BRANTFORD MUNICIPAL AIRPORT

Master Plan Update 2016 - 2035

FINAL REPORT

Prepared by:

Aviotec

In Association with:

Stantec DKMA

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Brantford Municipal Airport Master Plan Study

FINAL REPORT

Version 2.1

29 July 2016

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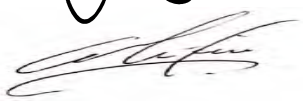
Christopher Mirfin, Senior Airport Consultant & Director	Aviotec International Inc., Mississauga, Ontario		29 July 2016
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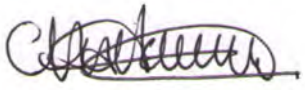
Catherine Harmel, Senior Aviation Forecaster & Director	DKMA Inc., Montreal, Quebec		29 July 2016

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Glossary

Abbreviations

Common Abbreviations	
AAR	Average Annual Rate
AGL	Above Ground Level
AGN	Aircraft Group Number
ASDA	Accelerate-stop Distance Available
ASL	Above Sea Level
ARCAL	Aircraft Radio Control of Aerodrome Lighting
ATC	Air Traffic Control
AVOP	Airside Vehicle Operator's Program
BFC	Brantford Flying Club
CAP	Canada Air Pilot
CAR	Canadian Aviation Regulations
CASR	Canadian Aviation Security Regulations
CFS	Canada Flight Supplement
FBO	Fixed Base Operator
FSS	Flight Service Station
GA	General Aviation
GDP	Gross Domestic Product
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
LDA	Landing Distance Available
MRO	Maintenance, Repair and Overhaul
MTOW	Maximum Take-off Weight
NDB	Non-directional Beacon
NEF	Noise Exposure Forecast
NEP	Noise Exposure Projection
NFPA	National Fire Protection Association
NOTAM	Notice To Airmen

Common Abbreviations	
ODALS	Omnidirectional Approach Lighting System
OLS	Obstacle Limitation Surfaces
PAPI	Precision Approach Path Indicator
PCN	Pavement Classification Number
RESA	Runway End Safety Area
RNAV	Area Navigation
ROT	Runway Occupancy Time
RSA	Runway Safety Area
RTIL	Runway Threshold Identification Lights
SWOT	Strengthens, Weaknesses, Opportunities and Threats
TC	Transport Canada
TORA	Take-off Run Available
TODA	Take-off Distance Available
UNICOM	Universal
VASI	Visual Approach Slope Indicator
VFR	Visual Flight Rules
VMC	Visual Meteorological Conditions
YFD	Brantford Municipal Airport

Definitions

Common Definitions	
Approach	A manoeuvre commencing with the final descent with the intention to land resulting in the arrival of an aircraft at an aerodrome but not including the completion of the flight by the contact with the surface.
Apron	A defined area, on a land aerodrome, intended to accommodate aircraft for purposes of loading or unloading passengers, mail or cargo, fueling, parking or maintenance. Where there is a local ATC service, an apron is generally uncontrolled.
Certifying Authority	Means the Regional Director of Civil Aviation, Transport Canada.
Clearway	A defined rectangular area over land or water under the control of the aerodrome operator, selected as a suitable area over which an aircraft may make a portion of its initial climb to a specified height.
Critical Aircraft	The aircraft identified as having the most demanding operational requirements with respect to the determination of movement areas
Crosswind	Wind direction that is not parallel to the runway or the path of an aircraft.
Crosswind Runway	An additional runway (secondary, tertiary, etc.) that provides wind coverage not adequately provided by the primary runway. Generally, a crosswind runway is required when a primary runway accommodates less than 95 percent of documented wind conditions (see wind rose).
Declared Distances	The distances that the aerodrome operator declares available for the aircraft take-off run, take-off distance, accelerate-stop distance, and landing distance requirements.
Fixed Base Operator	An individual or company located at an airport providing aviation services, such as aircraft servicing, fueling, flight training, aircraft rental or charter, aircraft repair, etc.
General Aviation (GA)	All civilian (non-military) aviation operations other than commercial scheduled air services and non-scheduled air transport operations for hire.
Itinerant Operation	All aircraft operations at an aerodrome other than local (i.e., flights that originate from another aerodrome).
Local Operation	Aircraft operation in the traffic pattern or within sight of an air traffic control tower, or aircraft known to be departing or arriving from flight in local practice areas, or aircraft executing practice approaches at the aerodrome.
Non-instrument Runway	A runway intended for the operation of aircraft using visual approach procedures, or an instrument approach procedure down to a height above the aerodrome or threshold not lower than 500 ft.
Non-precision Runway	A runway served by visual and non-visual approach navigational aids that provides at least lateral guidance adequate for instrument approach procedures down to a height above the aerodrome or threshold lower than 500 ft but not lower than 250 ft, and with an approach visibility not less than ¾ statute miles.
Obstacle	A fixed (whether temporary or permanent) or mobile object that could have an adverse effect on the safe operation of aircraft in flight or on the ground.
Obstacle Limitation Surface	Consists of a series of planes in space that define the approach, take-off and transitional surfaces and the penetration of which represent an obstacle to air navigation.
Pavement Classification Number	A number expressing the bearing strength of a pavement for unrestricted operations.

