Extension of Runway 08-26 to 7,002 feet (2,134 metres) in 2002;
- ▶ Expansion of the main Apron III to accommodate multiple large Code C aircraft (B737/A320 type) in 2002;
- ▶ Completion of a new air terminal building in 2003 (with further expansions in 2008 / 2011);
- ▶ Development of Apron IV in 2004;



Early Aerial Photo – YKF (estimated 1953)

- ▶ Reconstruction of Runway 14-32, four taxiways and two aprons in 2008-09;
- ▶ Installation of Approach Lighting in 2010;
- ▶ Upgrade to the Field Electric Centre (including new generator and regulators in 2010
- ▶ Reconstruction of Taxiway Charlie in 2010;
- ▶ Construction of Apron VII and associated development lands in 2011;
- ▶ Construction of a new Airport Operations Centre in 2011;
- ▶ Reconstruction of Runway 08-26 in 2012;
- ▶ Parking Lot Improvements in 2014;
- ▶ New Air Traffic Control Tower in 2017 (by NAV CANADA); and
- ▶ Groundside Improvements in 2016 / 2017.

Today, the Region of Waterloo International Airport is a full-service facility that provides commercial, corporate and general aviation activities. Commercial services include daily non-stop flights to Calgary, plus seasonal service to sun destinations in Orlando and Punta Cana. Charter services have also experienced increased growth at YKF. In April 2015, the Chartright Air Group purchased a new hangar at YKF and launched its new service for corporate jet charters.

3.1 NEIGHBOURING AIRPORTS

The Region of Waterloo International Airport is one of seven commercial airport alternatives located within a two-and-a-half hour drive from either Kitchener or Waterloo. As [Figure A-2](#) shows, these airports offer regular non-stop service to over 131 different destinations (30 domestically, 55 in the US, and 46 internationally), with an aggregate outbound seat capacity in excess of 25 million per year.

- ▶ Toronto Pearson International Airport is 85 km away, and is both the closest airport and largest of the available alternatives, with service to 127 of the 131 total scheduled destinations.
- ▶ While the furthest distance from YKF at approximately 185 km, Buffalo Niagara International Airport is the second largest airport in the region, providing direct scheduled service to 21 US destinations and offering the advantage of lower airfare to much of the USA.
- ▶ Billy Bishop Toronto City Centre Airport has rapidly become the third largest of the airports, with over 2.5 million departed seats and non-stop service to twelve destinations (eight in Canada, four in the US). Depending on time of day, Highway 401 and Gardiner Expressway provide drive time access under an hour and a half and allow City Centre to offer a competitive alternative for US and longer-haul destinations.
- ▶ The two other nearby Canadian airports, London International Airport and John C. Munro Hamilton International Airport, compete for traffic to the south of the YKF's catchment area. These airports are within 100 km distance to YKF and offer direct service to seven additional destinations, of which Winnipeg and Calgary are common to both. London provides direct service to Toronto Pearson. Outbound seat capacity is 312,000 seats for Hamilton and 480,000 for London.
- ▶ Niagara Falls International Airport in New York is 150 km from Kitchener or Waterloo and approximately 15 km closer than Buffalo. At the time of the study the airport had year-round schedule service only to Sanford Orlando Airport and just drew a small share of the region's traffic.
- ▶ The Region of Waterloo International Airport is the smallest of the Canadian airports in the group and with direct service to only three destinations (one Canada, one US and one sun destination); it is significantly smaller than Pearson and Buffalo, and also falls short of Toronto City Centre, Hamilton and London.

Figure A-2 | Competitive Airport Overview: Non-stop Scheduled Services

AIRPORT	CANADA		UNITED STATES		INTERNATIONAL		TOTAL		APPROXIMATE DRIVE DISTANCE FROM YKF (km)
	NUMBER OF DESTINATIONS	OUTBOUND SEAT CAPACITY							
Region of Waterloo Airport (YKF)	3	78,300	1	18,000	0	-	4	96,300	
Toronto Pearson (YYZ)	29	8,873,500	52	6,115,200	46	4,919,800	127	19,908,500	85
Toronto City Centre (YTZ)	7	1,346,700	3	491,500	0	-	10	1,838,200	105
Hamilton (YHM)	5	207,900	0	-	0	-	5	207,900	60
London (YXU)	4	288,600	1	30,800	0	-	5	319,400	100
Buffalo (BUF)	0	-	21	3,233,800	0	-	21	3,233,800	185
Niagara (IAG)	0	-	1	45,000	0	-	1	45,000	150
Net Total	30	10,795,000	55	9,934,300	46	4,919,800	131	25,649,100	

Source: Current as of 2012 (Scheduled to be updated in 2017)

The Regional of Waterloo International Airport’s location and relative position in Southern Ontario is both an opportunity and a challenge. Proximity to the other airports suggests it will always struggle to capture a significant share of the market unless YKF can support comparable direct service. Conversely, proximity to other metropolitan areas provides an opportunity to draw traffic from outside its primary catchment area.

Another alternative being considered by Transport Canada is the Pickering Airport. The Pickering Airport is a proposed international airport to be built directly northeast of Toronto in Pickering, Ontario (within the Region of Durham), and approximately 65 km east of Toronto Pearson International Airport. Over the past four decades, in keeping with the direction of the federal government, the Region of Durham has been operating on the premise that an airport would be built and have taken steps to prepare for an eventual airport on the Pickering lands. Many studies have been completed on this site (including current on-going studies); however, no direction or outcome has been established.

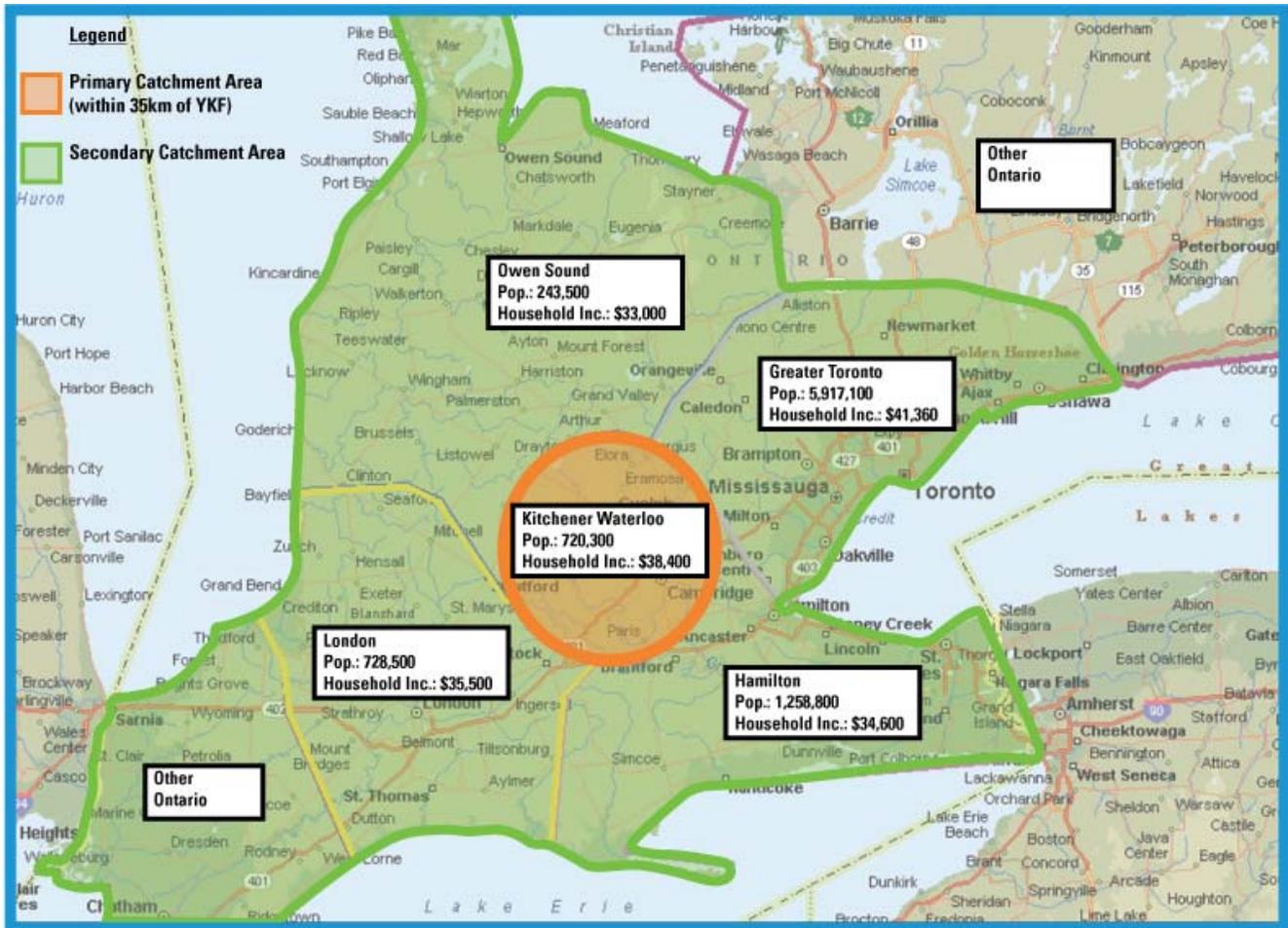
3.2 CATCHMENT AREA SUMMARY

Understanding the potential for air service and airport growth necessitates a practical definition of the Airport’s catchment area – the region from which YKF can realistically expect to draw passengers. For the purpose of the market size analysis, the study considers that:

- ▶ A primary catchment area within which the Region of Waterloo International Airport would be the preferred choice if service and price were comparable to the alternatives offered by other relatively nearby airports. The primary catchment area falls within a comfortable 35 km drive zone, with the borders roughly equidistant between the closest competitive airports; and
- ▶ A set of secondary catchment areas associated with each of the nearby airports, but offers potential for Region of Waterloo International Airport to offer a service advantage. While the Region of Waterloo International Airport may garner only a small share of the secondary catchment areas, these regions’ large population base and number of generated trips suggest a material opportunity. Collectively, the secondary catchment areas lie within a two-hour drive from the Region of Waterloo International Airport and include Owen Sound to the north, Greater Toronto to the east, Hamilton and south to Lake Erie, and London to the west. Approximately 31 percent of today’s passengers originate from the secondary catchment area.

Figure A-3 provides a map of the individual catchment areas and the associated population and average income. Collectively, the areas have a population of 8.9 million, of which Kitchener / Waterloo accounts for 8.1 percent. Driven by the dominance of Greater Toronto, the region generates an average household income of \$39,500, while Kitchener / Waterloo incomes of \$38,400 are 3 percent less.

Figure A-3 | Catchment Area Map



Source: Statistics Canada 2011 Census Information

Figure A-4 provides a summary of the origin destination passengers by airport and sector for each catchment area. The primary Waterloo Region catchment area generates an estimated 2.5 million origin-destination passengers of which the Region of Waterloo International Airport garners a modest 3.9 percent share. While the airport captures almost 10 percent of the primary catchment domestic market, it fares less well with respect to the US and international markets, with local shares of only 1.5 percent and 1 percent respectively. As would be expected, the majority of the leakage is to Toronto Pearson (87 percent overall), with London, Hamilton and Billy Bishop Toronto City Centre capturing modest 2 percent, 3 percent, and 6 percent shares of the domestic market, while Buffalo draws a material 10 percent of the US market.

Of the estimated 150,000 Region of Waterloo International Airport passengers, 69 percent originate in the primary catchment area, 7 percent in Owen Sound, 15 percent in Greater Toronto, 3 percent from the London catchment, 2 percent from the Hamilton catchment and approximately 5 percent from other parts of Ontario.

Figure A-4 | OD Passengers by Sector and Airport

ORIGIN DESTINATION PASSENGERS (JANUARY TO DECEMBER 2012)

KITCHENER WATERLOO	YKF	YYZ	YXU	YHM	YTZ	BUF/IAG	TOTAL
Domestic	67,250	546,940	14,820	22,890	43,330	700	695,920
Transborder	11,440	644,430	5,610	210	7,110	77,670	746,460
Sun Destination	1,260	154,090	1,080	1,820	10	510	158,770
International	170	426,390	540	0	120	1,300	428,510
Total	80,110	1,771,850	22,040	24,920	50,560	80,180	2,029,660
OWEN SOUND	YKF	YYZ	YXU	YHM	YTZ	BUF/IAG	TOTAL
Domestic	6,530	158,820	4,300	2,380	6,290	10	178,330
Transborder	1,070	102,110	4,100	160	1,240	10,300	118,990
Sun Destination	10	32,030	590	390	10	500	33,530
International	0	99,050	520	0	50	1,320	100,940
Total	7,610	392,010	9,520	2,930	7,590	12,130	431,780
GREATER TORONTO	YKF	YYZ	YXU	YHM	YTZ	BUF/IAG	TOTAL
Domestic	11,320	4,267,690	7,910	53,030	914,700	310	5,254,960
Transborder	3,520	4,241,210	540	640	110,230	289,680	4,645,810
Sun Destination	2,320	1,858,530	0	8,800	230	4,930	1,874,810
International	70	4,203,920	50	0	3,910	12,280	4,220,230
Total	17,220	14,571,350	8,500	62,480	1,029,070	307,200	15,995,810
LONDON	YKF	YYZ	YXU	YHM	YTZ	BUF/IAG	TOTAL
Domestic	1,610	150,150	169,190	3,820	15,910	260	340,930
Transborder	1,930	196,220	83,860	160	3,120	65,000	350,300
Sun Destination	70	223,480	25,590	2,790	0	420	252,340
International	0	283,500	19,210	0	10	100	302,830
Total	3,610	853,340	297,860	6,770	19,040	65,780	1,246,390
HAMILTON	YKF	YYZ	YXU	YHM	YTZ	BUF/IAG	TOTAL
Domestic	2,220	243,770	31,770	220,490	77,480	0	575,740
Transborder	450	248,260	5,290	3,200	20,460	170,220	447,870
Sun Destination	20	429,790	5,270	13,700	30	2,320	451,130
International	0	1,045,340	3,380	10	1,020	3,390	1,053,140
Total	2,700	1,967,160	45,710	237,390	99,000	175,920	2,527,870
FULL CATCHMENT *	YKF	YYZ	YXU	YHM	YTZ	BUF/IAG	TOTAL
Domestic	93,710	7,819,000	289,450	322,050	1,095,990	1,570	9,621,770
Transborder	19,050	6,888,100	104,860	4,540	173,930	649,590	7,840,070
Sun Destination	3,700	3,081,130	34,530	28,340	280	15,290	3,163,270
International	270	7,230,370	24,650	10	5,600	23,810	7,284,710
Total	116,730	25,018,600	453,480	354,940	1,275,800	690,270	27,909,820

* Full Catchment includes other Ontario regions that access the airports (Scheduled to be updated in 2017)

The Region of Waterloo International Airport participates in a collective air travel market of close to 28 million origin destination passengers per year. The majority of the market lives in, or is travelling to, destinations within a two-hour drive time from the Airport and even small incremental share increases can mean significant travel growth.

3.3 AVIATION MARKET

Figure A-5 lists the carriers operating to the major commercial airports in the primary and secondary catchment areas.

- ▶ WestJet and Air Canada control the Canadian long-haul market (greater than 1,000 km) with approximately 38 percent and 62 percent shares respectively, while amongst the regional Canadian market, Porter provides 22 percent lift compared to 61 percent for Air Canada, 17 percent for WestJet and a 0.5 percent by Bearskinⁱⁱ.
- ▶ US service is dominated by Air Canada, providing 50 percent of the total and the balance coming from WestJet (8 percent), Porter (8 percent), American (12 percent), United (11 percent), Delta (7 percent), and US Airways (3 percent). Absent from transborder services are any of the US low-cost carriers.
- ▶ Canadian carriers Air Canada and Air Transat offer the majority of the international service with 45 percent and 10 percent shares respectively.
- ▶ Air Canada (32 percent), WestJet (25 percent) and Sunwing (25 percent) drive the majority of the sun market, while Air Transat and Caribbean airlines contribute 9 percent and 8 percent respectively.

Figure A-5 | Carrier and Capacity by Market

CARRIERS SERVING THE PRIMARY AND SECONDARY CATCHMENT AREAS – JANUARY TO DECEMBER 2012 OUTBOUND SEAT CAPACITY

CARRIER	MARKET						REGION OF WATERLOO SHARE
	CANADA	REGIONAL (ONTARIO)	USA	INTERNATIONAL	SUN	TOTAL	
Air Canada	3,649,900	3,220,800	3,578,900	1,854,600	628,100	12,932,300	0.0 %
WestJet	2,207,000	890,300	616,500	-	480,400	4,194,200	1.1%
Porter Airlines Inc.	7,700	1,178,300	602,600	-	-	1,788,600	0.0%
Bearskin Airlines	-	26,300	-	-	-	26,300	100.0%
American Airlines	-	-	870,100	-	-	870,100	2.1%
United Airlines	-	-	751,700	-	-	751,700	0.0%
Delta Air Lines	-	-	522,700	-	-	522,700	0.0%
US Airways	-	-	239,300	-	-	239,300	0.0%
Air Transat A.T. Inc.	-	-	-	429,600	200,600	630,200	0.0%
British Airways	-	-	-	186,300	-	186,300	0.0%
KLM	-	-	-	176,500	-	176,500	0.0%
Cathay Pacific	-	-	-	173,900	-	173,900	0.0%
Lufthansa	-	-	-	144,200	-	144,200	0.0%
Air France	-	-	-	93,600	-	93,600	0.0%
Jet Airways	-	-	-	82,700	-	82,700	0.0%
Emirates	-	-	-	76,800	-	76,800	0.0%
Alitalia	-	-	-	71,600	-	71,600	0.0%
Korean Air	-	-	-	65,800	-	65,800	0.0%
Turkish Airlines	-	-	-	64,600	-	64,600	0.0%
Austrian Airlines	-	-	-	61,300	-	61,300	0.0%
Etihad Airways	-	-	-	59,000	-	59,000	0.0%
LOT	-	-	-	58,700	-	58,700	0.0%
Copa Airlines	-	-	-	31,400	-	31,400	0.0%
Cubana	-	-	-	-	29,700	29,700	0.0%
Sunwing Airlines	-	-	-	-	490,800	490,800	0.0%
Caribbean Airlines	-	-	-	-	164,900	164,900	0.0%
Other	-	-	-	429,500	35,200	464,700	0.0%
Grand Total	5,864,600	5,315,700	7,181,800	4,060,100	2,029,700	24,451,900	0.4%

ii The airport catchment area study was completed with a base year of 2012, prior to the announcement of withdrawal of services by Bearskin Airlines on April 1, 2014 and the withdrawal of American Airlines in October 2016.

The Region of Waterloo International Airport currently captures only a very small share of WestJet and Sunwing service. American Airlines had operated at Waterloo since 2012; however, effective October 2016, American Airlines suspended its twice-daily non-stop service between the Region of Waterloo and Chicago.

4. STUDY APPROACH

The Master Plan has been developed with insights from the Steering Committee comprised of Airport / Region of Waterloo staff including Councillors and representatives from airport stakeholder groups, the aviation community at large, politicians, and airport, community and commercial organizations.

Beyond the traditional Master Plan process, focus will be given to ensure the Region of Waterloo has the ability to react and develop a plan to address the rapidly approaching capacity concerns in Southern Ontario. The approach will be to continue to monitor the Southern Ontario aviation market and identify trigger points that YKF can implement when the traffic numbers are met.

The purpose of the Master Plan Steering Committee is to provide advice, feedback and endorsement to the Region of Waterloo at key milestone periods during the project.

4.1 PROCESS, STEPS, TIMELINE

The Project Team has developed or completed the following milestones for the delivery of this Master Plan. The following identifies both Phase 1 and Phase 2 of the Master Plan process:

Phase 1

- ▶ April 5, 2013 First Project Team Meeting
- ▶ May 13, 2013 Passenger and Aircraft Forecasts and Development of Four (4) Alternatives
- ▶ June 20, 2013 Second Project Team Meeting
- ▶ June – Sept 2013 Assessment of Environmental, Stakeholder Input, Financial Impacts of Development Scenarios - Prepare Preliminary Master Plan Report
- ▶ September 18, 2013 Third Project Team Meeting
- ▶ December 5, 2013 Fourth Project Team Meeting
- ▶ February 6, 2014 Public Consultation No. 1 (Waterloo Region Museum)
- ▶ April 15, 2014 Public Consultation No. 2 (Waterloo Region Museum)
- ▶ May 8, 2014 Fifth Project Team Meeting
- ▶ June 5, 2014 Presentation of Preferred Option to Aeronautical Noise Management Committee
- ▶ June 17, 2014 Presentation of Preferred Option to Planning and Works Committee
- ▶ September 2014 Completed Draft Master Plan Report made available for comment
- ▶ September 25, 2014 Sixth Project Team Meeting
- ▶ October 2014 Phase 1 Draft Master Plan report submitted to YKF

Phase 2

- ▶ September 2015 GROWTH, CONNECTIVITY, CAPACITY - The future of a key regional asset (GTAA Study)
- ▶ September 2015 KPMG Service Review Study
- ▶ October 2015 Regional Council recommends the completion of the Master Plan
- ▶ April 13, 2016 First Airport Master Plan Steering Committee Meeting
- ▶ May 13, 2016 Second Airport Master Plan Steering Committee Meeting
- ▶ May 25, 2016 Public Consultation No. 1 – Waterloo Region Museum
- ▶ August 2016 Draft Master Plan Report
- ▶ September 28, 2016 Third Airport Master Plan Steering Committee Meeting
- ▶ November 10, 2016 Public Consultation No. 2 – Waterloo Region Museum
- ▶ December 2016 Draft Business Plan
- ▶ December 10, 2016 Fourth Airport Master Plan Steering Committee Meeting
- ▶ February 28, 2017 Fifth Airport Master Plan Steering Committee Meeting
- ▶ April 4, 2017 Master Plan and Business Plan Submitted to Planning and Works Committee
- ▶ April 12, 2017 Master Plan and Business Plan submitted to Regional Council for final approval

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B. EXISTING CONDITIONS

CHAPTER B. EXISTING CONDITIONS

1. EXISTING CONDITIONS

To provide an overview of the Region of Waterloo International Airport's existing physical facilities and operational characteristics, a thorough inventory of the Airport is essential to the success of a viable Master Plan.

The Project Team conducted an inventory assessment of the Airport's existing facilities, services and environs. This information was obtained through on-site investigations, interviews with airport management, tenants, and users, as well as the review of available documents and studies concerning the Airport.

Figure B-1 (included at the end of this chapter) illustrates the existing conditions at the Region of Waterloo International Airport as described in the following sections.

To properly assess the Airport's existing conditions, it is important to understand the most recent industry developments that impact current and future directions for YKF.

September 2015, Transport Canada issued an update to [TP312 AERODROME STANDARDS AND RECOMMENDED PRACTICES](#). The update to TP312 (5th Edition) is more oriented toward an operational approach to better address evolving airport development, and be more consistent with aircraft operations and the objectives of the airport operator. Notably, the existing classifications and aerodrome clearances in the following sections are all based on TP312 5th Edition Aerodrome Standards and Recommended Practices (unless otherwise noted). Airport management has a plan to implement TP312 5th Edition certification by 2019 at the latest.

1.1 AIRSIDE FACILITIES

The airside facilities at the Region of Waterloo International Airport consist of two runways (08-26 and 14-32) plus associated taxiways and aprons. The existing runway pavements are identified in [Table B-1](#).

The Airport's primary runway, Runway 08-26, consists of a 2,134 metre (7,002 foot) by 45 metre (150 foot) asphalt surfaced pavement. The Airport's secondary runway, Runway 14-32, is also asphalt surfaced and is 1,250 metres (4,100 feet) by 45 metres (150 feet).

The aircraft group number (AGN) (per TP312, 5th Edition Section 1.2) for Runway 08-26 is AGN IIIB and is classified as a Precision Instrument runway, while Runway 14-32 is classified as an Code 3C (TP312, 4th Edition) Non-Precision Instrument runway.

Based on 2012 NAV CANADA data, Runways 32 and 26 are the predominant runways utilized at YKF due to prevailing wind conditions. These runways are responsible for 34 percent and 39 percent of the traffic respectively.

Runways 08 and 14 are utilized less often with traffic at 13 percent and 14 percent respectively. Each runway's utilization has been further broken down into Visual Flight Rules (VFR) and Instrument Flight Rules (IFR) movements, with the percentage of IFR traffic significantly higher on Runways 08 and 26. Helicopter traffic accounts for a small overall percentage of traffic at the Airport as it is typically handled on the apron areas, it has not been included in the runway utilization analysis. Runway usage is summarized in **Table B-2**.

Table B-1 | Summary of Runway Pavements

RUNWAY	SIZE m (ft.)	CLASSIFICATION	PLR¹
08-26	2,134 x 45 (7,002 x 150)	AGN IIIB Instrument, Precision, CAT I	9.8
14-32	1,250 x 45 (4,100 x 150)	Code 3C Instrument, Non-Precision	9.0

¹ Pavement Load Rating (PLR).

Table B-2 | Runway Utilization – Aircraft Movements

	TYPE OF TRAFFIC		RUNWAY		
	08	1,4	26	32	HELI
IFR	2,078	344	4,743	1,066	3
VFR	3,602	5,422	11,917	13,229	2,864
Total	5,680	5,766	16,660	14,295	2,867
Percent Usage	13	14	39	34	

1.1.1 Runway 08-26

Given its length and into-wind orientation, Runway 08-26 is designated as the primary runway at the Region of Waterloo International Airport. Due to its greater length as well as the presence of the instrument landing system on Runway 26, this runway is favoured by jet and turbo prop aircraft typically utilized by corporate aircraft and scheduled carrier service. With the Instrument Landing System (ILS) located on Runway 26, the Airport is capable of providing precision approach guidance under wind conditions associated with poor weather, although in certain IFR conditions Runway 08 is the preferred runway.

Runway 08-26 was constructed in 1949 and has been extended multiple times, lastly in 2003 to its current length of 2,134 metres (7,002 feet). In 2012, Runway 08-26 was rehabilitated to increase the pavement strength to a Pavement Load Rating (PLR) of 9.8 on the centre keel section (22.5 metres in width) west of Taxiway Foxtrot. The outer sections of the runway were rehabilitated to a PLR of 9.2. The remaining section of the runway east of Taxiway Foxtrot remains at a Pavement Load rating (PLR) of 9.2 as originally constructed in 2003.

At its present length, the runway can accommodate all AGNⁱ IIIB aircraft without limiting their takeoff weight (under ideal conditions) and some AGN IV aircraft with weight limitations (under operational restrictions).

Runway 08-26 is equipped with the following:

- ▶ AN, Simplified Short Approach Lighting System with Runway Alignment Indicator Lights (SSALR) High Intensity Approach Lighting (Runway 26 only);
- ▶ AO, Omnidirectional Approach Lighting System (ODALS) Medium Intensity Approach Lighting (Runway 08 only);
- ▶ TE-HI, Threshold and Runway End Lighting with Variable Setting High Intensity Runway Edge Lighting on both Runways 08 and 26;
- ▶ P2, Precision Approach Path Indicator (PAPI) eye-to-wheel height up to 25 feet on Runways 08 and 26; and
- ▶ CAT I Instrument Landing System (ILS) on Runway 26.

The declared distances for Runway 08-26 as published in the Canada Airport Pilot are summarized in **Table B-3**. As 300 metre (984 foot) clearways have been provided at each end of the runway the Take-Off Distance Available (TODA) for both Runways 08 and 26 are published at 7,986 feet.

Table B-3 | Declared Distances for Runways 08-26

DECLARED DISTANCES ¹	08	26
TORA	7,002'	7,002'
TODA	7,986'	7,986'
ASDA	7,002'	7,002'
LDA	7,002'	7,002'

¹ Declared distances are expressed in feet to be consistent with data published within the Canada Air Pilot (CAP). Acronyms are defined below.

TORA – Take-Off Run Available

TODA – Take-Off Distance Available

ASDA – Accelerate-Stop Distance Available

LDA – Landing Distance Available

Presently, the Runway 08-26 pavement structure is in excellent condition given its rehabilitation in 2012. This rehabilitation also included drainage system repairs as well as replacement of electrical cables for the high intensity edge lights on the first 1,585 metres (5,200 feet) of the runway. Longitudinal cracking within the 549 metre (1,800 feet) extension completed in 2003 was repaired in the summers of 2013 and 2016. The section of the runway east of Taxiway Foxtrot requires pavement rehabilitation in the keel section, and temporary repairs for the keel section within the touchdown zone of the Runway 26 end are scheduled to be completed in the near future.

i The Aircraft Group Number (AGN) is determined in accordance with the characteristics of critical aircraft, including the wing span, outer main gear span and tail height for each part of the manoeuvring area of the airport. The objective is to provide aerodrome facilities that are suitable for the aircraft that are intended to operate at the aerodrome, or part thereof is provided. Sample AGN IIIB aircraft include the Boeing 737 series and a sample AGN IV Aircraft includes the Boeing 767-300.

1.1.2 Runway 14-32

Runway 14-32 is used extensively for flight training and by light general aviation aircraft during crosswind conditions. The runway is not of sufficient length to accommodate large corporate jets or heavy turbine aircraft.

Runway 14-32 is equipped with the following:

- ▶ TE-ME, Threshold and Runway End Lighting with Medium Intensity Runway Edge lighting for both Runways 14 and 32; and
- ▶ P1, Precision Approach Path Indicator (PAPI) eye-to-wheel height up to 10ft for both Runways 14 and 32.

Runway 14-32, fully reconstructed in 2008, is in very good condition. This reconstruction included a new drainage system and medium intensity runway edge lights.

Clearways of 300 metres (984 feet) and 162 metres (531 feet) are maintained on the approaches to Runways 14 and 32 respectively. The declared distances as published in the Canada Airport Pilot for Runway 14-32 are provided in **Table B-4**.

Table B-4 | Declared Distances for Runways 14-32

DECLARED DISTANCES ¹	14	32
TORA	4,100'	4,100'
TODA	5,084'	4,631'
ASDA	4,100'	4,100'
LDA	4,100'	4,100'

1 Declared distances are expressed in feet to be consistent with data published within the Canada Air Pilot (CAP). Acronyms are defined below:

TORA – Take-Off Run Available

TODA – Take-Off Distance Available

ASDA – Accelerate-Stop Distance Available

LDA – Landing Distance Available

1.1.3 Runway End Safety Areas (RESA)

The purpose of the RESA is to reduce the severity of damage to an aircraft undershooting or overrunning the runway. RESAs must have an area free of objects, other than frangible visual and navigational aids required to be there by function, and must support the movement of rescue and fire fighting vehicles.

Under current certification there are no RESAs at the Airport nor are they required by Transport Canada, as they are identified as recommendations only. However, future planning and development of the Airport identified in the further sections of this report will identify “level of service change” and will trigger the implementation of new TP312 5th Edition standards, which identifies RESAs as standard requirements. Consequently, each runway end will have to provide a RESA that extends 150 metres (492 feet) beyond each runway threshold and is twice the width of the runway (in this case it would be 90 metres / 295 feet wide). RESA requirements are further identified in the Facility Requirements section.

1.1.4 Taxiways

Access between the apron areas to the various runways are provided by three primary parallel taxiways designated as Taxiways Alpha, Bravo and Charlie. All taxiways at the Airport are provided with edge lighting and are marked and signed in accordance with Transport Canada standards and Regulations. **Table B-5** summarizes the properties of these taxiways.

Table B-5 | Taxiway Summary Table

TAXIWAY	TAXIWAY CLASSIFICATION ^{1, 2}	WIDTH (m)	PLR ³
A	Code C	15	9
B	Code C	15	9
C – North	Code D	18	9
C - South	Code C	15	9
E	Code C	15	9
F	Code C	15	9

1 All Taxiways are provided with edge lighting

2 Taxiways are certified to TP312 4th Edition standards

3 Pavement Load Rating

In 2012, runway guard lights were installed at all taxiway hold short locations to help avoid runway incursions and improve overall Airport safety, actions which have reduced incursions drastically since 2012.

TAXIWAY ALPHA

Taxiway Alpha runs parallel to Runway 08-26, providing access from the general aviation / terminal area to the departure thresholds. The majority of the taxiway was reconstructed / realigned in 2008 and 2009 to meet TP312 4th Edition requirements for a Code 4-C precision approach runway. The new 168 metre (551 feet) offset from the runway allows for full Category I ILS operations to 200 foot and half mile minimums. The existing Taxiway Alpha spacing can accommodate future upgrading to a larger AGN on Runway 08-26 without the need to relocate the taxiway centreline.

Given its reconstruction in 2008 and 2009, the majority of the taxiway is in very good condition. The most easterly portion of the taxiway was reconstructed in 2003 and is currently in good condition. A new sub-drainage system as well as a new taxiway edge light system were also installed during the reconstructions. To allow for a possible further widening in the future, the catchbasins installed in conjunction with the new sub-drainage system were set back an additional 3 metres (9.8 feet) to provide for a possible 18 metre (59 feet) width in the future.

TAXIWAY BRAVO

Taxiway Bravo provides access to the threshold of Runway 32. The pavement surface is presently in very good condition, as it was fully reconstructed and relocated closer to Runway 14-32 in 2008 to coincide with the expansion of the main terminal apron (Apron III).

The taxiway is presently set back 92 metres (301 feet) from Runway 14-32, which meets Transport Canada's standards (4th Edition) for a Code 3-C non-precision runway. The taxiway spacing will need to be increased to 122 metres from Runway 14-32 once the runway is extended and classified as a precision approach to meet current TP312 5th Edition standards. An aircraft holding bay / run-up area is also located at the south end of the taxiway and threshold of Runway 32, allowing smaller type aircraft to taxi past other aircraft doing engine run-ups prior to departure.

TAXIWAY CHARLIE

Taxiway Charlie provides access to the threshold of Runway 08 and Runway 14. The taxiway pavement structure is in very good condition as it has been reconstructed on two separate occurrences in the recent past. The portion

south of Runway 08-26 was fully reconstructed in 2008 as was the portion north of Runway 08-26 in 2010. During the 2010 reconstruction, Taxiway Charlie was also widened from 15 metres (49.2 feet) to 18 metres (59 feet) to allow for larger AGN IIIB aircraft and some smaller AGN IV aircraft (under operational restrictions) requiring access to Apron VII located northwest of the Runway 08 threshold. The taxiway spacing will need to be increased to 122 metres (400 feet) from Runway 14-32 once the runway is extended and classified as a precision approach to meet current TP312 5th Edition standards.

TAXIWAYS ECHO AND FOXTROT

Both Taxiways Echo and Foxtrot provide aircraft landing on Runway 08 or 26 the opportunity to exit either runway before reaching the end. Also, if desired, aircraft requiring short take-off runways may use either Taxiway Echo or Foxtrot to limit a long taxi on Alpha when departing on Runway 26.

As both Taxiways Echo and Foxtrot were fully reconstructed in 2009, their pavement is in good condition.

1.1.5 Aprons

There are six existing aircraft parking aprons at the Airport and the condition of each apron is summarized below.

APRON I

Apron I is located on the west side of the Airport and provides access to several T-hangar buildings for many of the aircraft based on site. It is also used by Great Lakes Helicopter Flight Training School. Portions of Apron I pavement have been resurfaced in recent years; however, much of the pavement is in poor condition and should be considered for rehabilitation / reconstruction. This apron is used primarily by light aircraft which do not impose heavy loads on the pavement. Apron I is certified to TP312 4th Edition Code A, 15 metre (50 feet) wing span restrictions.



Aerial View of Apron I

APRON II

Apron II is located west of the terminal building and east of the Waterloo Wellington Flight Centre. As part of the Airside Development Program in 2008, Apron IIA was fully reconstructed and expanded to allow for AGN II type aircraft (and some small AGN IIIA Aircraft) to be remotely parked. The pavement conditions are very good and currently the apron has a pavement strength of PLR 9 with a tire pressure limit of 1.0 MPa. Apron II is used for operations by a mix of both local and itinerant aircraft, including corporate jets. The apron also provides access to the T-hangars at Apron I located to the west. To protect the public parking lot located immediately south of the apron, a blast fence has been installed along the south edge of the apron to deflect jet blast and prop wash. Apron IIA is certified to TP312 4th Edition Code B, 17 metre (55 feet) wing span restrictions. Apron IIB is certified to TP312 4th Edition Code B, 24 metre (79 feet) wing span restrictions.



Aerial View of Apron II

APRON III

Apron III is the main apron servicing the Airport. It is located directly in front and towards the east of the Airport Terminal Building and is used for commercial airlines, including WestJet and Sunwing. The restricted area of the Apron allows for four AGN IIIB type aircraft (B737, A320, and Dash 8, etc.) to be gated and serviced from the Terminal Building. Along with this commercial airline traffic, Apron III also services many corporate airlines, FBOs (FliteLine Services) and air cargo aircraft on a frequent basis, primarily outside the restricted area and further east towards Apron IV and Apron V.



Aerial View of Apron III and the Air Terminal Building

The apron was originally reconstructed in 2003 and was expanded again in 2008 to provide for larger-type aircraft for scheduled service. The current pavement strength is PLR 9 with a tire pressure limitation of 0.43 MPa. It is considered to be in fairly good condition.

Apron III can be accessed multiple ways, including Taxiway Alpha and Bravo, Apron II and Apron IV and V. The apron is also equipped with a snow dump area located at its south end along with a fueling station. Apron III is certified to TP312 4th Edition Code C, 36 metre (118 feet) wing span restrictions.

APRON IV

Apron IV, constructed in 2004, is located southwest of the Air Terminal Building (ATB) and is used by private and corporate tenants. The apron has also served as a locale for fire and rescue training for the airport maintenance staff as well as an additional snow dump area in the past. Given the recent development of hangars and aviation facilities in Apron IV, along with the relocation of the Airport's Maintenance Garage to the new Airport Operations Centre (AOC), the apron is no longer used as a training area or a snow dump area. The old maintenance facility was located in this area and has since been leased to the airlines for their Ground Support Equipment (GSE) storage area. The pavement condition is in fairly good condition and does not need any immediate rehabilitation.

At the time of this writing, most of the designated lots have been leased or developed and there are four lots (109,760 square feet total) available in this area for future development. All lots are fully serviced with both airside and groundside connections available. Apron IV is certified to TP312 4th Edition Code C, 36 metre (118 feet) wing span restrictions.



Aerial View of Apron IV and V

APRON V

Apron V is located south of the ATB and is used for private and corporate hangars. Portions of Apron V have been resurfaced in recent years; however, much of the pavement is in poor condition and should be considered for rehabilitation. This apron is used primarily by light aircraft which do not impose heavy loads on the pavement. A pavement condition survey will be completed by the Airport to analyze all pavements in poor condition.

Apron V is accessed via Taxiway Bravo with groundside connections for all developments. Apron V is certified to TP312 4th Edition Code B, 24 metre (79 feet) wing span restrictions.

APRON VI

This future apron area is located to the west of the new Air Traffic Control Tower (ATCT). Airside access to this new development area will be provided via Taxiway Alpha.

Groundside connections to the Apron VI development area will be through an extension to New Germany Lane.

APRON VII

Apron VII is located on the northwest corner of the Airport and was constructed in 2011. The apron was developed to service commercial hangars designed to accommodate up to small AGN IV aircraft (B757 type). Apron VII currently has over 100,000 m² of available development lots (up to five additional service lots) and is serviced by two groundside access roads (Jetliner Court and Otter Court) connected directly to Fountain Street.



Aerial View of Apron VII and Chartright Hangar

This apron is accessed via Taxiway Charlie which was recently expanded to 18 metres wide to accommodate Code D (B757) aircraft. Apron VII is certified to TP312 4th Edition Code D, 52 metre (170 feet) wing span restrictions.

SERVICE ROADS

The entire airside complex is accessible via a gravel service road, comprised of recycled asphalt.

1.2 AIR TERMINAL FACILITIES

The original Airport Terminal Building was built in 1973 to support general aviation activities. It remained largely unchanged until improvements were initiated in 1997.

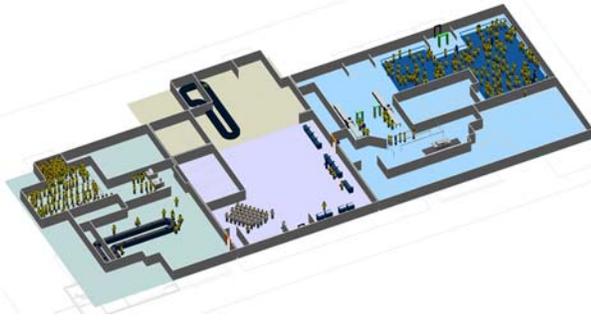
To support the Airport's objective to attract regional scheduled services, a new passenger terminal building was commissioned in 2004. At 3,200 square metres, the new facility is approximately 10 times bigger than the previous terminal and now boasts complete customs and immigration facilities, concessions and Canadian Air Transport Security Authority (CATSA) screening facilities. Since opening, an additional baggage reclaim unit has been commissioned, the security and hold room have been remodelled, and two food concession stands have been added.

Passenger amenities include free wireless high-speed internet, an ATM, a licensed sit-down café (for which a valid boarding pass is required), charging stations, complimentary luggage carts and well-lit outdoor parking adjacent to the terminal.

The current annual capacity of the ATB has been assessed at approximately 250,000 passengers, which is in excess of existing traffic levels. This estimated capacity is subject to arrival and departures times and more specifically on airline schedules. For example, the terminal can process more passengers if the flights were spaced out as opposed to if the flights occurred simultaneously.

A passenger flow simulation model was conducted to review the existing performance of the ATB based on the current busy day schedule.

Terminal Simulation Model – Current Schedule



The simulation indicates that the existing Terminal Building performs well during most periods of the time, but struggles when narrowbody jets (i.e. B737, A320, E190) are in operation. As demand grows, the existing Terminal Building will be stressed to accommodate two narrowbody jets operating at the same time, creating an undesirable level of service. Additional aircraft operations will cause severe deterioration of operations within the terminal building, resulting in possible shutdowns of terminal operations.

Key findings include the following:

- ▶ The **Check-In Hall** has the ability to process more passengers than originally designed for, effectively through the introduction of common-use self-service check-in technologies.
- ▶ The **Passenger Screening** process is dependent on CATSA throughput (passengers / hour). Under consistent operations using both units, the anticipated demand can be met with acceptable queuing.
- ▶ The **Departure Lounge** will become increasingly congested as demand increases near or during the peak period, and currently experience periods of congestion. The Airport is currently exploring temporary expansion opportunities within the current facility.
- ▶ The **Domestic Reclaim** provides insufficient dwell space and presentation length for narrowbody jet operations. This will be an area of concern should narrowbody jet operations continue at the Airport.
- ▶ The **Immigration** process struggles during processing of narrowbody jet arrivals. Additional counters or Trusted Traveller Kiosks may offset some of the congestion, which will in turn lead to increase occupancy near the International Reclaim. This will further impact capacity at the baggage claim unit as bag storage limits are reached due to congestion at Immigration.
- ▶ The **Customer Experience** – under current conditions YKF offers outstanding convenience as well as a utilitarian experience.

The complete simulation report is included in [Appendix F](#).

Figure B-2 (included at the end of this chapter) illustrates the existing floor plan of the Airport Terminal Building as described in the previous sections.

1.3 AIRPORT SUPPORT FACILITIES

In addition to the ATB, there are numerous other buildings and structures located at the Airport that are owned and operated by the Region and other entities.

1.3.1 Air Traffic Control Tower

The Air Traffic Control Tower (ATCT) is a stand-alone facility constructed in 1969 by Transport Canada and is currently owned and operated by NAV CANADA. It is located adjacent to the Airport Terminal Building (to the north) and in between Apron II and Apron III on the groundside.

The existing ATCT has reached the end of its useful life and will be replaced with a new control tower (currently under construction) located east of Runway 14-32 and south of Taxiway Alpha, on New Germany Lane, adjacent to the Airport Operations Centre (AOC).

The new Air Traffic Control Tower is expected to be in operation in the summer of 2017, at which time the current ATCT will be decommissioned and demolished by NAV CANADA before the end of 2017.



Rendering of new Air Traffic Control Tower adjacent to the AOC

1.3.2 Airport Operations Centre

The Airport Operations Centre (AOC) was constructed and opened in 2011. The facility comprises a maintenance garage and fire hall facility solely for the Region of Waterloo International Airport. The groundside meeting and training rooms can also be used by additional Regional staff beyond Airport employees. The facility has more than 2,600 square metres of floor area and is comprised of two large maintenance bays (including a crane and vehicle lift), three large equipment storage bays, two fire hall bays and office areas.

The AOC facility was approved for funding in 2010 under the federal and provincial Infrastructure Stimulus Fund, with the balance financed by the Region of Waterloo.

The AOC also is equipped with a fueling system, including above-ground diesel and gasoline fuel storage tanks and fuel dispensing pumps to service the Airport / Regional vehicle fleet.

The AOC can be accessed from landside via New Germany Lane and airside from Taxiway Alpha and the Airport Perimeter Road. The building was constructed to allow for expansion of both sides.



Airfield view of the Airports Operation Centre

1.3.3 Field Electrical Centre

The Field Electrical Centre (FEC) is located adjacent to Apron I / II.

The FEC provides power supply for the Hangar 6 building and all other aviation loads (such as Localizer, Glide Path, Automated Weather Observing System building and PAPIs) at the voltage of 600/347V, while airfield edge light circuits are fed from constant current regulators supplied from 600/347V three-phase distribution panel RP-B.

The FEC facility was expanded and modified in 2003 with a regulator switchgear assembly. The latest FEC Expansion Project was completed in 2010 and included a new 400A Service. It should be noted that the building housing the FEC was previously used as a Fire Hall, and the Fire Hall has now moved to the new AOC facility.

Two constant current regulators (CCR#12 and CCR#13) were added for the Runway Guard Lights in 2012.

1.3.4 Aircraft Refuelling Facilities

Aircraft refuelling services are provided by FliteLine Services (Hammond Fuels) and the Waterloo Esso Service (Imperial Oil – renamed World Fuels in October 2016), and Chartright. All fuels are dispensed using bowsers operating on the aprons. Fuel storage is undertaken in three locations.

FliteLine Services has their fuel farm located adjacent to Hangar 5. The fuel farm is comprised of above ground storage tanks with the following capacities:

- ▶ Jet A 125,000 L
- ▶ 100 LL 25,000 L

The fuel farm belonging to World Fuels is located on the west perimeter of Apron II, adjacent to the WWFC Hangar. This fuel farm has the following storage capacity:

- ▶ Jet A 35,000 L
- ▶ 100 LL 35,000 L

Chartright is located on the north side of Apron VII and has the following fuel storage capacity:

- ▶ Jet A 120,000 L

Ideally, a central fuel farm should be provided on the Airport grounds in a location that does not impede future aviation-related development.

1.3.5 Aircraft Rescue and Firefighting

The Region of Waterloo International Airport has undergone extensive improvements to airport fire services in recent years by establishing their own trained fire personnel on site (currently 11 in total). Presently, the Airport has two fire trucks located in the new fire hall located at the Airport Operations Centre (AOC), which allows them to meet a Category 7 for Aircraft Rescue and Firefighting (ARFF) as required, a requirement for B737-800/900 type aircraft.

1.4 LANDSIDE FACILITIES

1.4.1 Parking

In 2013, the Airport implemented a new parking control system. The main entrance road and drop-off curb were realigned and reconfigured to direct traffic to controlled (gated) parking areas. Parking is available at two parking lots located in close proximity of the ATB.

Payment can be made at two pay stations, located inside the ATB and at the pedestrian entrance to the parking lot.

1.4.2 Approach Road and Access

Landside access to the Region of Waterloo International Airport is provided by Fountain Street (Regional Road 17) located along the west boundary of the Airport. Airport Road, which connects to Fountain Street, provides access to the ATB, south commercial development, and all of the vehicle parking lots.

Access to Jetliner Court (north side of Apron VII) and Otter Court (south side of Apron VII) is provided from Fountain Street.

Fountain Street connects with Highway 7 to the north and provides access to Waterloo and Guelph. Highway 401 to the south provides access to Toronto and London, making the Region of Waterloo International Airport extremely accessible to all the surrounding areas.

Fountain Street was last resurfaced in 1997. In 2010, the entrance was widened, allowing for multiple turning lanes, as well as an illuminated airport entrance sign. Sidewalk, curb and gutter as well as additional street lighting were also recently added to the airport entrance road. In 2012, the extension of Fairway Road and the new bridge over the Grand River increased the Airport's accessibility to Kitchener, resulting in increased traffic passing by the Airport. Fountain Street is scheduled to be widened in 2018.

1.5 UTILITIES AND SERVICES

Utilities and municipal services within the Airport property are described in the following sections.

1.5.1 Sanitary Service

Sanitary services to all buildings on the Airport property are currently provided by a mix of individual septic systems and a sanitary system connected to holding tanks, located in front of the Air Terminal Building and adjacent to Apron VII. These tanks have been designed to accommodate future pumping stations to allow for a forcemain connection to a sanitary main installed within the Fountain Street right-of-way in 2018. A section of forcemain has been installed beneath the Randall Drain to allow for future connection without needing to excavate beneath the watercourse.

1.5.2 Water Supply

Water is supplied to the central portion of the airport by a 300 mm watermain. In 2010, the 200 mm watermain was extended to service the new AOC on New Germany Lane.

Besides the core portion of the airport being serviced by this main, many individual wells serve a number of buildings on the airport grounds. The water quality is tested on a regular basis, and in most locations is safe for drinking.

Due to the surrounding high water table, the water supply at the airport is generally reliable. The current policy at the Airport is to not allow any new wells to be drilled and to encourage users to move to municipal water service.

1.5.3 Stormwater Drainage

Stormwater drainage within the Airport property is directed to two branches of the Randall Drain, which drains through the airport lands and outlets to the Grand River located on the west side of the Airport property.

The Randall Drain is a municipal drain which serves as a drainage basin of approximately 415 hectares before entering the northeast quadrant of the Airport. The two major branches of the Randall Drain serve the Airport property and join immediately outside the southeast corner.

To maximize the development potential of existing and future commercial areas, a stormwater management pond was constructed in 2004 to attenuate peak run-off.

Given the relative flatness of the site, drainage around the Airport has become an issue at times. Periodic flooding around the Terminal Building can be attributed to insufficient underground piping network as the existing storm pipes are undersized to accommodate all the recent development in the area. An overall site servicing master planning exercise is expected to be completed as part of this Master Plan which will help alleviate some of the existing drainage concerns on site.

Chapter E provides additional details on the Randall Drain and overall site drainage.

1.5.4 Gas

A 150 mm gas main was extended to the airport in 1997, and was upgraded in 2012 by Union Gas to meet the needs of the various tenants at the Airport. This gas main is of sufficient capacity to meet current demands but will need to be revisited for any future developments.

To accommodate the AOC, a 50 mm gas line was extended from Kossuth Road along Cober Road and west on New Germany Lane to the new facility. This gas line can service additional developments in the area, subject to verification by Union Gas.

1.5.5 Power

There are currently three feeds to the Airport property from Waterloo North Hydro (WNH).

The main power service to 4881 Fountain Street is currently supplied by the 27.6/16kV feeder 21M25 along Fountain Street North (Regional Road 17). The feeder is distributed from the north and shared by WNH for other customers of WNH. The feeder formerly had a load limit at the delivery point from Cambridge Hydro, but has been tied with the distribution network of WNH in recent years to accommodate the increasing demand.

The power service to 5015 Fountain Street for the Apron VII area is supplied from the same feeder 27.6/16kV feeder 21M25 coming from the north and east of the Airport.

The power service for the AOC building and new Air Traffic Control Tower (ATCT) is owned and supplied by WNH using the same feeder 27.6/16kV feeder 21M25 transformer and overhead feeder from Kossuth Road, north on Cober Road and west along New Germany Lane.

The Airport owns and operates two separate 27.6/16 kV distribution systems downstream of the service entrance switch on a pole at the west entry point of the Airport Road and Jetliner Court from Fountain Street North. The distribution system consists of both overhead lines and underground cables systems, serving various buildings and facilities of the Airport and the leased tenants.

1.5.6 Communication

The Airport is currently provided with two telephone / data trunk lines. It is anticipated that this service will meet the Airport's foreseeable needs. Fibre-optic cables are also installed to many buildings operated by third-party vendors.

1.5.7 Airfield Lighting

The existing airfield lighting systems consist of an aerodrome beacon, threshold / end lights, medium-intensity edge lights at Runway 14-32 threshold / end, high-intensity edge lights at Runway 08-26, medium-intensity taxiway and apron edge lights, taxiway guard lights, wind cones, aircraft guidance signs, and Precision Approach Path Indicators (PAPIs) for approaches in both directions on each runway. Lighting is controlled by the programmable logic controllers (PLCs) Airfield Lighting Control System at the ATCT, FEC and aircraft radio control of aerodrome lighting (ARCAL) during off hours.

The power supply for the airfield equipment is provided from the Field Electric Centre located within the Hangar 6 Building. The approach lighting systems, edge lights, runway guard lights, wind cones and signs are fed through a series of lighting circuits from constant current regulators (regulated circuits), while the PAPIs are voltage powered (non-regulated circuits).

RUNWAY APPROACH LIGHTING INSTALLATION

The Runway 26 CAT I Approach Lighting System (SSALR) was installed in 2009 with a lamp fail monitoring system. The system has steady-burning fixtures and flashing units.

The Runway 08 Omni Directional Approach Lighting System (ODALS) was installed in 2010. The original proposed CAT I Approach for Runway 08 was abandoned due to major challenges, including crossing the Grand River and significant grading restrictions along the approach line, but could be revisited with new Transport Canada TP312 regulations.

APRON FLOODLIGHTING

The current apron floodlighting was installed as part of the apron redevelopment work in 2003 and subsequently modified / enhanced in 2010. All floodlighting on Apron I (direct feed from distribution), Apron II (fed from the FEC) and Apron III (fed from ATB) meet Transport Canada Standards and Regulations.

NAVIGATIONAL AIDS

In addition to the Approach Lighting System (ILS and ODALS), the Airport currently utilizes a Non Directional Beacon (NDB) on their lands.

There is also an existing area navigation (RNAV) – Global Navigation Satellite System (GNSS) approach that provides IFR access to Runway 32.

1.5.8 Airfield De-icing

All de-icing is completed at the gate by the airline partners through their contracted ground handlers. Glycol-based de-icing is restricted to Apron IIB, Apron VII and Apron III to ensure containment has the ability to be managed. Basic alcohol-based de-icing is done on other private aprons by private operators.

All fluids are gravity collected into the Airport's storm sewer drainage system through a series of catchbasins which all flow through a common diversion valve chamber which eventually flows into the Airport's storm water management (SWM) pond located adjacent to the Randall Drain.

During de-icing season, the SWM pond is tested to monitor the levels of glycol in the water to ensure that as it discharges into the Randall Drain that the levels of glycol remain compliant with Federal guidelines for discharge into a watercourse. Present practice is to test the SWM pond monthly, bi-weekly testing of the Randall Drain is undertaken at the upstream entrance to the Airport lands and at the discharge point of the SWM pond into the Randall Drain.

The protocol followed is that when the glycol levels approach the maximum discharge limits, the diversion valve is modified to divert collection to one of two underground containment tanks for collection.

Once the glycol levels have diminished at the SWM pond to an acceptable level the diversion valves are modified to permit flow back to the SWM pond.

The two containment tanks are located in different areas. The primary tank is located groundside adjacent to the Airport's sanitary sewer wet well. This tank has 13,700 litres of storage capacity, with an interconnection pipe with appropriate shut off between the glycol tank and the sanitary wet well.

This interconnection is presently closed until the sanitary wet well becomes a pumping station which then would allow the collected glycol to be discharged into the sanitary sewer system.

In the event that glycol is diverted to this tank, it is monitored and tested until it is within federal guidelines to be emptied by pump into the storm sewer system.

The secondary tank has 30,000 litres of storage and is located east of Runway 14-32. This tank is the secondary tank for collection of glycol. In the event that additional capacity is required for diversion storage this tank would then be filled and managed similarly to how the primary tank is managed.

In the event that both tanks are filled and additional storage is required, offsite disposal would be initiated through a registered hauler for disposal.

Figure B-3 (included at the end of this chapter) illustrates all the utilities currently serving the Region of Waterloo International Airport as described in the previous sections.

1.6 AIRPORT LANDS

The Region of Waterloo International Airport is recognized as an important transportation facility for the movement of people and as an asset, through its passenger and freight handling capacity, to the continued economic growth and development of this municipality and region as a whole. The Airport lands, totaling approximately 364 hectares, are comprised of both airside and groundside areas. The airport is experiencing a steady interest in land development for aviation-related purposes.

The Township of Woolwich has adopted the following policies regarding the Region of Waterloo International Airport (these policies are contained in the Woolwich Official Plan):

- ▶ It shall be the policy of the municipality to monitor proposals for the further development of the Airport considering the needs of and impact on:
 - The residents and businesses of the Township of Woolwich; and
 - The residents of the Waterloo Region and the County of Wellington.
- ▶ It shall be the policy of the Township to restrict, insofar as possible through zoning powers and development consideration, land uses or developments in the areas surrounding the Airport which would jeopardize the future usefulness of this facility.
- ▶ The Township shall consider the adoption of a by-law to regulate the maximum permitted height of buildings or structures in areas surrounding the Airport.

1.6.1 Airside Land Capacity

The existing Land Use Plan for the Airport as shown on **Figure B-4** consists of the following land use areas:

- ▶ Airfield
- ▶ Commercial Development
- ▶ Airport Terminal and Operations
- ▶ Environmentally-sensitive Areas
- ▶ Airport Reserve

These areas as delineated on **Figure B-4**, and as depicted in the [AIRPORT BUSINESS PLAN 2009-2014](#), present the Plan's vision of Airport land use.

With respect to airside land capacity, the existing Airport lands, including reserves on the east side of Shantz Station Road, are considered adequate for existing Airport operations, including the future extension of Runway 08-26 toward the east.

Should Runway 14-32 be extended in the future, an assessment will be completed to determine if any additional land will need to be acquired at the north end of the runway, as well as significant land clearing agreements to the south would be required to maintain the required approach and take-off clearance requirements for the extended runway.

1.6.2 Groundside Land Capacity

Groundside / commercial development to date has generally taken place along the west side of the Airport in proximity to Fountain Street North and existing utilities and services. As development of these lands is nearing capacity, this Master Plan will consider the development of the Airport Reserve areas located on the south side of Taxiway Alpha on either side of the Airport Operations Centre.

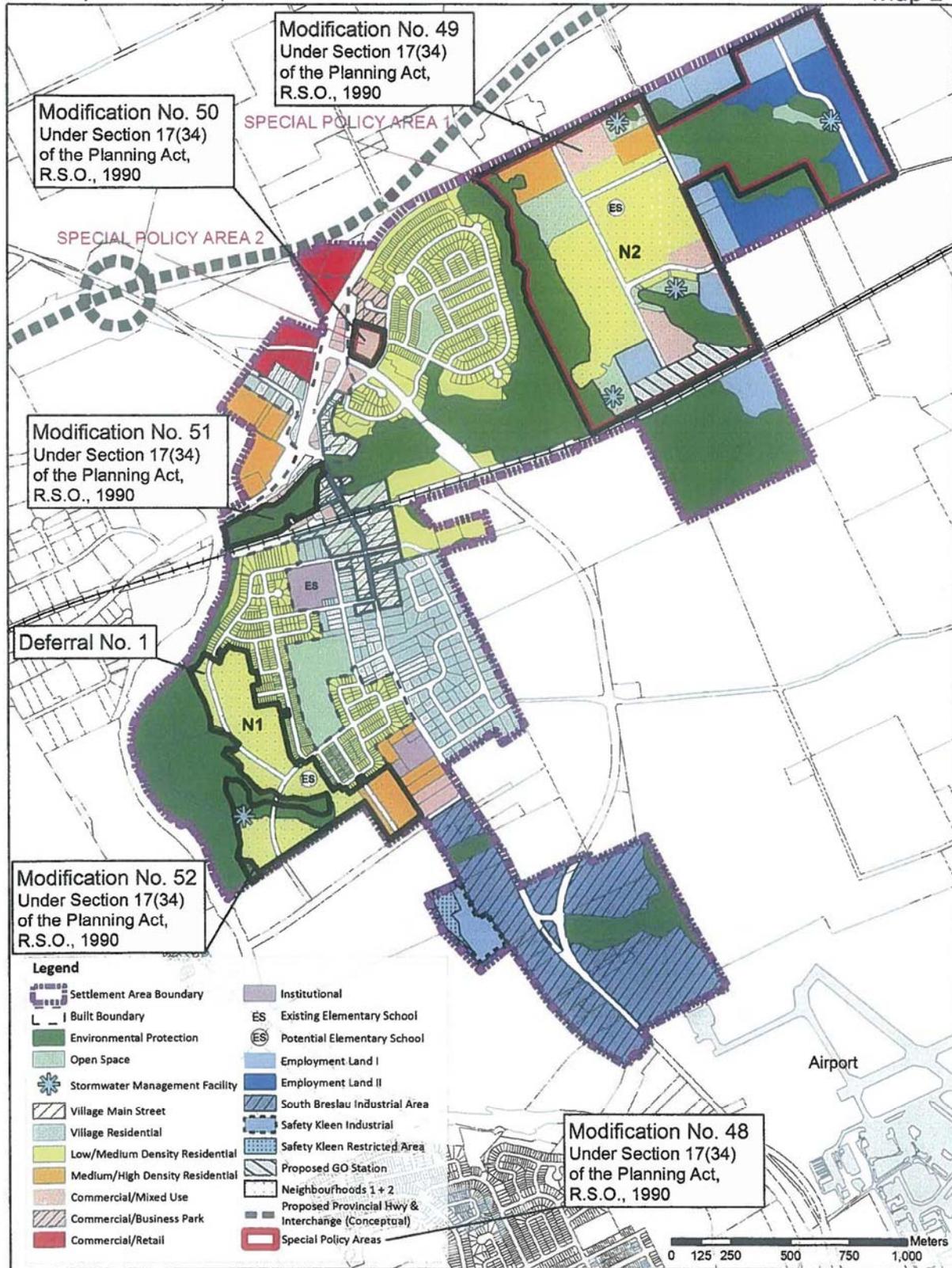
1.7 SURROUNDING LANDS

1.7.1 Airport Neighbours

The Airport is currently situated in relatively close proximity to urban residential communities, including Kitchener, Breslau and Cambridge. To the west of the Airport and under the approach to Runway 08 there is a new residential subdivision located on the west side of the Grand River. Commercial / industrial lands are located immediately northwest of the Airport property, while existing residential properties are located further to the northwest but within 1.6 km of the threshold of Runway 14.

Lands located to the north, east and south of the Airport are primarily agricultural or industrial lands. There are also floodplains located on Airport property.

Zoning maps from the Township of Woolwich are in the process of being updated and not available at the time of this final report. An updated land-use plan of the Breslau Settlement Area as contained in the Township's Official Plan is shown below.



© Regional Municipality of Waterloo, 2016

Breslau Settlement Plan (2016)

1.7.2 Grand River Conservation Authority (GRCA)

The Grand River Conservation Authority (GRCA) manages water and other natural resources on behalf of 39 municipalities, including the Regional Municipality of Waterloo. Given YKF's location immediately east of the Grand River, the GRCA plays a significant role in protecting the environment in and around the Airport. All allowances to the features identified above are regulated by the GRCA.

The Airport property contains several wetlands and drainage courses, including the Randall Drain and the steep slopes of the Grand River, which are regulated by the GRCA. Development of lands within these regulated areas will require addressing the environmental issues associated with each of the areas under consideration as well as the issuance of a permit by GRCA prior to any development. Notably, the East Side Lands Stage 2 Master Environmental Servicing Plan (MESP) and Secondary Plan is currently ongoing and the results will be factored into any Airport Master Planning decisions.

1.8 AERONAUTICAL ZONING

1.8.1 Airport Zoning

Airport zoning requirements have been established by Transport Canada, as documented in TP312 (4th Ed., March 1993), to ensure a satisfactory level of safety at an aerodrome, and are enforced through the Federal Aeronautical Act (1985). These zoning requirements serve to establish a set of imaginary surfaces which extend beyond the boundary of the Airport, the penetration of which represents an obstacle to air navigation. In general, airport zoning is comprised of a takeoff / approach surface as well as transition and outer surfaces.

Table B-6 below summarizes the Obstacle Limitation Surfaces (OLS) zoning characteristics for each of the two runways (based on current conditions).

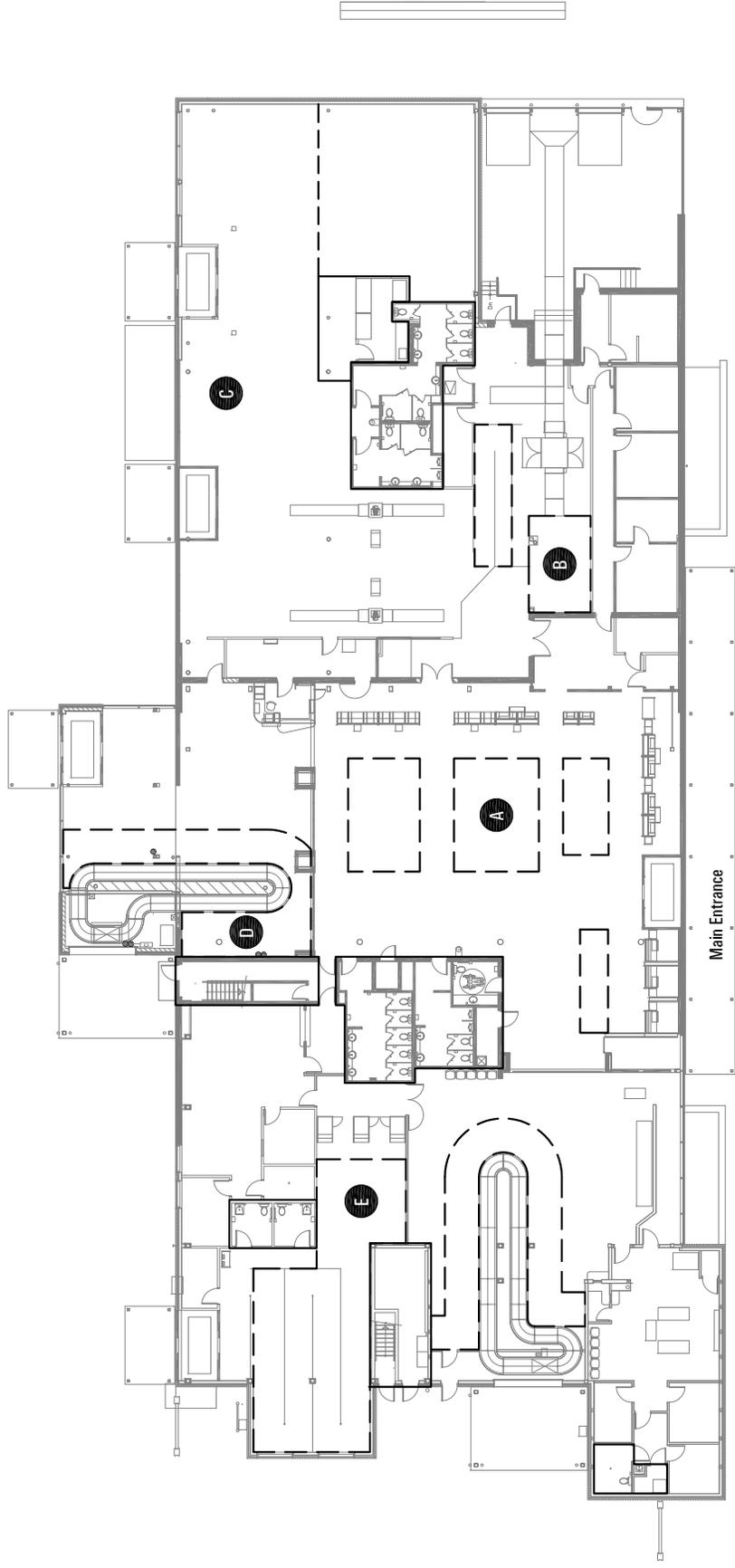
Table B-6 | Obstacle Limitation Surfaces Characteristics

		08-26	14-32
Reference Code		Precision Code 4C, CAT I	Precision Code 3C ⁽¹⁾
Take-off / Approach Surface	Length of Inner Edge (Total)	300.0 m	300.0 m
	Distance from Threshold	60.0 m	60.0 m
	Divergence	15%	15%
	Section Length	15,000 m	3,000 m
	Slope	2.0% (1:50)	2.0% (1:50)
Transitional Surface			
Slope		14.3% (1:7)	14.3% (1:7)
Outer Surface			
Elevation (ASL)		356.5 m	356.5 m
Radius		4,000 m ⁽²⁾	4,000 m ⁽²⁾

(1) Runway 32 is zoned for a non-precision approach and Runway 14 is certified for operation as a non-instrument approach

(2) A portion of the outer surface has been removed

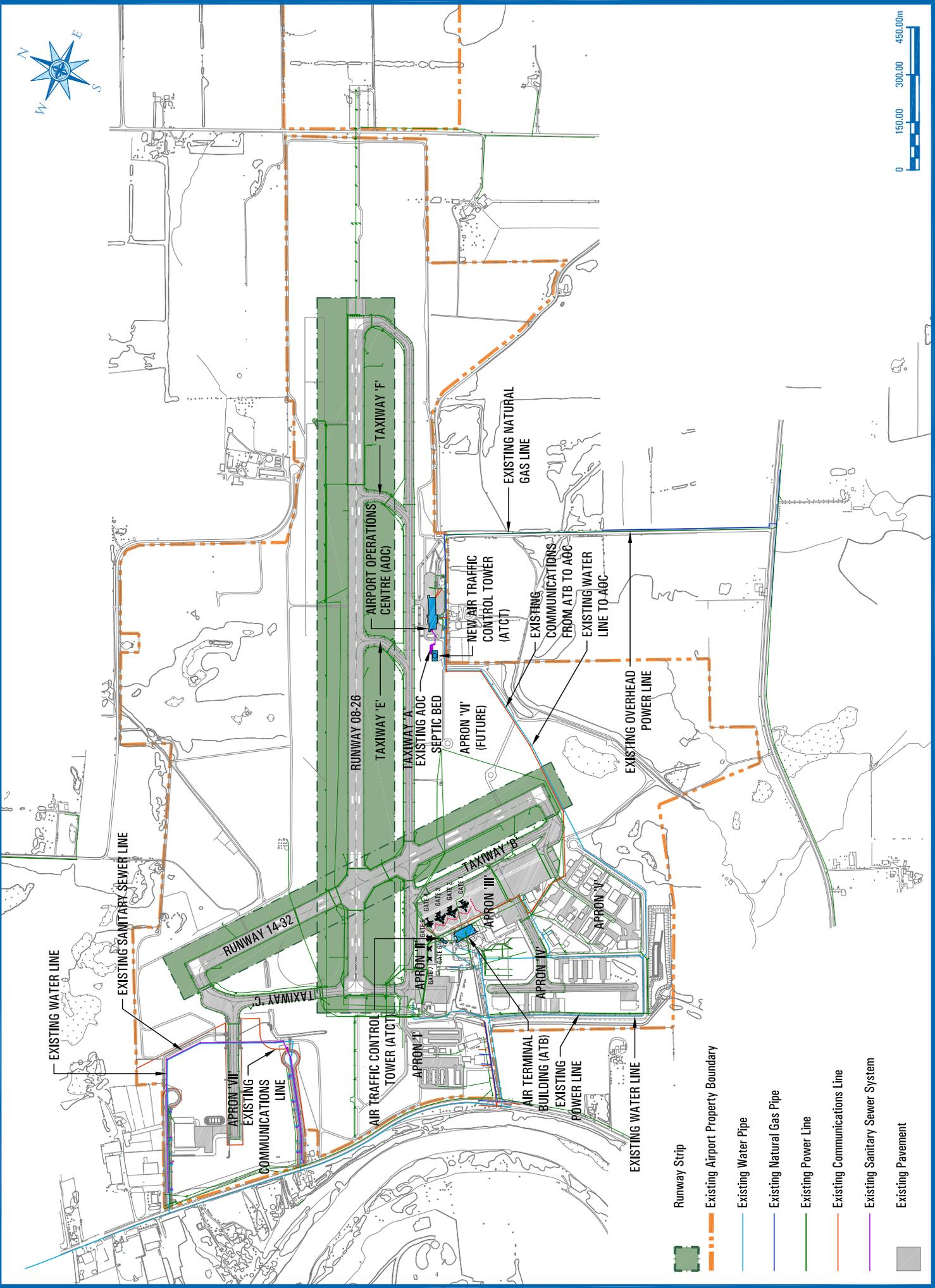
Figure B-5 (included at the end of this chapter) illustrates the existing Obstacle Limitation Surfaces and identifies the key characteristics shown in **Table B-6**.



- A** Check-in Hall
- B** Passenger Baggage / Security Screening
- C** Departure Lounge
- D** Domestic Reclaim
- E** CBSA and International Baggage Reclaim

Existing Terminal Floor Plan

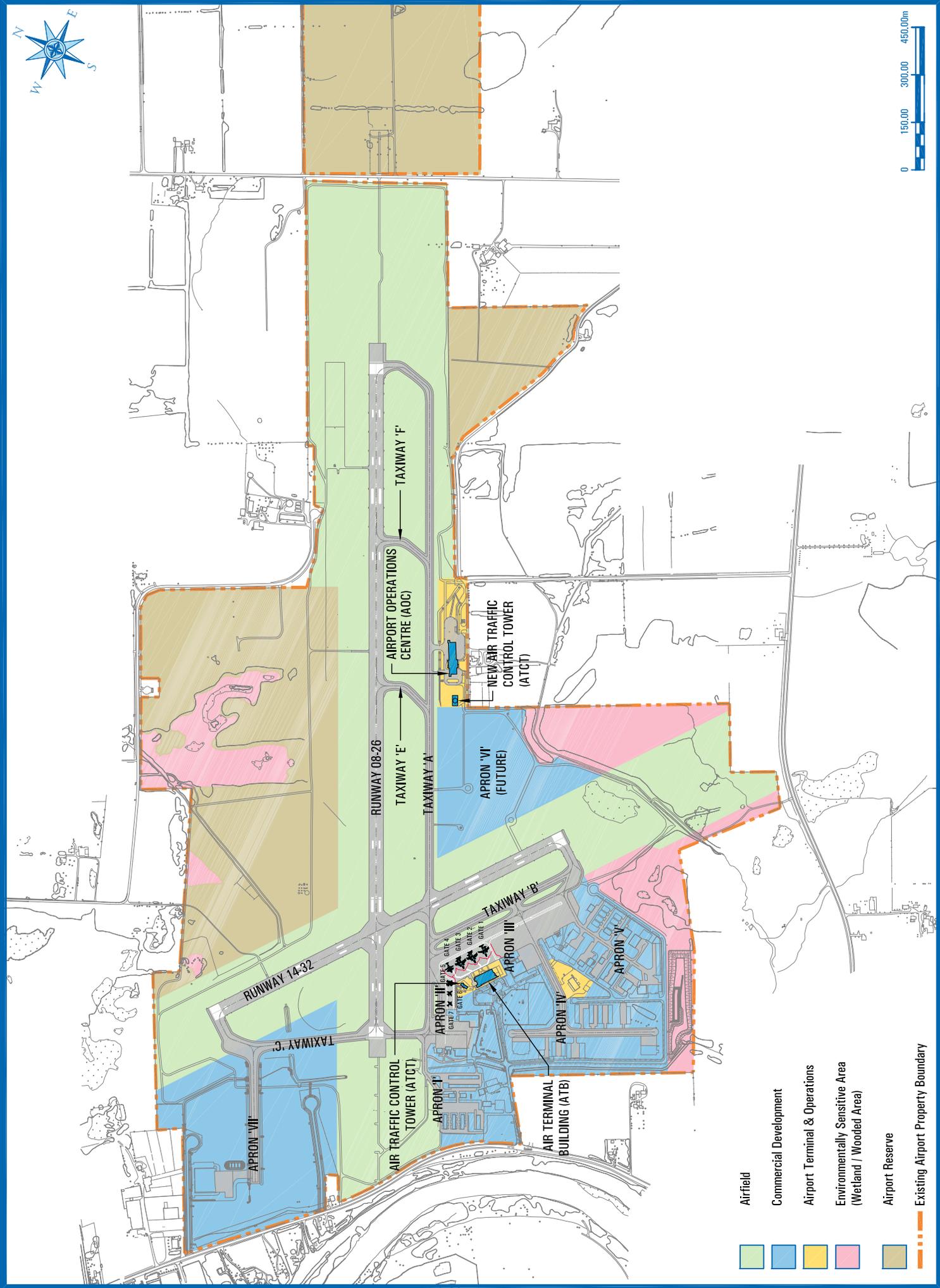
Figure B-2



- Runway Strip
- Existing Airport Property Boundary
- Existing Water Pipe
- Existing Natural Gas Pipe
- Existing Power Line
- Existing Communications Line
- Existing Sanitary Sewer System
- Existing Pavement

Existing Utilities Plan

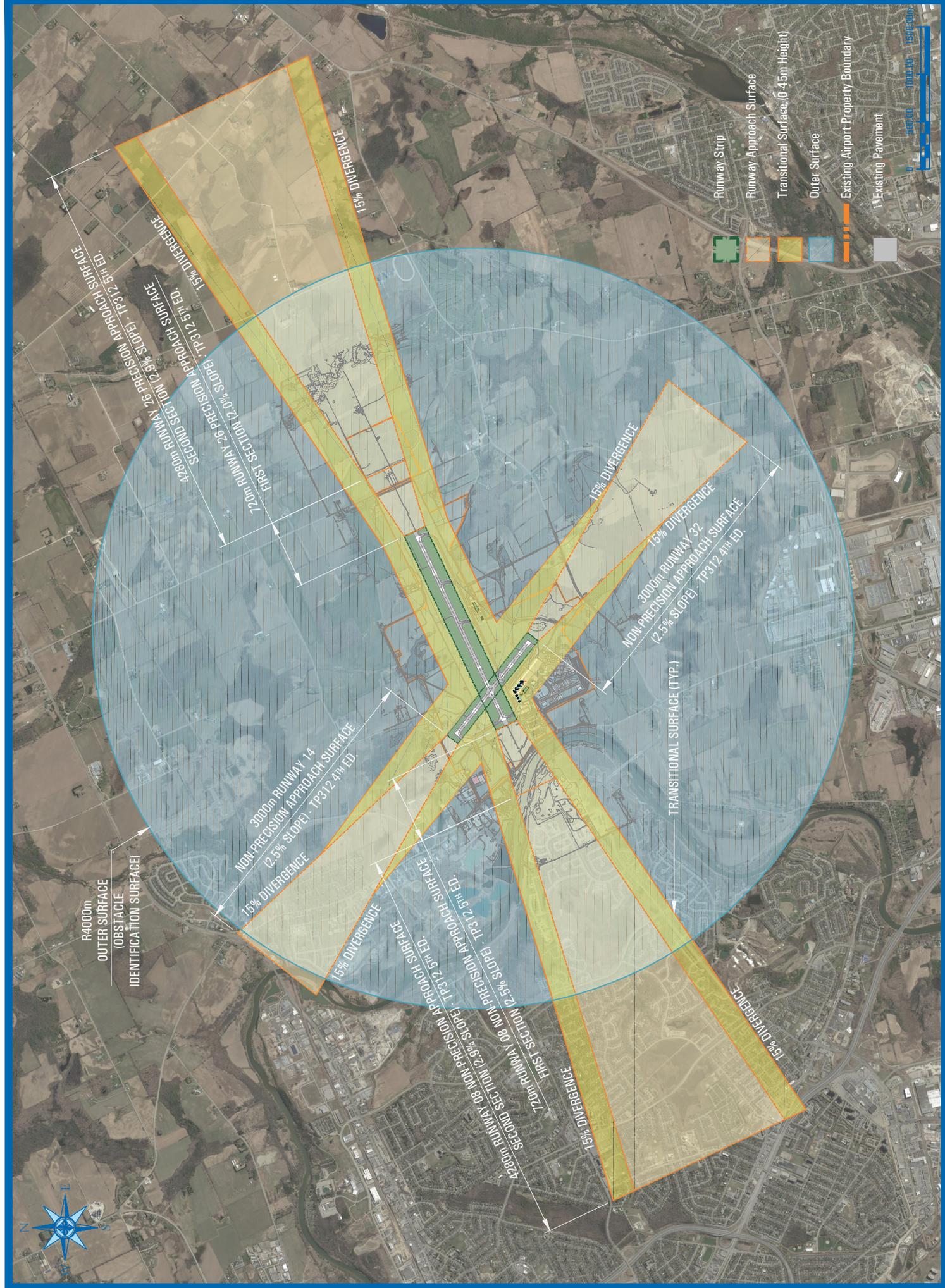
Figure B-3



- Airfield
- Commercial Development
- Airport Terminal & Operations
- Environmentally Sensitive Area (Wetland / Wooded Area)
- Airport Reserve
- Existing Airport Property Boundary

Existing Land Use Plan

Figure B-4



Existing Obstacle Limitation Surface Plan

Figure B-5



C. SWOT ANALYSIS AND FUTURE DEVELOPMENT



CHAPTER C. SWOT ANALYSIS AND FUTURE DEVELOPMENT

1. OVERVIEW

Once the review of the Airport’s existing inventory is complete, the Master Plan process now focuses on obtaining feedback from the Steering Committee and the community as a whole to help guide the direction moving forward. As part of this process, a SWOT Analysis was completed by the project team, followed by consultations with the aviation community and then presentations to the public through Public Information Centres. All feedback was reviewed and addressed and formed the basis of the Development Opportunities identified in this chapter.

A SWOT (strengths, weaknesses, opportunities, threats) analysis identified the key internal strengths and weaknesses alongside external opportunities and threats that impact the Region of Waterloo International Airport (YKF) and its business. This process is critical in assessing key areas for focus in the coming years. A summary of the SWOT analysis is provided below, together with a review of areas that can be helpful or harmful for the Airport’s future plans.

1.1 KEY SWOT ELEMENTS



STRENGTHS

- ▶ Sizable primary catchment area with a travel demand of over 2,500,000 trips within 35 km of the Airport;
- ▶ Diverse local economy with new demand for aviation derived from one of the highest economic growth rates in Canada among medium-sized cities;
- ▶ Performance of aviation services with a strong business traffic product and growing demand for leisure travel;
- ▶ Strategic location close to major population centres, but further away from the US border than other airports;
- ▶ Quality of current infrastructure, including airfield and terminal facilities;
- ▶ Active community support for the Airport;
- ▶ Critical mass of aviation activity, including corporate jet and general aviation / flight training;
- ▶ State-of-the-art Airport Operations Centre ensures reliable operations with room to grow;
- ▶ Inexpensive parking proximate to the terminal, compared to competing airports;
- ▶ Main rail line (GO, VIA) within 3 km of the Airport, with a future proposed high-speed rail link to TPIA; and
- ▶ Shorter waiting times for air travel compared to TPIA.

WEAKNESSES

- ▶ Limited direct ground transportation, with no direct access off major highways;
- ▶ Restriction with a cross-wind runway (1,250 metres / 4,100 feet) – airlines prefer to have two viable runways to help minimize missed approaches during bad weather events;
- ▶ Insufficient scheduled services from air carriers, as they focus on hub airports;
- ▶ Very little air cargo processed in the airport;
- ▶ Utility restrictions such as sanitary and water constraints; and
- ▶ Perceived noise issues from a small segment of the neighbouring population.

OPPORTUNITIES

- ▶ To fulfill a larger role to solve the capacity crunch in the Southern Ontario aviation market;
- ▶ Continued population growth in the region and community;
- ▶ Continued generation of new economic activity, jobs, and innovation;
- ▶ Revenues from land development for both aeronautical and non-aeronautical activities;
- ▶ Improved financial viability by growing regularly scheduled air service (increased revenue);
- ▶ US or Canadian low-cost carrier service generation;
- ▶ Training facilities at the Airport;
- ▶ Untapped potential for sun destination international services traffic;
- ▶ Growing regional airport role to serve traffic off-loaded from TPIA;
- ▶ East Side Lands development;
- ▶ Future connection to the rail with opportunity for direct connection to TPIA (proximity to the new Breslau GO Station and completion of new Highway 7);
- ▶ Capitalization of increased opportunities as a Canadian ultra-low-cost carrier (ULLC) hub; and
- ▶ Opportunity to support a significant aerospace design and manufacturing cluster.

THREATS:

- ▶ Competition from nearby airports with more options for destinations and flight frequencies;
- ▶ Entrenched passenger behaviours and air carrier commitment to TPIA and Billy Bishop City Centre hubs;
- ▶ Environmental land restrictions for future development;
- ▶ Potential opponents to infrastructure options such as a runway extension;
- ▶ Compatible land use planning in the vicinity of the Airport;
- ▶ Changing markets and conditions affecting spending patterns on air travel;
- ▶ Future development of the Pickering Airport; and
- ▶ Associated infrastructure expenditure outside of the Airport expansion, such as transportation improvements to Fountain Street, Shantz Station Road re-alignment, and the extension of transit service.

2. PUBLIC CONSULTATIONS

In 2016, two Public Consultations were held to provide updates on the Master Plan and present the various development stages and options under consideration.

Public Information Centre (PIC) #1 was held May 25, 2016. It was advertised in local media outlets as well as on social media (Airport Facebook and Twitter channels), plus via individual invitations.

The Information Session was held at the Waterloo Region Museum located at 10 Huron Road, Kitchener, from 16:00 to 20:00. Fifteen presentation boards featured key components of the marketing research, Airport facts, and traffic forecasts for review.

The evening was comprised of two separate sessions that each consisted of a 30-minute introductory presentation. The Project Team was available throughout the evening to discuss input from the community in an informal atmosphere.

The overall tone of this PIC was positive, as the majority of the noise concerns brought forward during the 2014 PICs were eliminated with the suspension of the Nolinor Service in early 2016. A summary of all the comments received is included in [Appendix E](#) of this report.

Public Information Centre (PIC) #2 was held on November 10, 2016. Similar to the first PIC, the event was advertised in local media as well as on social media (Airport Facebook and Twitter channels), plus via individual invitations.

The Information Session again was held at the Waterloo Region Museum from 16:00 to 20:00. For this PIC, twenty-three presentation boards were featured with the primary focus on presenting a complete breakdown of all development stages moving forward.

The intent of these public meetings was to inform the community of the direction the Project Team will be bringing forward to Regional Council in 2017. A review of the complete Master Plan process was presented including status of the process and the next steps moving forward; however, the main focus was on presenting the five development stages (including all associated triggers). Financial considerations and inputs were also provided, giving the community a full, transparent view of the overall Master Plan progression.

The overall tone of this PIC was positive, as the vision for an expanded role of the Airport in the community was well received. A complete list and summary of all the comments received is included in the Appendices of this Master Plan.

3. DEVELOPMENT OPPORTUNITIES

The Region of Waterloo International Airport has a unique opportunity to position itself as an upcoming aviation industry leader. As air traveller numbers are forecasted to rise significantly in Southern Ontario over the next two decades, the airport system must grow to meet this demand, or other airports outside of Southern Ontario will compete for market shares and the behavioural practices of the travelling public.

The Region of Waterloo International Airport is well positioned both geographically and from a governance perspective to capture some of this growth and play a larger role in the system of airports, reaping major economic benefits for the community. Airports are significant drivers of economic impact and rival major manufacturing facilities when it comes to assessing these benefits.

Based upon feedback from the PICs, the community, Stakeholder meetings, and Project Team meetings, the strategic direction of the Airport will be to grow in a carefully managed way and minimize risk. The ideal solution is to provide a “just in time” delivery of infrastructure to be prepared for opportunities as they arise. The mandate is to complete all required concepts, planning, regulatory requirements, environmental reviews, designs, and approvals in advance of any trigger to ensure the Airport is positioned to act promptly.

The Airport will continue to pursue additional passenger air service opportunities which will maximize the capacity of the existing Airport infrastructure. Given the recent events surrounding the potential Southern Ontario aviation capacity shortfall, it is recommended that the strategic direction be to grow with a series of development stages and supporting triggers to be implemented, while allowing the Airport to grow both organically and in parallel with TPIA. As TPIA approaches capacity, the decision by the airlines to supplement their Toronto hub will become more urgent, and the Region of Waterloo International Airport should be in a strong position to meet this demand.

The ultimate goal of this proposed Master Plan is to meet the travel needs of the over 2,000,000 passengers within YKF’s catchment area by capitalizing on the existing infrastructure already in place and grow the Airport simultaneously, “just in time” for the airlines to provide service as they become impacted at TPIA. Given the current ability to expand services at YKF without investing significant capital, the Airport has the ability to increase passenger growth and increase revenues prior to investing in the next stages. However, it is imperative that YKF be prepared for the next stages with a plan that would allow the necessary infrastructure to be implemented once passenger numbers are within reach. Numerous dynamics are in play – from opportunities with low-cost carriers to the potential of becoming a major reliever to TPIA, among others – that could drastically alter the landscape at YKF. Therefore, it is vital that the Airport be prepared to accommodate and capitalize upon potential growth.

Low-cost carriers in Canada have had a difficult time starting up for many reasons, including Canada’s sparse population, high taxes and fees, and restrictions on foreign ownership. It is the latter that has primarily kept low-cost airlines out of Canada, even though Canada provides a prime market for an ultra-low-cost carrier (ULCC). A ULCC is defined as an airline that unbundles its fares to keep them as affordable as possible, while charging for extras such as checked and carry-on bags, assigned seats, and food and drink. On November 3, 2016, the federal government unveiled several initiatives designed to make air travel more economical, specifically relaxing foreign ownership rules for Canadian airlines in the hopes of spurring more competition and the prospect of lower airfares. The change allows foreign companies to own a greater share of a Canadian airline — 49 percent, up from 25 percent now — to encourage competition. While the Federal Government devises new legislation to reflect these changes, Transport Canada has issued exemptions to allow upstart airlines — Canada Jetlines and Enerjet — to pursue international investments immediately.

According to the Greater Toronto Airports Authority (GTAA), “forecasts show that by the mid-2030s Southern Ontario region’s airports will start to approach a capacity milestone, even after the planned expansions at Toronto Pearson.”ⁱⁱ

Consequently, there is a dynamic that could see an “integrated multi-airport system for Southern Ontario” that could help offload capacity from TPIA to other airports in the region in a complementary fashion, keeping in mind that Waterloo Region alone currently generates over two million passengers annually.

The Region of Waterloo International Airport is one of several facilities that could, over the planning period of the next 20 years, play a major role in meeting regional aviation demands. According to a study commissioned by the GTAA, by 2043, a staggering 90 million people will be looking to travel through Southern Ontario (Kingston to Windsor) by air; yet the currently planned capacity amongst the region’s airports is estimated to be approximately 70 million passengers per year, a gap of more than 20 million passengers by 2043. While each of the other airports in the southern Ontario market have their unique strengths and opportunities as this regional system is established, only YKF has the potential for a direct passenger rail connection to TPIA.

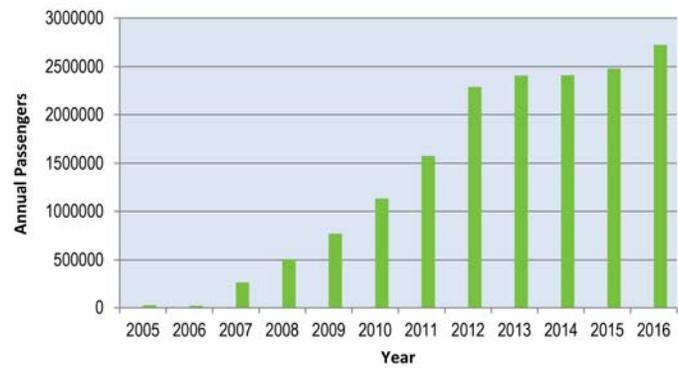
Based on past analyses, the evaluation of the ultimate potential for YKF is approximately 2,500,000 enplaned / deplaned passengers on the existing terminal site. Additional passengers could be accommodated by moving the terminal building, or adding an additional terminal facility. The timing for achieving this volume is undetermined, but ideally the Airport would be ready to build once airline decision makers are ready to supplement their TPIA operation at another airport.

A similar recent example is Billy Bishop Toronto City Centre Airport, where a new airline, Porter Airlines, launched service in 2006. Passenger traffic rose from 28,500 annual passengers in 2005 to almost 2,500,000 annual passengers in less than 10 years. Billy Bishop Toronto City Centre Airport grew by almost 100 times in only a decade, and hundreds of millions of dollars were spent on airport infrastructure to accommodate this growth. After Porter launched in 2006, passenger volumes increased to the point at which airport operations became self-sufficient by 2010. Such growth was completed despite many constraints, including limited runway lengths, physical access to the Island, a tripartite agreement governing usage and noise limits, and significant political objections. Porter Airlines transformed the fortunes of Billy Bishop Toronto City Airport by targeting an airport with a high population and high propensity to travel, and made it easier for passengers to travel from their homes and offices in the downtown core – a model of what current low-cost carriers could do with airports such as the Region of Waterloo International Airport. As Toronto Pearson becomes more congested, and as Highway 401 becomes more unreliable, airlines that currently focus almost exclusively on Toronto Pearson will begin to seek alternatives. YKF could capitalize on such an opportunity by ideally situating itself as a key player to meet this demand, benefiting the regional economy, area residents’ business and leisure travel options, and the sustainable growth of the Airport for decades to come.

*ii Greater Toronto Airport Authority, “Regional Growth”
<https://www.torontopearson.com/regionalgrowth/>*

Billy Bishop Toronto City Centre Airport Annual Passengers

YEAR	ANNUAL PASSENGERS	YEAR	ANNUAL PASSENGERS
2005	28,500	2011	1,576,000
2006	22,300	2012	2,292,500
2007	262,300	2013	2,410,000
2008	508,600	2014	2,413,000
2009	770,700	2015	2,481,000
2010	1,130,600	2016	2,725,800



4. TRIGGER POINTS AND STAGING OF DEVELOPMENT

Waterloo Region and surrounding communities need convenient access to affordable aviation and airline services. As one of Canada's most innovative and successful urban regions, Waterloo Region depends on efficient connectivity to national and global economies. YKF's catchment area is an exporting region, driven by creative, capital intensive companies that sell into and pull talent and product from diverse markets. The region's residents travel extensively, both for business and recreation. They currently rely on costly air services located at the other end of an unreliable highway system. The community has demonstrated its interest in local air service through the success of both the current WestJet service to Calgary and former American Airlines service to Chicago, both of which have been well used by local customers. Passengers who have flown through YKF are passionate about the experience – its speed, efficiency, comfort and cost. However, they have a strong desire for better, cheaper and more frequent service to more destinations.