Common Definitions	
Peak Hour	Represents that highest number of operations or passengers during the busiest hour of an average day of a peak month.
Precision Approach Path Indicator	A lighting system providing for visual flight path, within the airport approach zone, so that an approaching pilot can establish a positive controlled descent (also called VASI).
Primary Runway	Runway used in preference to others as identified by the aerodrome operator. (Typically, the runway which provides the best wind coverage, usability and accessibility for operations.)
Runway	A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.
Runway End Safety Area	An area symmetrical about the extended runway centreline intended to reduce the severity of damage to an aeroplane undershooting or overrunning the runway.
Runway Safety Area	A defined area, within the runway strip intended to reduce the risk of damage to aircraft running off a runway.
Runway Strip	A defined area, which includes the runway and stopway (where provided), intended to protect aircraft flying over it during take-off or landing operations.
Runway Turn Pad	A defined area on a land aerodrome adjacent to a runway for the purpose of completing a 180-degree turn on a runway.
Stopway	A defined rectangular area on the ground at the end of take-off run available prepared as a suitable area in which an aircraft can be stopped in the case of a rejected take-off.
T-hangar	A rectangular aircraft storage hangar with several interlocking "T" shaped units that optimizes building space. Structures are generally two-sided with either bi-fold or sliding doors.
Taxiway	A defined path on a land aerodrome designed for the taxiing of aircraft and intended to provide a link between on part of an aerodrome and another.
Taxilane	A defined path used by aircraft to move within an aircraft parking apron, hangar areas and other facilities.
Threshold	The beginning of that portion of the runway declared usable for landing by the aerodrome operator.
Tie-down	A fitting or a system of lines and fittings used to secure an aircraft for outdoor parked storage in order to minimize the possibility of movement due to high winds or propeller wash / jet engine efflux during aircraft taxiing.
Transitional Surface	An imaginary surface extending to the sides of the runway strip and approach surfaces and inclined at a specified slope 90 degrees to the extended centerline of the runway, the penetration of which is considered to be a hazard to air navigation..
Transverse Slope	The slope of a runway, taxiway or a strip measured perpendicular to the centreline or direction of aircraft travel.
UNICOM	An air-to-ground radio communication facility operated by a non-air traffic control private entity to provide advisory service at uncontrolled aerodromes and airports..
Wind Coverage	Refers to the orientation of a runway in relationship to the direction of prevailing winds which dictates the usability of a runway for takeoffs and landings.
Wind Rose	A diagram that depicts observed wind data direction and speed on a 360-degree compass rose. Existing or planned proposed runway alignments are overlain to determine wind coverage levels based on the crosswind limits of the design aircraft.

1 Study Context

1.1 Introduction

The Brantford Municipal Airport is a regional airport which has been in operation since the 1940's and under the City of Brantford's ownership and control since 1970.

The City undertook the initial Airport Master Plan in 1983, which was subsequently updated in 1991. Since that time, the City has prepared a number of studies related specifically to airport governance, business development and marketing, but little in terms of land use and physical master planning.