The challenge is to position YKF to succeed by leveraging its existing assets rather than building additional infrastructure on a speculative basis. YKF will require new infrastructure (runway and terminal capacity) to achieve its potential, however this investment should be made in response to clear signals from the customers, air carriers and the provincial and federal Governments that additional services will be required. This Plan advocates that the Region of Waterloo carefully manage its risk by staging development in response to predetermined trigger points that correspond with the capacity limits of the current air terminal building. As capacity limits are reached, check-in, security and holding areas will become congested and customer experience will deteriorate. These development stages are described below in more detail.

The approach of this Master Plan will:

- Equip YKF to accommodate the passengers generated within its primary catchment area;
- Help attract and retain aviation companies to serve the local market;
- Position YKF as an essential reliever to increasing demand at TPIA;
- Help the Region of Waterloo manage risk associated with significant capital investments to support improved air service; and
- Help YKF attract and support a vibrant aeronautics cluster within the airport campus and associated Aviation Business Park.

Traditionally, airport master plans have based their development scenarios and related capital programs on a forecast of incremental growth in passengers and aircraft movements. This forecast is much easier to model for airports that have well established scheduled services to multiple destinations. It is very difficult for an airport like YKF that has little scheduled service and is located close to a major international airport like TPIA.

This Master Plan's approach is to manage risk for YKF and the Region of Waterloo, while positioning the airport to move quickly to support expanded air service if the opportunity presents itself. Each stage in the implementation of the Master Plan is initiated once the airport has achieved a specific level of passenger activity – described here as a “development trigger”. Meeting these targets provides confidence that YKF will achieve the growth projections of the next stage.

The first stage of development follows Council approval of the Master Plan. It is essentially a planning stage, in which the Region of Waterloo plans for growth that could arise as a result of the launch of new airline service at YKF. Subsequent stages are initiated in response to passenger growth triggers that correspond with the deterioration of service quality as a result of passenger congestion in the existing terminal facilities. At each stage, Regional Council considers the decision to proceed with expansion based on demand forecasts and commitments of support from Provincial and Federal governments. With each trigger, a positive decision by Regional Council results in the initiation of both capital works for that stage of development, and planning for subsequent stages. In this way, the Master Plan presents a flexible strategy that allows the Airport to respond to changing market conditions and partnership opportunities.

DEVELOPMENT STAGE NO. 1 – PRE-PLANNING FOR GROWTH

Trigger – Regional Council Approval of Master Plan

Upon Regional Council approval of the Airport Master Plan in early 2017, implementation of Development Stage No. 1 (as shown in [Table C-1](#)) will begin. This stage is linked to the current capacity of the Airport Terminal Building (ATB) and is consistent with previous Region of Waterloo Council direction to protect YKF for immediate and future growth scenarios. The following processes will take place:

- Planning, assessing and protecting the Airport's ability to grow when other stages are implemented;
- Federal Aeronautical Zoning studies for both the proposed third runway and the extension of Runway 14-32 and Runway 08-26 will be undertaken and potentially registered;
- Conceptual and detailed designs and environmental assessment for both the Runway 14-32 Extension and the Air Terminal Expansion (accommodating up to 500,000 Annual Passengers) will be completed;
- Assess the strategic acquisition of land and a review of all environmental constraints for each development will be undertaken;
- A continuation of the development associated with the existing serviced lands; and
- A preliminary review (both from a layout and environmental assessment perspective) of Rail Connectivity between YKF and TPIA will commence.

This stage is tied to the approval of the Master Plan and is predicated on the existing passenger numbers at YKF.

Development Stage No. 1 is designed to ensure YKF is thoroughly protected and prepared for business growth when future opportunities arise. By implementing zoning studies, design documents, and infrastructure assessments, YKF will be able to quickly react to a potentially fast-moving airline opportunity. Additionally, implementing this stage will allow YKF to meet the KPMG Region of Waterloo Service Review (refer to [Appendix G](#)) recommendation that identified the Airport needed to “optimize YKF's commercial value” and protect its lands for the future.

Capital costs for each pre-planning item associated with this stage are included in [Chapter H](#) of this report and outlined in the Airport Business Plan being completed in conjunction with this Master Plan.

The two main components of Development Stage No. 1 involve planning and preparing for the design for the expansion of the Air Terminal Building (ATB) and the detailed design for the extension of the secondary runway (14-

32). A thorough review of each item's requirements, feasibility, and ultimate configuration will ensure any future growth will be compatible, efficient, and expandable.

The design of the ATB to 500,000 Passengers (PAX) will be the first step in allowing YKF the opportunity to grow and accommodate any immediate passenger increase generated by new airline services. Having this ATB expansion designed and ready to proceed to construction would provide YKF with the ability to react in a timely and well-positioned way when the passenger volumes reach the projected future capacities. This expansion could be used as a marketing tool to attract new airlines, tenants, and businesses to YKF. For example, should a low-cost carrier want to use YKF as their base, having a plan in place that is "shovel ready" and expandable in the immediate future demonstrates the Airport's commitment to growth to both the Region and the aviation industry. This commitment could potentially lead to a situation similar to that which the Billy Bishop Toronto City Centre Airport and Porter relationship exemplified, in which a new airline – or potentially an existing airline flying out of Toronto Pearson International Airport – will have a viable option to consider with a known plan of action to expand. Being "shovel ready" is key, as conceptual and detailed design can take months – or sometimes years – to complete. Having proactive preparation in place provides airlines with opportunities to plan for the immediate future while the Region of Waterloo International Airport proceeds with the next steps in constructing this expansion, as outlined in the next development stage.

Prior to the commencement of the planning of the ATB expansion, a feasibility study will be conducted to determine whether the full build-out of the ATB will remain within the current footprint. An option to move to a completely new location (location yet to be determined) will also be explored and a decision made as to when this process would begin.

For the purposes of this Master Plan, all terminal expansions have been shown to occur on the southern portion of the Airport site, as this area is fully serviced and the site of the current ATB. Should it be determined that the new ATB be built on an alternative site (with more land availability), all subsequent stages would include additional initiatives related to site servicing and site access to and from the new terminal site. In addition all subsequent terminal expansions shown in the future stages will still apply (but now in a new location on Airport property)

A parallel assessment of the feasibility of extending passenger rail service from the future Breslau GO Station a future Region of Waterloo International Airport's Air Terminal Building should also be under taken in this stage of the Master Plan. Both YKF and Toronto Pearson International Airport are located 2.5 km from the Kitchener Line in the GO transit system. Toronto Pearson is promoting increased transit connectivity through a future multi-modal hub located adjacent to its terminal buildings. As recently outlined in the paper **PEARSON CONNECTS: A MULTI-MODAL PLATFORM FOR PROSPERITY** released by the GTAA in February 2016, stating "[a] key component of a Pearson Hub would be direct connections by high quality regional transit service. The specific mode of such connections would need close study and would evolve over time. In the long term, considerations should be given to the role of the Metrolinx-operated Kitchener GO rail line, which runs approximately three kilometres to the northeast of the Toronto Pearson terminals, and could provide rail integration either directly at a transit hub or through an airport-controlled people mover." The accessibility of rail transit infrastructure to YKF creates a unique opportunity to position this airport as a primary reliever airport for TPIA. In the long run, a future terminal building at YKF should have the ability to connect to this larger intercity/inter-airport rail transit system if necessary. The Region of Waterloo Transportation Master Plan, currently underway, will also review opportunities to connect YKF to the Region of Waterloo transit system.

A detailed design and environmental assessment of the Runway 14-32 extension, including all taxiway extension and lighting upgrades, is critical at this stage, as it would provide YKF with a useful secondary runway option for airlines to consider. The current thought is to extend the runway for a total of approximately 2,133 metres (7,000 feet); however, a runway planning and zoning exercise would ultimately determine the optimum length.

Runway 14-32 currently accommodates light general aviation aircraft and flight training activity. However, to improve the overall utilization of the Airport, it is essential to extend the runway and provide a viable cross-wind runway option for any potential scheduled airline service. Under extreme cross-wind conditions or combinations of low friction and cross-wind conditions where Runway 08-26 cannot be utilized, the extension of Runway 14-32 would provide a viable alternative. Additionally, Runway 14-32 could accommodate scheduled service if it becomes necessary to shut down Runway 08-26 for maintenance purposes or during the proposed expansion. The extension of Runway 14-32 is an important step in improving the Airport's credibility and ultimate positioning within the airline industry, both with regards to its ability to expand passenger service and to become a prime location for diversions.

With the potential land acquisition, new zoning requirements, and the need to address environmental design challenges, the planning and design of this extension will take time to complete. It is therefore essential to proceed with these processes immediately upon approval of the Master Plan so it can be constructed in line with any ATB expansion and proceed without delay.

In addition to the three main components identified above, Development Stage No. 1 also includes the following action items:

- Begin the zoning process for the Runway 14-32 and 08-26 extension;
- Review federal, provincial, and other sources of funding to support short-term capital projects;
- Continue to develop existing serviced lands on Airport property based on demand;
- Assess the need to purchase additional land for future development;
- Commence master land use and servicing plan for Airport; and
- A preliminary review of Rail Connectivity between YKF and TPIA

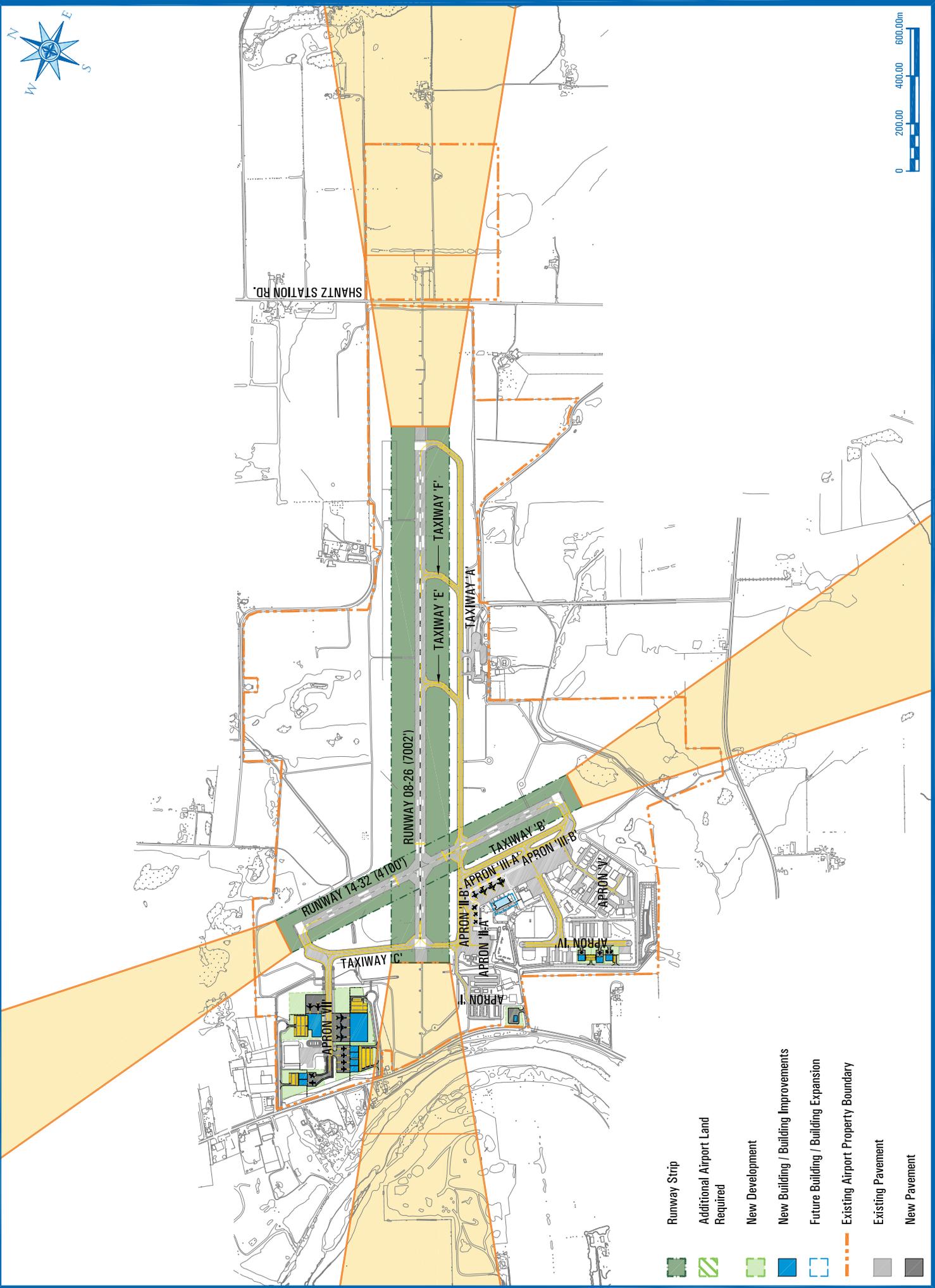
Table C-1 references all recommended items for moving forward with of Development Stage No. 1.

Table C-1 | Development Stage No. 1 – Pre-Planning for Growth | Trigger – Regional Council Approval of Master Plan – Spring 2017

CONSTRAINT/ PRESSURE/NEED	RESULTING ACTION	OTHER FACTORS FOR CONSIDERATION
<ul style="list-style-type: none"> • Immediate need to protect for future growth surrounding the Airport • Enhance reliability in adverse conditions 	<ul style="list-style-type: none"> • Commence zoning process for Runway 14-32 and 08-26 extension (including by-law regulations for maximum building heights in areas surrounding the Airport) • Initiate Third Runway Study including zoning implications • Conduct an environmental assessment for both Runway 14-32 and Runway 08-26 extensions • Design Runway 14-32 for precision approach • Coordinate Transportation upgrade requirements with Regional Transportation Master Plan • Commence a preliminary review (both from a layout and environmental assessment perspective) of Rail Connectivity between YKF and TPIA 	<ul style="list-style-type: none"> • TPIA has experienced capacity issues. This creates opportunities for YKF and infrastructure expansion will help facilitate this opportunity • YKF could become a viable diversion airport for carriers with two usable runways • Enhance the southern Ontario transit initiatives and provide "connectivity" between Airports • Ensure compliance and coordination with the Regional Transportation Master Plan that is currently on-going

CONSTRAINT/ PRESSURE/NEED	RESULTING ACTION	OTHER FACTORS FOR CONSIDERATION
	<ul style="list-style-type: none"> Initiate the Official Plan Amendment process to consider the implementation of the Airport Noise Protection Area 	
<ul style="list-style-type: none"> Immediate need to pursue funding available from external sources to offset costs 	<ul style="list-style-type: none"> Review of federal, provincial and other sources of funding to support short-term capital projects 	<ul style="list-style-type: none"> New infrastructure programs may be available from the provincial and federal levels of government in 2016-17
<ul style="list-style-type: none"> Immediate need to finalize terminal expansion readiness plan in the event of additional passenger growth 	<ul style="list-style-type: none"> Reassess feasibility of expanding existing terminal building vs. relocating terminal building to new site Commence concept /design of terminal expansion to 500,000 PAX Review environmental impacts for future Terminal Expansions (including developing engineered mitigations / solutions). 	<ul style="list-style-type: none"> Executive decision – terminal development existing site vs. other site (south site will be limited for future expansion) Traffic release from TPIA and/or pursuing new airline service Low-cost carriers launch service in Canada
<ul style="list-style-type: none"> The East Side Lands MESP is currently underway which will have servicing impacts to the Airport and bring surrounding lands to a state of development readiness 	<ul style="list-style-type: none"> Continue to develop existing serviced lands on Airport property based on demand Explore the purchase of additional land for future development Commence master land use and servicing plan for Airport 	<ul style="list-style-type: none"> Reserve lands for future Airport development before lands are zoned for commercial development

The following **Figure C-1** shows YKF's proposed site plan incorporating the options identified in Development Stage No. 1.



- Runway Strip
- Additional Airport Land Required
- New Development
- New Building / Building Improvements
- Future Building / Building Expansion
- Existing Airport Property Boundary
- Existing Pavement
- New Pavement



Development Stage No. 1 Airport Site Plan **Figure C-1**

DEVELOPMENT STAGE NO. 2 – SECONDARY RUNWAY EXTENSION AND TERMINAL EXPANSION TO 500,000 ANNUAL PASSENGERS

Trigger – YKF Hits 250,000 Annual Passengers

Development Stage No. 2 is projected to be implemented upon a degradation of the Level of Service (LOS) of the existing Air Terminal Building (ATB). This translates to approximately 250,000 Annual Passengers (PAX) but also depends on the airline schedules operating at YKF. The existing ATB has been designed to accommodate approximately 250,000 PAX but this number is subject to airline slots and the timing of each flight. YKF should maximize the functionality of the ATB, including technology upgrades (Common Use technology – i.e. methods that multiple airlines use to process passengers), but any degradation of the LOS would result in implementation of Development Stage No. 2. The estimated timeline, which has been carried forward in the Region of Waterloo International Airport Business Plan, is 2019. As TPIA continues to grow, the likelihood that the airlines will need to diversify their operation at TPIA becomes increasingly inevitable.

The two main components of this stage revolve around the construction of the previously designed Runway 14-32 extension (including all associated taxiways, service roads and lighting) and the construction of the ATB expansion, including apron improvements and expansions. These two items will be staged to allow the Airport to continue to grow while still completing the additional items identified in [Table C-2](#).

The design of the Runway 08-26 extension, including all taxiway extensions and lighting upgrades, would provide YKF and its users with additional flexibility to operate larger and newer aircraft types that require a longer runway. The additional length would enhance airport safety and allow aircraft to operate under more extreme weather conditions, such as wet weather or ice, where the Canadian Runway Friction Index (CRFI) is low. Preliminary estimates show a total of approximately 2,663 metres (8,737 feet); the runway planning and zoning exercise will ultimately determine the optimal length for this runway. The total length shown in [Figure C-2](#) utilizes the existing land owned by the Region; however, should a longer length be required, additional land acquisition is recommended. Specific requirements will be determined during the planning and detailed design stages.

In addition to implementation of these two major construction activities, the planning and design of the Runway 08-26 extension (including a review of all options to deal with the Shantz Station Road crossing) and the next ATB Expansion will be conducted to protect YKF for the next contemplated expansion. These design assignments will be supplemented by minor infrastructure improvements, such as surface parking improvements, development of existing serviced lands, and any facility improvements to coincide with this development.

The next stage of the ATB expansion (up to 1,000,000 annual passengers) will result in a shift regarding how the current ATB operates, including the first expansion up to 500,000 PAX. Growing to this potential passenger traffic level will trigger a two-level concept (arrivals and departures on separate levels) for the ATB and subsequently a major rework of the existing ATB. It is critical to implement a thorough detailed phasing plan so passengers are not negatively impacted by any disruption during this expansion. This concept would allow the Airport to introduce significantly more retail and concession opportunities, earning increased revenue while providing passengers with a better experience, such as passenger boarding bridges, food and beverage options, Duty Free and additional retail options.

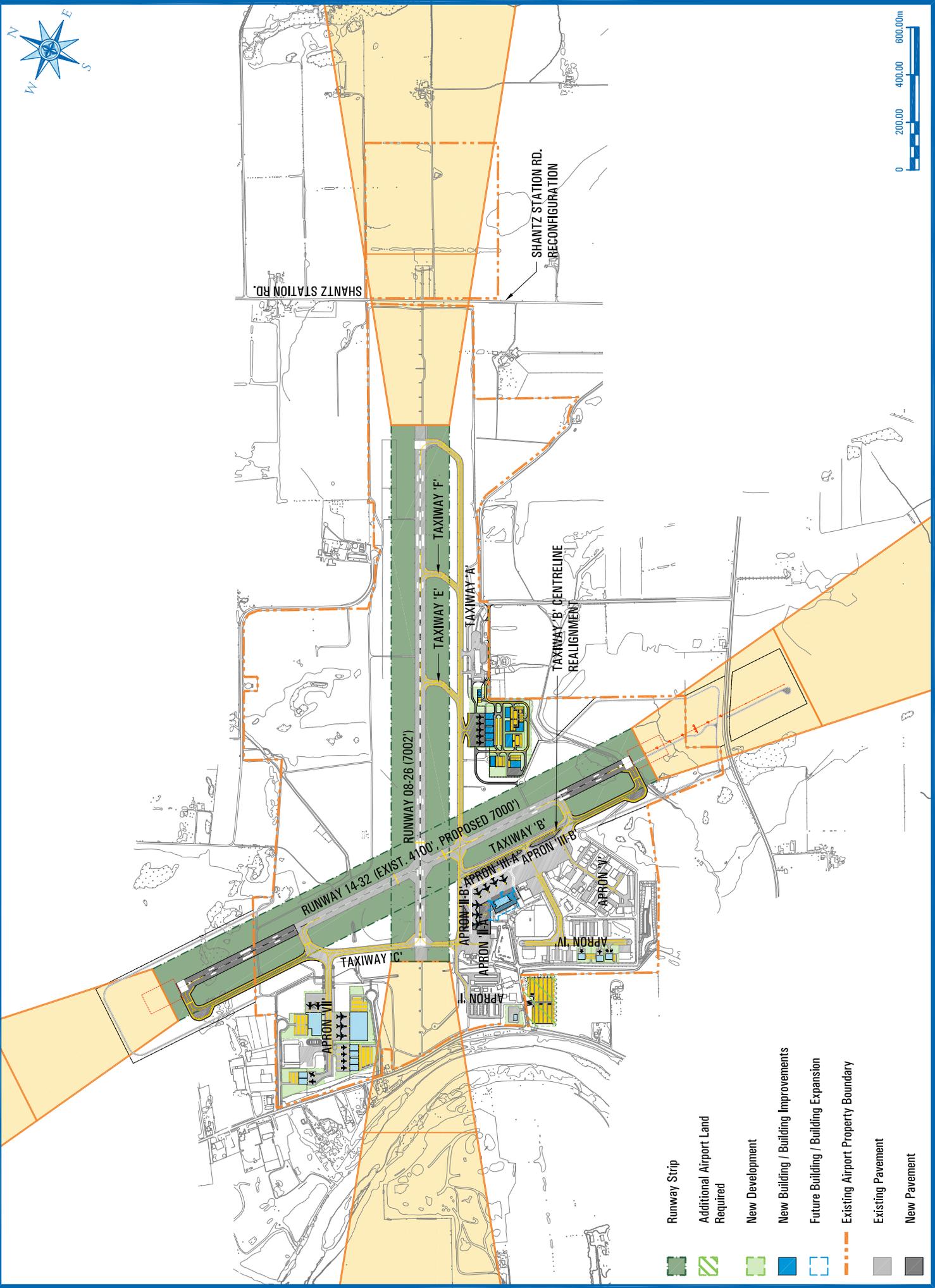
As the existing Air Traffic Control Tower will be demolished in 2017, the next stage of the ATB expansion can proceed with relative ease as all the required land and areas are already in place and available for immediate use. A new and expanded terminal apron will be required and will be incorporated into the future design.

It is anticipated that projects would be carried out over a five to seven-year timeframe but will be driven by YKF growth projections.

Table C-2 | Development Stage No. 2 – Secondary Runway Extension and Terminal Expansion to 500,000 Annual Passengers
| Trigger – YKF Hits 250,000 Passengers

CONSTRAINT/PRESSURE/NEED	RESULTING ACTION	OTHER FACTORS FOR CONSIDERATION
<ul style="list-style-type: none"> • Immediate need to protect for future growth surrounding the Airport • Enhance reliability in adverse conditions 	<ul style="list-style-type: none"> • Purchase land identified as required (i.e. for future vehicle parking) • Construct Runway 14-32 extension (including taxiway extensions and approach lighting) • Design Runway 08-26 extension to 2,663 m (8,737 feet) including associated taxiways and approach lighting • Review Shantz Station Road reconfiguration options including a full traffic analysis of the roads in the surrounding area and an environmental review • Coordinate Transportation upgrade requirements with Regional Transportation Master Plan • Design runway / taxiway / apron clearances and widths to accommodate AGN-IV aircraft • Continue to explore Rail Connectivity options and expand on Stage 1 findings 	<ul style="list-style-type: none"> • TPIA has experienced capacity issues; this creates opportunities for YKF and infrastructure expansion will help facilitate this opportunity • Takeoff and Landing Performance Assessment (TALPA) regulations will drive longer runways • Noise benefits over City of Kitchener • Potential new high-speed train in Breslau directly to and from TPIA, solidifying the position of a second airport in the Toronto Region
<ul style="list-style-type: none"> • Immediate need to expand terminal building to accommodate passenger growth beyond 250,000 PAX 	<ul style="list-style-type: none"> • Design and construct Apron II expansion • Construct new terminal expansion (up to 500,000 PAX) including associated apron expansion • Increase available surface parking • Commence planning and design for ATB expansion (up to 1,000,000 PAX) • Review environmental impacts for future Terminal Expansions (including developing engineered mitigations / solutions). 	<ul style="list-style-type: none"> • Traffic release from TPIA and / or pursuing new airline services
<ul style="list-style-type: none"> • Increasing demand for lot development due to growth around Airport 	<ul style="list-style-type: none"> • Continue to develop existing serviced lands on Airport property based on demand 	<ul style="list-style-type: none"> • Toronto Buttonville closure • East Side Land availability

Figure C-2 shows projected impacts that Development Stage No. 2 has on the Airport.



- Runway Strip
- Additional Airport Land Required
- New Development
- New Building / Building Improvements
- Future Building / Building Expansion
- Existing Airport Property Boundary
- Existing Pavement
- New Pavement



Development Stage No. 2 Airport Site Plan

Figure C-2

DEVELOPMENT STAGE NO. 3 – PRIMARY RUNWAY EXTENSION AND TERMINAL EXPANSION TO 1,000,000 ANNUAL PASSENGERS

Trigger – YKF Hits 500,000 Annual Passengers

Development Stage No. 3 is projected to be implemented upon a degradation of the Level of Service (LOS) of the existing expanded Airport Terminal Building. This is expected to happen when YKF reaches approximately 500,000 PAX but also involves the airline schedules operating at YKF. Any degradation of the acceptable LOS will result in Development Stage No. 3 being implemented. The estimated timeline which has been carried forward in the Business Plan is approximately 2025.

Table C-3 provides a detailed breakdown of the items associated with this development.

Development Stage No. 3 is the most transformational portion of the proposed development and shifts YKF into a new dynamic level in the aviation world. A further expansion of the ATB to accommodate 1,000,000 PAX will be constructed and phased in over the timeline of this stage. Along with this new ATB, Runway 08-26 will be extended to 2,663 m (8,737 feet), including all associated taxiways and approach lighting, and the realignment or tunneling of Shantz Station Road. One million annual passengers is the equivalent of approximately 11 daily Boeing 737-800 flights.

Given YKF's projected growth, the Airport will need to accommodate larger aircraft. Accordingly, the classification of the Airport will need to advance to an AGN IV level Airport, thereby allowing aircraft up to a Boeing 767 type (formerly Code D type aircraft) to operate at YKF, which will in turn help offload some of the passenger constraints at TPIA. As a result of this change in design aircraft, all airfield infrastructure will need to be modified. The majority of change initiatives will focus on widening of taxiways, which creates the greatest impact.

YKF's increase in annual traffic would require the entire Regional transportation network to be revisited. As such, this stage needs to be identified as part of the overall Regional Transportation Master Plan. Both vehicular traffic and rail transit will need to be accounted for when finalizing the regional transportation plans.

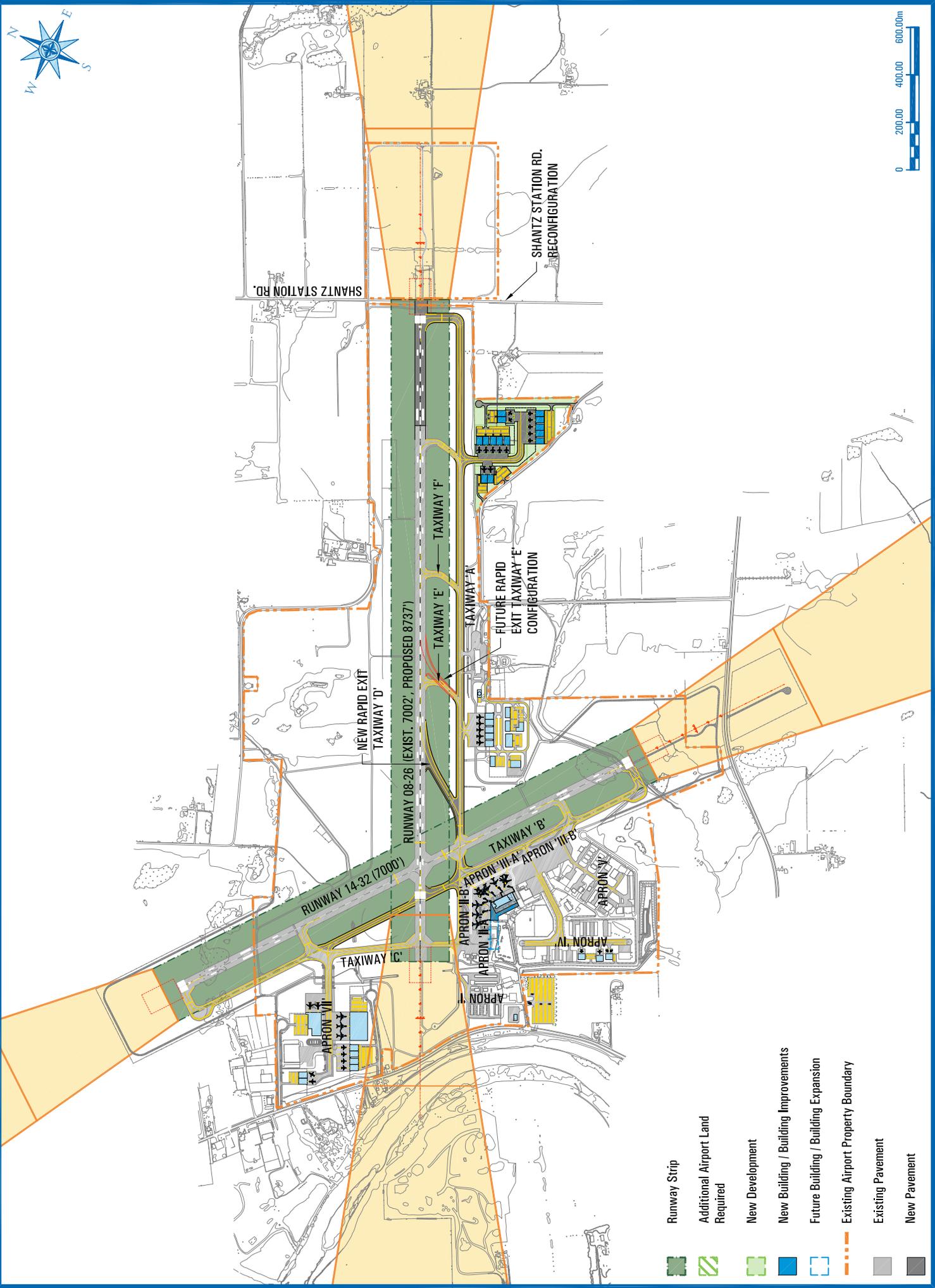
All other connectivity studies and improvements completed between the southern Ontario Airport systems prior to this stage will form the baseline moving forward. All transit improvements specifically related to YKF will be implemented to address the increase in passenger traffic such that they have additional transit options available to them.

The next ATB expansion will potentially require the displacement of existing hangars if it is expanded in its current location on the south side of the Airport. Therefore, negotiations need to begin to relocate these facilities to other locations around the Airport. Concurrently, the planning and design for the next ATB expansion will be completed and will incorporate additional land development areas within the Airport to house these relocated facilities.

Table C-3 | Development Stage No. 3 – Primary Runway Extension and Terminal Expansion to 1,000,000 Annual Passengers | Trigger - YKF Hits 500,000 Passengers

CONSTRAINT/PRESSURE/NEED	RESULTING ACTION	OTHER FACTORS FOR CONSIDERATION
<ul style="list-style-type: none"> • Immediate need to protect for future growth surrounding the Airport • Enhance reliability in adverse conditions 	<ul style="list-style-type: none"> • Purchase land identified as required (i.e. for future landside development) • Construct approved Shantz Station Road reconfiguration • Review the Regional Transportation Master Plan to incorporate necessary transportation requirements for continued expansion of the Airport • Construct partial Taxiway 'B' • Construct Runway 08-26 extension to 2,663 m (8,737 feet) including associated taxiways and approach lighting • Widen existing taxiways to accommodate AGN-IV aircraft • Coordinate Transportation upgrade requirements with Regional Transportation Master Plan • Implement Rail Connectivity options and expand on Stage 2 findings 	<ul style="list-style-type: none"> • TPIA has experienced capacity issues. This creates opportunities for YKF • Takeoff and Landing Performance Assessment (TALPA) regulations will drive longer runways • Runway End Safety Area (RESA) regulations • Advocate for high speed rail in the London-Waterloo-Toronto corridor
<ul style="list-style-type: none"> • Immediate need to expand terminal building to accommodate passenger growth beyond 500,000 PAX 	<ul style="list-style-type: none"> • Construct new terminal expansion (up to 1,000,000 PAX) • Begin negotiations with existing tenants in vicinity of terminal expansion for future relocation • Design future terminal building expansion (including associated apron expansion) to accommodate a total of 2,000,000 PAX (in two additional 500,000 increments) • Review environmental impacts for future Terminal Expansions (including developing engineered mitigations / solutions). • Design new landside configuration (roads and parking) 	<ul style="list-style-type: none"> • Traffic release from TPIA and / or pursuing new airline service • Pursue U.S. Customs and Border Protection (CBP) pre-clearance facilities for passengers and General Aviation (GA) traffic
<ul style="list-style-type: none"> • Increasing demand for lot development due to growth around Airport 	<ul style="list-style-type: none"> • Continue to develop existing serviced lands on Airport property based on demand 	

Figure C-3 provides further details on this development stage.



Development Stage No. 3 Airport Site Plan

Figure C-3

DEVELOPMENT STAGE NO. 4 – TERMINAL EXPANSION TO 1,500,000 ANNUAL PASSENGERS

Trigger – YKF Hits 1,000,000 Annual Passengers

Development Stage No. 4 is projected to be implemented upon a degradation of the Level of Service (LOS) of the existing ATB. This is expected to happen when YKF achieves approximately 1,000,000 PAX. Any degradation of the acceptable LOS will result in this stage being implemented. The estimated timeline, which has been carried forward in the Business Plan, has been shown to be 2030. **Table C-4** provides a detailed breakdown of the components associated with this development.

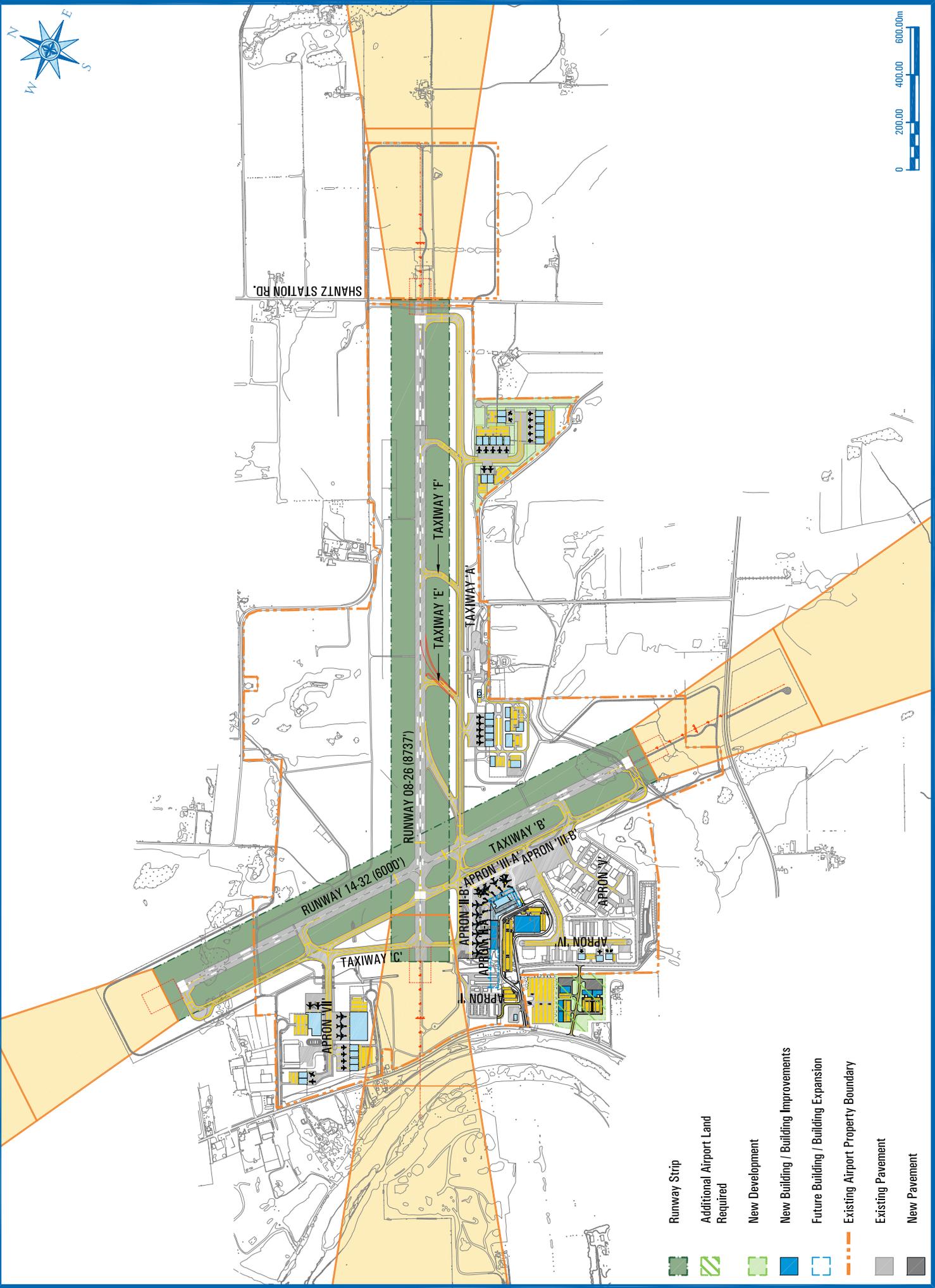
The two main components for Development Stage No. 4 revolve around the construction of the next stage of the ATB Expansion (which will accommodate an additional 500,000 PAX) and the construction of the revised landside road and parking network. These two items will be staged to allow the Airport to continue to grow while still completing the other items identified in **Table C-4** below.

Given the significant impact that the ATB expansions will have on the existing developments, newly purchased lands will have needed to be developed to house these relocated facilities, including hangars and parking.

It is anticipated that the components of this stage would be carried out over a five to seven-year window; however, they will be driven by both YKF and TPIA growth projections. The next ATB expansion will require the displacement of existing businesses so negotiations need to begin to relocate these facilities to other locations around the Airport. While this is ongoing, the planning and design for the next ATB expansion will be completed. **Figure C-4** provides more details on this stage.

Table C-4 | Development Stage No. 4 – Terminal Expansion to 1,500,000 Annual Passengers | Trigger - YKF Hits 1,000,000 Passengers

CONSTRAINT/PRESSURE/NEED	RESULTING ACTION	OTHER FACTORS FOR CONSIDERATION
<ul style="list-style-type: none"> Immediate need to protect for future growth surrounding the Airport 	<ul style="list-style-type: none"> Review additional land acquisition requirements Continue implementing Rail Connectivity options and expand on Stage 3 findings 	<ul style="list-style-type: none"> TPIA has experienced capacity issues. This creates opportunities for YKF
<ul style="list-style-type: none"> Immediate need to finalize terminal expansion readiness plan in the event of additional passenger growth 	<ul style="list-style-type: none"> Relocate existing tenants within terminal expansion footprint Construct new terminal building expansion and associated apron to accommodate additional 500,000 PAX Construct new landside configuration Design new parking structure Commence negotiations with tenants for relocation to new facility Design new south terminal building expansion (additional 500,000 PAX) Review environmental impacts for future Terminal Expansions 	<ul style="list-style-type: none"> Local roadway system must be reconfigured to support higher volume of traffic to and from the Airport
<ul style="list-style-type: none"> Increasing demand for lot development due to growth around Airport 	<ul style="list-style-type: none"> Develop newly purchased lands based on demand 	<ul style="list-style-type: none"> General aviation/corporate traffic from TPIA East Side Lands available



- Runway Strip
- Additional Airport Land Required
- New Development
- New Building / Building Improvements
- Future Building / Building Expansion
- Existing Airport Property Boundary
- Existing Pavement
- New Pavement



Development Stage No. 4 Airport Site Plan

Figure C-4

DEVELOPMENT STAGE NO. 5 – NEW PARKING STRUCTURE AND TERMINAL EXPANSION TO 2,500,000 ANNUAL PASSENGERS

Trigger – YKF Hits 1,500,000 Annual Passengers

Development Stage No. 5 is projected to be implemented upon a degradation of the Level of Service (LOS) of the existing ATB. This is expected to happen when YKF reaches approximately 1,500,000 PAX. Any degradation of the acceptable LOS will result in Development Stage No. 5 being implemented. The estimated timeline, which has been carried forward in the Business Plan, has been shown to be 2034. **Table C-5** provides a detailed breakdown of the components associated with this development.

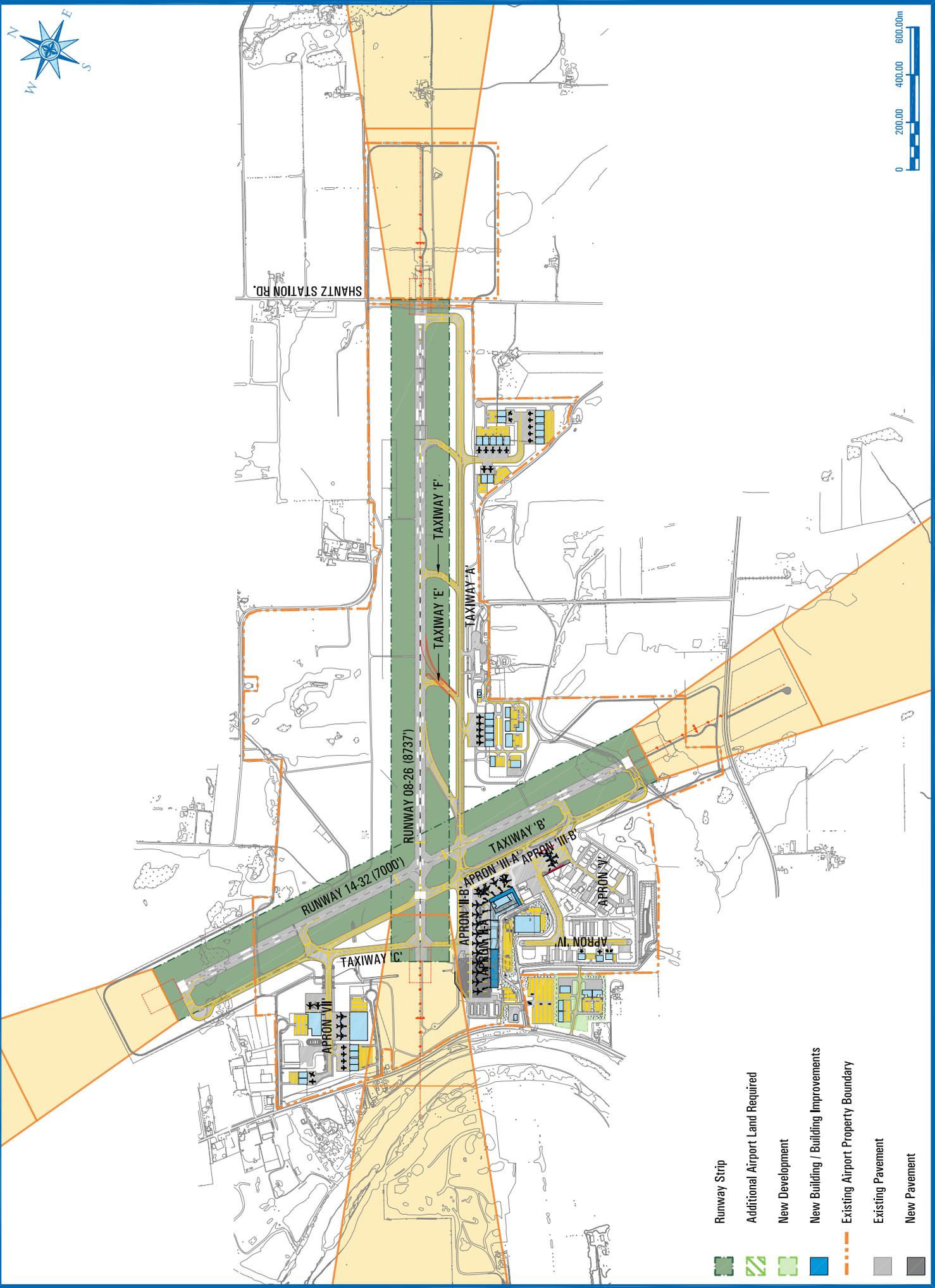
The two main components for this stage revolve around the construction of the next two stages of the ATB expansion (which will accommodate an additional 1,000,000 PAX) and the construction of a new above-ground parking structure. These two items will be staged to allow the Airport to continue to grow while still completing the other items identified in **Table C-5** below.

It is anticipated that these two components of this stage would be carried out over a three to five-year timeframe but will be driven by actual growth at both YKF and TPIA. The next ATB expansion would require a review of the existing land available on the southern portion of the Airport site. It was recommended that as part of Development Stage No. 1, a feasibility study be undertaken to analyze expanding the existing ATB in its current location versus developing another site at the Airport, which could accommodate significantly more traffic. The results of this feasibility study will direct the location of the future ATB.

Figure C-5 provides more details on this stage.

Table C-5 | Development Stage No. 5 – New Parking Structure and Terminal Expansion to 2,500,000 Annual Passengers | Trigger - YKF Hits 1,500,000 Passengers

CONSTRAINT/PRESSURE/NEED	RESULTING ACTION	OTHER FACTORS FOR CONSIDERATION
<ul style="list-style-type: none"> Immediate need to finalize terminal expansion readiness plan to accommodate additional passenger growth 	<ul style="list-style-type: none"> Construct new south terminal building expansion and associated apron (additional 500,000 PAX – 2,000,000 PAX total) Construct new parking structure Construct new terminal building expansion and associated apron (additional 500,000 PAX – 2,500,000 PAX total) 	<ul style="list-style-type: none"> Local roadway system must be reconfigured to support higher volume of traffic to and from the Airport



-  Runway Strip
-  Additional Airport Land Required
-  New Development
-  New Building / Building Improvements
-  Existing Airport Property Boundary
-  Existing Pavement
-  New Pavement

Development Stage No. 5 Airport Site Plan

Figure C-5

DEVELOPMENT SUMMARY (GUIDELINES)

Stage No. 1 – Pre-Planning for Growth

ACTION
Commence zoning process for Runway 14-32 and 08-26 extension
Initiate zoning study for a third runway
Environmental assessment for both Runway 08-26 and Runway 14-32 extensions
Review of Federal, Provincial and other sources of funding to support short-term / long-term capital projects
Design Runway 14-32 for precision approach and 2,133 m (7,000 feet) in length
Commence concept/design of Airport Terminal Building expansion to 500,000 passengers
Continue to develop existing serviced lands on Airport property based on demand
Assess need to purchase additional land for future development
Reassess feasibility of expanding existing ATB vs. relocating ATB to new site
Commence Master Land Use and Servicing Plan for Airport
Commence a preliminary review of Rail Connectivity between YKF and TPIA

Stage No. 2 – Secondary Runway Extension and Terminal Expansion to 500,000 Annual Passengers

ACTION
Purchase land identified as required (i.e. for future vehicle parking)
Construct Runway 14-32 extension including taxiway extensions and approach lighting
Design Runway 08-26 extension to 2,663 m (8,737 feet) including associated taxiways and approach lighting
Review Shantz Station Road reconfiguration options
Design Runway/Taxiway/Apron clearances and widths to accommodate AGN-IV aircraft
Design and construct Apron II extension
Relocate existing utilities on Fountain Street
Construct new ATB expansion (up to 500,000 passengers) including associated apron expansion
Design new ATB expansion (including associated apron expansion) to accommodate 1,000,000 passengers
Increase available surface parking
Continue to explore Rail Connectivity options and expand on Stage 1 findings
Continue to develop existing serviced lands on Airport property based on demand

Stage No. 3 – Primary Runway Extension and Terminal Expansion to 1,000,000 Annual Passengers

ACTION
Purchase land identified as required (i.e. for future landside development)
Construct approved Shantz Station Road reconfiguration
Construct partial Taxiway Bravo (from Taxiway Alpha to Runway 14 end)
Construct Runway 08-26 extension to 2,663 m (8,737 feet) including associated taxiways and approach lighting
Widen existing taxiways to accommodate AGN-IV aircraft
Construct new ATB expansion (up to 1,000,000 passengers)
Begin negotiations with existing tenants in vicinity of ATB expansion for future relocation
Design new Airport Terminal Building expansion (including apron expansion) to accommodate 2,000,000 passengers (in
Design new landside configuration (roads and parking)
Continue to develop existing serviced lands on Airport property based on demand
Implement Rail Connectivity options and expand on Stage 2 findings

Stage No. 4 – Terminal Expansion to 1,500,000 Annual Passengers

ACTION
Review additional land acquisition requirements
Relocate existing tenants within Airport Terminal Building expansion footprint
Construct new ATB building expansion and associated apron to accommodate additional 500,000 passengers
Construct new landside configuration (roads and parking)
Design new parking structure
Commence negotiations with existing tenants impacted for relocation to new facility
Design new south ATB building expansion and associated apron expansion (additional 500,000 passengers)
Continue implementing Rail Connectivity options and expand on Stage 3 findings
Develop newly purchased lands based on demand

Stage No. 5 – New Parking Structure and Terminal Expansion to 2,500,000 Annual Passengers

ACTION
Construct new south ATB expansion and associated apron (additional 500,000 passengers – 2,000,000 total passengers)
Construct new parking structure
Construct new ATB expansion and associated apron (additional 500,000 passengers – 2,500,000 total passengers)



D. CAPACITY/DEMAND AND FACILITY REQUIREMENTS



CHAPTER D. CAPACITY / DEMAND AND FACILITY REQUIREMENTS

Conventional Airport Master Plans typically consider various components of the airport, analyzing the capacity / demand assessment and facility requirements based on forecasted aviation activity. However, the Region of Waterloo International Airport Master Plan differs from a “traditional” Airport Master Plan describing the facility requirements based on future passenger traffic volumes identified as trigger points. Descriptions of airfield capacity, airside design criteria requirements, terminal / space needs, landside facility needs, and support facility provided in this section analyze how capacity / demand and facility requirements can optimize the functionality and success of YKF both now and as the Airport grows in the future.

1. AIRSIDE

1.1 AIRFIELD CAPACITY

Airfield capacity analysis provides a numerical metric measure of the airfield’s (i.e. runways, taxiways, and taxiway connectors) inherent capability to accommodate the safe and efficient movement of aircraft activities. The capacity of the airfield is impacted by several factors, including the physical layout of the airfield, local prevailing meteorological conditions, aircraft fleet mix, runway utilization rates, percent of aircraft arrivals to each runway, relative level of aircraft touch-and-go activity on one or more of an airport’s runways, and the location of exit taxiways relative to the approach end of the runway. An airport’s airfield capacity is expressed in terms of Annual Service Volume (ASV) and represents a reasonable estimate of the maximum level of aircraft operations that can be accommodated in a year without induced aircraft operational delay.

The ability – or capacity – of the Region of Waterloo International Airport’s runway system to accommodate existing and future levels of operational demand was determined without detailed analysis based on the use of published Federal Aviation Administration (FAA) guidelines (commonly used in aviation industry to determine airfield capacity) as described in the [FAA ADVISORY CIRCULAR 150/5060-5, AIRPORT CAPACITY AND DELAY](#). The estimated ASV for the YKF’s runway configuration is in the range of 220,000 to 230,000 movements. Since the level of movements for the Airport indicates that existing and future aircraft movement activity levels will remain below this level, the capacity of the existing airfield system will not be reached; therefore, the airfield can meet movement demands without adverse effect to aircraft operations and without incurred operational delay, while maintaining the high level of general aviation and training activity it currently achieves. Consequently, the runway facility requirements analysis will concentrate on developing the appropriate facilities to improve safety and service considerations rather than operational capacity.

1.2 FUTURE AIRSIDE REQUIREMENTS

The Region of Waterloo International Airport’s ultimate goal is to be a fully-equipped, certified airport facility able to accommodate scheduled / charter passengers, air cargo facilities, business charter services, flight training,

recreational flying, and aviation-related industrial, commercial business and service facilities. To enhance the overall viability of the Airport, improvements to the airside system are required. These improvements will be reviewed in the following sections.

1.2.1 New Transport Canada TP 312 5th Edition Compliance

Effective September 15, 2015 [TRANSPORT CANADA TP312 AERODROME STANDARDS AND RECOMMENDED PRACTICES 5TH EDITION](#) became the standard document for airport design. In the previous editions of TP312, including the 4th Edition, airport design / infrastructure requirements were specified based on the physical characteristics of runway length and aircraft size. The new 5th Edition of TP312 revises this approach to associate airport design / infrastructure requirements with aircraft performance and type of operation, in addition to the physical characteristics of aircraft size.

Transport Canada indicates that TP312 5th Edition aims to address issues commonly experienced at Canadian aerodromes, including challenges associated with changing levels of service and the type of traffic using airport facilities. The modifications presented in TP312 5th Edition were created to ensure consistency in the operational concepts within North America and to harmonize, where possible, with current International Civil Aviation Organization (ICAO) specifications, the latest instrument procedure design criteria, and advances in airfield technology.

Notably, the TP312 5th Edition contains 'Standards' only. The recommendations previously contained in TP312 4th Edition have either been removed or adopted as standards. Where certain recommendations are found to be of use to airports in adopting a best practices approach, the information is released in the form of Advisory Circulars or simply by reference to ICAO Annexes and Aerodrome Design / Service Manuals.

The key principle of TP312 5th Edition is the certification level of service that will be established based on the largest aircraft using the site (factoring in dimensions and approach speed) or, in some cases, planned usage as declared by the airport operator. Runway length will no longer be of prime consideration in the overall concept. In the future, the certification level of service will be published in Aeronautical Information Publications for use by aircrews in determining the suitability of the aerodrome for the intended operation pursuant to Canadian Aviation Regulation 602.96(2b).

Transport Canada describes implementation of TP312 5th Edition over a three-year time period:

YEAR 1 – ENDING DECEMBER 31, 2016

- ▶ Transport Canada will publish the following Advisory Circulars:
 - Grandfathering at Airports pursuant to Canadian Aviation Regulations (CARs) 302.07;
 - Methodology for the identification of the Aircraft Group Number (AGN); and
 - Introduction of TP312 5th Edition.
 - 1) Identification of the Aircraft Group Number (AGN)
 - 2) Aeronautical publication changes
 - 3) Airport Operations Manual (AOM) changes
 - 4) Airport improvements following the introduction of TP312 5th Edition
- ▶ Airport operators are asked to commence identification of the AGN for each part of the manoeuvring area and include this information in the Airport Operations Manual prior to the end of 2017.

YEAR 2 – ENDING DECEMBER 31, 2017

- ▶ Transport Canada will publish Advisory Circulars in reference to CARs Parts VI, and VII – Changes to Aeronautical Information for certified aerodromes.
- ▶ Transport Canada will update Aeronautical Information Manual (AIM) and Aeronautical Information Publication (AIP)
- ▶ International Civil Aviation Organization (ICAO) to advise the international community of the introduction of the operational concept and the publication changes to aerodrome information.

YEAR 3 – ENDING DECEMBER 31, 2018

- ▶ Publication of airport certification level (AGN, level of service, aerodrome visibility) on a common Aeronautical Information Regulation and Control (AIRAC) date in the Canada Flight Supplement (CFS). This is planned to occur on AIRAC date of January 3, 2019. To achieve this publication date, airport operators are advised that all necessary information must be submitted to NAV CANADA prior to October 1, 2018.
- ▶ Convene a Focus Group for the first amendment to the 5th Edition.

Transport Canada has indicated that TP312 5th Edition will be enacted via [CARS SECTION 302.07 – OBLIGATIONS OF OPERATORS](#), which states:

302.07 (1) The operator of an airport shall:

- a) Comply
 - i. subject to subparagraph (ii), with the standards set out in the aerodrome standards and recommended practices publications, as they read on the date on which the airport certificate was issued,
 - ii. in respect of any part or facility of the airport that has been replaced or improved, with the standards set out in the aerodrome standards and recommended practices publications, as they read on the date on which the part or facility was returned to service, and
 - iii. with any conditions specified in the airport certificate by the Minister pursuant to subsection 302.03(3).

Section 302.07 is generally referred to as the “grandfathering” clause. Compliance with the most recent edition of TP312 has not typically been required until the operator undertakes the reconstruction, replacement or improvement of the specific facility (i.e. airfield electrical rehabilitation or taxiway reconstruction). Transport Canada has indicated that routine maintenance activities such as crack sealing and repaving are not considered triggers for compliance with the latest edition of TP312. Transport Canada has clarified in the [ADVISORY CIRCULAR \(AC\) NO. 302-018 GRANDFATHERING AT AIRPORTS PURSUANT TO CANADIAN AVIATION REGULATION \(CAR\) 302.07](#) as to what specific activities will trigger compliance with the TP312 5th Edition.

In addition to [AC NO. 302-018](#), the Transport Canada website provides the following Advisory Circulars (ACs) in order to clarify the implementation process and major changes of the new TP312 5th Edition:

- ▶ [AC NO. 302-021 INTRODUCTION OF TP312 5TH EDITION](#);
- ▶ [AC NO. 302-019 METHODOLOGY FOR THE IDENTIFICATION OF THE AIRCRAFT GROUP NUMBER](#); and
- ▶ [AC NO. 302-020 MIXED OPERATIONS AT AN AIRPORT](#).

1.3 AIRPORT PLANNING DESIGN CRITERIA

The airport planning and design criteria utilized in this Airport Master Plan are referenced in the Transport Canada TP312 5th Edition. Other reference documents such as Canadian Aviation Regulations (CARs) or ICAO Airport planning manuals were also used, as appropriate, to determine the estimates of the need for additional facilities and / or improvements.

1.4 AIRCRAFT GROUP NUMBER (AGN)

Airport design criteria are specified by the Aircraft Group Number (AGN), which consists of two components.

1. The first component is the Aircraft Approach Speed Category and is related to the approach speed of aircraft and provides information on the **operational characteristics** of aircraft using the airport.
2. The second component is the Aircraft Group Number (AGN) that is related to the wingspan, outer main gear span, and tail height of the aircraft and provides information regarding the **physical characteristics** of aircraft using the airport. The AGN is further divided into the runway and taxiway environment.

Tables D-1 through D-3 provides a listing of the Aircraft Approach Categories and AGNs based on runway and taxiway environment.

Table D-1 | Aircraft Approach Speed Category

CATEGORY	SPEED
A	Less than 91 knots
B	91 knots or more but less than 121 knots
C	121 knots or more but less than 141 knots
D	141 knots or more but less than 166 knots
E	166 knots or more

Source: TP312 Aerodrome Standards and Recommended Practices. 5th Edition, September 15, 2015.

Table D-2 | Aircraft Group Number – Runway Environment

AIRCRAFT GROUP NUMBER	WING SPAN	OUTER MAIN GEAR SPAN (A)
I (for approach speed category C or D use AGN IIIB)	Less than 14.94 m	Less than 4.5 m
II (for approach speed category C or D use AGN IIIB)	14.94 m up to but not including 24.10 m	4.5 m up to but not including 6 m
IIIA (for approach speed category C or D use AGN IIIB)	24.10 m up to but not including 36.00 m	6 m up to but not including 9 m
IIIB (includes Groups I - IIIA with C & D approach speeds)	24.10 m up to but not including 36.00 m	6 m up to but not including 9 m
IV	36.00 m up to but not including 52.12 m	9 m up to but not including 14 m
V	52.12 m up to but not including 65.23 m	9 m up to but not including 14 m
VI	65.23 m up to but not including 79.86 m	14 m up to but not including 16 m

(A) – Distance between the outside edges of the main gear wheels.

Source: TP312 Aerodrome Standards and Recommended Practices. 5th Edition, September 15, 2015.

Table D-3 | Aircraft Group Number – Taxiway Environment

AIRCRAFT GROUP NUMBER	WING SPAN	OUTER MAIN GEAR SPAN (A)	TAIL HEIGHT
I	Less than 14.94 m	Less than 4.5 m	Less than 6.10 m
II	14.94 m up to but not including 24.10 m	4.5 m up to but not including 6 m	6.10 m up to but not including 9.15 m
IIIA	24.10 m up to but not including 36.00 m	6 m up to but not including 9 m	6.10 m up to but not including 9.15 m
IIIB	24.10 m up to but not including 36.00 m	6 m up to but not including 9 m	9.15 m up to but not including 13.72 m
IV	36.00 m up to but not including 52.12 m	9 m up to but not including 14 m	13.72 m up to but not including 18.30 m
V	52.12 m up to but not including 65.23 m	9 m up to but not including 14 m	18.30 m up to but not including 20.12 m
VI	65.23 m up to but not including 79.86 m	14 m up to but not including 16 m	20.12 m up to but not including 24.40 m

(A) – Distance between the outside edges of the main gear wheels.

Source: TP312 Aerodrome Standards and Recommended Practices, 5th Edition, September 15, 2015.

1.5 IDENTIFICATION OF CRITICAL AIRCRAFT AND APPLICABLE RUNWAY / TAXIWAY DESIGN GEOMETRY STANDARDS

To properly plan future facilities at the Region of Waterloo International Airport, the most appropriate airport design criteria that are applicable to the AGN must be identified and applied by using a “Critical Aircraft.” The Critical Aircraft (or Design Aircraft) is defined as having the most demanding operational requirements with respect to the determination of movement area dimensions, and other aerodrome physical characteristics at the aerodrome or part thereof, which could be a single taxiway, runway, apron, runway end safety area, or an area of the aerodrome that includes a combination of these.

With anticipation of YKF pursuing a new role as being a reliever airport, for planning purposes the Critical Aircraft is identified as the Boeing 767-300ERW that is anticipated to operate at the airport on regular basis within the 20-year planning period.

The current AGN for the Region of Waterloo International Airport traffic is shown in [Table D-4](#) and is based on the aircraft mix currently utilizing the airport.

The existing design aircraft (as identified in the AOM) is the B737-900. The new proposed design aircraft B767-300ERW is one classification higher than the existing design aircraft due to its size, weight and operational capabilities. However, the impacts on airfield geometry are minimal and mostly relate to taxiway widening and pavement thickness that would be addressed when next pavement rehabilitation is scheduled for both runways and taxiways.

Table D-4 | Summary of Critical Aircraft Data, Existing Fleet and Respective Aircraft Group Number

A/C TYPE	WINGSPAN	OUTER MAIN GEAR SPAN (A)	TAIL HEIGHT	APPROACH SPEED (KNOTS)	AGN (RWY)	AGN (TWY)	ALR (MAX.)
B767-300ERW	50.9 m	10.9 m	16.0 m	145	IV	IV	10.9
B737-900	34.3 m	7.0 m	12.6 m	141	IIIB	IIIB	10.7
B727-200	32.9 m	7.1 m	10.6 m	133	IIIB	IIIB	11.3
Q400	28.4 m	9.6 m	8.3 m	129	IIIB (All Except RWY Width) IV (RWY Width)	IIIB (All Except TWY Width & Gear Clearance) IV (TWY Width & Gear Clearance)	6.4
CRJ-900	24.8 m	5.0 m	7.3 m	141	IIIB	IIIA (All Except TWY Width & Gear Clearance) II (TWY Width & Gear Clearance)	7.7

(A) – Distance between the outside edges of the main gear wheels.

Source: TP312 Aerodrome Standards and Recommended Practices. 5th Edition, September 15, 2015.

FAA AC 150-5300-13A Airport Design, 2014.

Transport Canada Aircraft Load Ratings (ALRs). June 2004.

1.6 RUNWAYS

Transport Canada’s TP312 (both 4th and 5th Editions) recommend the actual length of an airport’s primary runway should be adequate to meet the operational requirements of the aircraft for which the runway is intended. This length should not be less than the longest length determined by applying the corrections for local conditions (i.e. elevation and temperature) to the operations and performance characteristics of the relevant aircraft. For YKF, the critical design aircraft moving forward will be the Boeing 767-300ERW.

1.6.1 Runway 08-26

Improvements to Runway 08-26 are recommended in order to:

- ▶ Provide Instrument Landing System (ILS) CAT I for Runway 08 end;
- ▶ Further enhance airport safety and reliability in all weather conditions by extending the runway towards the east;
- ▶ Attract larger, newer technology aircraft and additional airlines;
- ▶ Support TPIA as a reliever airport; and
- ▶ Further reduce noise concerns over the Kitchener area.

These proposed improvements are detailed below and shown on **Figure D-1** and **Figure D-2**. Approaches to Runway 08 are currently limited to non-precision standards of 251 feet and 1 mile visibility. By potentially displacing the existing threshold to the east (to be determined during detailed design) and installing the required high-intensity approach lighting system (SSALR) as well as the required instrument landing system (ILS), these minimums can be lowered to precision approach standards of 200 feet and a half mile. This modification will increase airport utilization during Instrument Meteorological Conditions (IMC) when winds favour Runway 08, which is during most storms impacting visibility.

Currently, the existing runway length can accommodate weight-restricted B767; however, there are restrictions that may be implemented in extreme weather conditions.

By extending the runway to 2,663 metres (8,737 feet), additional flexibility would be provided to aircraft operators to operate larger aircraft types that require a longer runway. The additional length would enhance airport safety and allow aircraft to operate under more extreme weather conditions, such as wet weather or ice, where the Canadian Runway Friction Index (CRFI) is low. The proposed 2,663 metres (8,737 feet) is the maximum length of runway that can be accommodated on existing airport property while providing approach lighting systems supporting ILS CAT I operations on both ends of Runway 08-26.

Other factors when considering the 2,663 metre (8,737 foot) runway are summarized as follows:

- ▶ Installation of the new SSALR for Runway 08 will require that several approach lights be installed within the GRCA Regulatory Limit and on the west side of Fountain Street. The necessary agreements will need to be in place prior to installing the SSALRs. It is anticipated that by the time this Runway is required to be extended, new GPS technology will be implemented to alleviate the land / GRCA constraints on the Runway 08 end;
- ▶ Extension of Runway 08-26 toward the east will require a relocation of the existing ILS system and precision approach path indicators (PAPI) for Runway 26 as well as a relocation of the existing Simplified Short Approach Lighting system with Runway alignment indicator lights (SSALR);
- ▶ The instrument approach procedures will need to be modified to take into account the new runway configuration;
- ▶ Taxiway Alpha will need to be extended toward the east to connect to the new threshold of Runway 26. To allow the Air Traffic Control (ATC) the flexibility to release Code C (AGN III) aircraft ahead of Code A (AGN I) aircraft, a holding bay is recommended at the new threshold of Runway 26;
- ▶ Runway End Safety Area (RESA) is required at both ends of the runway; 150 metres long and 90 metres wide; and
- ▶ Overall Airport zoning changes will need to be implemented to account for the two runway extensions as well as to provide protection for the potential third runway (subject to a separate analysis).

A review will be completed to determine the optimum Runway 08 Displacement (if any); however, as currently shown, the new declared distances will be as follows:

Table D-5 | New Declared Distances for Runway 08-26

DECLARED DISTANCES	RUNWAY 08	RUNWAY 26
TORA	8,737'	8,737'
TODA	9,721'	9,721'
ASDA	8,737'	8,737'
LDA	8,094'	8,737'

The Obstacle Limitation Surface (OLS) on the approach to Runway 08 will be improved by displacing the threshold of Runway 08 to the east. Issues with the existing trees on the west side of the property will be reduced or eliminated, while clearance over the residential area to the west will be improved. With respect to the OLS on the east end of the extended runway, preliminary analysis indicates that obstacles will not be an issue due to the flat terrain to the east. In addition, it should be noted that the airport already owns reserve lands on the east side of Shantz Station Road.

With an additional 1,735 feet added to Runway 08-26, it becomes feasible to improve aircraft takeoff and landing performance by existing medium-range aircraft and will limit existing payload restrictions. The additional runway length will offer air carriers operating existing aircraft (such as the B737-800) an opportunity to extend their range of operations and at maximum payload from YKF.

As part of the Runway 08-26 extension, RESA requirements and relocation of the Runway 26 approach lighting system, Shantz Station Road will need to be either tunneled or relocated. A separate study will be required to determine the appropriate option for Shantz Station Road, addressing the need for roadway access in conjunction with Regional transportation planners.

In addition to the Runway 08-26 extension, the existing airside perimeter roads will need to be reconfigured to account for the longer runway, as well as provide access to the relocated Runway 26 approach lighting system.

A longer runway length will also enable larger, heavier aircraft to utilize Runway 08-26 for operations to longer-haul destinations such as the Caribbean and the west coast of Canada and the U.S. Although larger wide-body aircraft such as the B767 may require additional apron and taxiway expansion, there is a distinct possibility that such aircraft could offer low-cost air carriers the opportunity to serve the Waterloo Region in future. With potential air traffic relieved from TPIA and other potential air carriers such as Air Canada Rouge or WestJet currently operating the B767 aircraft on long-haul, leisure destinations, such expansions and extensions could create significant competitive business advantages for YKF. [Table D-4](#) indicates a number of aircraft that could benefit from the extended runway operation at the Airport.

[Table D-4](#) is for general planning purposes and was developed from Aircraft Characteristics for Airport Planning publications provided by aircraft manufacturers. They are specifically for airport planning and do not substitute for a flight crew operations manual. Further analysis by the flight crew and dispatch departments of air carriers such as WestJet are required to calculate accurate airfield performance by carrier-specific aircraft to determine precise runway length calculations.

Factors that affect runway length required for the landing and take-off of aircraft include:

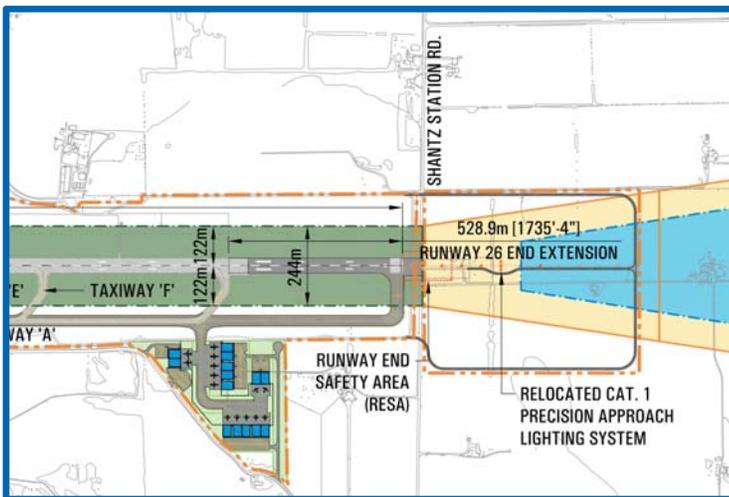
- ▶ Actual aircraft weight at take-off and landing
 - A heavier aircraft will require a longer runway
- ▶ Associated flap settings to increase lift or drag
- ▶ Stage length (or non-stop distance) to be flown
 - A longer stage length will require more fuel, and a longer runway
- ▶ Weather, particularly temperature and surface winds

- Increased temperatures require longer runway length
- Increase in head winds reduce required runway length
- Increase in tail winds will increase required runway length
- Wet, icy, or snowy runways will increase landing and take-off distance required and will significantly increase under new Takeoff and Landing Performance Assessment (TALPA) regulations in 2016.

With respect to pavement rehabilitation, the extension of Runway 08-26 which was undertaken in 2003 will need to be resurfaced in 2018 to 2020 assuming 15-year pavement life expectancy. The remaining portions of the runway were rehabilitated in 2012 and should therefore not need any rehabilitation until 2027 to 2029. All future pavement rehabilitation / reconstruction projects must consider the larger design aircraft that will be used at the airport (B767-300ERW), and the pavement structure should be designed accordingly to support this aircraft.

Based on discussion with YKF management, the Airport's Runway 08-26 extension to 2,663 metres (8,737 feet) is perceived as more attractive for diverting flights. It is perceived by future airlines as sufficient length for their potential aircraft fleet mix and market segment needs.

Figure D-2 | Proposed Runway 08-26 Extension Plan (inset)



1.6.2 Runway 14-32

Runway 14-32 currently accommodates light general aviation aircraft and flight training activity. Presently, it can accommodate smaller-type Code C (AGN III) aircraft; to improve overall utilization of the Airport, it is recommended that this runway be extended to 2,133 metres (7,000 feet). Details associated with this extension are shown on **Figure D-1** and **Figure D-3**.

Under extreme cross-wind conditions or combinations of low CRFI and cross-wind conditions where Runway 08-26 cannot be utilized, extension of Runway 14-32 would improve the overall effectiveness of the Airport. Additionally, Runway 14-32 could be utilized to accommodate scheduled service if it becomes necessary to shut down Runway 08-26, such as for maintenance purposes.

As 2,133 metres (7,000 feet) is considered a safe and viable length for the Boeing 737-900 under most weather conditions, the extension of Runway 14-32 to this length is therefore recommended. While this extension does not directly correlate with any of the passenger growth scenarios considered (as Runway 08-26 can accommodate all the existing and proposed air traffic), this extension is critical for the overall flexibility and operational effectiveness of the airport. All other comparable airports in the area have two useful runways for airline operations, and it is what airlines expect when they invest in a community.

Extension of Runway 14-32 would entail a 329.0 metre (1,080 feet) extension to the south and a 554.6 metre (1,820 feet) extension to the north. The southern extension of the runway has been maximized while maintaining minimum clearance requirements over Kossuth Road. It is anticipated that tree clearing / cutting will be required in the vicinity of the new thresholds of both runways, and that it will be necessary to bury the existing power lines adjacent to the threshold of Runway 32 on Kossuth Road.

The Runway 14-32 extension will directly impact existing provincially significant wetlands, including encroaching on engineered floodplains in these areas and impact a branch of Randall Drain. The north and south runway extensions will result in the removal of a portion of wetland and associated wildlife habitat, respectively. Given the existing alignment of Runway 14-32, avoidance of any impacts is not possible. Direct and indirect impacts may include: wetland removal, loss of wildlife habitat, habitat fragmentation, interference and / or changes to hydrologic conditions within wetland and adjacent units and hydrologic connectivity, light and noise impacts, increased 'edge' habitat and loss of interior habitats. A comprehensive review of the environmental constraints, impacts and potential mitigations will be completed during the detailed design process. Potential mitigations may include edge management plan(s), hydrologic connectivity measures (i.e. equalization culverts), ditching / diversion of water to maintain hydrologic conditions, realignment of Randall Drain, plant salvage, noise / light mitigation (pending health and safety assessment of potential mitigation measures), alignment options for the access route to the end of the runway, etc.

Property acquisition at the north end of the runway will be assessed in order to accommodate both the physical dimensions of the runway and required Runway End Safety Area (RESA), as well as to provide control over obstacles and trees within the Obstacle Limitation Surface (OLS and Approach lighting requirements supporting Precision Approach certification. Although sufficient length is available at the south end of Runway 32 to accommodate the proposed runway extension, additional property may be required in order to provide sufficient control over obstacles and trees under the OLS. It is recommended that the Region of Waterloo undertake the necessary analysis in the short term in order to explore the extent of property acquisition required for the Runway 14-32 extension.

Other considerations involved with extending Runway 14-32 will include:

- ▶ Taxiway Bravo will need to be extended to the south to the new threshold of Runway 32 while Taxiway Charlie will need to be extended to the north to the new threshold of Runway 14;
- ▶ Holding bays are recommended at the new thresholds of both Runway 14 and 32 in order to allow Code C (AGN III) aircraft to pass training type aircraft (AGN I) which often require more time prior to take-off to complete pre-take-off checks;
- ▶ Similar to Runway 08-26, a RESA is required at the new thresholds of Runway 14-32;
- ▶ The instrument approach procedures will need to be modified to take into account the new runway configuration;
- ▶ Airport re-zoning will be required to account for the new approach / take off surfaces (recommended in development stage No. 1).

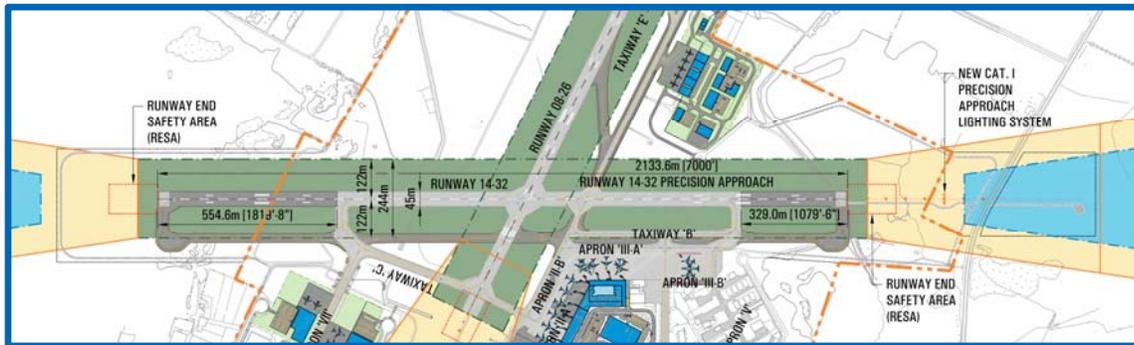
As part of the Runway 14-32 extension, the existing airside perimeter roads around the Runway 14 and 32 ends will need to be reconfigured to account for the additional runway length, as well as provide access to the new Runway 32 approach lighting system that will be installed.

It is recommended that Runway 14-32 be upgraded / certified to an instrument precision runway from its current non-precision status; therefore, it is recommended that a Simplified Short Approach Lighting system with Runway alignment indicator lights (SSALR) be installed on the Runway 32 end. The consideration of SSALR location and other visual aids and / or navigational aids will be revisited once 14-32 is extended.

Runway 14-32 was reconstructed in 2009 and based on a 15-year pavement life expectancy will need rehabilitation in the 2024 to 2026 timeframe.

To avoid departure noise over the community of Breslau, Standard Instrument Departure (SID) routes, also known as Departure Procedures (DP), are proposed to be published for Runway 32 departures for right turn to the north. The DPs are published flight procedures followed by aircraft on an IFR flight plan immediately after takeoff from an airport.

Figure D-3 | Proposed Runway 14-32 Extension Plan (inset)



1.6.3 Third Runway

As part of the Airport Master Plan and strategic consideration related to the growth of YKF, this process looked beyond the 20-year master planning period to determine which direction YKF may possibly grow in the future. Due to the natural barrier of the Grand River to the west and pockets of environmentally-sensitive areas to the northwest and to the south, the future growth and expansion of the airport would most likely occur in the northeast or east direction. Future airport development, specific to airfield expansion, in the northeast or north direction would most likely impose the least amount of social and environmental impacts. This includes, but is not limited to, the least amount of residential development, relatively undeveloped ground transportation infrastructure, and minimal socio-economic and industrial / commercial impacts. This strategic growth involves the possibility of a third runway. The previous Airport Master Plan completed in 2000 identified two airport development options related to an additional third runway. Both options identified the additional runway location in the east / northeast direction.

It is essential to maximize the capacity of the existing runways to delay the need for an additional runway. The improvements to Runway 08-26 and Runway 14-32 listed in [Sections 1.6.1](#) and [1.6.2](#) will allow the airport to function efficiently through the 20 year planning horizon; however, depending on the rate of passenger growth, and the ultimate role YKF becomes in the southern Ontario aviation market – a new runway may be needed to create additional capacity.

Given TPIA’s anticipated capacity shortfall and YKF’s potential to become a reliever airport, it is recommended that the Airport, from a strategic standpoint, assess the possibility of an additional runway. The Southern Ontario market is anticipating a 20M PAX shortfall over the next 20 years and the overall runway capacity available with the current runway configurations (including all extensions shown) will dictate whether a third runway should be protected for. It is also recommended that this assessment be considered as part of the development stage No. 1 to coincide with the potential relocation of the ATB to a new location. This assessment will include review all components of the potential third runway, including runway length, orientation, impacts to surrounding lands and potential environmental concerns. All studies will be completed in consultation with the Township of Woolwich and the City of Cambridge (and any other jurisdiction which may be impacted).

1.7 TAXIWAYS

Taxiways serve as an essential element of the airfield, as they segregate and expedite the movement of taxiing aircraft to and from the active runways. Taxiways may also be used to provide paved pathways to and from various activity areas of the airport such as Fixed Based Operators (FBOs), fuel farms, hangars, and apron areas. To provide

the greatest airfield capacity while reducing operational delays, it is desirable to construct and utilize taxiways that are parallel to the runways and to provide connector or exit taxiways at strategic locations. Apron-edge taxiways and / or taxilanes are also recommended to facilitate the optimum flow of aircraft in and around apron areas.

In determining airside requirements as part of this Airport Master Plan, the taxiway / taxilane design geometric standards are prescribed in TP312 5th Edition. For future development, the taxiway system should fully satisfy the minimum requirements supporting critical aircraft AGN IV standards.

1.7.1 Taxiway Alpha

The section of Taxiway Alpha that was extended in 2003 is currently approaching the end of its lifespan. It should require rehabilitation within the next five years, in conjunction with the rehabilitation of the corresponding section of Runway 08-26, which was constructed at the same time. The remaining sections of Taxiway Alpha were reconstructed in 2008 and 2009 and are in better condition. It is not anticipated that they will need rehabilitation until 2023 to 2025.

As shown in **Figure D-1**, Taxiway Alpha will need to be extended toward the east in order to provide access to the new threshold of Runway 26. As well, a holding bay is recommended in order to allow the Air Traffic Control Tower (ATCT) the flexibility to allow Code C aircraft departures to by-pass training aircraft that require more time prior to departure.

The current configuration of Taxiway Alpha is a 15 metre wide taxiway with 5 metre shoulders on both sides.

The separation between Runway 08-26 and Taxiway Alpha is currently 168 metres which exceeds the minimum requirement of 122 metres for an AGN IV (Code D) precision runway CAT I classification. Under the existing TP312 5th Edition standards, this runway to taxiway separation is adequate up to an AGN V, which is equivalent to Code E aircraft.

It is recommended that all future taxiways be expanded to 23 metres (75 feet) to support AGN IV operations. As a note, the 23 metre (75 feet) taxiway width also supports AGN V. This taxiway widening has been identified as being completed in development stage No. 3. In addition to the widening of taxiways, the pavement structure will need to be designed to accommodate the heavier B767-300ERW design aircraft.

1.7.2 Taxiway Bravo

Taxiway Bravo, which provides access to Runway 32 threshold, is presently in good condition, as it was fully reconstructed in 2008.

As shown on **Figure D-1**, Taxiway Bravo will be extended toward the south in order to provide access to the new threshold of Runway 32. It is recommended that the holding bay at the existing threshold of Runway 32 be relocated in conjunction with the extension of Taxiway Bravo.

Access to the new Runway 08 threshold will be provided by extending Taxiway Bravo to the north.

Consideration will be given to the taxiway-runway spacing requirements when upgrading Runway 14-32 to ILS CAT I classification. The expanded and later reconstructed Air Terminal Building will be located such that sufficient clearance is maintained to protect for a Code 4 (AGN IV) runway to taxiway separation and to provide a dual taxiway / taxilane system to relieve a potential congestion in the apron / taxiway maneuvering area, as well as to serve as a by-pass for taxiing aircraft utilizing parallel Taxiway Bravo supporting Runway 14-32 activities.

Similarly to Taxiway Alpha, the current configuration of Taxiway Bravo is a 15 metre (50 feet) wide taxiway with 5 metre (16.4 feet) shoulders on both sides. It also has been designed with the ability to expand to a 23 metre (75 feet) wide taxiway to support AGN IV operations.

1.7.3 Taxiway Charlie

Taxiway Charlie between Apron II and the threshold of Runway 08 is in good condition as it was fully reconstructed in 2008. It is therefore not anticipated that this section of taxiway will need rehabilitation until 2023 to 2025. Notwithstanding this requirement, the rehabilitation of this taxiway may not be required depending on the timing of the Runway 08-26 extension and the associated Runway 08 threshold displacement (if applicable).

Taxiway Charlie between the thresholds of Runway 14 and Runway 08 was fully reconstructed in 2010. This portion of Taxiway Charlie is currently 18 metres (59 feet) wide, which will accommodate all Code C (AGN IIIB) type aircraft and is recommended to be widened to 23 metres (75 feet) to accommodate AGN IV operations.

It is also recommended that partial parallel Taxiway Charlie be constructed to provide a full parallel taxiway system supporting Runway 14-32 activities.

1.7.4 Taxiways Echo and Foxtrot

Taxiways Echo and Foxtrot are taxiway connectors to Runway 08-26 and are both 15 metres (50 feet) wide with 5 metre (16.4 feet) shoulders.

Taxiways Echo and Foxtrot were both reconstructed in 2008 and are both in good condition. Future rehabilitation is not anticipated until the 2023 to 2025 timeframe.

Consideration into widening these two taxiways must be entertained and will coincide with all other taxiway widening to 23 metres.

1.8 APRONS

1.8.1 Apron I

Portions of Apron I have been resurfaced in recent years. It is recommended that the remaining portions be resurfaced within the next 10 years or on an as-required basis. Regular maintenance and monitoring should be completed on a consistent basis. Depending on future capacity and demand of terminal and landside expansion, Apron I may be redeveloped to support future terminal needs and surface transportation access and parking. Tenants located on Apron I would be relocated to other areas supporting general aviation activities and services.

1.8.2 Apron II

Apron II is currently divided into two sections for different operational use. Apron IIA is currently used by the Waterloo-Wellington Flight Centre and Apron IIB is used as for remote aircraft parking. Due to the apron proximity to the parking lots and the aircraft stand positions locations, Apron IIB is also equipped with blast deflector.

To facilitate the proposed ATB expansion, the infill grassy area will need to be filled in and converted to apron pavement. The apron will be expanded to the north to accommodate the Code C (AGN IIIB) type aircraft anticipated to be parked at the ATB. Apron IIB will continue to operate as remote aircraft parking; however, with the new ATB expansion, direct access into the terminal will be available.

Expansion of the northeast portion of Apron II will accommodate combination of Code B and Code C type aircraft (Dash 8s). This expansion of the Apron IIB pavement area connects into Apron IIIA allowing for servicing vehicles and operational procedures to maintain regularity between the aprons.

Apron IIB currently has de-icing capabilities with a diversion chamber which connects into the main de-icing system; however, modifications will need to be considered given the larger apron area.

The pavement on Apron II is in good condition as it was fully reconstructed in 2008 to a PLR of 9.2. The need for pavement rehabilitation is not anticipated until 2023 to 2025. Depending on future capacity and demand of terminal and landside expansion, Apron II may be redeveloped to support future terminal needs.

1.8.3 Apron III

Similar to Apron II, Apron III has been identified as two surfaces for different operational use. Apron IIIA, located in front of the ATB, and is currently used as the main apron that includes the existing aircraft stands. Apron IIIB is located in front of the existing Fixed Based Operator (FBO) FliteLine Services.

Apron III has changed in both size and configuration over the last 10 years, and it is proposed to change again over the next 20 years and beyond to accommodate the anticipated growth of YKF. With the ATB expansion, the redevelopment of the Apron IIIA and IIIB will include expanding the apron pavement by filling in the grassed islands between Apron III (A and B) and Taxiway Bravo. The apron design will provide sufficient apron depth to accommodate a combination of Code C (AGN IIIA/B) and Code D (AGN IV) aircraft, including sufficient space for Passenger Boarding Bridges (PBBs), service road access, Ground Support Equipment (GSE) storage and staging areas. Apron IIIB will also provide a designated area for de-icing operations.

The existing Air Traffic Control Tower (ATCT) will be relocated away from the Air Terminal Building area; as such, the Apron III area adjacent to the existing ATCT will now be available for aircraft parking and staging.

Apron III was reconstructed in 2002-2003 to a PLR of 9.2. In 2008 this apron was expanded to provide additional space for airline operations. Rehabilitation of this apron should be scheduled between 2018 and 2023.

1.8.4 Apron IV

Apron IV was constructed in 2004. Rehabilitation of this apron should be scheduled for 2019 to 2021. The current configuration of the Apron, and associated taxiway, should suffice for the tenants currently occupying this area and any future developments.

1.8.5 Apron V

Apron V has received periodic pavement repair / rehabilitation in recent years; however, it is recommended that this apron be completely rehabilitated within the next 10 years or on an as-required basis.

1.8.6 Apron VII

Apron VII is the most recent apron constructed at the Airport and provides access to the most northerly airside development lots. This apron currently links into Taxiway Charlie and future parallel Taxiway Bravo.

This apron was constructed in 2011 and is in very good condition. Rehabilitation of this apron is not anticipated at least until at least 2026 to 2028.

A pavement summary for each apron indicating the date of the last rehabilitation as well as the next rehabilitation is provided in [Table D-6](#).

Table D-6 | Apron Rehabilitation

APRON	LAST REHAB	FUTURE REHAB
I	Various timelines	By 2022
II	2008	2023 to 2025
III	2002/2003	2018 to 2025
IV	2004	2019 to 2021
V	Various timelines	By 2022
VII	2011	2026 to 2028

1.9 AIRPORT ZONING

In order to maintain the required obstacle-free airspace in the vicinity of a certified airport, regulations known as Airport Zoning Regulations (AZR) may be developed and enacted by Transport Canada. These AZR are established not only to protect the present operations of an airport, but also to help ensure that potential and future development surrounding the airport remains compatible with the safe operation of aircraft and of the airport itself.

The Region of Waterloo International Airport established an AZR registration SOR/2006-78 on April 30, 2003. However, the AZR is limited to protect airspace of the existing runway configuration at its existing runway lengths (4,100 feet and 7,000 feet respectively). The Airport is also required to protect the airspace and approaches of any obstruction within the Airport’s property boundary as defined in Obstacle Limitation Surfaces (OLS) section per [TP312 \(5TH EDITION\) – AERODROME STANDARDS AND RECOMMENDED PRACTICES](#), through close consultation and cooperation with surrounding land owners.

Since TP312 5th Edition is based more on operations rather than design considerations, there are extensive changes to obstacles in the airport environment. The previous 4th Edition of TP312 detailed Obstacle Restrictions and Removal, whereas in the 5th Edition update, Obstacle Management reflects a modified approach to addressing obstacles at an airport.

What used to be a standard surface for all types of runways, whether non-instrument, non-precision or precision, and aircraft code number, has now been re-evaluated and modified into multiple surfaces and obstacle-free zones.

TP312 5th Edition modifies all aspects of obstacle management as detailed below relating directly to the AOM designations:

- ▶ Obstacle Limitation Surfaces (OLS);
 - Approach Surface
 - Take-off Surface
 - Inner Transitional Surface
 - Transitional Surface
- ▶ Precision Obstacle Free Zone (POFZ);
- ▶ Obstacle Identification Surface (OIS); and
- ▶ Clearways.

An OLS is defined in the 5th Edition as the airspace around a runway to be maintained free of obstacles. In the TP312 4th Edition, this section refers to the outer surface, approach surface and transitional surface around a runway. In the new TP312 5th Edition, the OLS has been redefined to include the approach surface, take-off surface, inner transitional surface, and transitional surface.

Table D-7 | Proposed Obstacle Limitation Surfaces – Precision Runway 14-32 & 08-26 / AGN IIIB & IV

ITEM	AGN IIIB & IV PRECISION
Approach Surface	
Length of Inner Edge Each Side of Centreline	122 m
Distance from Threshold	61 m
Divergence	15%
First Section	
Length	720 m
Slope	2.0% (1:50)
Second Section	
Length	4,280 m
Slope	2.9% (1:34)
Total Length	5,000 m
Transitional Surface	
Slope First Segment	25% (1:4)
Slope Second Segment	14.3% (1:7)
Inner Transitional	
Distance from Centreline	61 m
Slope First Segment	Vertical
Slope Second Segment (CAT I)	16.7% (1:6)

Source: TP312 Aerodrome Standards and Recommended Practices. 5th Edition, September 15, 2015.

It is important to note that the primary Runway 08-26 at the Region of Waterloo International Airport has been recently certified to OLS TP312 5th Edition. Given the new standards, the runway is clear of OLS.

These surfaces have been identified and reviewed for the Region of Waterloo International Airport and are shown on **Figure D-5**.

Moving forward, it is recommended that the AZR protecting airspace to both runway extensions as well as the third runway (subject to separate analysis) be amended. This will require a full Federal AZR process in order to be enacted by Transport Canada, and is anticipated to take 24-36 months to complete. Lands within the airport boundary are under the control of the airport operator and do not require AZR. Since Transport Canada certification requirements normally extend beyond the airport boundary, AZR are enacted on the surrounding off-airport lands. For any AZR to be enacted an airport certificate must be in force at an airport or the land in question must be designated as an airport site. The importance of the new amended AZR is to protect airports' airspace related to the approach surfaces, the outer surface and transitional surfaces from any installation or construction of manmade objects and natural growth that may infringe on the above identified surfaces. AZRs can be enacted proactively on approved Master Plans, which is what is expected to happen in the case of YKF.

The zoning requirements for the third runway are shown on **Figure D-4**.

Figure D-5 | Proposed Obstacle Limitation Surfaces Plan (inset)



1.10 ELECTRONIC PROTECTION AREA AND NAVIGATIONAL AIDS

Electronic protection areas are established at and around airports to ensure that objects and structures do not interfere with the operation of telecommunications and electronic systems such as navigational aids, radar and communications. Specific guidelines for protection of electronic navigation aids operation are defined in [TP1247 \(9TH EDITION\) – AVIATION LAND USE IN THE VICINITY OF AIRPORTS](#). Additionally, building heights, material type and shapes can all impact electronic signals and should be considered when evaluating future development and / or site improvements.

The existing navigational aids at YKF are anticipated to be relocated based on future runway extensions and the upgrading of Runway 14-32 to an instrument precision runway with ILS CAT I capabilities and other visual guidance based on airfield improvements identified in this Airport Master Plan. The approach lighting system for both Runways 14-32 and 08-26 will need to be reviewed depending on the options carried forward. It is anticipated the existing Omni-Directional Approach Lights (ODALs) will be replaced with High Intensity Approach Lighting providing approach lighting systems to support ILS CAT I on both ends of Runway 08-26.

NAV CANADA has conducted an aeronautical study that reviewed the requirement for the Waterloo 'WYT' VHF Omnidirectional Range (VOR) navigation aid located at the Airport. The study concluded that the VOR was not required to support instrument procedures or en-route navigation and recommended decommissioning the VOR effective March 5, 2015. The Waterloo Distance Measuring Equipment (DME) associated with this VOR; however, is retained at the Airport. It is recommended that the DME be relocated to a new location at the Airport in the future to increase available developable land within the Apron VI development lands.

1.11 AIRCRAFT FUELLING

Aircraft fuelling services are currently provided by FliteLine Services (Hammond Fuels), Chartright Air Group and Waterloo Wellington Flight Centre (World Fuels). Fuel tanks associated with all suppliers are located adjacent to Hangar 5 and Waterloo Wellington Flight Centre's hangar located beside Hangar 1 on the west side of Apron IIA, and Chartright's Hangar 5 on Apron VII.

To increase the development potential of the Airport, YKF should discuss with suppliers to see if a business plan could be developed which would incorporate a centralized fuelling depot that could be located away from prime development space, providing ample room for future fuelling expansion in support of future aviation activity. A centralized fuelling depot could potentially reduce the likelihood of accidental fuel spills that would affect the safety of users; such a depot would also limit the potential for environmental impacts. Hydrant fueling is not being considered at this time.

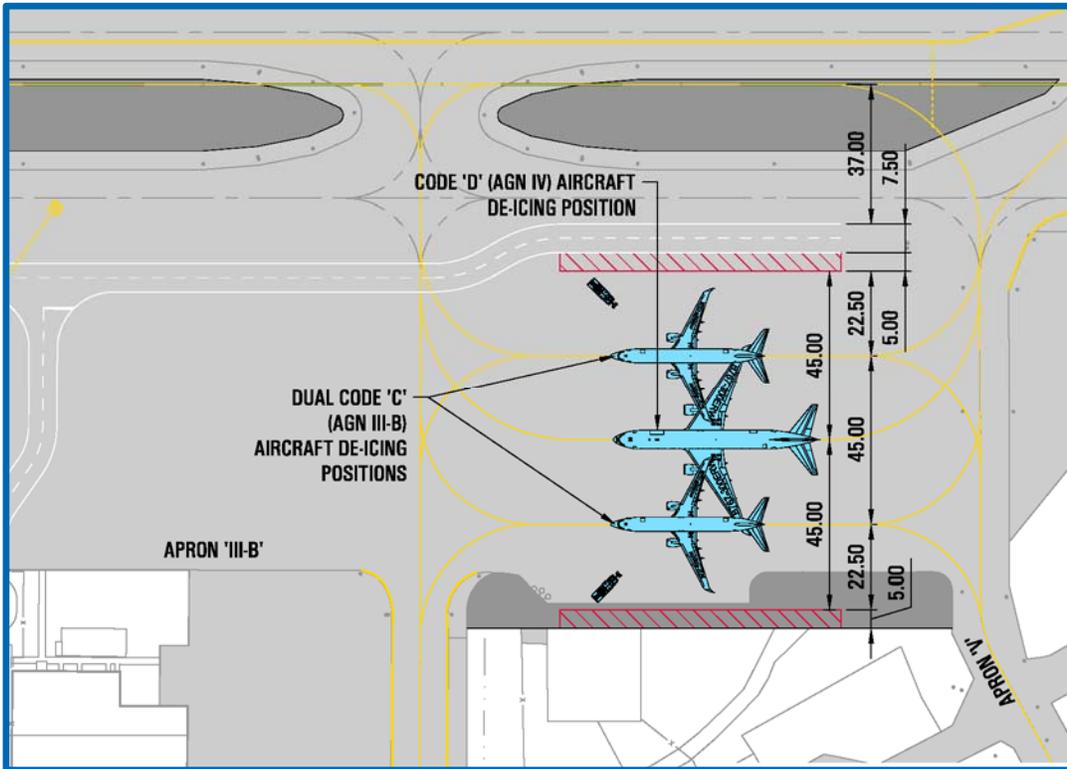
1.12 AIRCRAFT DE-ICING AREA

During winter months, current airline tenants regularly apply aircraft de-icing and anti-icing fluids to prevent the formation of ice on their aircraft critical surfaces. Additionally, other smaller aircraft and private aircraft operators de-ice on site depending on the conditions present at YKF.

The current de-icing plan, identified in **Chapter B** of this Plan, will continue to operate in a similar fashion moving forward. Studies suggest that biodegradation is the most important process for glycol breakdown; accordingly, measures have been taken (under the [CANADIAN ENVIRONMENTAL PROTECTION ACT](#)) to limit the glycol concentrations in stormwater leaving the airport to 100 mg/l. Samples are taken on a regular basis during winter months and tested for glycol concentrations.

The procedures and plans associated with aircraft de-icing are currently well suited for the existing Airport operations and are not anticipated to change in the short-term planning period. However, given the potential to become a larger airport, significant addition of airline service may trigger the need to provide a dedicated central de-icing facility that has been initially identified on Apron III south, as indicated in **Figure D-6**.

Figure D-6 | Proposed Aircraft De-icing Area Plan (inset)



1.13 AIRCRAFT MAINTENANCE AND REPAIR

Aircraft maintenance and repair at YKF is currently provided by FliteLine Maintenance Group, Kitchener Aero Avionics, Tri-City Aero, Rotor Services, Chartright Air Group, Aerotech Aviation, Aero Structural Inc. and Reliable Horsepower. This varied group of aircraft maintenance companies provide repair and overhaul services for airframe and engines, avionics and helicopters.

Further growth in commercial services offered at the Airport can be accommodated as outlined in [Section 4.0](#) of this chapter. There are currently many serviced airside properties available for this type of commercial service. The aircraft maintenance and repair services are anticipated to continue supporting aviation activity and the aviation community at the Airport within the 20-year planning period.

1.14 GENERAL AVIATION

General Aviation plays an important role at YKF and currently generates approximately 95 percent of total aircraft traffic. This includes business jets operations, flight training, air ambulance and private owners. Most local traffic is generated by flight training conducting touch-and-go operations.

There are two main flight schools located at the airport, the Waterloo Wellington Flight Centre and Great Lakes Helicopter. The Waterloo Wellington Flight Centre is located on Apron II, west of the main terminal building, and operates out of two hangars and utilizes apron space for aircraft parking. The second flight school is Great Lakes Helicopter; its facility is located on Apron V east of main terminal building.

Most general aviation facilities are located in the southwest quadrant of the Airport. There is still room for future expansion related to aircraft storage. Taxilane access is provided airside and vehicular access landside.

Other development areas for future general aviation and corporate growth are identified on the northwest quadrant of the airport adjacent to existing Chartright tenant located on Apron VII. Additionally, this area provides access to the airfield via a taxiway system that can accommodate AGN III A/B aircraft.

There are additionally two other development areas identified within the airport property boundary that can be potentially utilized for future general aviation, corporate, commercial or private development. The first area is located west of the newly constructed ATC tower and the second area is located further east of the newly constructed ATC tower. Both areas would provide vehicular access and parking plus airside access. It is important to note that these proposed airport development sites as illustrated in **Figure D-1** are conceptual in nature and are subjects to further alternatives based on future growth and aviation demand.

1.14.1 General Hangar Space

Currently, hangar and outdoor parking spaces are available through a number of entities at the Airport. Names and contact information are available on the airport web site (WWW.WATERLOOAIRPORT.CA). As is the case with other aviation-related businesses, the Airport supports development that can respond to market demands such as the need for additional hangar or parking space requirements.

With the pending closure of Toronto Buttonville Airport and future growth in the Region, this Airport Master Plan provides additional space that can be developed to meet increased demand for hangars.

2. AIR TERMINAL BUILDING

The Air Terminal Building (ATB) provides the interface between landside and airside for passengers. A range of departure and arrival processes are required to ensure the seamless flow of passengers with capacity requirements that may evolve at different rates over the course of this Master Plan.

This section initially reviews the existing constraints within the ATB and how they shape the development of the building as demand and operations change. Key development triggers are based on growth scenarios identified in the passenger movement forecasts and the capacity of the processors to accommodate anticipated demand. Alternatives for the development of the ATB have been reviewed accordingly and focus on individual processing components to determine the need for physical or operational changes.

Trends in passenger processing technology are reviewed as a means to identify opportunities to optimize development scenarios, mitigate or delay terminal expansion, and reduce capital expenditures. Revenue growth opportunities are also addressed through the development of targeted non-aeronautical opportunities compatible with the proposed design.

2.1 FLOW CONSTRAINT EVALUATION

The existing ATB can be expanded in a range of ways to cater to increased demand levels over the horizon of this Master Plan. When reviewing development options, it is essential to identify key constraints around which future development should be conducted. The constraints define the structure of a future operation and the planning provides areas for those operations to work. Balanced with this is the need to phase work to accommodate both ongoing operations and construction requirements. Ultimately, the focus is on minimizing costs and maximizing value for the Airport, its tenants and its passengers. This review broadly considers terminal, airside and landside constraints to determine the basic areas that are too costly or too difficult to relocate in any development option.

2.1.1 Airside

Airside elements such as runways and taxiways are the key pieces of infrastructure that will define the extent of the ATB reserve. Appropriate separations are required to provide the suitable passenger flows on the airfield based on the design aircraft under consideration.

2.1.2 Landside

Landside elements also constrain growth opportunities. The primary constraints in this zone are roadway(s), municipal infrastructure, existing access easements, existing buildings or long-term leases on adjacent lots. An assessment to define the level and potential duration of a constraint should be considered in the context of development and passenger flows prior to the terminal and along the curb.

2.1.3 Terminal

The existing ATB is an important piece of infrastructure with inherent complexities associated with its development. Such complexities include consideration of ongoing operations, structural elements, and mechanical and baggage systems that are costly to modify. **Figure D-7** summarizes key constraints that currently limit operations and potential expansion options within the ATB.

Figure D-7 | Existing Terminal Constraints Assessment (inset)



2.2 DEVELOPMENT TRIGGERS

The expansion of the ATB will be driven by passenger growth, especially during busy periods when the capacity of various airport sub-systems will be under the most stress.

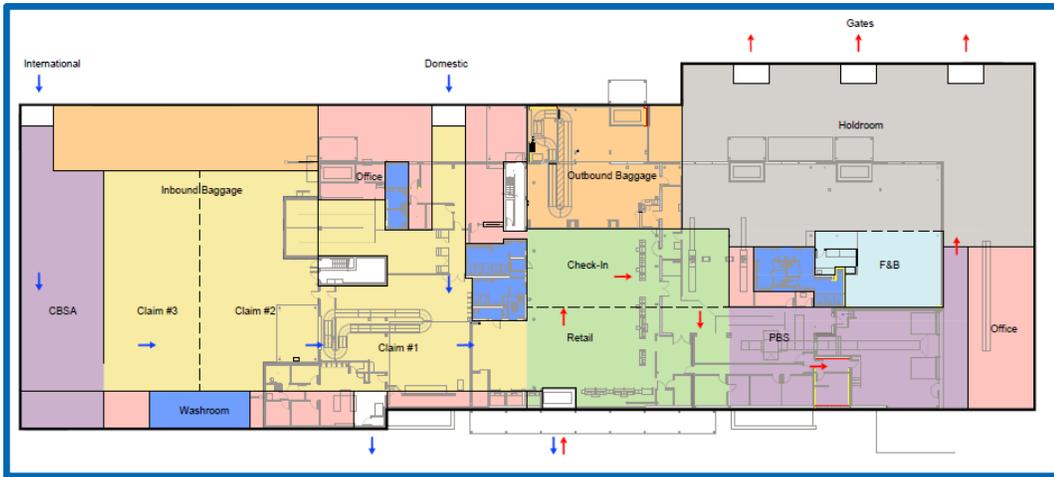
The determination of development triggers are driven by the inability of key processors to meet increasing demand levels or the lack of space to allow passengers and staff to comfortably utilize the area. Passengers and tenants may accept reductions in the level of service in some areas while other processes - such as passenger security screening, baggage make-up and reclaim facilities - will need to provide a compatible throughput as failure of these processes could impact the operations of the Airport as a whole.

As identified in **Chapter C**, five Development Stages have been recommended and each included terminal expansions to accommodate future passenger growth.

2.3 TERMINAL EXPANSION ALTERNATIVES

Figure D-8 illustrates one expansion alternative for key processors at YKF. This alternative includes a combination of spatial expansion and processing enhancements.

Figure D-8 | Proposed Terminal Expansion (inset)



- ▶ Check-In Hall will be remodelled with enhanced self-service processing technologies;
- ▶ Additional screening units and a revised passenger flow prior to Pre-Board Security will require this area to be relocated;
- ▶ Holdroom expansion will increase the existing single-storey volume towards the north and east;
- ▶ The current Domestic Reclaim Unit and area is to be refitted as an outbound baggage area;
- ▶ Baggage Reclaim should then be centralized towards the west and developed with “swing” capabilities that enable it to operate for domestic or transborder / international flights.

2.4 CURRENT PASSENGER PROCESSING TECHNOLOGIES

Technology has advanced to a level at which broad commercial applications have been successfully developed and implemented at facilities as large as airports. The utilization of Wi-Fi and near field communications also play a role in the introduction of increased technology-based processing at the following areas within the Airport:

- ▶ Check-in
- ▶ Baggage Drop
- ▶ Security Screening
- ▶ Immigration / Customs

As such, airports are advised to conduct assessments of the current technologies that are, or will likely be implemented as part of any expansion program.

2.5 FUTURE PASSENGER PROCESSING TECHNOLOGIES

The success of recent technological innovations at airports will increase confidence in utilizing technology, as will the correlated benefits of reduced staffing, better processing rates, and the mitigation of capital costs related to expansion works.

Accordingly, YKF is advised to conduct assessments of new technologies that are, or will likely be, implemented as part of any expansion program. As the major transport hub to Canada’s Technology Triangle, the Region of Waterloo

International Airport has a unique incentive to develop technologies which showcase local innovation and technology. Preparing for the introduction of additional technologies that maximize future benefits, and ensure flexibility within planning in the near future, will be key.

2.6 NON-AERONAUTICAL REVENUE

Non-aeronautical revenue in Air Terminal Buildings is an increasing component of business diversification for airports, as these provide relief from the inherent risks associated with scheduled air services. As well, the services provided within this revenue stream are part of the overall experience passengers increasingly seek.

The planning and design of the ATB plays an integral role in facilitating the growth of non-aeronautical revenue through the careful selection and location of both products and services for arriving and departing passengers. Access to retail and culinary outlets must be intuitive to maximize foot traffic near these facilities and offer tenants the best chance of operating a successful business.

Effective passenger processing upgrades minimize wait times and move people into dwelling areas. This tends to increase their exposure to additional services and expands opportunities for discretionary spending at these outlets.

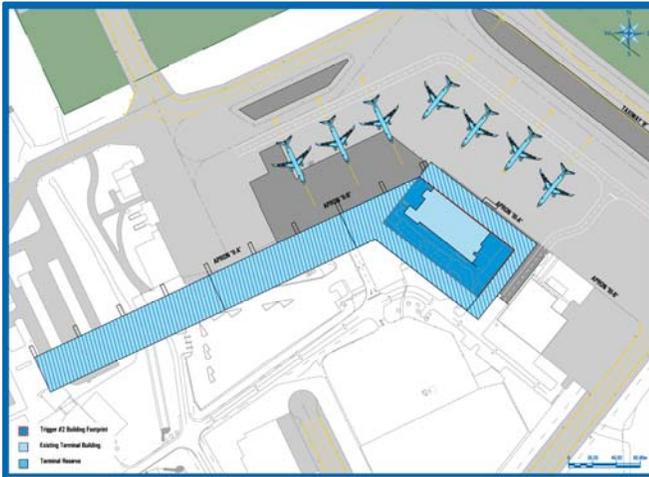
Provision of targeted retail opportunities is essential to maximize passengers' spending while optimizing the floor space used for non-aeronautical developments. The development of a retail strategy that encompasses a range of retail, service, and food and beverage options will enhance terminal expansion, passenger experiences, and the overall profile of the Region of Waterloo International Airport. Further, as passenger volumes increase, advertising revenue also increases exponentially, providing YKF additional revenue.

2.7 TERMINAL RESERVE

The Terminal Reserve is a zone intended as a blueprint for the long-term development of the terminal area at the Region of Waterloo International Airport. It provides the Airport and its stakeholders with a clear, flexible, and reliable road-map for development and investment, alongside discussion with the community and senior-level governments.

The Airport plays a vital economic role as the gateway for the surrounding regional population. It contributes to the sustenance and development of regional tourism and is a significant enabler of business and government activity. The Airport's long-term vision focuses on achieving efficient, flexible, cost-effective and environmentally-considerate planning – and the terminal reserve is an important consideration within this objective.

Figure D-9 | Proposed Terminal Reserve Plan (inset)



The terminal reserve area in this study consists of:

- ▶ Airfield
- ▶ Apron
- ▶ Air Terminal Building
- ▶ Terminal Landside

The Terminal Reserve Plan is a description of appropriate areas of protection for the core activities listed above. Once established, the envelopes of protection are reviewed as development options are created to ensure that land use, facilities, and services are developed within a long-term context.

The result is a strategic vision that enables YKF to meet its objectives of accommodating expected levels of traffic while also meeting additional commercial opportunities over the next 20 years.

The conceptual terminal development plan currently shows a potential terminal expansion that encroaches within the existing floodplain for the north branch of the Randall Drain as well as directly impacting through the existing alignment of the Randall Drain in this area. A comprehensive review of the environmental, hydrologic and hydraulic constraints, impacts and potential mitigations will be completed during both the feasibility study for the terminal expansion (Stage 1) and the detailed design process (Stage 2). The watercourse and flow conveyance must be maintained as it drains a large land area within and north of the airport prior to connecting with the main branch of the Randall Drain immediately south of the airport. Potential options and design considerations will need to be considered to address applicable GRCA (and others) policies. The Randall Drain can generally be identified as 'hydrologic maintenance' and 'ecological maintenance' options. Hydrologic options would require that the hydrologic function of the Randall Drain be maintained; this may include piping the affected portion of the watercourse, an engineered channel, etc. Ecological maintenance options may include realignment of the Randall Drain to maintain an open watercourse (i.e. not piped) with varying levels of natural channel design or other less-engineered channel opportunities to maintain fish habitat and flow and provide some ecological function in the realigned channel. Design alternatives for the terminal expansion will also be considered to minimize the environmental impacts.

3. LANDSIDE

User-friendly access to the Region of Waterloo International Airport is important when considering travellers' satisfaction of their overall airport experience.

The current landside road and parking network have recently been reconfigured to maximize the potential revenue stream for the Airport. As the Airport grows and the passenger volumes rise, additional parking and roadway flexibility will be required.

Additionally, the overall transportation system and airport connectivity will need to be reviewed and coordinated in conjunction with this Master Plan. Currently travellers in Waterloo Region can only access both YKF and TPIA by car or taxi (or bus through multiple connections). There is a relatively unknown rail connection between the GO Transit line and the UP Express that could get you from Waterloo Region to the Airport but the timelines and logistics are not ideal. As identified in an earlier section, there is an existing GO Transit line that is located approximately 2.5 km north of the Airport and has been preliminary assessed to provide a new Breslau GO Station (recently noted in Metrolinx's report [GO RAIL STATION ACCESS PLAN](#), dated December 12, 2016). The utilization of GO Transit would

enhance the capability to connect the GO Station with the Airport and potentially other Airports in the Southern Ontario market.

Connecting airports in the region via rail network will be reviewed and considered including a direct connection to TPIA and a potential future connection to London International Airport. **Figure D-10** illustrates a potential rail connection between TPIA and YKF.

Rail networks connecting airports in the region are supported by the Greater Toronto Airports Authority (GTAA) especially when the vehicular traffic congestion in and around the Greater Toronto Area (GTA) is reaching critical levels. As recently outlined in the [PEARSON CONNECTS: A MULTI-MODAL PLATFORM FOR PROSPERITY](#) paper released by the GTAA in February 2016, “[a] key component of a Pearson Hub would be direct connections by high quality regional transit service. The specific mode of such connections would need close study and would evolve over time. In the long term, considerations should be given to the role of the Metrolinx-operated Kitchener GO rail line, which runs approximately three kilometres to the northeast of the Toronto Pearson terminals, and could provide rail integration either directly at a transit hub or through an airport-controlled people mover.”

This Master Plan and the ultimate airport connectivity will play a significant role in the overall Regional Transportation Master Plan that is currently under review.

3.1 FUTURE REQUIREMENTS

3.1.1 Transit

At present, the automobile is the preferred mode of travel by employees, passengers and visitors to get to the airport. However, public transportation options are likely to increase over the next several years as the Region continues to expand their regional transit systems. The Regional Transportation Master Plan will coordinate with the Airport to review all options including scheduled bus service, Light Rail Transit (LRT) and high speed rail connectivity to other airports in the southern Ontario area.

3.1.2 Entrance Road

The majority of the land in the vicinity of the ATB is either developed or accounted for in future developments and thus additional landside growth is limited (within the existing Airport boundary). At the same time, the existing road network into the Airport will remain as-is for the foreseeable future; accordingly, the requirement to expand to accommodate the growth can be controlled based on the growth of the Airport.

The current configuration of the entrance road includes a two-lane roadway with opportunities to widen and expand (depending on the ultimate configuration). It is anticipated that the entrance road would be widened to a four-lane urban section that connects passengers to the Airport Terminal Building and the available parking lots. Additional enhancements, including improved drainage and street lighting, will need to be reviewed as part of the overall road widening. The departure road and drop-off curb will be discussed in **Section 2** of this section under the ATB component. Depending on future capacity and demand of terminal and landside expansion, the entrance road network may be redeveloped to support future terminal growth.

At this time, an additional separate airport entrance is being shown as part of Development Stage No. 4, connecting Fountain Street with Canuck Road South through the proposed new groundside development south of Airport Road. This new entrance road will provide direct access to the Apron IV and Apron V developments and reduce the amount of traffic along Airport Road.

3.1.3 Parking

In 2013, the Airport revised their parking strategy to help maximize the potential revenue from parking. A controlled, gated system was implemented. It is anticipated that this system will remain in place and be applied for the additional parking lots that have been identified.

Additional parking, in close proximity to the Terminal Building, will be required as the growth of the Airport moves forward. The parking lot expansion will be required to accommodate the growth of passengers using the Airport. [FAA ADVISORY CIRCULAR 150-5360-9, PLANNING AND DESIGN GUIDELINES FOR AIRPORT TERMINAL FACILITIES AT NON-HUB LOCATIONS](#), provides recommendations regarding the number of required parking spaces based on the number of annual enplaned passengers.

Given the lack of available Airport-owned land in this immediate area, property acquisition will be required to meet this need. It is recommended that an alternative parking strategy, similar to some offsite parking facilities at other airports, be implemented. An example concept would follow the JetSet Parking concept where customers are offered a choice of self-parking, regular parking, or in some locations, valet service. This would provide the customer with a low-priced airport parking option with shuttle service between the terminal and parking lot.

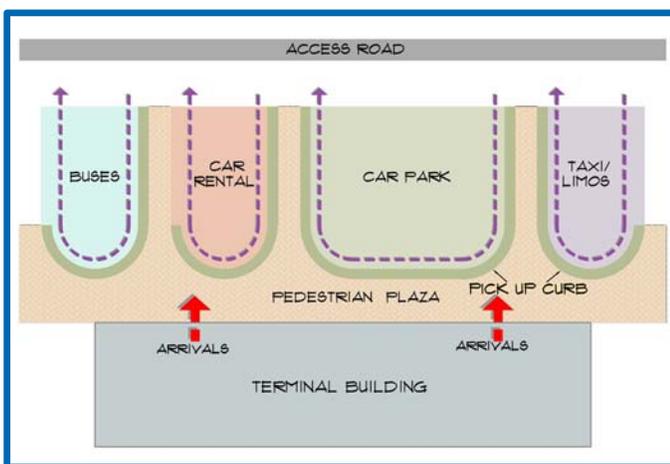
This alternative parking concept will require lands adjacent to the entrance road to be acquired by the Region and developed. An above-ground parkade structure has not been considered at this time for the initial stages; however, once demand exceeds a certain level, a parking structure will be warranted, and is currently being shown under Development Stage No. 5.

3.1.4 Pedestrian Plaza

While landside is constrained within the existing Airport boundary, there are opportunities to redevelop pedestrian facilities into dwell areas that act as an outdoor expansion of the Air Terminal Building.

Airports are increasingly relocating the traditional vehicle terminal curb to create an environment that is more pedestrian-friendly and creates a public space that promotes dwell and commercial activities that can showcase regional products and services.

Figure D-12 | Functional Landside Concept (inset)



YKF's constrained landside area provides an incentive to minimize vehicular flows and pedestrian crossing. While concerns can arise when pulling back drop-off areas from the terminal curb, especially in winter climate conditions, this can be offset through a site-specific design that provides covered pedestrian access.

4. AIRPORT SUPPORT FACILITIES

4.1 AIR TRAFFIC CONTROL TOWER (ATCT)

The new ATCT is being constructed south of Taxiway Alpha and directly west of the Airport Operations Centre (AOC). The construction started mid-2015 and the facility is anticipated to be fully operational by the mid to end of 2017, after which the old ATCT will be demolished. The new ATCT is sufficient to meet existing and future demand of Airport traffic and future Airport development, provided that a clear line of sight to existing and future runway ends is maintained.

4.2 AIRPORT OPERATIONS CENTRE (AOC)

As identified in the Existing Conditions section of this Airport Master Plan, the AOC facility accommodates combined airport maintenance plus aircraft rescue and fire-fighting services. The AOC is centrally located south of Taxiway Alpha and east of the newly constructed ATCT.

AIRPORT MAINTENANCE

As part of the AOC, the airport maintenance facility is comprised of maintenance equipment storage and a repair shop as well as offices for the maintenance staff. Currently, the maintenance facility is sufficient to store equipment and perform maintenance activities when needed. However, there are several pieces of winter equipment stored outside the facility along the fence line on Airport property that are exposed to weather elements. In order to preserve and maintain the airport maintenance equipment, it is recommended to sell the old maintenance facility and cold storage building and expand the existing maintenance storage building.

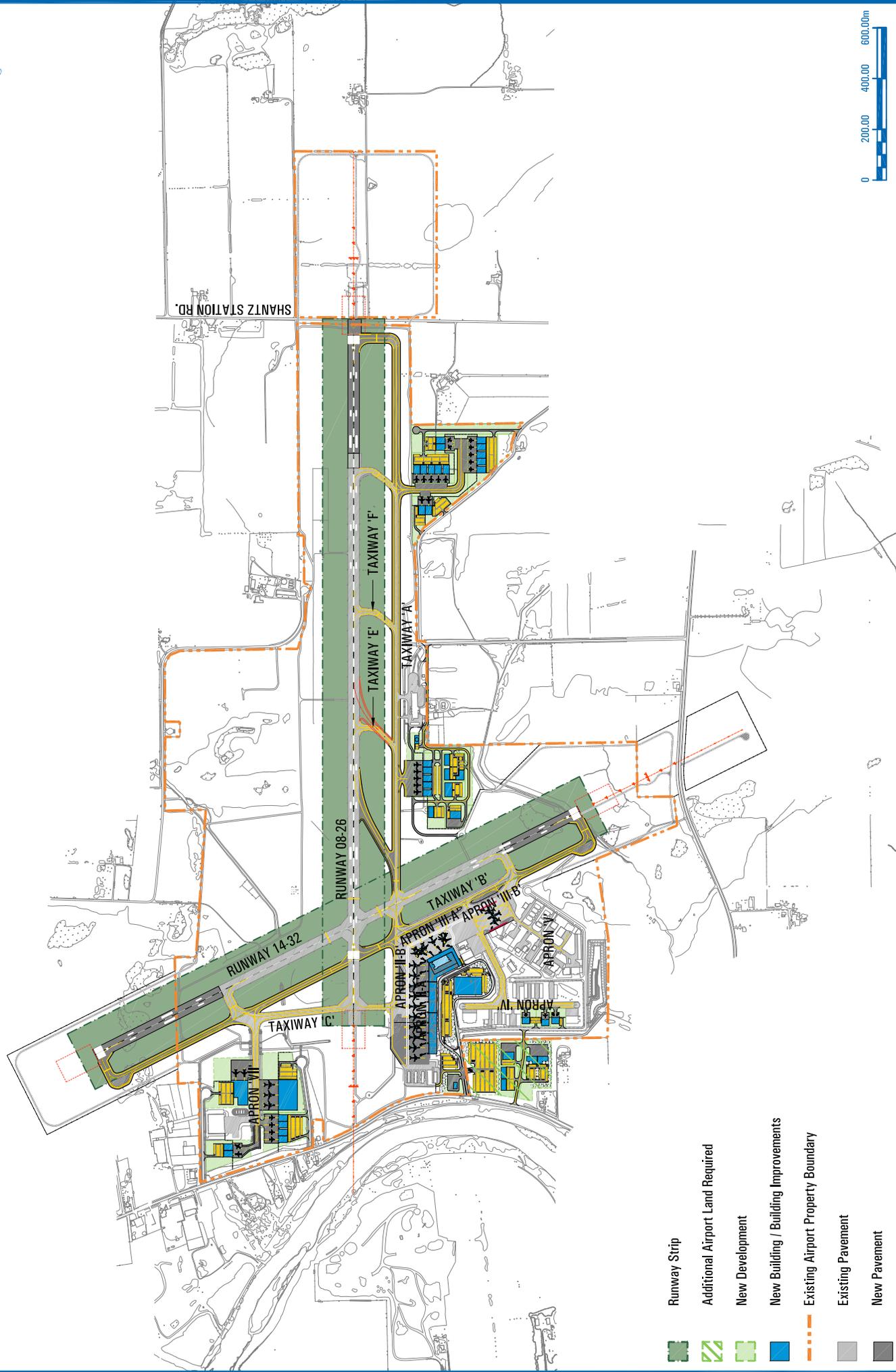
AIRCRAFT RESCUE AND FIRE FIGHTING (ARFF)

Under the [CANADIAN AVIATION REGULATIONS \(CARs\) PART III, SUBPART 3](#), airports with annual passenger volumes in excess of 180,000 are required to have on-site Aircraft Rescue and Firefighting (ARFF) facilities. Based on the critical design aircraft (Boeing 767-300ERW), YKF would be required to provide ARFF services supporting a Category 8 level of service. This would include the provision of a minimum of three ARFF vehicles that have a total capacity of 18,200 litres of water and 450 kilograms of complementary extinguishing agents.

To accommodate the ARFF vehicles and associated support facilities, it is recommended that a four-bay fire hall be provided. Three bays would accommodate the required ARFF trucks while the fourth bay would accommodate a spare truck or command vehicle. In addition to the apparatus bays, the fire hall would include support facilities such as equipment and extinguishing agent storage, administrative space, a watch / alarm room, and staff support areas, including break / training rooms, washrooms, and locker areas.

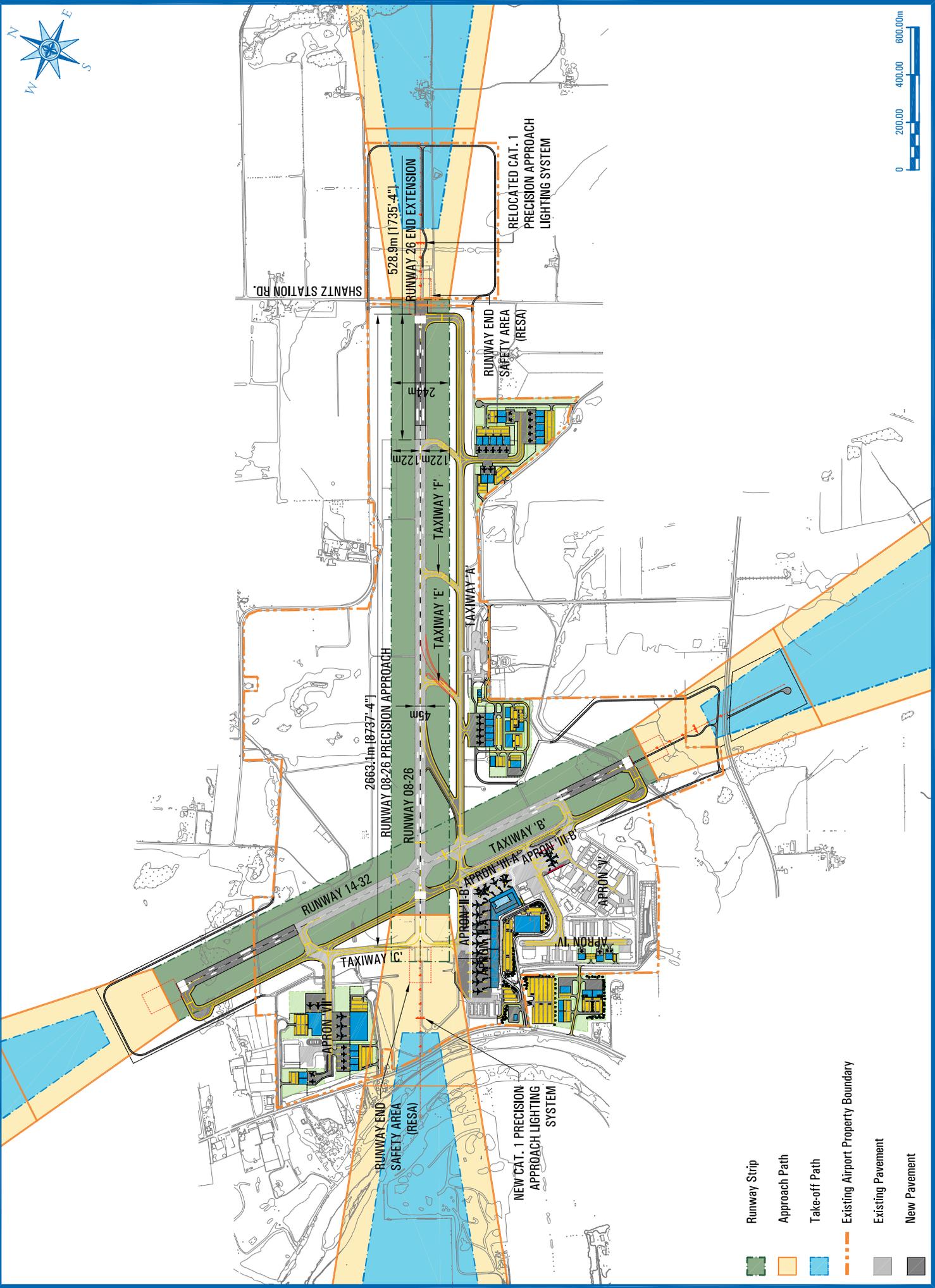
Since the existing critical design aircraft is B737-900 the ARFF meets Category 7 with existing two ARFF vehicles with a total capacity of 12,100 litres of water and 225 kilograms of complementary extinguishing agents, it is recommended that when the annual passenger volume exceeds 180,000 and B767-300ERW start operating at the Airport, the Region of Waterloo should expand its ARFF facility to accommodate Category 8 requirements. That said, Category 8 requirements could have significant impact on staffing and operating cost associated with that upgrade.

It is important to know that the Canadian Aviation Regulations (CARs) states if the number of movements of the critical design aircraft is less than 700 over a three-month period, then the category of service can be reduced by one category. Therefore, with the 767-300ERW as the critical design aircraft (Category 8) and the number of movements less than seven per day, then Category 7 level of service is acceptable.



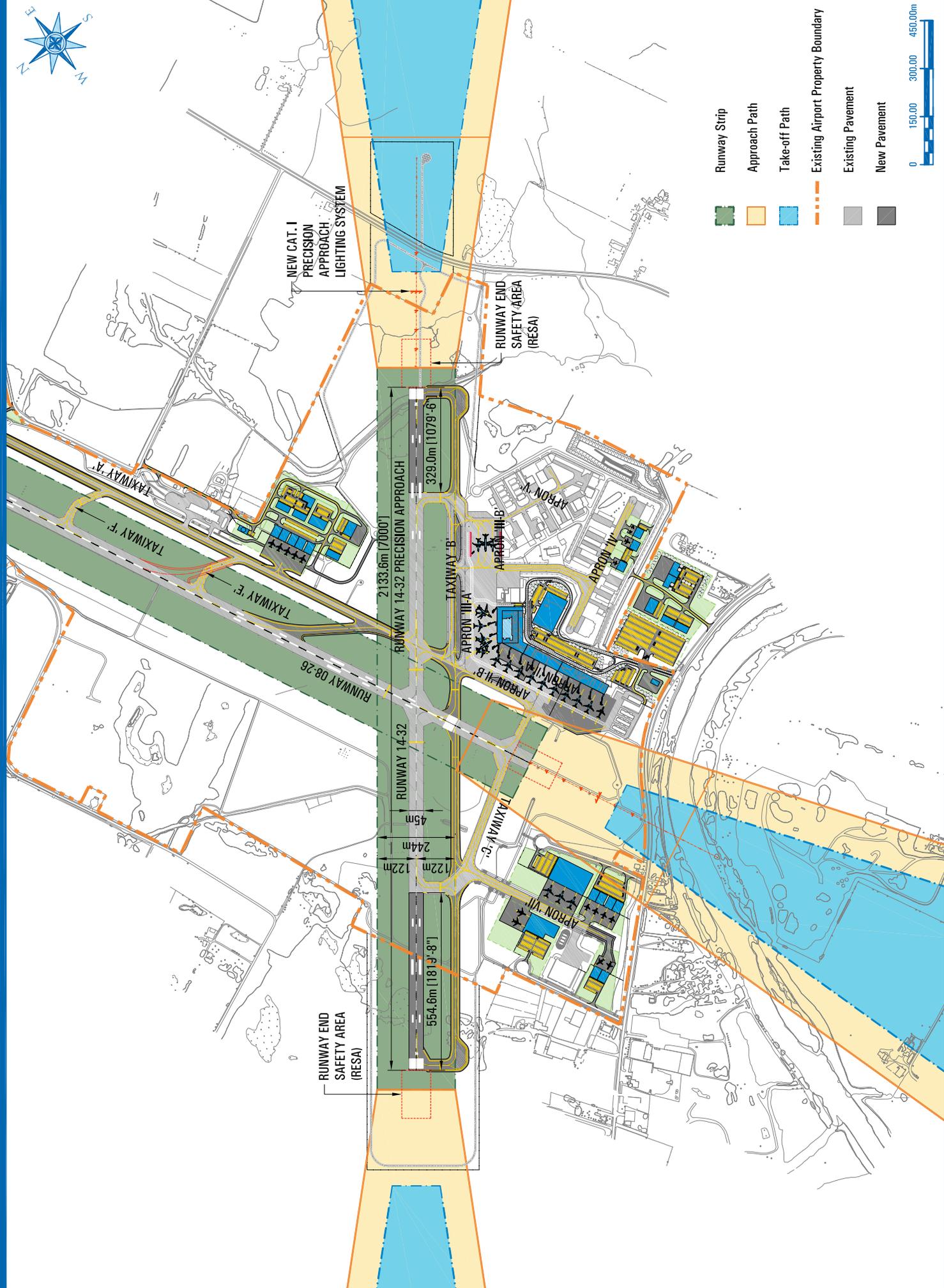
Proposed Airport Site Plan

Figure D-1



- Runway Strip
- Approach Path
- Take-off Path
- Existing Airport Property Boundary
- Existing Pavement
- New Pavement

Proposed Runway 08-26 Extension Plan **Figure D-2**



Proposed Runway 14-32 Extension Plan

Figure D-3

* Note: The third runway location, length and orientation, as shown in this figure, is preliminary only and is subject to change upon completion of the Third Runway Study that will be undertaken as part of Trigger 1. The Third Runway Study will also include impacts to surrounding lands, including environmental and zoning/height restrictions.

ZONING FOR BUILDING HEIGHT RESTRICTIONS REQUIRED FOR FUTURE THIRD RUNWAY APPROACH

ZONING REQUIRED FOR POTENTIAL FUTURE THIRD RUNWAY

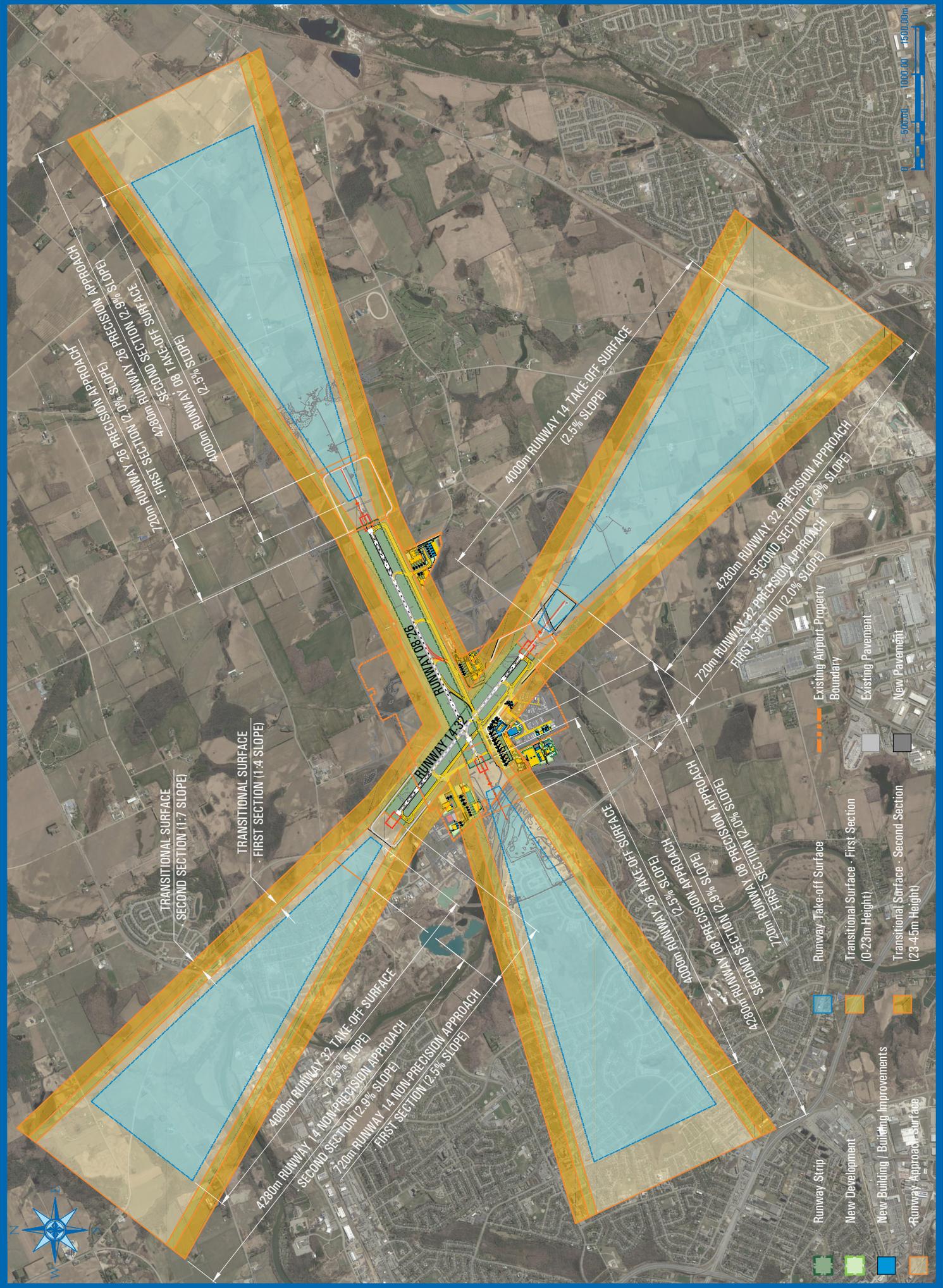
ZONING FOR BUILDING HEIGHT RESTRICTIONS REQUIRED FOR FUTURE THIRD RUNWAY APPROACH



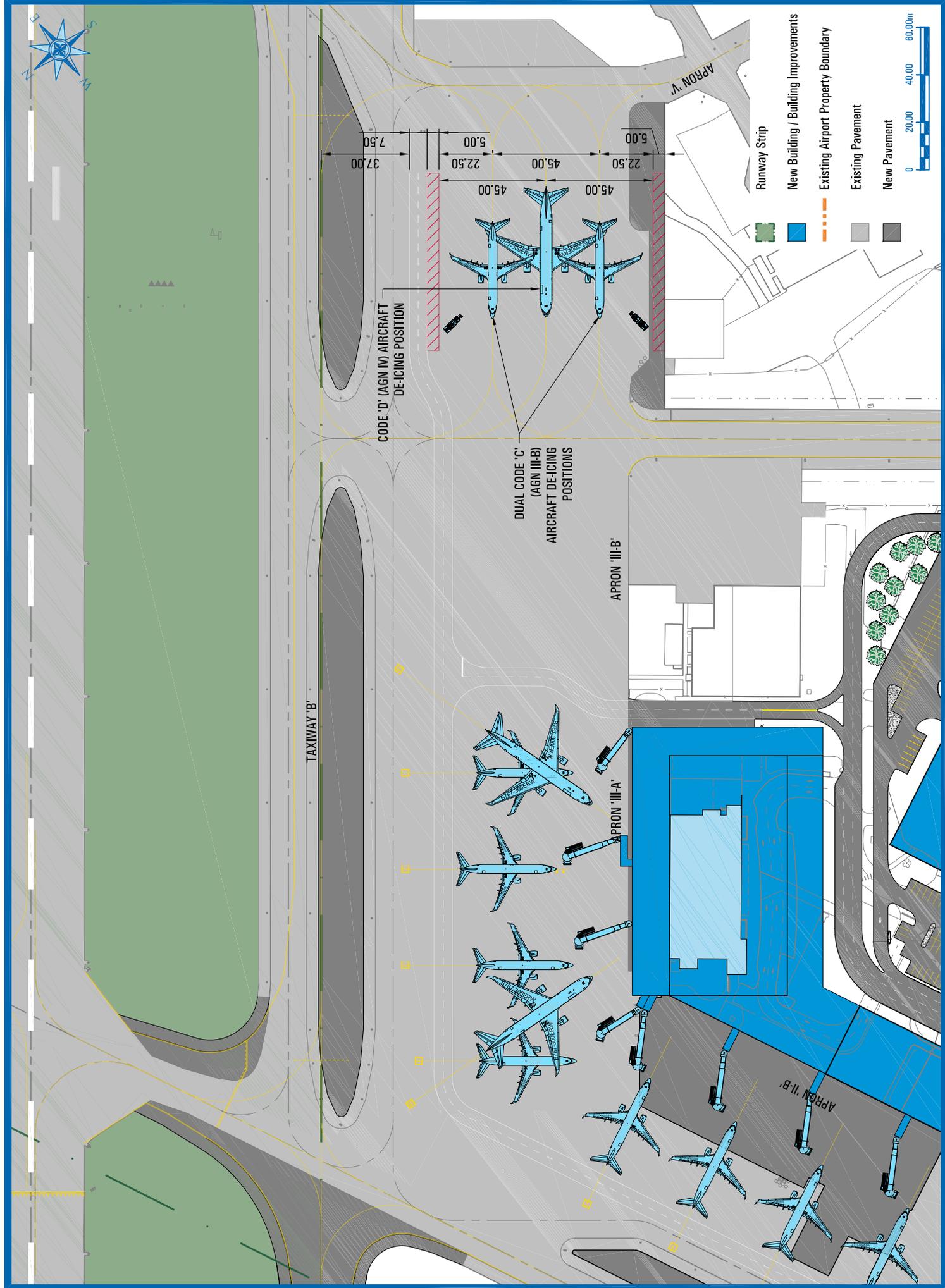
- Runway Strip
- Additional Airport Land Required
- New Development
- New Building + Building Improvements
- Existing Airport Property Boundary
- Proposed Zoning for Third Runway
- Existing Pavement
- New Pavement

Proposed Third Runway Zoning Plan

Figure D-4

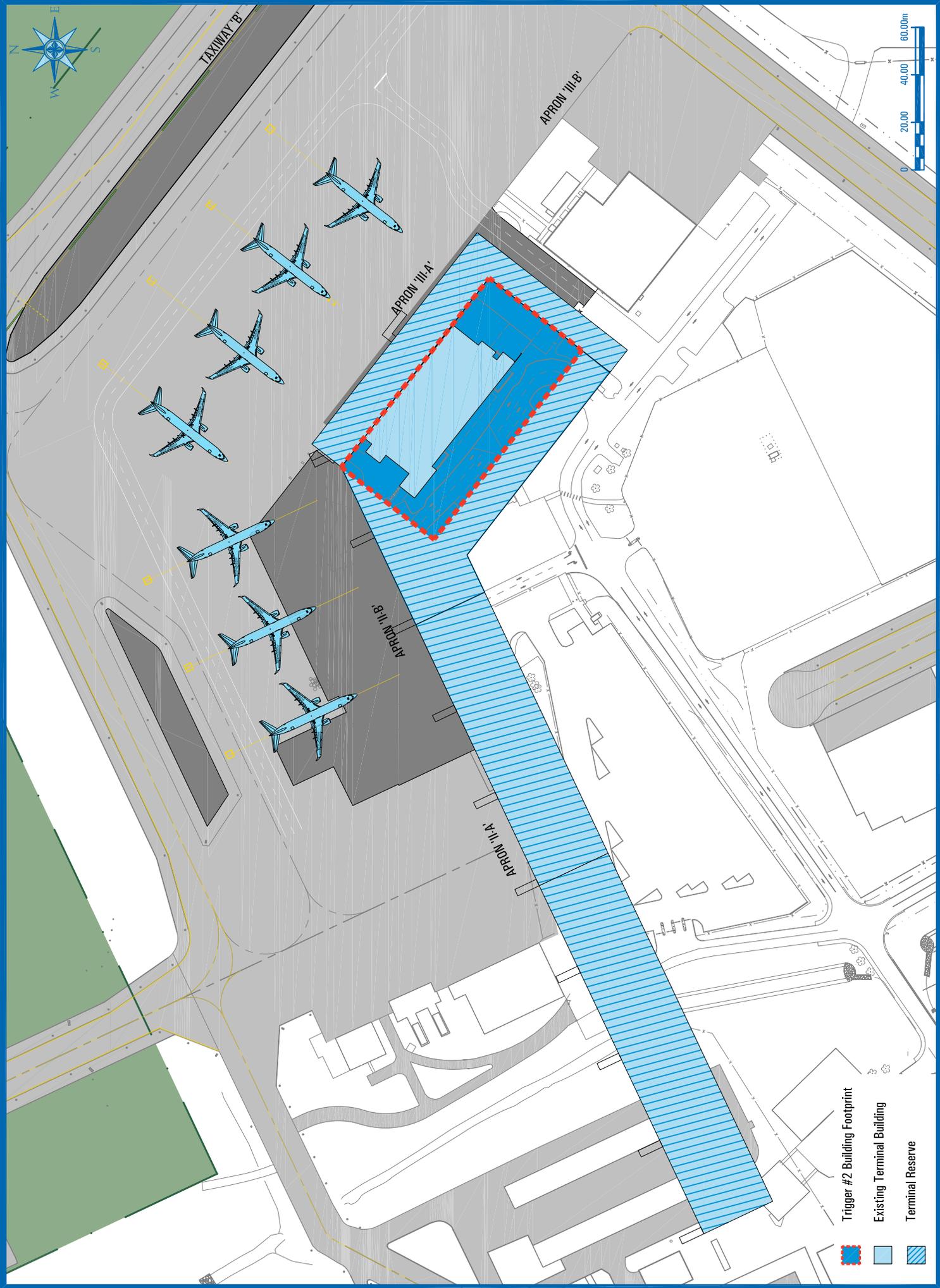


Proposed Obstacle Limitation Surfaces Plan **Figure D-5**



Conceptual Aircraft De-icing Area Plan

Figure D-6



Conceptual Terminal Reserve Plan **Figure D-9**

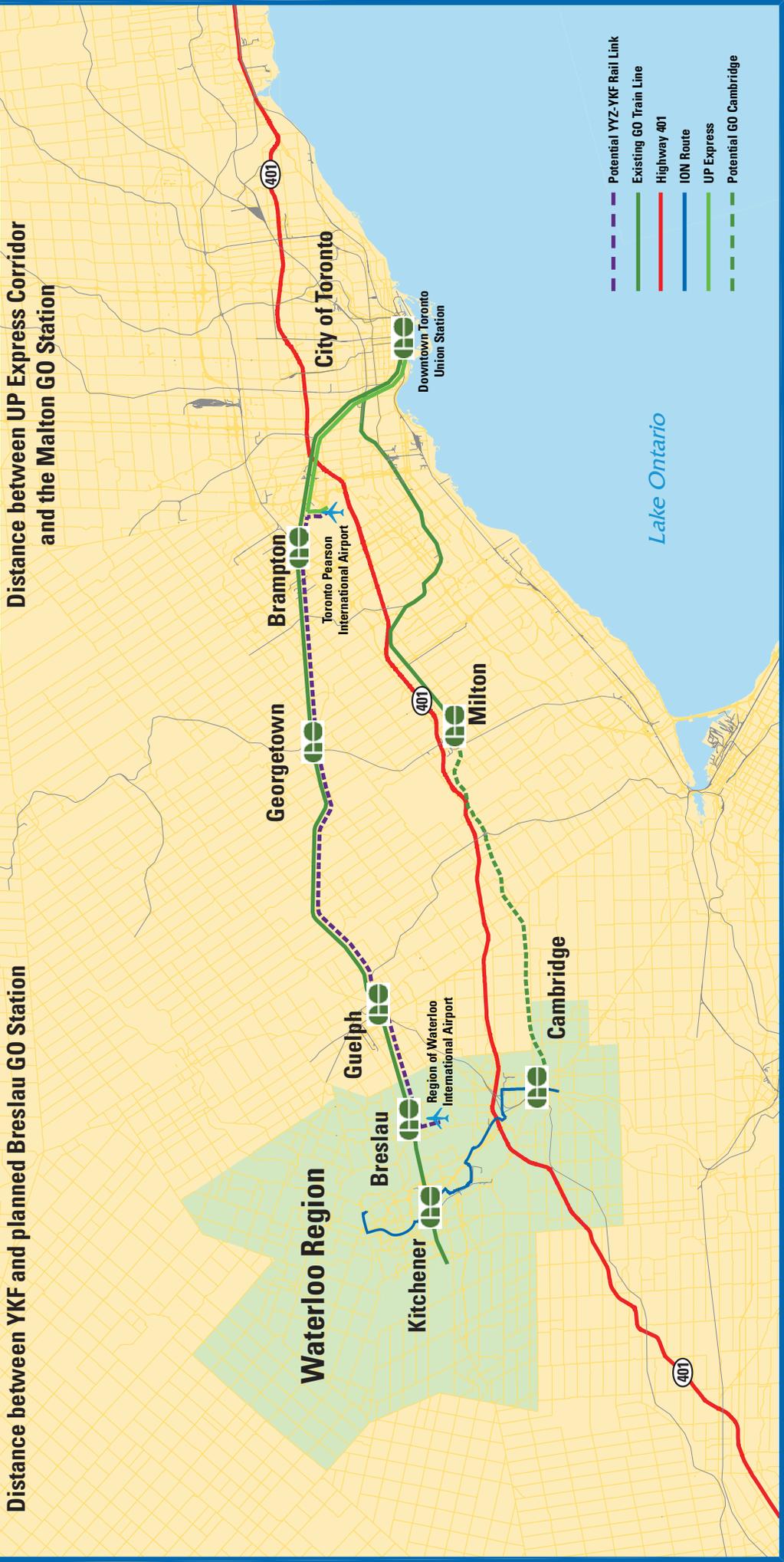
-  Trigger #2 Building Footprint
-  Existing Terminal Building
-  Terminal Reserve



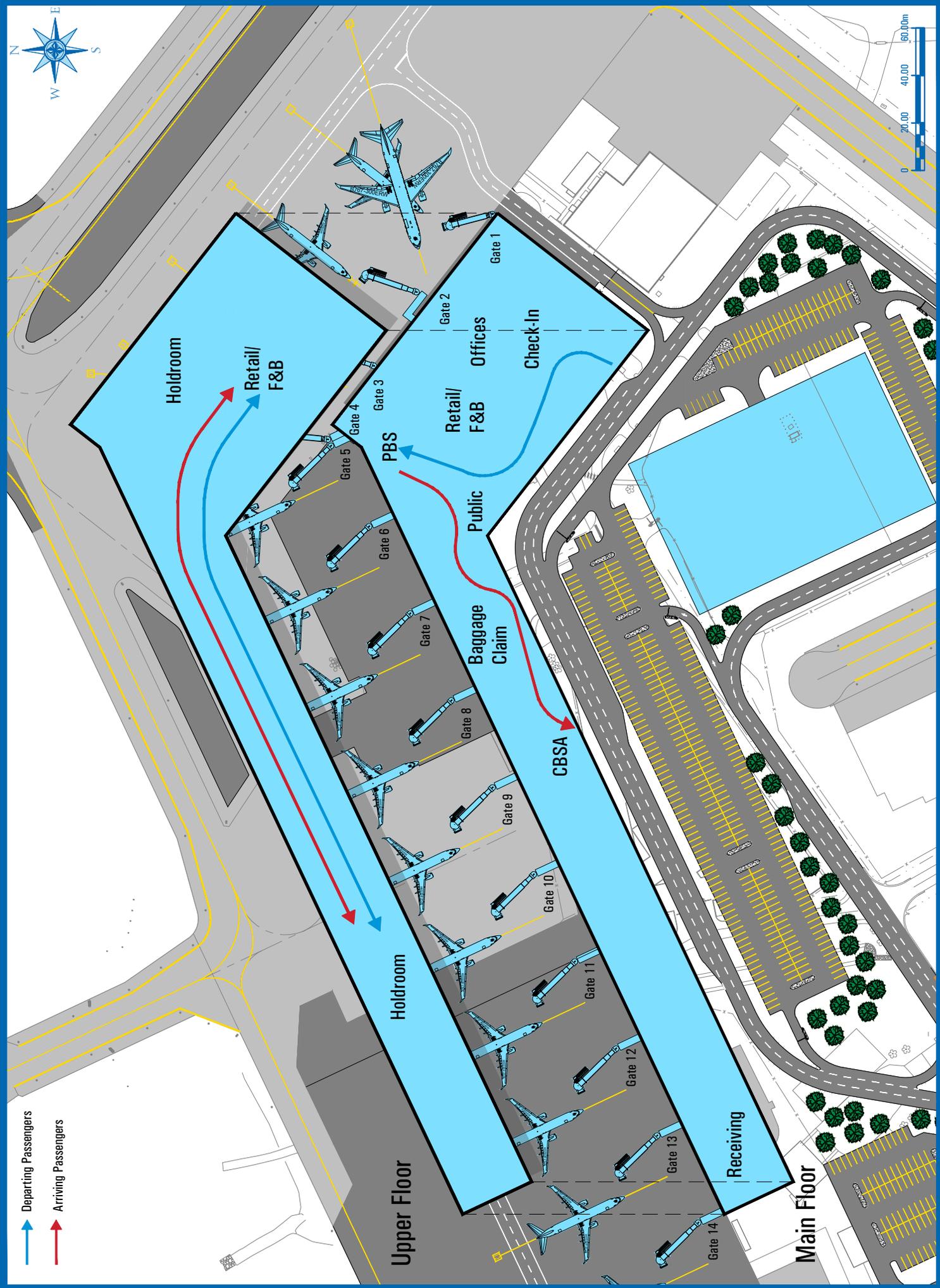
Distance between UP Express Corridor and the Malton GO Station



Distance between YKF and planned Breslau GO Station



Linking YZF to YKF: Building Southern Ontario's Airport Network Figure D-10



Conceptual Future Terminal Development Plan **Figure D-11**



E. ENVIRONMENTAL AND SOCIAL IMPACTS

CHAPTER E. ENVIRONMENTAL AND SOCIAL IMPACTS

New airport development and operational activities may create adverse impacts to the natural and social environment within airport lands and on adjacent properties. Balancing potential adverse impacts with positive long-term community benefits of planning initiatives is vital.

The two predominant impacts identified within the Region of Waterloo International Airport Master Plan relate to:

- ▶ Aircraft noise; and
- ▶ Environmental features and functions (including Federal, Provincial, Regional, and Township).

The following sections quantify these impacts and suggest measures to avoid, minimize and / or mitigate their effects where possible.

1. NOISE

The primary social impact associated with airports is often aircraft noise.

To assist municipalities in planning development surrounding airports, Transport Canada developed document [TP1247 - AVIATION LAND USE IN THE VICINITY OF AERODROMES](#), which includes a detailed chapter on Aircraft Noise. The most recent release of TP1247 was released in 2013 as the ninth edition. TP1247's Part IV discusses noise measurement, annoyance prediction, the Noise Exposure Forecast (NEF) and the Noise Exposure Projection (NEP). It also contains an assessment of various land uses in terms of their compatibility with aircraft noise as well as recommended practices and noise control actions.

1.1 BACKGROUND

The Region of Waterloo International Airport is located approximately 1.5 kilometers from residential areas in Kitchener and 2 kilometers from residential areas in the village of Breslau in Woolwich Township. The Waterloo Region is experiencing steady population growth which in turn triggers residential development. It is likely if left unchecked, residential development will encroach on the airport and the potential for land use conflict will remain a strategic challenge for the period of the Master Plan.

Synergizing community objectives and airport development objectives is vital moving forward. The balance between airport and community growth is governed by the Ontario Provincial Policy Statement, which regulates development and land use planning. The 2014 Provincial Policy Statement specifically addresses airports with the following section:

1.6.9.2 Airports shall be protected from incompatible land uses and development by:

- a) prohibiting new residential development and other sensitive land uses in areas near airports above 30 NEF/NEP;
- b) considering redevelopment of existing residential uses and other sensitive land uses or infilling of residential and other sensitive land uses in areas above 30 NEF/NEP only if it has been demonstrated that there will be no negative impacts on the long-term function of the airport; and
- c) discouraging land uses which may cause a potential aviation safety hazard.

The Airport’s interface with neighbours and surrounding jurisdictions is a critical part of successful airport development and operation. The following section delineates the noise exposure contours (NEFs) for YKF.

The Noise Exposure Forecast (NEF) is the officially recognized metric used in Canada for airport noise assessment. It was designed to encourage compatible land uses in the vicinity of airports, and to predict human annoyance to airport operations within noise zones. Appropriate land uses are defined in Transport Canada’s Land Use in the Vicinity of Airports guideline, which limits the residential development in areas greater than 30 NEF. **Table E-1** identifies typical community responses within specific noise contours. These responses are typical in nature and may vary from airport to airport.

Table E-1 | Community Response Predictionⁱ

RESPONSE AREA	RESPONSE PREDICTION *
1 (Over 40 NEF)	Repeated and vigorous individual complaints are likely. Concerted group and legal action might be expected.
2 (35 – 40 NEF)	Individual complaints may be vigorous. Possible group action and appeals to authorities.
3 (30 -35 NEF)	Sporadic to repeated individual complaints. Group action is possible
4 (Below 30 NEF)	Sporadic complaints may occur. Noise may interfere occasionally with certain activities of the resident

** It should be noted that the above community response predictions are generalizations based upon experience resulting from the evolutionary development of various noise exposure units used by other countries. For sporadic locations, the above response areas may vary somewhat in accordance with existing ambient or background noise levels and prevailing social, economic and political conditions.*

It is worth noting that in the previous edition of TP1247 (8th edition which was released in 2005) a new section was added that specifically addresses new airports and community response to noise. In this section, Transport Canada recommends no new noise sensitive land uses be permitted above the 25 NEF/NEP. While “new airport” does not apply in this case, the fact that Transport Canada has added the above limit clearly acknowledges that airport noise can be a concern between 25-30 NEF.

i Table 1 - Community Response Prediction extracted from AVIATION Land Use In The Vicinity of Aerodromes TP1247E 2013/14 page 24.

The NEF calculates the sound generated by individual aircraft types expected to operate at the airport, and adjusts for the number of operations forecasted to occur. Due to the higher social impacts of night-time noiseⁱⁱ, aircraft movements at night are factored to have 16.7 times the impact of daytime movements. These contours designate areas of equal noise exposure and thereby provide information to assist in planning for compatible land uses. Since the computer-generated result considers numerous factors, it cannot be directly related to measured noise.

Generally, three contours are generated to delineate areas of individual noise ranges (greater than NEF 40, NEF 35-40, and NEF 30-35); however, over the past decade the 25 NEF contour is becoming more common addition to NEF maps.ⁱⁱⁱ At extended distances from aircraft flight paths, ambient noise levels typically dominate.

Noise contours, in conjunction with a set of guidelines, are to be used to encourage compatible land use in the vicinity of the airport site. The Transport Canada guidelines, Land Use in the Vicinity of Airports, 9th Edition, 2013/14, provide community response predictions by noise contour ranges.

Until this current Master Plan process, the most recent noise contours for YKF were prepared as part of the previous Master Plan process for the Region of Waterloo International Airport in 2000 and are provided in **Figure E-1**.

In the past decade, the aviation industry has experienced a growing awareness of its impact on the environment. This has led to a commitment to lessen the impact as quickly and effectively as possible. While aircraft engines are vastly cleaner and quieter than they were 20 years ago, advances in technology will continue and aircraft are expected to operate more quietly than their predecessors, thereby positively influencing the areas previously exposed to aircraft noise.

1.2 CURRENT PLANNING STATUS AND LAND USE CONTROLS

On June 16, 2009, Regional Council passed By-law No. 09-025 to adopt a new Official Plan for the Regional Municipality of Waterloo (Regional Official Plan). The current status of the Regional Official Plan is “Approved, with Modifications, by the Ontario Municipal Bard on June 18, 2015”. This Plan is consistent with the most recent edition of TP1247 and it specifically includes Policy 2.G.17 which is provided below:

In the vicinity of the Region of Waterloo International Airport:

- (a) *Development applications proposing new residential development or other sensitive land uses will not be permitted in areas above 30 Noise Exposure Forecast (NEF);*
- (b) *Appropriate warning and / or noise attenuation measures will be required as a condition of approval for any development applications proposing new residential development or other sensitive land uses in areas between 25 and 30 NEF, including the requirement for permanent signage at the entrance to subdivisions identifying the presence of aircraft noise and other necessary noise attenuation measures; or*

ii Night movements are defined as aircraft movements occurring between 2201 and 0659.

iii Transport Canada convention is that NEF maps depict the 40, 35, and 30 contours. To implement a 25 NEF criterion, this additional contour would need to be added to NEF and NEP maps. (TP1247E 2013/14, pages 22 & 23).

(c) *Development applications proposing redevelopment of existing residential land uses or other sensitive land uses, or infilling of residential or other sensitive land uses, in areas above 30 NEF may only be permitted where the proposed development:*

- i) *Will not negatively impact the long-term function of the Airport; and*
- ii) *Incorporates appropriate warning and / or noise attenuation measures, including noise warning and other necessary noise attenuation measures.*

The NEF contours established under the Region of Waterloo International Airport Business Plan will be used for the purposes of implementing this policy and any other policies or legislation administered by the Provincial or Federal governments.

The current Regional Official Plan (ROP) makes reference to the contours that were prepared almost 20 years ago, albeit based on projected growth. So as to ensure these contours continue to provide protection against incompatible land use development in the vicinity of the airport, a fresh set on contours have been prepared.

1.3 2035 NOISE EXPOSURE PROJECTION (NEP)

It is recognized that much land use planning involves projections beyond five years into the future, when aircraft fleet mixes and runway configurations are most likely to be different from the known conditions of today. To provide provincial and municipal authorities with long range guidance in land use planning, Transport Canada introduced the Noise Exposure Projection (NEP). The NEP is based on a projection of aircraft movements for more than 10 years into the future, and includes aircraft types and runway configurations that may materialize within this period. NEPs may be made available in the same manner as NEFs.

1.3.1 Methodology

There are a number of factors that influence the noise exposure contours at an Airport including:

1. Aircraft types (fleet mix)
2. Number of night time movements (defined as any flight between the hours of 2200 and 0700). Night time movements are penalized by a factor of 16.7 times (12 dB)
3. Runway distribution
4. Departure configurations (Stage Lengths)

In order to define as accurately as possible the aircraft movement environment at YKF, Aircraft Movement Statistics based on NAV CANADA tower aircraft movement statistics (TAMS) data were obtained for 2015.

The data included all of the required information for the noise exposure analysis including:

1. Aircraft Type
2. Origin or Destination
3. Runway used
4. Arrival or Departure operation
5. Time of Day of flight

Data for itinerant movements and local movements were included, both of which are required for the NEF analysis. Itinerant and Local movements are defined as follows:

- Itinerant: an itinerant aircraft movement is one that enters or leaves the control zone of the air traffic control tower (approximately 5-7 nautical miles); and
- Local: a local movement is one that stays within the control zone of the air traffic control tower. These generally represent training circuits at the airport.

AIRCRAFT MOVEMENT FORECAST

Future aircraft movement activity was forecast by first defining three (3) traffic segments:

1. Itinerant Scheduled Commercial Passenger: includes all scheduled passenger traffic (i.e. WestJet) as well as seasonal charter traffic (i.e. Sunwing).
2. Itinerant All Other: includes all itinerant not identified as Itinerant Scheduled Commercial Traffic such as general aviation, medevac, government and military activity.
3. Local: includes circuits at the airport.

Aircraft movements for the year 2035 for the Itinerant Scheduled Commercial Passenger segment was determined based on an annualized nominal schedule of regular scheduled and seasonal charter passenger flights. For the remaining two segments, existing 2015 traffic levels for each segment was grown at a rate of 0.90 percent per annum.

PLANNING DAY

Transport Canada's NEF model requires data to be input for a planning day. By definition, the calculated planning day represents a very busy 24 hour day at the airport, where only 5 percent of the days in the year are busier. Transport Canada's recommended 95th Percentile Day method as described in Appendix B of the document TP6907 was used to determine the planning day values for the Itinerant All Other and Local traffic segments that were forecast. Actual 2015 movement data obtained from Statistics Canada was used in these planning day calculations. It was assumed the ratio of planning day movements to annual movements would remain during the forecast period. Ultimately, the nature of traffic at the airport was assumed not to change significantly so as to modify the "peakiness" of traffic at the airport.

The planning day for the Itinerant Scheduled Commercial Passenger segment was determined based on the annualized nominal schedule converted to an average day which was then "peaked". The ratio of planning day to average day that was used was determined based historical ratios determined at highly scheduled airports in Canada.

1.3.2 Summary of Inputs

The following tables provide a summary of the aircraft movement data for 2035 that was input into Transport Canada's NEF-Calc software version 2.0.6.1.

Table E-2 below identifies the number of NEF Day and NEF Night movements for the projected 2035 Peak Planning day, broken down by traffic segment.

Table E-2 | 2035 Projected Peak Planning Day Traffic

Segment	Day Movements	Night Movements	Total
Itinerant Scheduled	88	12	100
Itinerant Other	337	7	344
Local	564	19	583
Total	989	38	1027

The total number of peak planning day (PPD) movements projected for the year 2035 of 1,027 is similar to the PPD movements projected by the 2000 Master Plan of 1,004.

Runway utilisations for the NEP were determined by traffic segment. Runway utilisation for the Local and Itinerant Other segments were based up their respective existing 2015 runway use. Utilisation for the Itinerant Scheduled segment was modelled in such a way as to utilise the extended secondary runway, 14-32 which will be able to serve this segment at its extended length. The distribution modelled was consistent with preferential runways as defined in the current Noise Abatement Procedures. [Tables E-3](#) and [E-5](#) present the consolidated itinerant runway distribution and the local runway distribution respectively.

Table E-3 | 2035 Projected Itinerant Runway Distribution

Runway	Day Distribution	Night Distribution
08	20%	29%
14	12%	11%
26	32%	24%
32	36%	36%
Grand Total	100%	100%

A large variety of aircraft types made up the model used to determine the NEP contours for 2035. They have been summarized by power type and their distribution for day and night movements are listed below. [Table E-4](#) provides the power type distribution for itinerant traffic and [Table E-6](#) for local traffic.

Table E-4 | 2035 Projected Itinerant Aircraft Power Type Distribution

Power Type	Day Distribution	Night Distribution
Piston	73%	17%
Turboprop	8%	30%
Jet	19%	53%
Grand Total	100%	100%

Table E-5 | 2035 Projected Local Runway Distribution

Runway	Day Distribution	Night Distribution
08	19%	19%
14	14%	14%
26	30%	30%
32	37%	37%
Grand Total	100%	100%

Table E-6 | 2035 Projected Local Aircraft Type Distribution

Power Type	Day Distribution	Night Distribution
Piston	100%	100%
Turboprop	0%	0%
Jet	0%	0%
Grand Total	100%	100%

1.3.3 Observations

Figure E-2 illustrates the 2035 Noise Exposure Projection (NEP) contours for Region of Waterloo International Airport. As would be expected, the shape of the 2035 NEP is different as compared to the 2000 Master Plan contours currently used by the Region. The differences can be attributed to all of the variables that were used in the generation this NEP mode; however, the fact that three (3) of the four (4) thresholds at the airport have been modelled differently has a very significant impact.

For each runway threshold that has been extended, the contours associated with the approach will be pushed out in that direction. This can be clearly seen for the approaches of Runways 26 and 32. The existing Standard Instrument Departure Procedure (SID) for Runway 26 is also evident in the width of the contours just west of the airport. The quick left turn on departure from Runway 26 pulls the 25 NEF and to some extent 30 NEF contours south of the extended centerline of Runway 08-26.

While the contours under the arrival / departure paths are longer due to the new threshold locations, they tend to be somewhat narrower than the previous set of contours. Furthermore, along the runway, the new contours are generally as wide as or slightly narrower than the current contours.

Ultimately, some areas around the airport will see an increase in the NEF value while others will experience a decrease. Most importantly, areas of increase seem to be generally in areas without existing residential development.

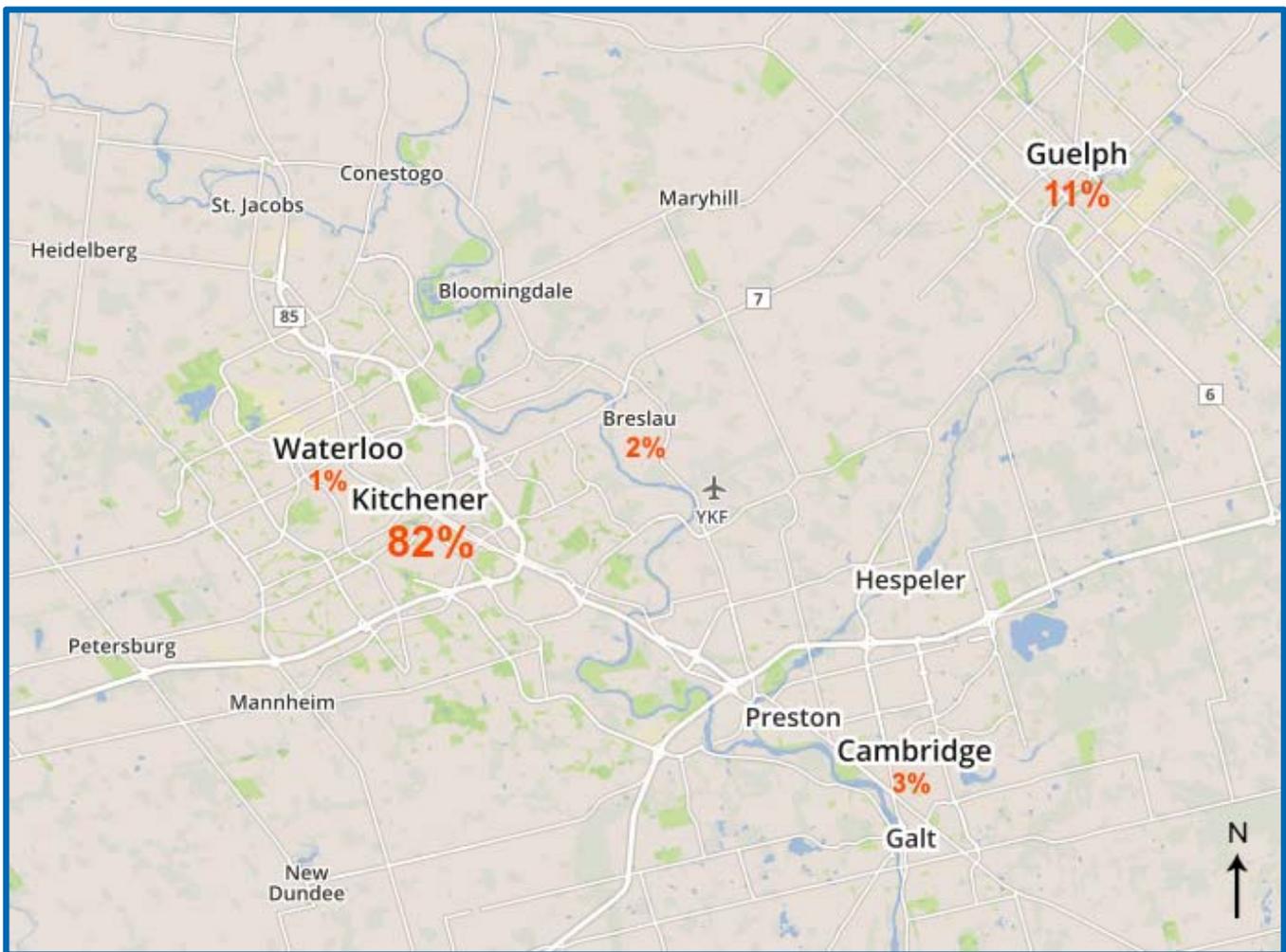
1.4 MITIGATIONS

The Region currently has implemented noise warning clauses and signage at the entrances of new developments within the Region, in conformance with the policy stated above. In addition, the Airport formed an Aeronautical

Noise Advisory Committee (ANAC) in June 1999 which meets quarterly and works collectively towards establishing amiable relationships with the residential and business areas adjacent to the Airport to mitigate concerns.

The Region of Waterloo International Airport tracks and investigates every noise concern received. From 2014 to 2016, 2,100 complaints were received, decreasing by 73 percent from 2014 to 2016 (1,269 were received in 2014, 494 were received in 2015 and 337 were received in 2016.) The largest number of noise reports each year originate primarily from eastern Kitchener and western Guelph. This corresponds with the direction of Runway 08-26. These complaints peaked with the use of an older cargo aircraft by Nolinor based here in 2012. Larger scheduled and charter jets have consistently received the most attention, despite continuing to decline since 2014. Overflights operating around our airport have constituted 8.7 percent of the complaints. While noise complaints are primarily concentrated around Guelph and Kitchener, there are also other complaints in other areas of the region. Refer to **Figure E-4** below that identifies the locations of the noise complaints and the percentage for that particular area.

Figure E-4 | Noise Complaint Distribution Map



Noise Abatement Procedures are also established and published in [CANADA AIR PILOT](#), as shown on **Figure E-5**. The ANAC also considers alternative measures, including revised Standard Instrument Departures (SIDs) which can help mitigate noise concerns in highly populated areas. These mitigations should remain in place and will serve to address new concerns should they arise as the airport evolves.

Figure E-5 | Noise Abatement Procedure as Published in the Canada Air Pilot



CYKF-NOR

KITCHENER/WATERLOO, ON
CYKF

NOISE ABATEMENT PROCEDURES

General
The following procedures apply to all IFR aircraft operating at Kitchener/Waterloo Airport.

Departures

Rwy	NADP
All rwys	1 or 2

Rwy 26:
Rwy heading to 1600. Left turn heading 190°. Heading 190° to YWT 4 DME BPOC.

Rwy 32:
Rwy heading to YWT 4 DME BPOC.

Arrivals
Contact and Visual Approaches (Rwys 08, 14 and 32):

1. Remain on or above assumed 3° glide path.
2. Maintain 3000 or last assigned altitude until established on final.

Preferential Rwys
Between 2300 and 0600 hours local time, consistent with safety of operations, pilots should select runways in the following order of priority:

Departures	Arrivals
Rwy 08	Rwy 26
Rwy 14	Rwy 32
Rwy 32	Rwy 14
Rwy 26	Rwy 08

Training Flights
No IFR or VFR training flights to rwy 08 are permitted between 2100 and 0700 hours local time.

Inquiries
Contact the Airport General Manager at 519-648-2256 between 0900 and 1700 hours local time.

NOISE ABATEMENT PROCEDURES

EFF 10 DEC 15

CYKF



CYKF-NOR

Canada Air Pilot
Effective 0901Z 10 DEC 2015 to 0901Z 4 FEB 2016

Source of Canadian Civil Aeronautical Data © 2015 NAV CANADA. All rights reserved

1.5 CONCLUSIONS

When comparing the NEP contours previously prepared as part of the 2000 Master Plan (refer to [Figure E-3](#)), the 2035 NEP contours presented above are partially consistent and very similar (depending on what area is being considered). When considering the 30 NEP contour the following can be concluded:

- East of the airport, under the approach for Runway 26, the contour extends east of the 2000 MP contour. This in large part due to the shift eastwards of the threshold location as envisioned by this Master Plan. The lands found within this expanded 30 NEP contour are primarily currently agricultural fields and owned by the Region of Waterloo.
- Northwest of the airport, towards Breslau, the contour is slightly shorter than the 2000 MP contour. At the same time, close to the threshold of Runway 14, the contour is wider. However, the area of minor contour growth seems to only impact commercial / industrial lots south of Fountain Street.
- West of the airport, towards Kitchener, the contour directly under the extended centerline of Runway 26 departures is consistent with the 2000 MP contour (albeit slightly shorter). These contours are a somewhat wider close to the airport but hardly cross the river.
- Southeast of the airport, under the approach for Runway 32, the contour is longer than the 2000 MP contour. This change is attributable to the change in threshold location as well as the types of aircraft operating from Runway 32. The lands found within this expanded 30 NEF contour are currently agricultural fields.

The 2035 NEP Contours are as generally larger as would be expected due to the extended runways and change in aviation activity at the airport. That being said, existing areas of incompatible land use surrounding the airport do experience a significant change in the noise environment as modelled by Transport Canada's Noise Exposure Forecast software. It is recommended that the 2035 NEP Contours be adopted and be included in the Regional Official Plan (ROP).

2. ENVIRONMENTAL CONSTRAINTS

The Region recognizes the need for conducting detailed environmental impact assessment studies for all the major recommendations outlined in the 20-Year Master Plan. The necessary studies will begin well before projects are implemented.

Some of the major known environmental impacts have been identified in **Chapter D** (under each specific improvement) and potential mitigations have been identified. A high level assessment has already been undertaken whereby the development plans included in this report have been reviewed in conjunction with the environmental constraints mapping. The development plans were revised to avoid impacts wherever possible and will be further reviewed during the applicable stage of the Master Plan.

2.1 POLICY CONTEXT

2.1.1 Federal

A number of federal laws and regulations apply to airports in Canada. A summary of federal environmental legislation is provided below.

FISHERIES ACT

The Fisheries Act provides for the protection of fish and fish habitat. Section 35 (1) of the Fisheries Act states:

“No person shall carry on any work, undertaking or activity that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery.”

The Act interprets ‘serious harm to fish’ as “the death of fish or any permanent alteration to, or destruction of, fish habitat”.

Proponents that plan to undertake activities in or near water have potential to negatively affect fisheries and are responsible for avoiding, mitigating, and offsetting ‘serious harm to fish’. Avoidance is achieved by undertaking measures which completely prevent serious harm to fish. These measures include project design considerations, location of activities, and timing of works. Mitigation is implemented by following best practices such as those described in the ‘measures to avoid harm to fish and fish habitat’. Any residual impacts are then required to be addressed by offsetting. An offsetting measure is one that counterbalances serious harm to fish resulting from a project, where serious harm remains after all feasible mitigation measures have been applied.

Works associated with airport development / expansion that could impact fish or fish habitat should be considered in the context of the federal Fisheries Act. The requirement for review by Fisheries and Oceans Canada (DFO) and potential for authorization under the Fisheries Act will be determined as details of the undertakings become known.

MIGRATORY BIRDS CONVENTIONS ACT

The Migratory Birds Convention Act, MBCA (1994) and Migratory Birds Regulations, MBR (2014) protect most species of migratory birds and their nests and eggs anywhere they are found in Canada, including surrounding ocean waters, regardless of ownership. General prohibitions under the MBCA and MBR protect migratory birds, their nests and eggs and prohibit the deposit of harmful substances in waters / areas frequented by them.

The MBR includes an additional prohibition against incidental take, defined by Environmental Canada as:

“The inadvertent harming, killing, disturbance or destruction of migratory birds, nests and eggs.”

Environment Canada implements policies and guidelines to protect migratory birds, their eggs and their nests. There is guidance on the Environment Canada website to minimize the risk of incidental take effects to migratory birds, to achieve compliance with the law and to maintain sustainable populations of migratory birds.

Compliance with the MBCA and MBR is best achieved through a due diligence approach, which identifies potential risk, based on a site specific analysis in consideration of the Avoidance Guidelines and Best Management Practices information on the Environment Canada website.

Works with potential MBCA implications may occur during the construction phase of development when properties or lands are cleared and grubbed of vegetation and/or vegetation is pruned or selectively removed, potentially removing nests of migratory birds. Compliance with the MBCA should be considered and integrated into the construction planning and implementation stages.

SPECIES AT RISK ACT

The Species at Risk Act (SARA) includes a number of prohibitions to protect individuals of listed Species at Risk, including:

No person shall kill, harm, harass, capture or take an individual of a threatened, endangered or extirpated species.

No person shall possess, collect, buy, sell or trade an individual of a threatened, endangered or extirpated species, or any part or derivative of such an individual.

No person shall damage or destroy the residence of one or more individuals of a threatened or endangered species, or of an extirpated species if a recovery strategy has recommended the reintroduction of the species into the wild in Canada.

These prohibitions apply on private lands throughout Canada only to aquatic species and species of migratory birds protected by the MBCA listed as Endangered, Threatened, or Extirpated under Schedule 1 of SARA. For other listed wildlife species, these prohibitions apply only on federal lands. However, the Governor in Council may, by order, apply these prohibitions to non-federal lands if the Minister of the Environment is of the opinion that the laws of a province do not effectively protect a listed species or the residences of a listed species.

On the recommendation of the Minister of the Environment, the Minister of Fisheries and Oceans or the Minister of Canadian Heritage, the Governor in Council may also apply these prohibitions on federal lands to species that are not listed by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) but are designated endangered or threatened by a provincial or territorial minister.

SARA also includes provisions to protect critical habitat; these are complex and vary according to the species in question and the location of the critical habitat. SARA's provisions also permit the Minister of the Environment, the Minister of Fisheries and Oceans and the Minister of Canadian Heritage broad discretionary powers to implement (or not) prohibitions to protect critical habitat. Generally, critical habitat protection applies to Threatened, Endangered and Extirpated species.

Species listed under SARA should be considered through the development of the design and implementation. Potential for impacts to federally protected species and potential for permit requirements should be assessed as more detailed information becomes available.

2.1.2 Provincial

Some provincial legislation is relevant to the Airport Master Plan process in providing information on sensitivities of features and functions on the airport lands and within adjacent lands. Consideration should be given to the

identification and protection of features identified as provincially significant or protected where possible. These are briefly discussed below.

ENDANGERED SPECIES ACT

Species designated as Threatened or Endangered by the Committee on the Status of Species at Risk (SAR) in Ontario (COSSARO), otherwise known as Species at Risk in Ontario (SARO), and their habitats (i.e., areas essential for breeding, rearing, feeding, hibernation and migration) are afforded legal protection under the Endangered Species Act (ESA) (Government of Ontario 2007). These species are threatened, endangered or of special concern in Ontario; consideration of these species and their habitats should be given to activities and development where possible for the airport lands.

PROVINCIAL POLICY STATEMENT

The Provincial Policy Statement (PPS 2014) provides policy direction on land use planning and development matters that are of provincial interest which protect the natural environment as well as public health and safety. Natural features generally afforded protection under the PPS include: *significant^{iv}* wetlands, *significant* woodlands, *significantⁱⁱⁱ* valleylands, significant wildlife habitat, significant areas of natural and scientific interest, coastal wetlands, fish habitat, habitat for threatened and endangered species, in addition to lands adjacent to these features.

2.1.3 Grand River Conservation Authority

In 2012, the Grand River Conservation Authority (GRCA) was requested by the Region to review and evaluate properties within close proximity of the Region of Waterloo International Airport under consideration for acquisition. This review included the land within the Airport boundary as well.

As part of the evaluation, the land areas were divided into 16 individual parcels and examined for their natural features, specifically related to wetlands, watercourses and their corresponding floodplains and steep slopes. A summary of the review findings as well as draft mapping updates developed through the East Side Stage 2 Lands Master Environmental Servicing Plan (underway at the time of this report) are shown on **Figure E-6**. All the properties under consideration are regulated by the GRCA under ONTARIO REGULATION 150/06 (DEVELOPMENT, INTERFERENCE WITH WETLANDS AND ALTERATIONS TO SHORELINES AND WATERCOURSES REGULATIONS) and they prohibit development in or on the following areas^v:

- a. Adjacent or close to the shoreline of the Great Lakes – St. Lawrence River System or to inland lakes that may be affected by flooding, erosion or dynamic beaches, and within the 15 metre allowance.
- b. River or stream valleys that have depressional features associated with a river or stream, whether or not they contain a watercourse,
- c. Hazardous lands;
- d. Wetlands;

iv As described and detailed in the PPS.

v Taken from GRCA Report dated October 18, 2012 Re: Potential Property Acquisitions, Township of Woolwich

- e. Or other areas where development could interfere with the hydrologic function of a wetland, including areas within 120 metres of all provincial significant wetlands and wetlands greater than or equal to 2.0 hectares in size, and areas within 30 metres of wetlands less than 2.0 hectares in size.

As well, this Regulation prohibits alteration to:

- f. Straighten, change, divert or interfere in any way with the existing channel of a river, creek, stream or watercourse or change or interfere in any way with a wetland prior to receiving written consent of the Grand River Conservation Authority.

Any future development, construction, reconstruction and /or site alteration within the regulated areas will require the prior issuance of a permit pursuant to Ontario Regulation 150/06 from the GRCA. The permit process involves the submission of a Permit Application to the GRCA for their review and approval.

2.1.4 Region of Waterloo Official Plan (ROP) (2015)

The Regional Official Plan (ROP) identifies and protects a 'Greenlands Network' of environmental features and linkages among them. Policies of the Plan have the goal of maintaining, enhancing, or where feasible restoring the Greenlands Network. The Greenlands Network is comprised of Landscape Level Systems (including Environmentally Significant Landscapes, Significant Valleylands [i.e. the Grand River Valley]), Core Environmental Features (CEF) (including Provincially Significant Wetlands and Significant Woodlands), Fish Habitat, Supporting Environmental Features, and the linkages between them. Further detail on the features that form the Greenlands Network and the policies that pertain to them can be found in Chapter 7 of the ROP. Greenlands Network features are shown on Map 4 - Greenlands Network of the ROP.

As per policies of the ROP, development and site alteration is generally not permitted within the Core Environmental Features. However, development or site alteration proposed contiguous to Core Environmental Features could be permitted subject to the completion of an Environmental Impact Statement to evaluating potential adverse environmental impacts on the features and their ecological functions.

2.2 FIELD INVESTIGATIONS

A representative of the GRCA has been included as part of the Project Team and further field and site investigations have been recommended to determine the viability of some of the available airport lands.

These investigations include an assessment of the regulated areas identified in GRCA mapping specifically delineating wetlands and completion of hydraulic modeling to confirm floodplain limits.

Field investigations were undertaken in 2014 and preliminary findings are summarized in the following sections.

2.2.1 Study Area Overview

The Study Area is located near the community of Breslau and is generally bounded by Fountain Street to the West, Lonsdale Road to the North, Cober Road to the East and Kossuth Road to the South. Lands within the study area are dominated by the Region of Waterloo International Airport and associated lands, but include a number of private residential and agricultural land uses. Natural features present within the study area include woodland, wetland and meadow communities. As is typical within the Region, areas of remaining natural features are generally lands that historically could not readily be cleared for farming and are dominated by two Provincially Significant Wetland (PSW) Complexes – Kossuth PSW Complex and Breslau PSW Complex. These two features are generally located to the south and north of the airport lands, respectively. Both PSWs include a range of wetland communities including swamp, marsh and shallow open water communities. Upland forest areas are generally limited and are contiguous with the existing wetland features within the study area. Meadow and old field

communities are found throughout the Regional Airport property as well as along margins or larger feature units (i.e. buffers, edge communities).

Other designated features within the study area include Core Environmental Features identified and designated for protection in the ROP, areas regulated by the Grand River Conservation Authority (GRCA) under Ontario Regulation 150/06 Regulation of development, interference with wetlands and alterations to shorelines and watercourses and floodplains associated with Randall Drain.

2.2.2 Summary of Key Findings

PROVINCIALY SIGNIFICANT WETLANDS

Two Provincially Significant Wetlands (PSWs) are present within or immediately adjacent to the airport Master Plan study area: the Breslau Wetland Complex (north of the airport) and the Kossuth Wetland Complex (south of the airport).

Breslau PSW Complex

The Breslau PSW complex is located in the northern portion of the study area and consists of a complex of 21 wetlands. Wetland units associated with this PSW are located both within and beyond the limits of the study area (See [Figure E-6](#)). In addition, there are 19 nearby unevaluated wetlands that have not been complexed into the PSW. The majority of these unevaluated wetlands are under 2 hectares, dominated by non-native species, and do not provide much connection to the larger complex. The approved Breslau Secondary Plan and the ongoing Randall and Breslau Drain Subwatershed Study which is being prepared as part of the Region's comprehensive planning process for the East Side Lands, provide some assessment of unevaluated wetlands that may be of import to this study.

Kossuth PSW Complex

The Kossuth PSW complex is located in the southeastern portion of the study area (See [Figure E-6](#)). Several wetland units associated with this PSW complex are located within or adjacent to the study area. This wetland complex is also within the vicinity of four unevaluated wetlands adjacent to the airport lands, one of which was surveyed during this study. The ongoing Randall and Breslau Drain Subwatershed Study, which is being prepared as part of the Region's comprehensive planning process for the East Side Lands, provides some assessment of unevaluated wetlands that may be of import to this study.

SIGNIFICANT WOODLANDS

According to the Provincial Policy Statement (2014), woodlands are defined as "Treed areas that provide environmental and economic benefits to both the private landowner and the general public, such as erosion prevention, hydrological and nutrient cycling, provision of clean air and the long-term storage of carbon, provision of wildlife habitat, outdoor recreational opportunities, and the sustainable harvest of a wide range of woodland products. Woodlands include treed areas, woodlots or forested areas and vary in their level of significance at the local, regional and provincial levels."

The Natural Heritage Reference Manual (NHRM; MNRF 2010), provides guidance and recommended criteria for the evaluation of woodland significance with recommended standards for each criterion. However, where municipal policies are more inclusive (i.e. identify more areas as significant), they shall guide the identification of significant woodlands through Official Plan policies and / or guidance documents.

The Region of Waterloo sets out criteria for identifying Significant Woodlands in Policy 7.C.6 (Core Environmental Features: Significant Woodlands) of the ROP and are identified as areas that meet all of the following criteria:

- Greater than four hectares in size, excluding any adjoining hedgerows
- Consisting of primarily native species of trees, and
- Meets the criteria of a 'woodland' in accordance with the provisions of the Regional Woodland Conservation By-law.
- The Regional Woodland Conservation By-Law identifies a woodland as an area >1 hectare and containing:
 - (i) 1,000 trees, of any size, per hectare
 - (ii) 750 trees, measuring over five centimetres in diameter, per hectare
 - (iii) 500 trees, measuring over 12 centimetres in diameter, per hectare, or
 - (iv) 250 trees, measuring over 20 centimetres in diameter, per hectare

Significant Woodlands within the Region of Waterloo are shown as part of the Core Environmental Features designation in the Official Plan on Map 4 - Greenlands Network. Within the airport lands, there are two Significant Woodlands: one to the north of Runway 14 adjacent to Lonsdale Road and another to the south and east of Runway 32. *Significant Woodlands* per the ROP and recent work completed as part of the Randall and Breslau Drain Subwatershed Study are shown on [Figure E-7](#).

FLORA

Within the study area, vegetation communities are predominantly composed of wetlands and include swamp, marsh, meadow marsh and shallow open aquatic communities associated with Kossuth PSW Complex and Breslau PSW Complex. These two PSWs dominate the existing natural vegetation communities within the study area. Smaller areas of upland forest and meadow communities are present, primarily contiguous to these wetland features.

A total of 241 plant species were recorded, with an additional 23 records identified to genus, in 33 ELC (Ecological Land Classification) communities (15 unique community types). Six regionally significant species were recorded: Black Walnut (W*+), Black Spruce (W), Hard-stemmed Bulrush (W), Pretty Sedge (W*), Virginia Stickseed (W*), and White Spruce (W+). No vegetation SAR or provincially rare (S1-S3) species were recorded during field investigations.

Primary sensitivities within the study area include potential impacts to wetland communities associated with the Kossuth and Breslau PSW Complexes. Overall, areas within the managed airfield lands are more disturbed and more tolerant than those outside of the currently managed area. Given provincial designation of the wetlands present within the study area and the overall sensitivity of these features, the surrounding landscape is generally fairly sensitive.

TERRESTRIAL FAUNA:

Wildlife Habitat within the study area is diverse and provides opportunities for a diverse range of terrestrial fauna. Overall habitat quality is high within natural areas providing relatively large contiguous areas associated with the PSW features and opportunities for grassland species in tall-grass / meadow areas within the airport lands.

Overall wildlife diversity within the study area is good. Species diversity is generally consistent with habitats represented within the study area – wetland, forest and meadow communities. A total of 60 bird species were recorded during field investigations - 57 during breeding bird surveys, an additional three species recorded

incidentally. Six breeding amphibian, four butterfly, one dragonfly and five mammal species were observed in the study area through targeted and supplementary surveys.

The study area provides habitat for seven SAR species – six bird species and one butterfly species:

- ▶ Threatened (THR)
 - Barn Swallow
 - Bank Swallow
 - Bobolink
 - Eastern Meadowlark
- ▶ Special Concern (SC)
 - Eastern Wood Pewee
 - Wood Thrush
 - Grasshopper Sparrow^{vi}
 - Monarch Butterfly^{vi}

Of specific note is the presence and density of grassland SAR species within tall-grass / meadow habitat features within the airport lands. Periodic management (i.e. mowing) of grassed areas within the airport allows for the presence and perpetuation of excellent habitat opportunities for Bobolink, Eastern Meadowlark and Grasshopper Sparrow. These species are generally low-flying and pose a smaller risk than other larger bird species or aerial insectivores (aerial foragers) that are an issue with regard to plane safety (i.e. collisions with planes). Opportunities to continue lands-management to retain these habitats is recommended where safety concerns do not require further changes to land management activities.

In addition to SAR bird species, 15 regionally rare bird species were observed. No regionally rare amphibian, insect, or mammal species were observed.

Primary sensitivities within the study area include potential impacts to SAR and SAR habitat, specifically within the airport lands. The requirement to manage and maintain these lands is a recognized requirement for airport operation. Opportunities to manage these properties in a way that maintains habitat for these species should be considered where there is no threat to safety. Other sensitivities include potential impacts to wetland and forest habitats and associated habitat features and functions.

FLOODPLAIN - RANDALL DRAIN

The Regulatory Floodplain represents the modelled extent of flooding that could occur in the event of a Regional storm event. This approach was established in Ontario after the events of Hurricane Hazel and are intended to protect public health and safety, and property from storm events that could occur in the future. Lands within the floodplain are regulated by the GRCA with the express intent to mitigate and protect for potential flood events within the Grand River watershed and its tributaries. Development is generally prohibited within the floodplain; proposed development or site alteration within the floodplain requires a permit / approval from the GRCA. Preliminary floodplain mapping and HEC-RAS models for Randall Drain were obtained from the GRCA and

vi Federally listed, all others are provincially listed species

updated as part of the Randall and Breslau Drain Subwatershed Study (MMM | WSP 2017). The Draft Regulatory Floodplain for Randall Drain is shown on [Figure E-6](#).

Opportunities to enhance the drainage function within the subwatershed and improve facility operation and management through improvements to drainage, floodplain management, etc. should be explored, as appropriate, as options are considered through the Phases of the Master Plan.

FISHERIES

Randall Drain is the only defined aquatic feature within the study area. Randall Drain is classified as a Type E Drain (permanent, coldwater); however, of the nine species of fish captured within the study reaches (MMM 2014 survey and historical data from MNRF). All were coolwater / warmwater bait/forage fish. These species are relatively tolerant to disturbance.

Within the study area Randall Drain is split into two branches – East and North. The North branch initiates north of the study area and flows southerly across the west limit of the airport lands joining the East branch approximately 400 m upstream of Fountain Street. This branch has been historically channelized and straightened and has retained very little natural channel character. Reaches through the North branch have very narrow riparian areas and little cover. The East Branch originates east of Cober Road in a wetland headwater feature and flows westerly through the study area, south of the airport lands. Generally, reaches within the East Branch display more natural channel characteristics and habitat diversity; this is particularly true through PSW features than elsewhere in the study area. Several reaches through the East branch have been historically straightened.

No SAR, provincially rare, or regionally rare species were observed or anticipated within the study area.

Overall sensitivity of aquatic features within the study area is low with respect to fisheries. These features are managed as coldwater and any recommended mitigation measures will be in consideration of this management objective.

2.2.3 Species of Conservation Concern

SPECIES AT RISK

Through a review of the Regional Species (SAR) at Risk List for Waterloo created by the Ministry of Natural Resources and Forestry (MNRF), 52 SAR were identified for screening within the study area including 9 vegetation species, 38 wildlife species, and 5 aquatic species.

Of the 52 species screened, 24 were identified as having potential for occurrence within the study area ranging from very low to high potential. During standard field surveys (i.e. non species-specific surveys) six SAR bird species and one SAR butterfly species were recorded, confirming their presence. Some species identified as potentially present require species-specific targeted surveys to confirm presence / absence. The screening table provides information on habitat suitability to assess any future survey requirements with respect to SAR if / as required.

A summary of SAR observed / confirmed within the study area is provided below. The detailed SAR table is provided in the [PRELIMINARY EXISTING CONDITIONS MEMORANDUM](#) (MMM August 2014).

Threatened

- ▶ Bank Swallow
- ▶ Barn Swallow

- ▶ Bobolink
- ▶ Eastern Meadowlark

Bank Swallow and Barn Swallow were observed foraging over the study area in reasonable numbers. It is unlikely that Bank Swallow is breeding within the study area. There is potential for Barn Swallow to be breeding within the study area. Both Bobolink and Eastern Meadowlark were recorded within the study area in good habitat for these species and were observed in relatively large numbers; they are assumed to be breeding within the study in areas of suitable habitat (i.e. tall grass – primarily within the airfield area, Terrestrial Survey Unit (TSU) 5 and 7).

Special Concern

- ▶ Eastern Wood Pewee
- ▶ Wood Thrush
- ▶ Monarch Butterfly

Eastern Wood Pewee was observed in 4 TSUs (2, 4, 6 and 8) within suitable forest habitats. Wood Thrush was observed in TSU 6. Monarch Butterfly was observed in TSU 5 and 7 within cultural / old field meadow where suitable foraging habitat is present.

In addition to the above-listed and screened provincial Species at Risk, 2 federal SAR were recorded:

- ▶ Grasshopper Sparrow
- ▶ Monarch Butterfly

Both species are listed as Special Concern under the federal Species at Risk Act.

PROVINCIALY SIGNIFICANT SPECIES

Based on Natural Heritage Information Centre (NHIC) database information, recent records exist for two provincially rare wildlife species: Bobolink (2004) and Eastern Meadowlark (2004). These species are listed provincial SAR and are discussed in the preceding section. Historical records were found in the area for:

- ▶ 14 plant species: American Gromwell, Braun's Holly Fern, Carolina Wood Vetch, Hairy Valerian, Harbinger-of-spring, Long-styled Canadian Snakeroot, Moss Phlox, Oswego Tea, Pawpaw, Sharp-fruit Rush, Smith's Bulrush, Virginia Yellow Flax, Wahoo, and White-tinge Sedge.
- ▶ 3 additional wildlife species: Cerulean Warbler, Eastern Ribbonsnake, and Tawny Emperor; and
- ▶ 2 aquatic species: Silver Shiner and Rainbow Mussel.

No provincially significant (S1-S3) plant or fish species were recorded during field surveys.

Both Bobolink and Eastern Meadowlark were observed in relatively large numbers within the study area and are discussed in the Species at Risk section above.

REGIONALLY SIGNIFICANT SPECIES

A total of 18 regionally significant species were recorded within the study area, including 6 plant species and 12 bird species. No regionally significant mammals, herpetofauna or insects were recorded. A detailed list of regionally rare species recorded and units in which they were observed is provided in the Preliminary Existing Conditions Memorandum.

2.2.4 Setbacks and Buffers

One of the key mitigation and protection measures for natural heritage features is the establishment of ecological buffers. Buffers serve to protect existing features from developed land uses by including physical development setback distances and buffer management measures.

To mitigate potential impacts and provide enhancement opportunities, minimum development setbacks and buffer management measures were developed as part of the East Side Lands (Stage 2) MESP & Secondary Plan, with the following ecological management objectives:

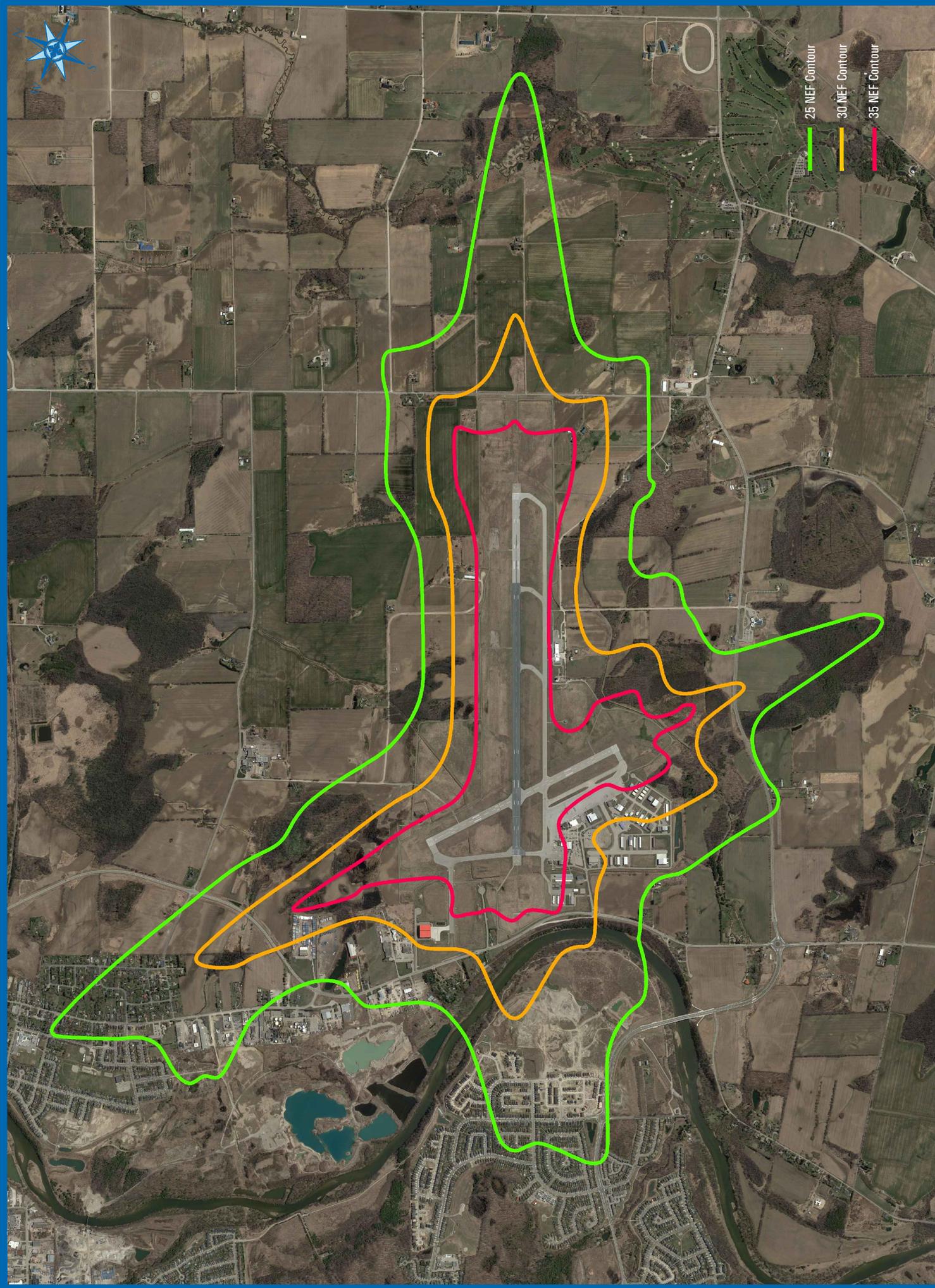
- Vegetation and tree root zone protection.
- Protection of surface water quality from potential effects of sedimentation/erosion, nutrient loading, contaminants and temperature.
- Protection or enhancement of aquatic habitat quality and function (i.e. benthic community diversity through water quality improvements, etc.).
- Reducing potential for physical edge effects via establishment of a more robust and dense edge vegetation community.
- Protection and enhancement of woodland and forest interior habitat (including habitat for forest interior or forest-associated birds and woodland breeding amphibians), via increased functional setbacks from 'core' areas and increased woodland size – relative to current agricultural use.
- Protection and enhancement of herpetofaunal and terrestrial invertebrate (i.e. Lepidoptera / Odonata) breeding and foraging habitat.
- Reducing potential for occupancy-related activities (i.e. encroachment, dumping, noise / lighting etc.), via physical separation and buffer management measures - along with other mitigation measures.
- Ecological enhancement of the buffer zones, (which are largely agricultural in nature with abrupt agricultural / natural interfaces) via: increased width; increased habitat diversity; increased native species composition; and areas for potential enhancement opportunities.
- Enhancement of ecological corridors, via setbacks and buffer zone enhancements.
- Hazard mitigation (regulatory floodplain, steep and oversteep slope setbacks, valley setbacks where appropriate, tree fall zones).

These development setbacks will be considered during the development and assessment of detailed proposals, however in some cases, encroachment may be required for public infrastructure associated with the airport.

Cumulatively, the ecological buffers and hazard setbacks form the Recommended Development Constraint presented in the Draft Randall and Breslau Drain Subwatershed Study (Refer to Figure 6-3 of the Subwatershed Study). The draft Recommended Development Constraint from the Subwatershed Study within and adjacent to the airport lands are shown in **Figure E-6**.

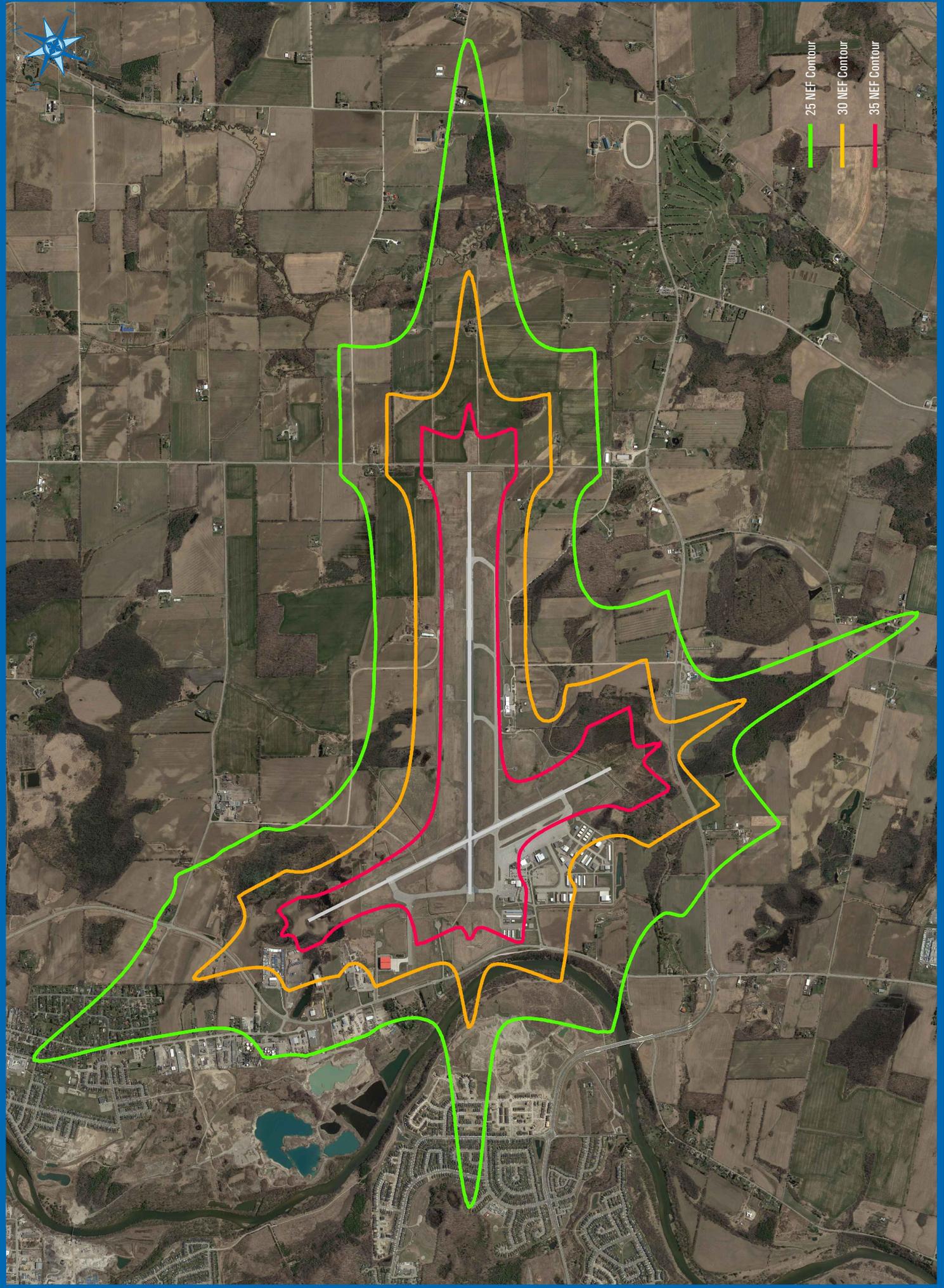
2.3 CONCLUSIONS AND RECOMMENDATIONS

The Randall and Breslau Drain Subwatershed Study establishes high-level guidelines for the management of the natural heritage system and guidance for future development of the lands within its study area and includes lands within and adjacent to the airport. Subsequent planning and design initiatives associated with airport expansion will require further assessment at a site-specific level during both the preliminary feasibility studies and ultimately during the detailed design stages. Impacts to natural heritage features associated with proposed expansion activities will be assessed with appropriate avoidance and / or mitigation measures identified and implemented where required. Opportunities to retain or increase habitats that currently support species at risk (i.e. Eastern Meadowlark and Bobolink) should be explored wherever possible to protect or, if possible, enhance the ecological support functions provided by some of the airport lands.



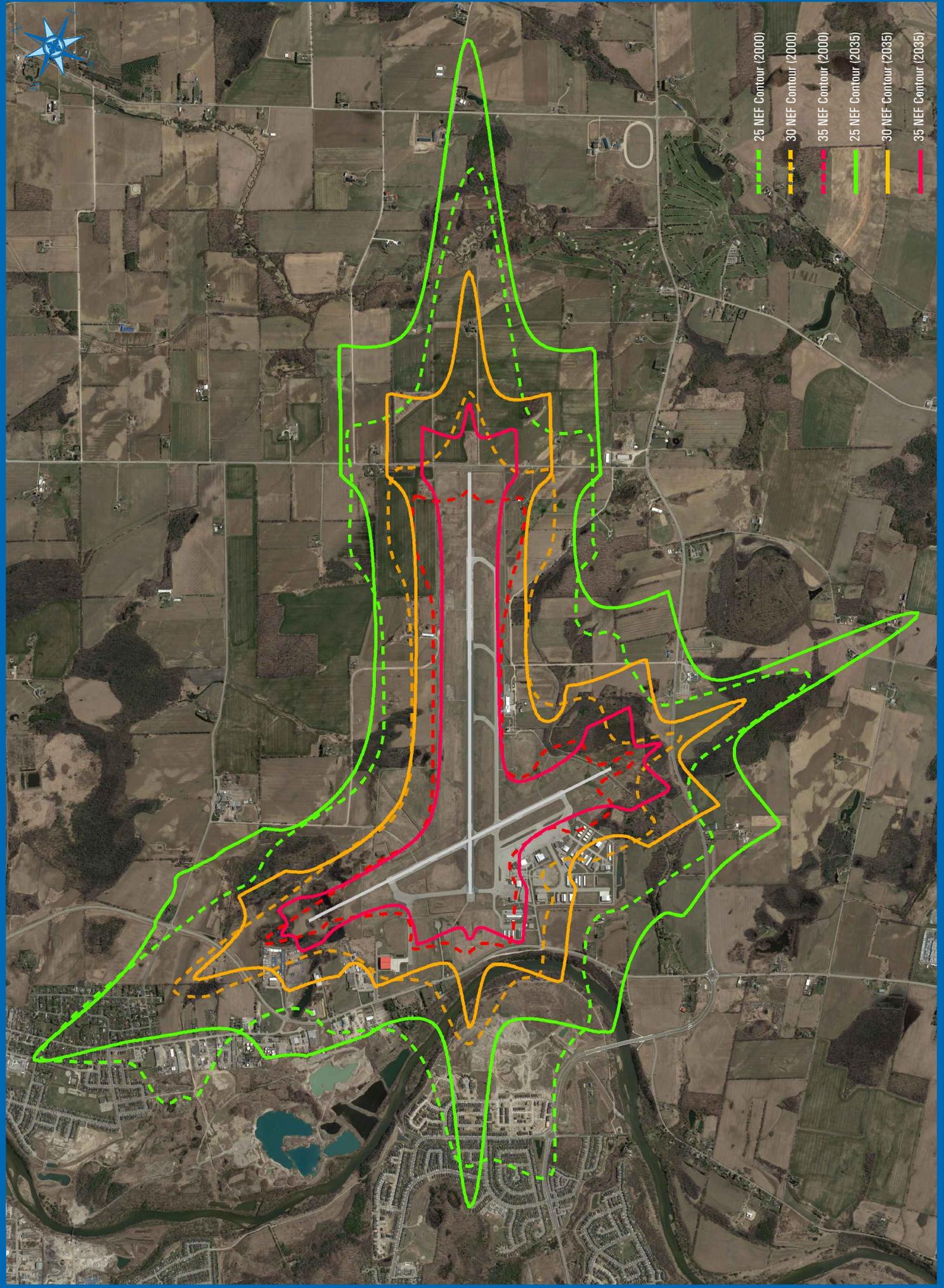
Existing 2000 Master Plan Noise Contour Plan

Figure E-1



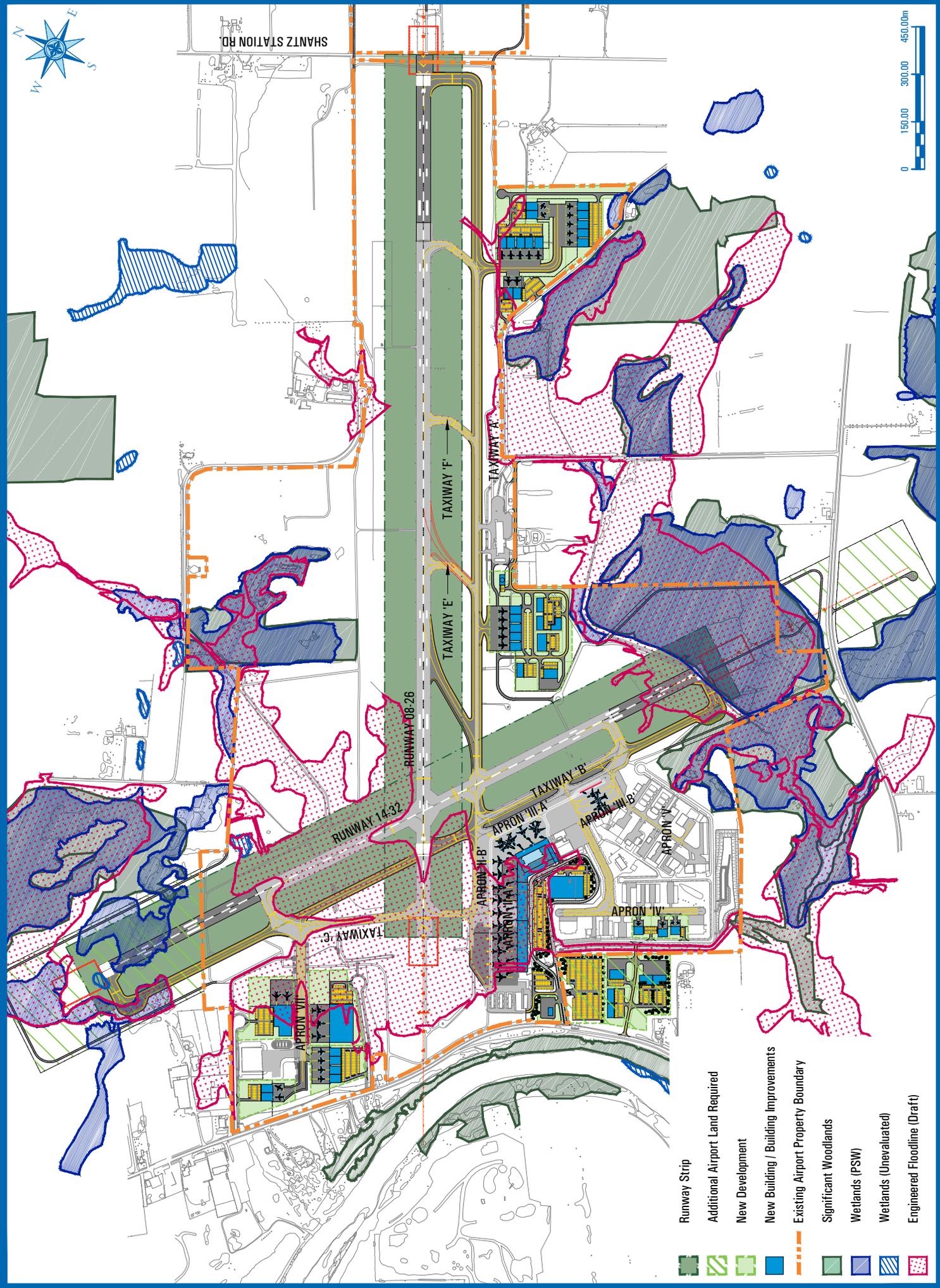
Proposed 2035 Noise Contour Plan

Figure E-2

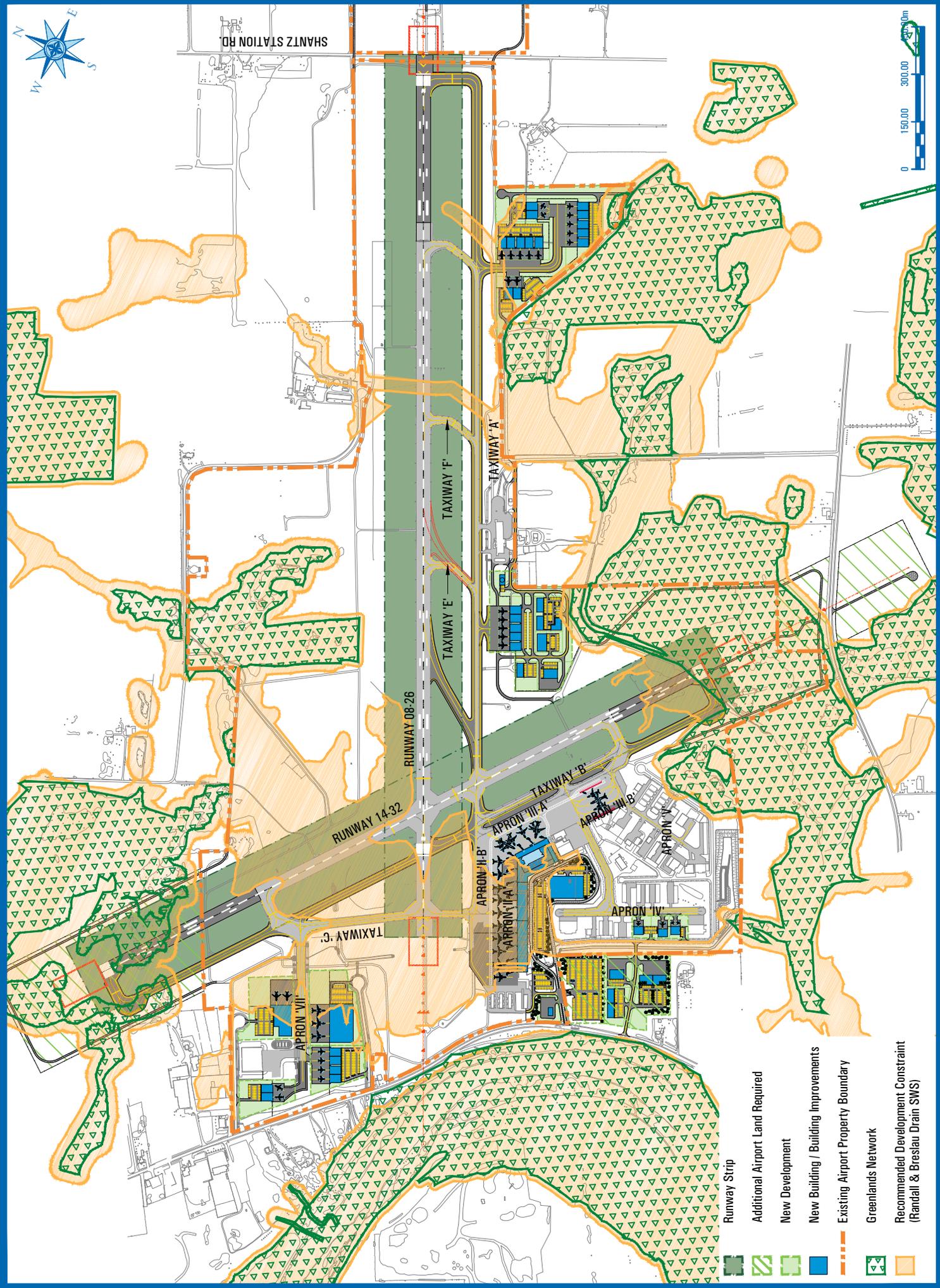


Composite Noise Contour Plan

Figure E-3



Natural Heritage Features and Constraints Plan **Figure E-6**



Recommended Greenlands Network and Development Constraint Plan Figure E-7



F. RECOMMENDED AIRPORT LAND USE

CHAPTER F. RECOMMENDED AIRPORT LAND USE

1. RECOMMENDED LAND USE PLAN

The Region of Waterloo International Airport's recommended Land Use Plan recognizes current areas for existing and proposed aviation and non-aviation uses, alongside future development opportunities for both aviation-related and non-aviation uses. The proposed Land Use Plan divides the Airport's various compatible activities into a series of sub-areas to foster development synergies for the long-term growth of the site.

The proposed Land Use Plan prioritizes:

- ▶ Maximizing the economic development potential of the Airport and surrounding area;
- ▶ Minimizing future land use conflicts; and
- ▶ Establishing a local land use framework for the area that maintains or enhances the quality of life of the surrounding community.

1.1 PLAN APPROACH

The Airport's Land Use Plan considered and emphasizes the following key objectives:

- ▶ Prioritization of safe operation of the Airport and aircraft;
- ▶ Protection of lands, facilities and infrastructure required for essential Airport operations, both now and into the future;
- ▶ Utilization of lands and facilities surplus to essential aircraft operations in order to enhance the overall commercial viability of the Airport; and
- ▶ Optimization of development with regard for the physical and natural features of the area.

An assessment of the total available land base of the Airport was conducted. The recommended Land Use Plan and future development sequencing presented in this document reflect the physical, environmental, and aviation-related constraints to development that exist; safety regulations; and the need to ensure compatibility with existing adjacent land uses. A subtractive method identified areas with the least constraints for development and that lay outside the areas identified as essential to core Airport operations.

The proposed extent of each of the land use types proposed for the Region of Waterloo International Airport is illustrated in **Figure F-1**.

Figure F-1 | Proposed Land Use Plan (inset)



1.2 LAND USE PLAN

The intent of the Land Use Plan is to identify the various land uses and their locations to optimize the use of Airport lands.

1.2.1. Adjacent Land Use

The integration of an international airport within the surrounding urbanized environment is a major consideration in the development of a long-term land-use plan. The municipal statutory plans and regulations for compatible land use around airports form the basis of ensuring harmonious growth of both the airport and its neighbors. The adherence to these policies, guidelines and regulations ensures airport operations do not adversely impact adjacent land uses and the adjacent area land uses do not unduly restrict airport operations.

1.2.2. Airport Regulations

The airport and the surrounding communities are subject to airport zoning that are included in the Region of Waterloo International Airport Zoning Regulations. The federal government is responsible for enacting federal Airport Zoning Regulations that establish height restrictions and buffer zones both on and off airport property. These regulations provide protection and clearance for aircraft flight paths, navigational and telecommunication equipment and air traffic control visibility.

1.2.3. Land Use in the Vicinity of Airport

In addition to these regulations, guidelines for land use in the vicinity of airports are published by Transport Canada (TP 1247E). These guidelines are only enforceable through cooperative planning between airport authorities and surrounding communities. The zoning regulations and land-use planning guidelines together provide:

- ▶ Height restrictions for safe operations of aircraft, radar and telecommunications signals and protection of line of sight from the Air Traffic Control Tower;
- ▶ Buffer zones around airport facilities to minimize aircraft noise impacts;

- ▶ Restrictions for buildings and structures, to prevent interference with navigational aids;
- ▶ Land-use restrictions for non-compatible land uses related to bird strike hazards;

The Regional Official Plan has identified similar guidelines as shown in Chapter 5 of ROP (5.A.20)

In planning for land uses in the vicinity of the Region of Waterloo International Airport, Area Municipalities will establish policies in their official plans that:

- (a) support the long-term operation and economic role of the Airport;*
- (b) protect the Airport from development that would preclude or hinder its expansion or continued use, or which would be incompatible for reasons of public health, public safety or environmental concerns;*
- (c) ensure that the Airport and sensitive land uses are designed, buffered and/or separated from each other to prevent adverse effects from odour, noise and other contaminants;*
- (d) provide for the inclusion of warning clauses advising property owners in the vicinity of the Airport of potential outdoor lighting and height restrictions, and of the potential for occasional noise-related impacts;*
- (e) prohibit any land uses that may cause a potential aviation safety hazard; and*
- (f) be in conformity with Transport Canada’s Region of Waterloo International Airport Zoning Regulations*

1.2.4. Airport Noise Protection Area

As indicated, if land uses adjacent to the airport are properly planned, constraints to airport operations, expansion and the loss of economic benefits to the region can be reduced or eliminated. For the ease of implementation of the land-use guidelines, it is recommended that the region establish an airport noise protection area. The recommended airport noise protection area will follow the natural and manmade boundaries encompassing the 30 NEF contour limit.

1.2.5. Other Factors Affecting Airport Development

Operational Influences Developments proposed must conform to Aerodrome certification standards. The constraints on facilities siting and height, and the materials to be used for building construction are governed by:

- ▶ Runway zoning surfaces,
- ▶ Control tower line of sight, and electronic zoning associated with navigational and telecommunication equipment.
- ▶ These restrictions provide an envelope for airport facility siting and development

1.2.6. Airport Reserve

Airport reserve lands are properties including the airport noise protection area where sensitive land uses are prohibited. The lands may or may not be within the current Urban Boundary. The long term intended use of these lands are employment, and uses complimentary to the airport. The objective of the airport reserve is to provide predictable long term strategic direction for land uses around the airport for the benefit of air carriers, land owners, surrounding communities and developers. There will be comprehensive review / consultation process to ensure all developments are in line with the municipality requirements.

1.2.7. Land Use Districts

The proposed land use districts and their intended usage are summarized as follows:

- ▶ **Additional Airport Land Required:** This area is required for future expansion and development of the Airport, including runway and taxiway extensions;
- ▶ **Airfield:** This area includes land designated for existing and future runways, taxiways, navigational aids and approach facilities;

- ▶ **Commercial Development:** This area is designated for maintenance, repair, overhaul, fixed-base operators, aircraft sales, and additional specialty air services and businesses requiring airside access;
- ▶ **Environmentally-sensitive Areas:** Environmentally-sensitive areas are identified on the Land Use Plan where restrictions and / or constraints are placed on any contemplated development in the area;
- ▶ **Airport Reserve:** Airport reserve lands are properties designated as reserve lands where sensitive land usages are prohibited. Land uses may include employment and other complimentary land uses;
- ▶ **Airport Terminal and Operations:** These areas provide for the future expansion of the existing Air Terminal Building, Airport Operations Centre as well as a future NAV CANADA Air Traffic Control Tower.

1.3 DEVELOPMENT PLAN OBJECTIVES

Further to the key objectives listed in the Plan Approach, the following objectives have been factored in developing the ultimate land use and development alternatives shown within this Master Plan:

- ▶ The usability of the Airport should be optimized in order to be capable of not only handling the current fleet of aircraft servicing the Airport, but also to attract additional air traffic that can contribute important additional revenues to the Airport;
- ▶ The amount of developable land that can be created within the Airport lands already owned by the Region should be maximized;
- ▶ The land created for development should be able to respond to the projected mix of uses, which comprises in reasonable equal parts: large scale airport related industrial usages; larger lots for MRO (Maintenance, repair, and operations) activities and larger aircraft types (i.e. Apron VII area), medium sized lots for private / corporate sized aircraft and commercial operations (i.e. Proposed Apron VI and Apron VIII areas), and smaller lots for smaller aircraft T-hangars, etc., (i.e. Apron I, IV, and V);
- ▶ The Plan should strive to provide the additional land and associated facilities for reasonable construction cost;
- ▶ Operating and maintenance cost considerations are significant factors and all proposed options should minimize these as well;
- ▶ The alternatives must respect and work within the constraints in the current site, specifically related to any environmental considerations (including engineered environmental solutions);
- ▶ The Plan should present acceptable risk to the Airport and the Region;
- ▶ The Plan should accommodate ground based transportation and transit connectivity including future road expansions to the new ATB;
- ▶ The importance of generating revenue for the Airport must be a key focus, in order to reduce the current subsidy from the community; and
- ▶ The economic impacts of any proposed developments should be designed to improve the overall viability of the Airport.

2. AIRPORT COMMERCIAL SERVICES AND FACILITIES

2.1 FUTURE SPACE

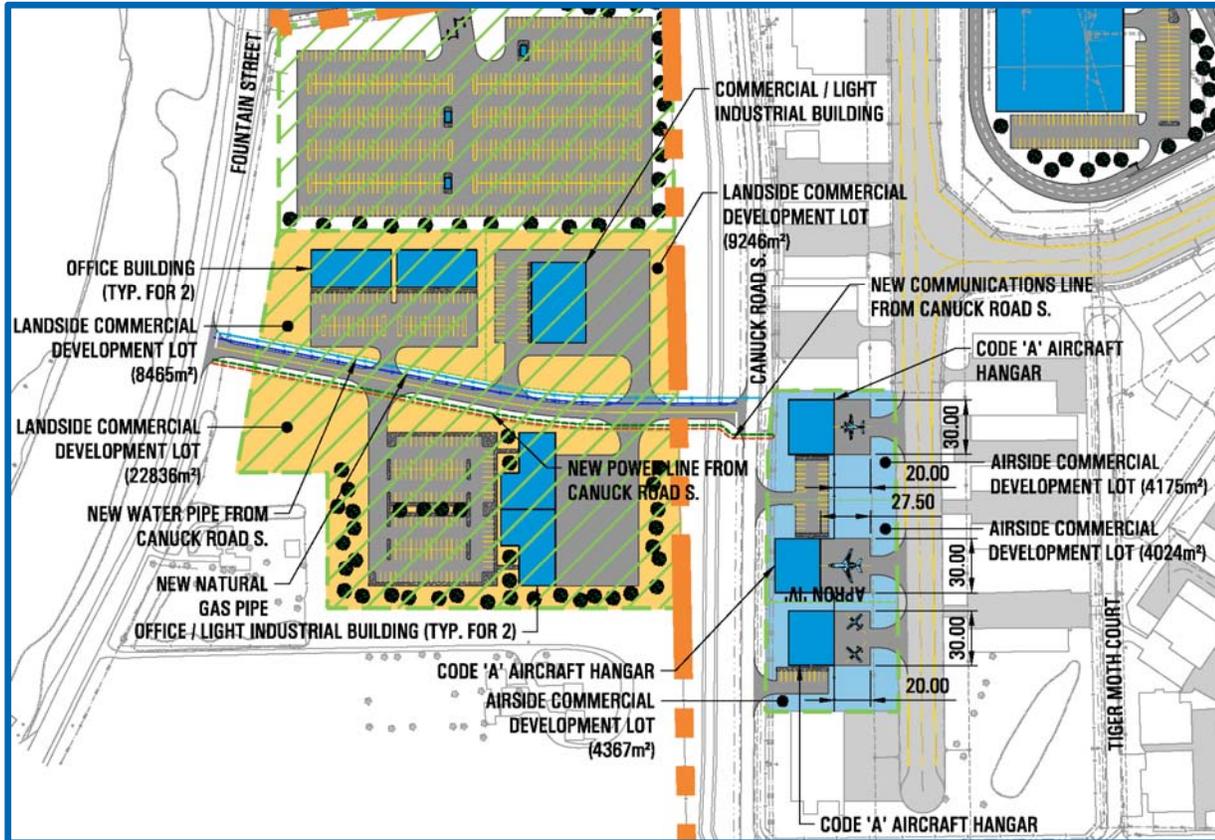
Demand for developable land with airside access has been expressed to the Region of Waterloo by the aviation community. In order to respond to this need, this Master Plan sets out various areas for land development, including constraints and challenges that will need to be addressed during the development process.

Large scale industrial developments (50 + acres) may be accommodated with additional land acquisition as current available airport lands are restricted by height and environmental constraints.

2.1.1 Existing Developments – Serviced Lots

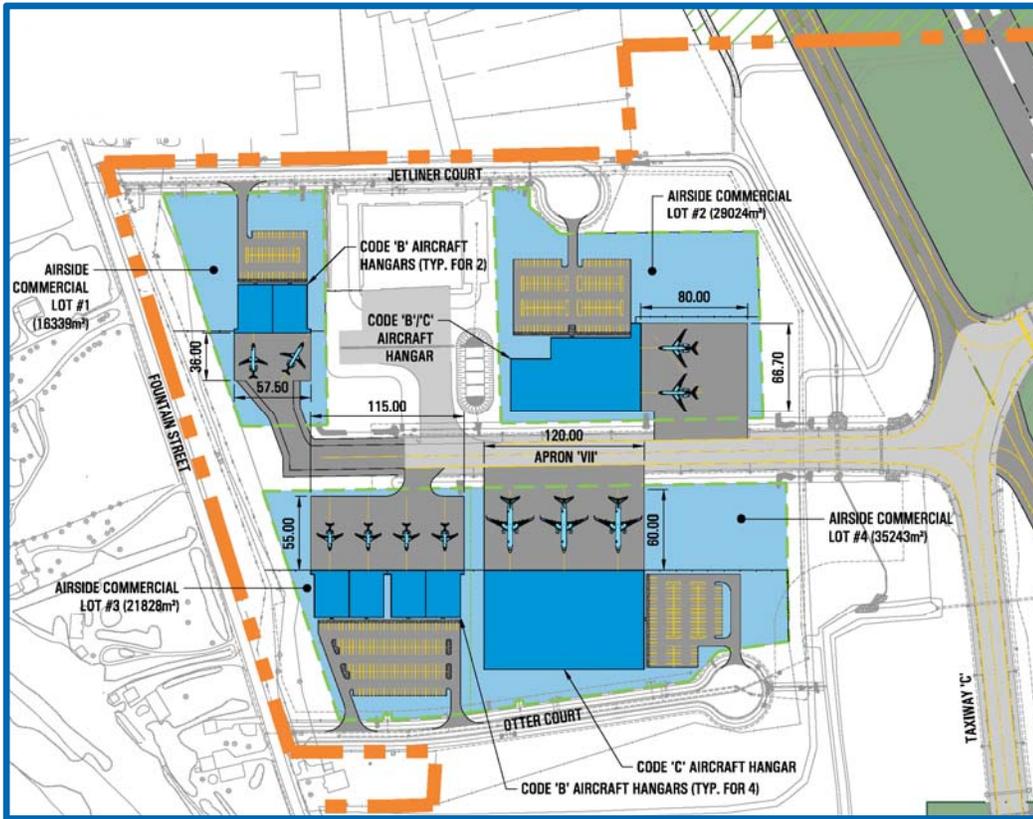
Development-ready lots with airside access are currently available in the areas adjacent to Apron IV and Apron VII. Development lots are available along the west side of Apron IV and can be accessed from Canuck Road, which connects to Airport Road. This area can accommodate several more hangars with a depth in the order of 45 metres. A sample of a proposed development within this Apron IV area is shown on **Figure F-2**.

Figure F-2 | Sample Apron IV Development Plan (inset)



Two large blocks with airside access to Apron VII are currently available. The block on the north side of Apron VII is approximately 2.9 hectares and can be accessed from Fountain Street via Jetliner Court, a serviced cul-de-sac located on the north side of this block. The block on the south side of Apron VII is approximately 4.8 hectares and can be accessed from Fountain Street via Otter Court, a serviced cul-de-sac located on the south side of this lot. A sample of a proposed development within this Apron VII area is shown on **Figure F-3**.

Figure F-3 | Sample Development Plan – Apron VII (inset)



It is anticipated that these “shovel-ready lots” will be the next lots to be developed when demand warrants.

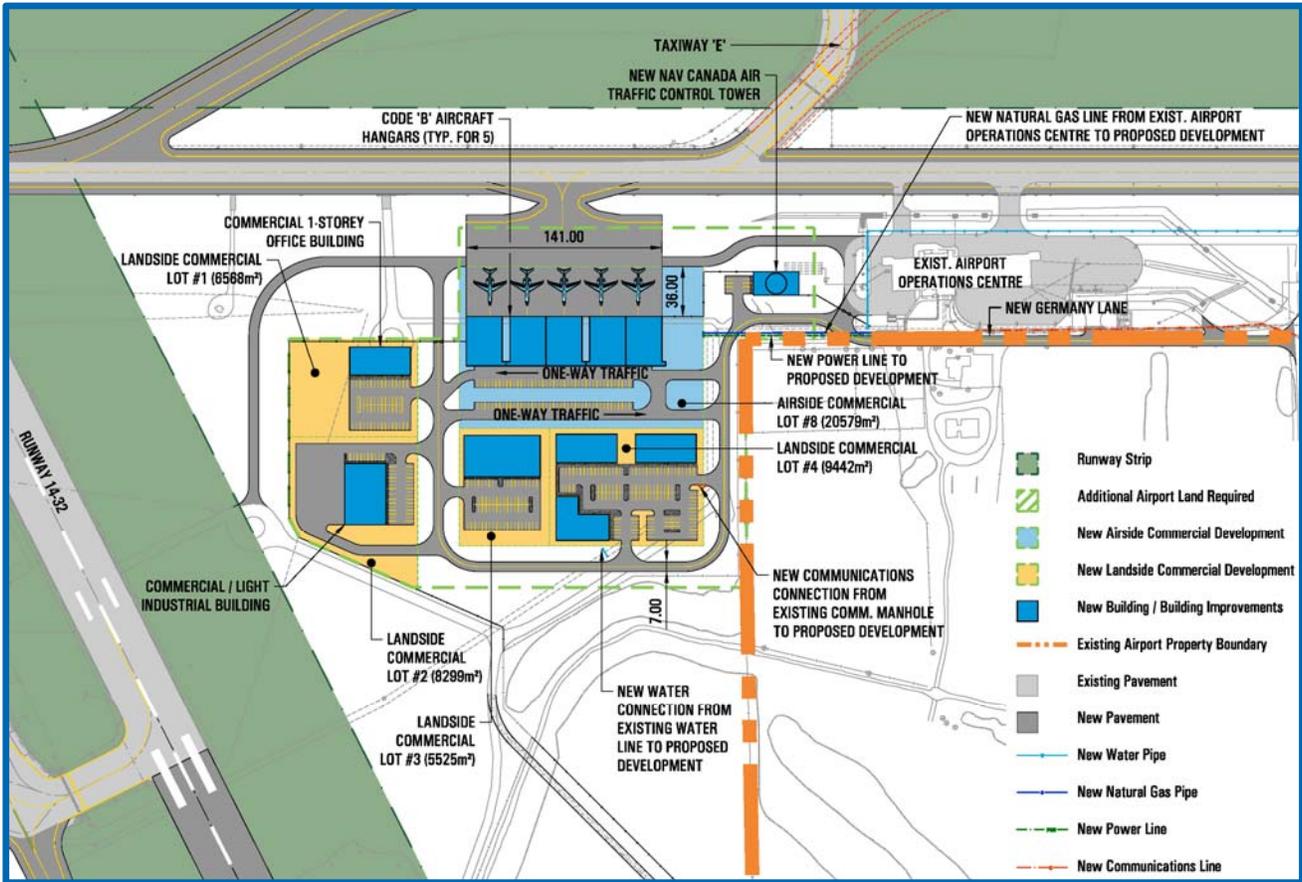
2.1.2 Proposed Developments – Future Availability

Additional blocks of land have been identified in the proposed Land Use Plan for future aviation-related development. These areas have been developed in conjunction with the environmental constraints and have been sized to maximize available land owned by the Region.

One of these blocks is located southeast of the Runway 14-32 and Runway 08-26 intersection. This block is bounded by Taxiway Alpha to the north, Runway 14-32 to the west, the Airport Operations Centre (AOC) to the east, and the Airport Perimeter Road to the south. Airside access to this block could be provided from Taxiway Alpha by constructing a taxiway connection. A potential development scenario for this area can be as shown on [Figure F-4](#).

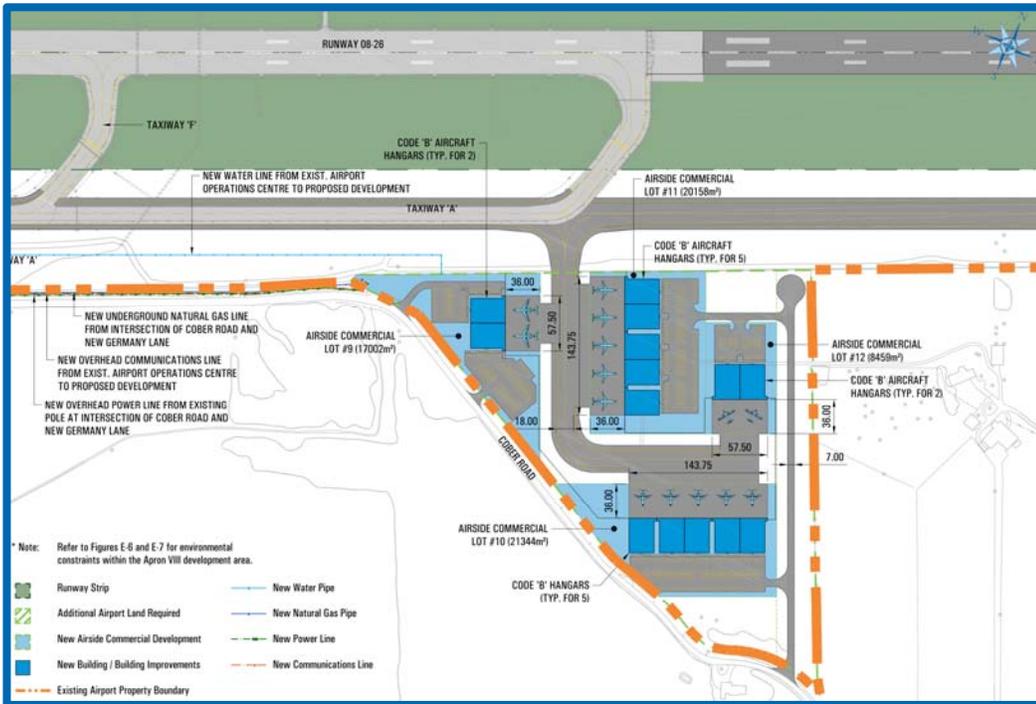
The provided sample development shows both groundside and airside commercial developments. These types of developments include hangars, small cargo facilities, and light industrial commercial facilities.

Figure F-4 | Sample Development Plan – Proposed Apron VI (inset)



Another block identified for development is located on the south side of Taxiway Alpha opposite the existing threshold of Runway 26. This triangular block is bounded by Taxiway Alpha to the north, Cober Road on the northwest, and the Airport boundary to the east. Airside access to this block would be provided by a new taxiway connection from the end of existing Taxiway Alpha, while landside access would be provided from Cober Road via New Germany Lane. A potential development scenario for this area can be as shown on [Figure F-5](#).

Figure F-5 | Sample Development Plan – Proposed Apron VIII (inset)



A third block identified for possible future development is located northeast of the Runway 14-32 and Runway 08-26 intersection. This block is bounded by the Randall Drain to the north, the Airport Perimeter Road on the west and south sides, and a forested area in the east. Development of this lot for aviation usage would require the extension of taxiway access as well as roads and services. As the necessary infrastructure to service this lot is not readily available, this block is being held in reserve for development beyond the Master Plan horizon.

2.1.3 Future Utilities

The majority of the site services / utilities associated with the Region of Waterloo International Airport originate and are an extension from Fountain Street on the west side of the Airport.

The areas to the north of Runway 08-26, east of Runway 14-32, are currently not serviced and would require an extensive redevelopment to facilitate this area.

The areas to the south and east of the airport, bordering Taxiway Alpha and Runway 14-32, have had services previously extended to this area and as such, future development in this area has been considered as part of this Master Plan. It is anticipated that the Airport can continue to extend these services in this area to accommodate two of the proposed developments previously shown.

The Airport lands do not currently have any sewer connections and are fed from one water service connection from Fountain Street. Some current Airport developments are serviced through the use of ground wells and sewer service is via septic tanks and septic beds. The Region of Waterloo should consider extending sanitary services to the Airport in the very near future, and should further consider looping the current water service around the boundary of the Airport to eliminate any potential stagnant water concerns.

A sample extension of the utilities on the southeast portion of the Airport has been shown on [Figure F-6](#) included at the end of this chapter.

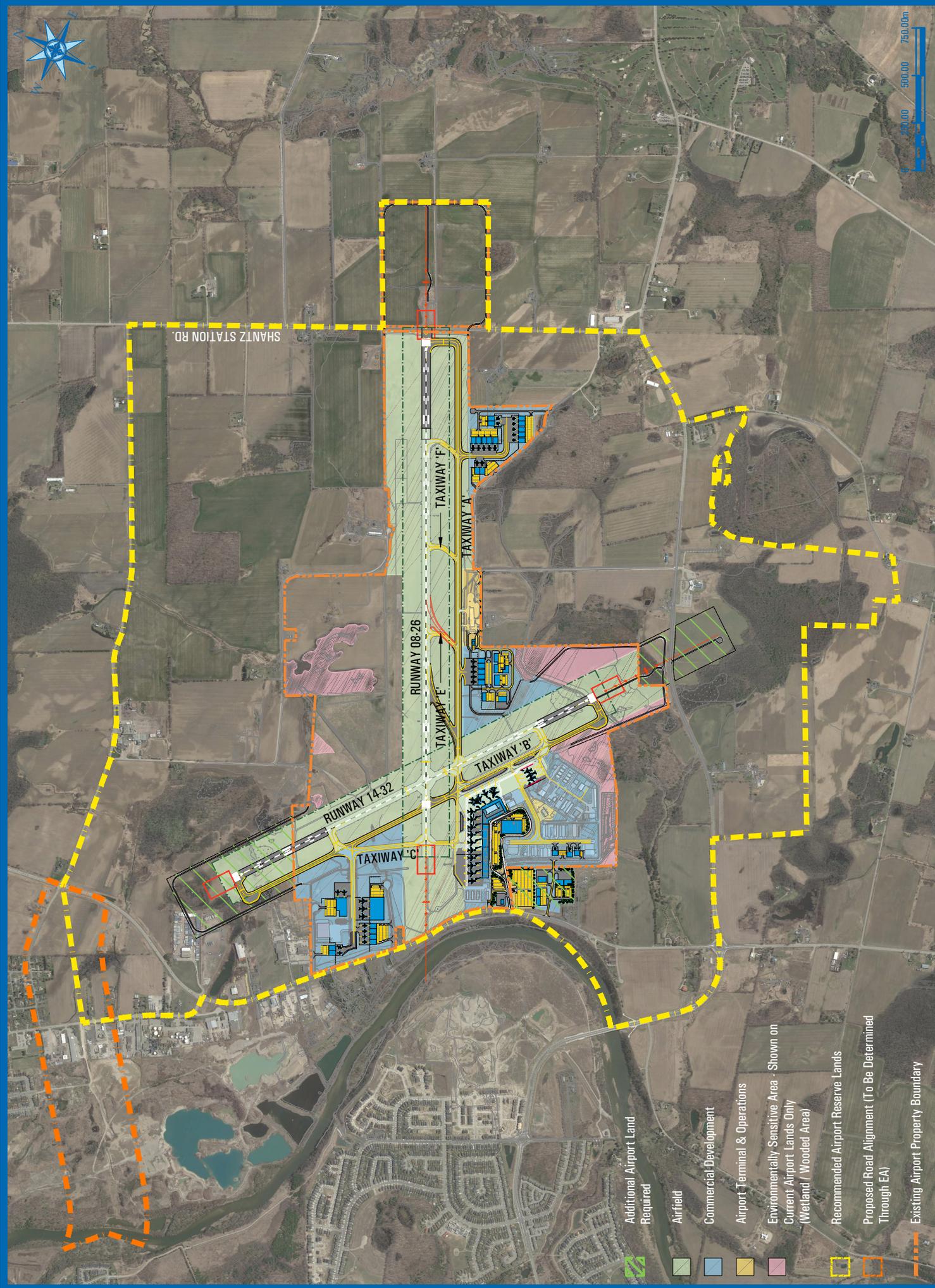
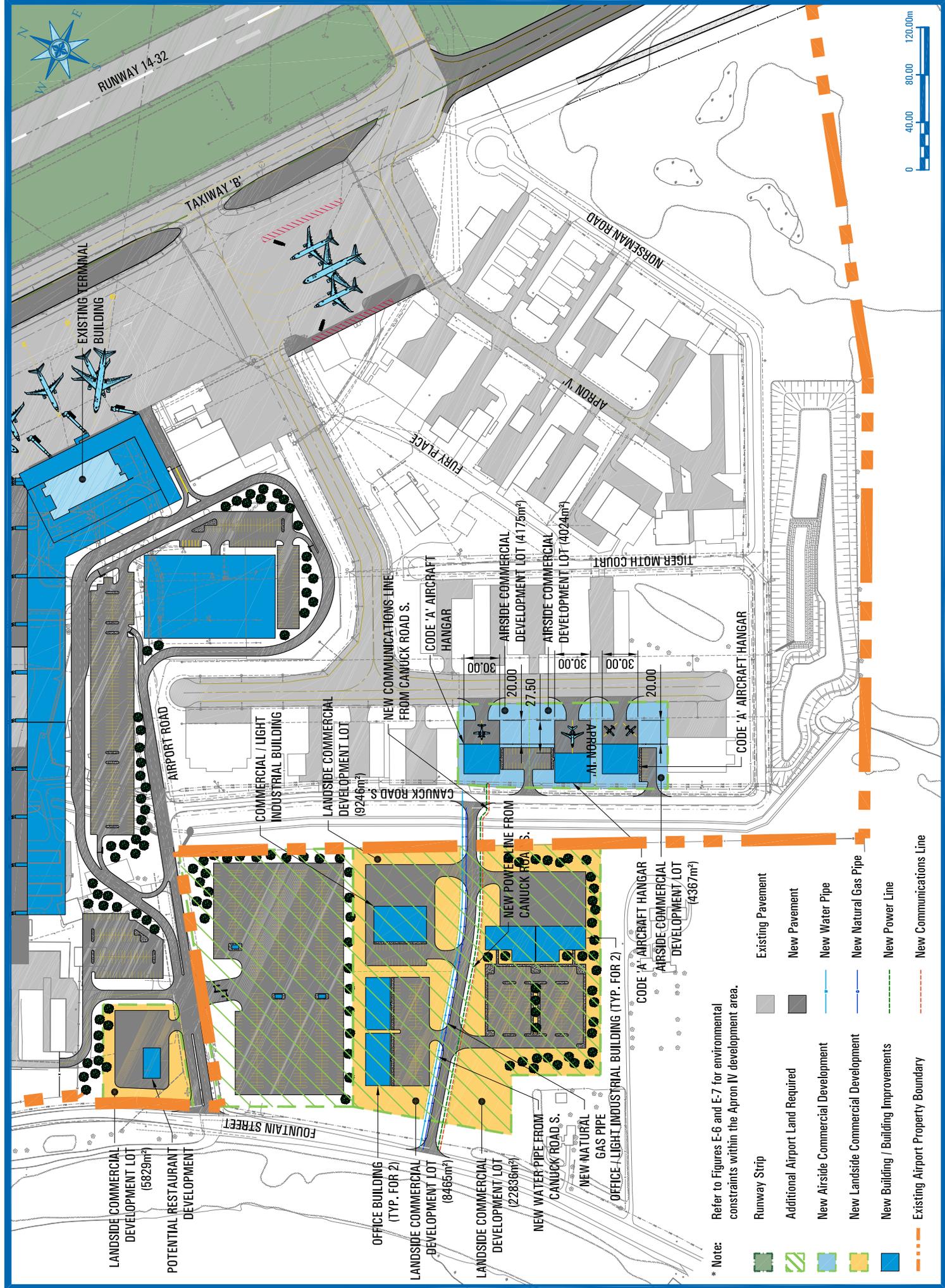


Figure F-1

Proposed Land Use Plan



* Note: Refer to Figures E-6 and E-7 for environmental constraints within the Apron IV development area.

- Runway Strip
- Additional Airport Land Required
- New Airside Commercial Development
- New Landside Commercial Development
- New Building / Building Improvements
- Existing Airport Property Boundary
- Existing Pavement
- New Pavement
- New Water Pipe
- New Natural Gas Pipe
- New Power Line
- New Communications Line

Sample Development Plan - Apron IV Figure F-2

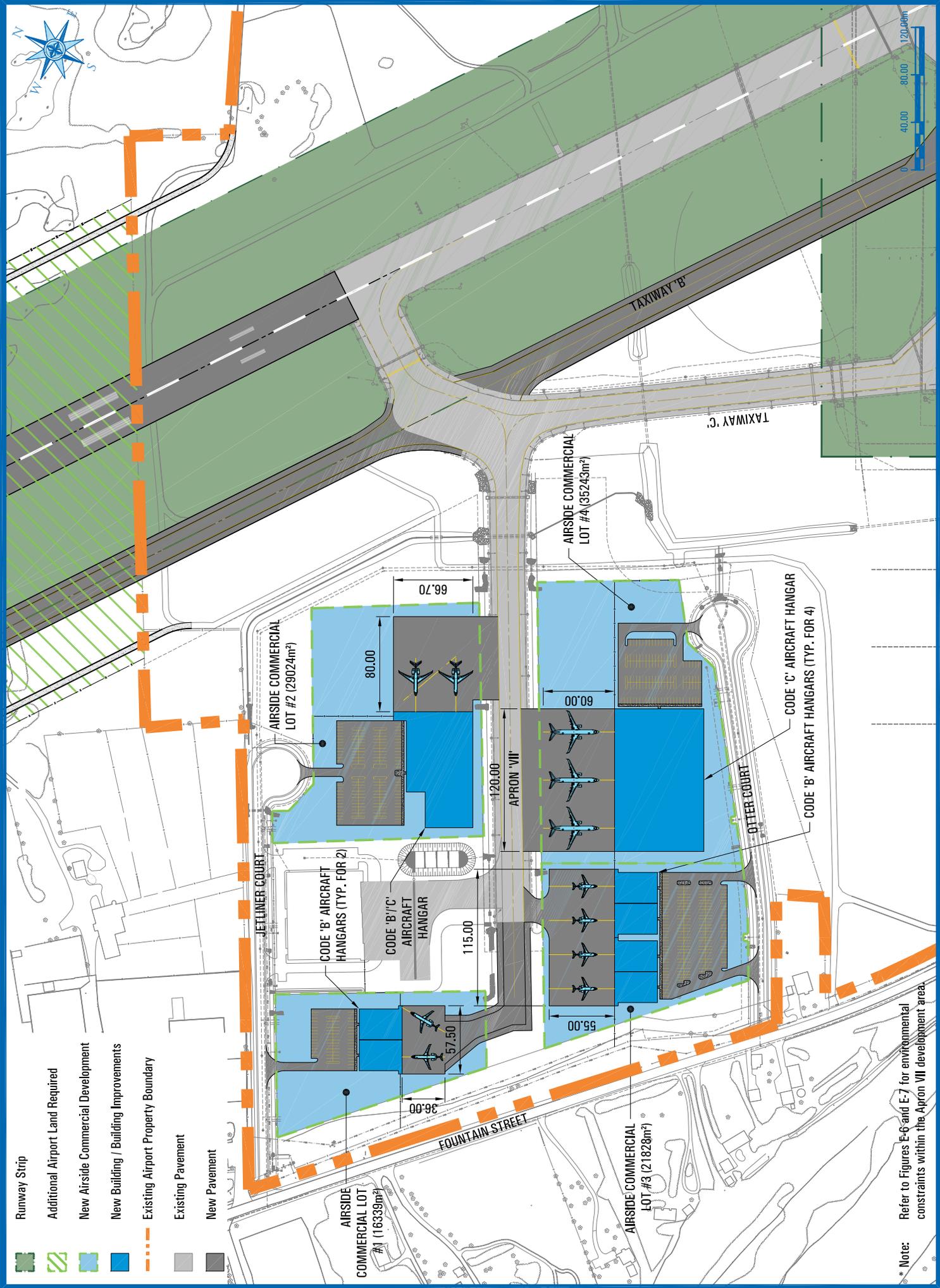


Figure F-3

Sample Development Plan - Apron VII

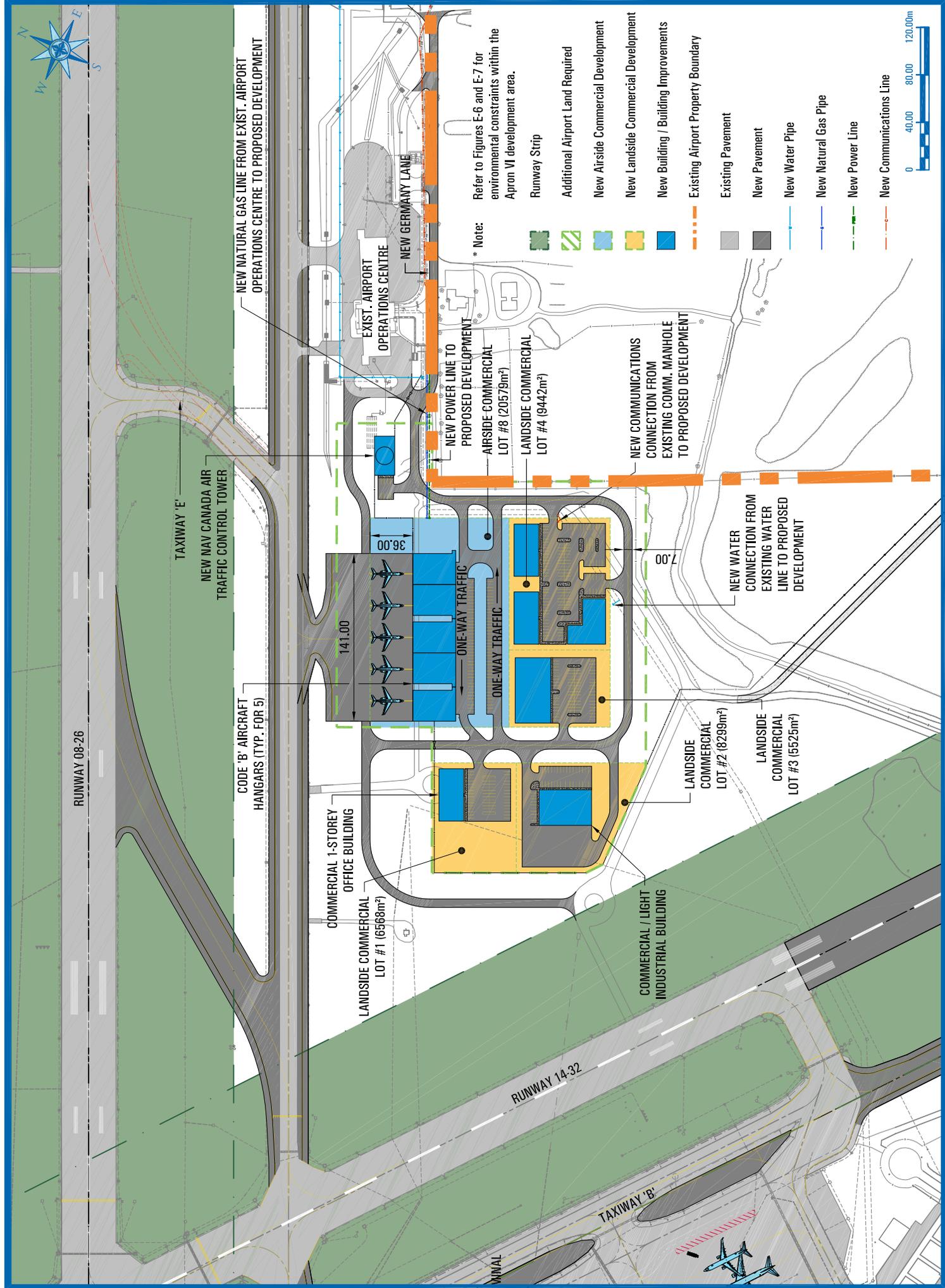
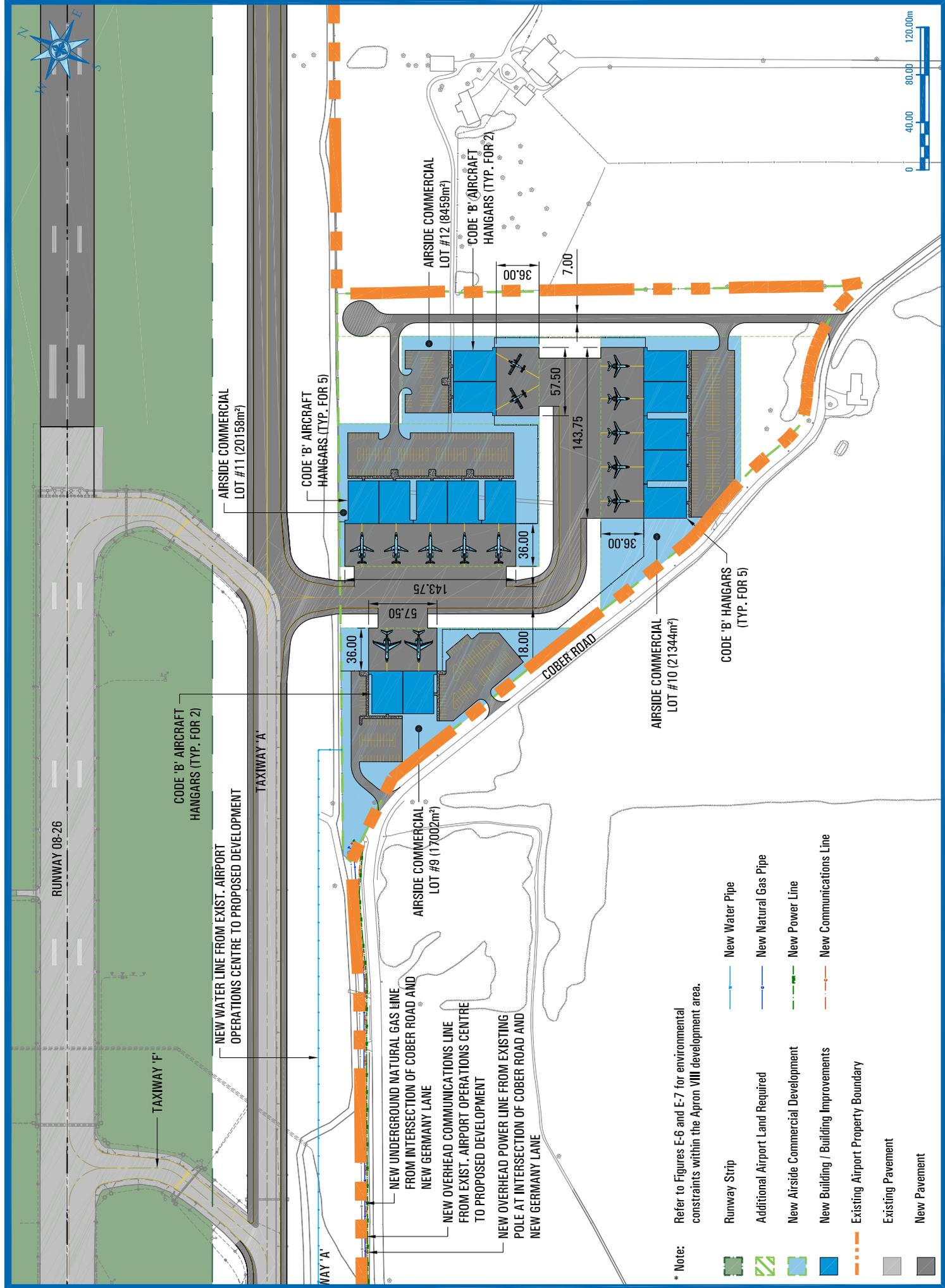


Figure F-4

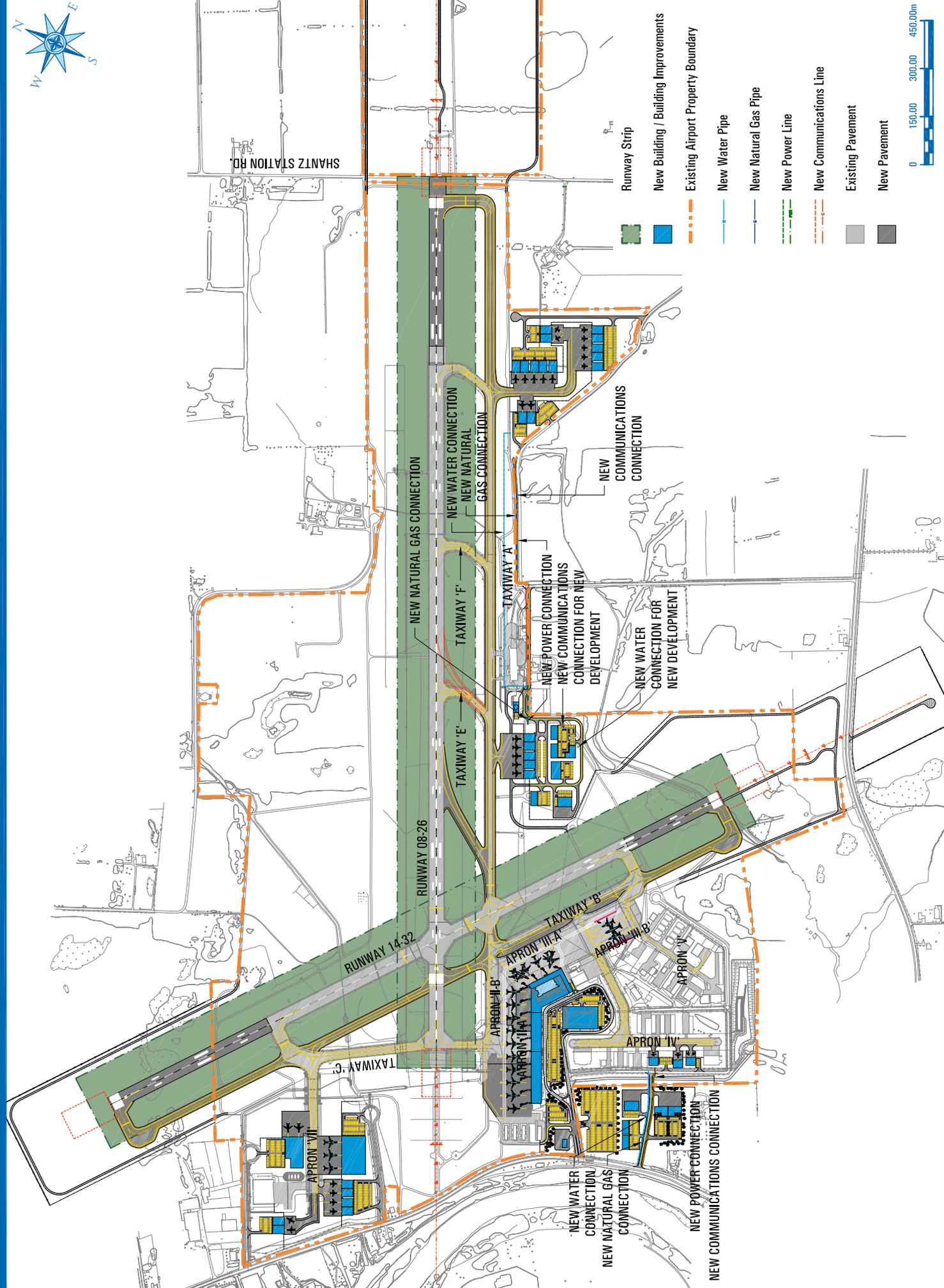
Sample Development Plan - Apron VI



* Note: Refer to Figures E-6 and E-7 for environmental constraints within the Apron VIII development area.

- Runway Strip
- Additional Airport Land Required
- New Airside Commercial Development
- New Building / Building Improvements
- Existing Airport Property Boundary
- New Water Pipe
- New Natural Gas Pipe
- New Power Line
- New Communications Line
- Existing Pavement
- New Pavement

Sample Development Plan - Apron VIII Figure F-5



Proposed Utilities Plan

Figure F-6



G. GOVERNANCE

CHAPTER G. GOVERNANCE

1. GOVERNANCE MODELS

As part of the Region of Waterloo International Airport's Master Plan, the Project Team examined a range of options in place in Ontario and other parts of Canada regarding airport governance. Five governance models are reviewed, as follows:

OPTION 1: STATUS QUO

- ▶ The Region of Waterloo serves as the governing entity for the Region of Waterloo International Airport. The Airport reports to the Department of Planning, Development and Legislative Services; services from the Region are used for financial / reporting.
- ▶ Day-to-day management of the Airport is led by an Airport General Manager and staff responsible for all aspects of the facility, including maintenance, operations, marketing, and many other diverse roles. Capital planning and long-term decision-making is governed through the Region via processes within the Department of Planning, Development and Legislative Services.

Modified Status Quo

Some airports operate through municipalities or regional municipalities also have alternate governance structures established. An alternate arrangement is possible for the status quo through the introduction of a governing board, similar to Kelowna, BC.

- ▶ The City of Kelowna serves as the governing entity for the Kelowna International Airport, with an Airport Director managing the day-to-day operations.
- ▶ In addition to this framework, which is similar to the Region of Waterloo, the City of Kelowna has created an Airport Advisory Committee to assist in the governance of the Airport.
- ▶ The committee is composed of regional and local representatives who have an interest in the Airport, and provides strategic direction for the airport's development. The committee members are appointed by their respective organizations for three-year terms.

OPTION 2: AIRPORT AUTHORITY

- ▶ This model is in place at the London International Airport. Like many airport authorities in Canada, the Airport Authority is a not-for-profit distinct entity incorporated under [THE CANADA CORPORATIONS ACT – PART II](#).
- ▶ An Airport Authority or Airport Commission model has the entity holding a fee simple title to the airport lands. As such, there is no fiduciary or reporting requirement on the part of the Board to any of the local municipal councils. The Board of Directors hire and appraise the CEO and set the vision and mission of the airport. The Board also makes appointments to fill vacant Board positions.

- ▶ From a management perspective, the CEO and staff are responsible for achieving the vision and mission of the airport, while operating within the numerous regulatory requirements, such as Transport Canada for safety and security, Environment Canada for environmental conformance and reporting, Labour Canada for employee and public safety.
- ▶ Municipalities do not fund airports.

OPTION 3: CORPORATION WITH LOCAL REPRESENTATION

A third model is a corporate entity established with a Board of Directors.

- ▶ As an example, the Sudbury Airport Community Development Corporation (SACDC) was formed under the National Airports Policy and assumed governance of the airport following the transfer of the facility from Transport Canada.
- ▶ A Board of Directors is composed of two City Councillors, two appointees from the Greater Sudbury Development Corporation, one ex-officio non-voting Director, and seven Sudbury citizens. The Board is charged with overseeing the affairs of the airport. The SACDC operates as an independent, financially self-sustainable corporation that does not receive financial assistance from the municipal tax base.

OPTION 4: HEAD LEASE TO A PRIVATE OPERATOR

Some airport owners have elected to retain ownership of lands, but lease out operations to a private entity.

- ▶ This is a growing trend to share risk for capital-intensive airports and is used for airports of all sizes. New York LaGuardia airport, for example, went through a process to select a private terminal operator.
- ▶ In Canada, a number of facilities – such as Iqaluit and Moncton – have this arrangement and the model is in place at the John C. Munro Hamilton International Airport. The Council of the City of Hamilton signed a head lease with a private operator. Hamilton collects annual rent and a portion of bottom line profit from the operator. The lease dictates the need for the operator to operate the airport in compliance with all regulatory requirements. The municipality maintains control of airport development through the building code and permitting process.

OPTION 5: COMPANY ESTABLISHED BY THE REGION

- ▶ This model is in place for Windsor International Airport, which is operated by Your Quick Gateway (Windsor) Inc. Your Quick Gateway was established by the City of Windsor as a federal share corporation. The City appointed a Board of Directors as the governing body and staff to manage the activities of the company within the parameters established by the Board.
- ▶ Your Quick Gateway is operated by Council of the City of Windsor with the City of Windsor as the sole shareholder of the Corporation. Your Quick Gateway operates with a volunteer board to govern the enterprise and manage the legacy fund; as a non-profit, the organization has developed a legacy fund to return the profits to support community initiatives.

2. ANALYSIS OF GOVERNANCE MODELS

MODEL	STRENGTHS	WEAKNESSES
1. Status Quo and Modified Status Quo	<ul style="list-style-type: none"> Region does not relinquish control of the airport and can set strategic direction and retain control over airport development Direct tie-in for regional and transportation objectives 	<ul style="list-style-type: none"> The airport potentially competes with other priorities of the Region Airport issues may demand more time and effort than is available The modified status quo would enable a separate body to have overall strategic oversight for airport-specific requirements
2. Airport Authority (Commission)	<ul style="list-style-type: none"> The Accountable Executive (CEO) is responsible for day-to-day operations at the airport, including managing community relations issues such as noise complaints Relieves the Region of the operational and financial responsibilities associated with running, maintaining and developing the airport 	<ul style="list-style-type: none"> The Region would relinquish ownership and fee simple title of the airport to the Airport Authority Board No legal requirement of the Authority Board to take Regional priorities and objectives into consideration (except as written into the Letters Patent of the entity)
3. Corporation with local representation	<ul style="list-style-type: none"> Relieves the Region of the operational and financial responsibilities associated with running, maintaining and developing the airport Provides more opportunity for the Region to shape the operating parameters of the society through the development of the initial by-laws but would not necessarily be able to influence any future by-law amendments 	<ul style="list-style-type: none"> The Region would retain ownership of the airport asset but would relinquish significant control over the strategic development of the airport The Region would forego any potential revenue stream from airport development (except taxation on airport property)
4. Head lease to private operator	<ul style="list-style-type: none"> The Region retains ownership of the asset and retains ability to control the development of the airport through the terms of the head lease The Region generates not only taxation revenue from airport developments but also levies rent and profit contribution from the private operator The Region is able to maintain control of development through the building code and building permit processes 	<ul style="list-style-type: none"> The Region's ability to maximize revenue from the airport is limited to the operator's performance A long-term lease can become a liability if the operator fails to develop the airport into a viable and profitable business
5. Company Established by the Region	<ul style="list-style-type: none"> The Region would maintain the responsibility and authority to make appointments to the Board of Directors This option would limit the Region's exposure to the day-to-day issues associated with running the airport Securing funding for airport development has other options available outside of direct municipal governance 	<ul style="list-style-type: none"> The Region would relinquish direct control of the airport to the Board of Directors of the limited company The Region would forego any future potential revenue stream from airport activities

CONCLUSIONS

Under the National Airport Policy (NAP) of 1994, all airports in national, provincial and territorial capitals, as well as all those with more than 200,000 passengers a year, were designated National Airports System (NAS) airports. The federal government's plans were to retain ownership of these airports, but to transfer the management and upkeep responsibilities to local entities. By 2003, all 26 NAS airports had been transferred from federal to local responsibility

Canadian airports receive no subsidies from the federal government; however, they do pay rent to the government as the owner. It is the responsibility of the individual airports to fund their own infrastructure improvements and their operating expenses by their own means.

As described in the sections above, in each governance model identified, the airports are required to finance any and all investments into their facilities by a substantial increase in the indebtedness of the airport authorities / municipalities / corporate entity / or private operator, a debt which is largely repaid by fees imposed on users -- most notably the Airport Improvement Fees (AIFs). Consequently, it is critical that the correct governance model for the individual airport be implemented, as this will dictate how the airport is ultimately operated.

Notably there is no single 'best model' of airport governance / management. In the context of the Regional Municipality of Waterloo and the operation of the Region of Waterloo International Airport, it is a useful exercise to review the major types of airport governance models used in the industry in similar size configurations. The ultimate buildup of the Airport and the passenger numbers will dictate the path to proceed, as the type of governance model chosen will significantly influence the Airport's business model.

Given the existing parameters in place at YKF and the path moving forward, this Master Plan recommends the Region of Waterloo and YKF continue to operate as it does today; however, governance models will need to be reviewed at each development stage to determine the best course of action for where the Airport is at that specific period in time.



H. IMPLEMENTATION

CHAPTER H. IMPLEMENTATION

1. INTRODUCTION

Preparation of a long-term development concept for the Region of Waterloo International Airport is an important planning exercise that will enable the Region of Waterloo and the Project Team to visualize the Airport's future role in the aviation community, the local community and surrounding areas, and, ultimately, in untapped markets. The concept presents a vision for a fully built-out Airport and allows the Region the ability to make decisions today regarding development – both in and around the Airport. This will ensure that future needs are not constrained and that the Airport is instead able to thrive and become a major economic contributor to the region, a community driver, and an example of aviation excellence.

The first priority in developing a recommended “Go Forward” strategy was to ensure that any future Airport development could take place without unduly limiting future expansion of purely aviation-related activities and facilities such as the extension of the primary runway, addition of new taxiways, and improvements to visual and navigational aids. Once the long-term needs of these key facilities were accounted for, additional secondary compatible land uses were considered. These uses are designed to enhance the Airport's operation by providing new and valuable community assets to help stimulate overall long-term growth.

After reviewing all the feedback from public consultations, stakeholders, and Project Team meetings, it was determined that the path moving forward would start by identifying and quantifying Development Stages to allow continued growth at the Airport, specifically related to passenger growth.

Since the existing airfield infrastructure is adequate for the current traffic demands and the Air Terminal Building still has some capacity before it reaches its peak flow, the Airport is in a unique situation in which it can continue to pursue airlines and air carriers in the short term while not having to immediately invest capital in infrastructure. This position is clearly demonstrated in the development stages and where each component comes into the process.

Notably, while the existing terminal has a current annual capacity of 240,000 passengers and the 2015 passenger numbers are approximately 154,000 – well below capacity – the terminal simulation models indicate that the terminal struggles when multiple narrowbody jets are in operation at this current usage. The Master Plan provides productive opportunities to develop strategies for addressing challenges, making improvements, and identifying areas of potential growth.

The overarching goal of this Master Plan is to maximize the existing infrastructure already in place and grow the Airport at the same time. The Airport's current ability to expand services without investing significant capital will allow the Airport to continue on its growth projections and increase revenues prior to investing in the subsequent stages.

The development concept, as further outlined in **Chapter C**, has been arranged into five distinct Development Stages. Each stage has been assigned multiple planning, design and construction components and has been illustrated on site plans to ensure each trigger is compatible from stage to stage. Ultimately, the Master Plan is dedicated to building the Region of Waterloo International Airport via a well-mapped process that is fiscally and environmentally responsible while also responsive to the evolving aviation industry and communities to which YKF aspires to be a significant contributor.

2. FINANCIAL PLAN STAGING

The following tables have been generated based on the Development Stages identified in **Chapter C**. The estimated costs shown for each stage have been correlated with the concurrent Business Plan being completed.

Stage No. 1 – Pre-Planning for Growth (2017)

ACTION	COST
Commence Zoning Process for Runway 14-32 Extension	
Initiate Zoning Study for Third Runway	\$ 300,000
Environmental Assessment for Runway 32 End Extension	
Review of Federal, Provincial and Other Sources of Funding to Support Short-term Capital Projects	
Design Runway 14-32 for Precision Approach (5% Cost of Works)	\$ 1,000,000
Reassess Feasibility of Expanding Existing Terminal Building vs. Relocating Terminal Building to New Site	\$ 1,044,000
Commence Concept / Design of Terminal Expansion to 500,000 Passengers (5% Cost of Works)	
Continue to Develop Existing Serviced Lands on Airport Property Based on Demand (Apron VII Extension)	\$ 500,000
Assess Need to Purchase Additional Land for Future Development (Not included in costing)	
Commence Master Land Use and Servicing Plan for Airport	\$ 100,000
Commence a preliminary review of Rail Connectivity between YKF and TPIA	
15% Contingency	\$ 441,600
Total	\$ 3,385,600

Stage No. 2 – Secondary Runway Extension and Terminal Expansion to 500,000 Annual Passengers (Approximately 2019)

ACTION	COST
Strategic Acquisition and Relocation Fees	\$ 11,250,000
Construct Runway 14-32 Extension (Including Taxiway Extensions and Approach Lighting)	\$ 20,000,000
Design Runway 08-26 Extension to 8737' (Including Taxiways and Approach Lighting (5% Cost of Works)	\$ 400,000
Review Shantz Station Road Reconfiguration Options (5% Cost of Works for Realignment Option)	\$ 230,000
Design Runway / Taxiway / Apron Clearances and Widths to Accommodate AGN-IV Aircraft (5% Cost of Works)	\$ 140,000
Design and Construct Apron 'II' Expansion	\$1,250,000
Construct New Terminal Building Expansion (up to 500,000 Passengers) Including Associated Apron Expansion	\$ 21,400,000
Design New Terminal Building Expansion (Including Associated Apron Expansion) to Accommodate 1,000,000 Passengers (5% Cost of Works)	\$ 3,100,000
Increase Available Surface Parking	\$ 2,500,000
Continue to explore Rail Connectivity options and expand on Phase 1 findings	\$ 0
Continue to Develop Existing Serviced Lands on Airport Property Based on Demand	\$ 2,400,000
Fountain Street Utility Relocations	\$ 2,000,000
15% Contingency	\$ 9,700,500
Total	\$ 74,370,500

Stage No. 3 – Primary Runway Extension and Terminal Expansion to 1,000,000 Annual Passengers (Approximately 2025)

ACTION	COST
Strategic Acquisition and Relocation Fees	\$ 11,250,000
Construct Approved Shantz Station Road Reconfiguration (Based on Two-Lane Road Realignment Around Runway 26 Extension)	\$ 4,600,000
Construct Partial Taxiway 'B'	\$ 3,400,000
Construct Runway 08-26 Extension to 8737' (Including Associated Taxiways and Approach Lighting)	\$ 10,000,000
Widen Existing Taxiways to Accommodate AGN-IV Aircraft	\$ 2,800,000
Construct New Terminal Expansion (up to 1,000,000 Passengers)	\$ 62,250,000
Begin Negotiations with Existing Tenants in Vicinity of Terminal Expansion for Future Relocation	\$ 0
Design New Terminal Building Expansion (Including Associated Apron Expansion) to Accommodate 2,000,000 Passengers (in Two – 500,000 Passenger Increments) (5% Cost of Works)	\$ 4,200,000
Design New Landside Configuration (Roads & Parking) (5% Cost of Works)	\$ 200,000
Continue to Develop Existing Serviced Lands on Airport Property Based on Demand (Southeast Development – New Taxiway, Road and Utilities)	\$ 3,300,000
15% Contingency	\$ 15,300,000
Total	\$ 117,300,000

Stage No. 4 – Terminal Expansion to 1,500,000 Annual Passengers (Approximately 2030)

ACTION	COST
Review Additional Land Acquisition Requirements	TBD
Relocate Existing Tenants Within Terminal Expansion Footprint	TBD
Construct New Terminal Building Expansion and Associated Apron to Accommodate Additional 500,000 Passengers	\$ 40,500,000
Construct New Landside Configuration (Roads and Parking)	\$ 4,000,000
Design New Parking Structure (5% Cost of Works)	\$ 1,050,000
Commence Negotiations with Tenant for Relocation to New Facility	\$ 0
Design New South Terminal Building Expansion and Associated Apron (Additional 500,000 Passengers) (5% Cost of Works)	\$ 2,000,000
Develop Newly Purchased Lands Based on Demand (Southwest Development – Road and Utilities)	\$ 750,000
15% Contingency	\$ 7,245,000
Total	\$ 55,545,000

Stage No. 5 – New Parking Structure and Terminal Expansion to 2,500,000 Annual Passengers (Approximately 2034)

ACTION	COST
Construct New South Terminal Building Expansion and Associated Apron (Additional 500,000 Passengers – 2,000,000 Total Passengers)	\$ 43,600,000
Construct New Parking Structure	\$ 21,000,000
Construct New Terminal Building Expansion and Associated Apron (Additional 500,000 Passengers – 2,500,000 Total Passengers)	\$ 40,400,000
15% Contingency	\$ 15,750,000
Total	\$ 120,750,000

(Note: the financial costs for each development stage does not include any potential transportation infrastructure improvements that may be identified in the Regional Transportation Master Plan to support the Airport growth).