Airport master plans are typically updated every 5 to 15 years. The City has not updated the Airport Master Plan in 25 years. Many important aspects have dramatically changed in the past 25 years, including aerodrome standards and regulations, aircraft operational requirements, tenant mix, surrounding land uses, etc. Therefore, a comprehensive master plan update is important to ensuring the long term viability and growth of the Airport, and ensuring that the Airport serves the best interests of aviation users and the people of Brantford and the surrounding communities.

Consequently, the City retained Aviotec International Inc. in July 2015 to undertake a comprehensive Airport Master Plan update.

1.2 Study Goal and Objectives

The goal of the study, as stated by the City, was to establish a master plan for the Airport that provides, within the appropriate operational requirements, rules and obligations, for the full and efficient utilization of its lands in a way that best benefits the City and its constituents, and optimizes commercial development revenue opportunities and outlines a viable marketing plan.

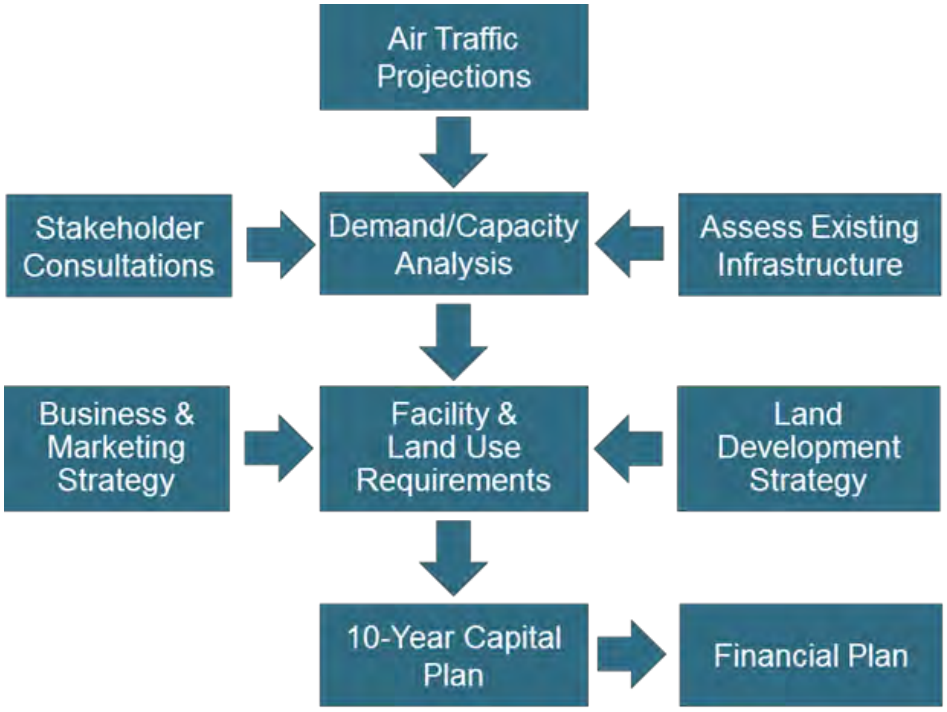
The main objectives of the master planning study were to:

- Undertake an airport stakeholder consultation process in order to identify aviation trends, as well as issues, concerns and needs regarding the Airport;
- Analyze past trends in air transport and prepare a 20-year projection of aircraft movements (for commercial and general aviation) at the Airport under a baseline unconstrained scenario, as well as for a high and low demand scenario;
- Determine the physical and operational requirements required to satisfy the projected aviation demands and to resolve any existing infrastructure issues and deficiencies;
- Identify current airfield safety issues and regulatory non-compliances;
- Develop a business strategy and marketing plan for the Airport;
- Prepare an update to the Airport's Land Use Plan including an update to the aircraft noise exposure forecast contours; and
- Prepare a probable capital cost and timelines for implementation of the recommended infrastructure improvements.

This planning study is not intended to define specific infrastructure projects for the City to proceed with. Each recommended infrastructure element will need to be reviewed by the City on its own merits and on the progression of aviation demand. In many cases, the recommended infrastructure elements will require further technical and business case analysis, feasibility studies, impact assessments, detailed design concepts and identification of funding sources.

Exhibit 1-1 presents a flow schematic for the study work which the Consultant Team has undertaken.

Exhibit 1-1 – Study Work Flow Schematic



Source: Aviotec International Inc.

2 Background and Role

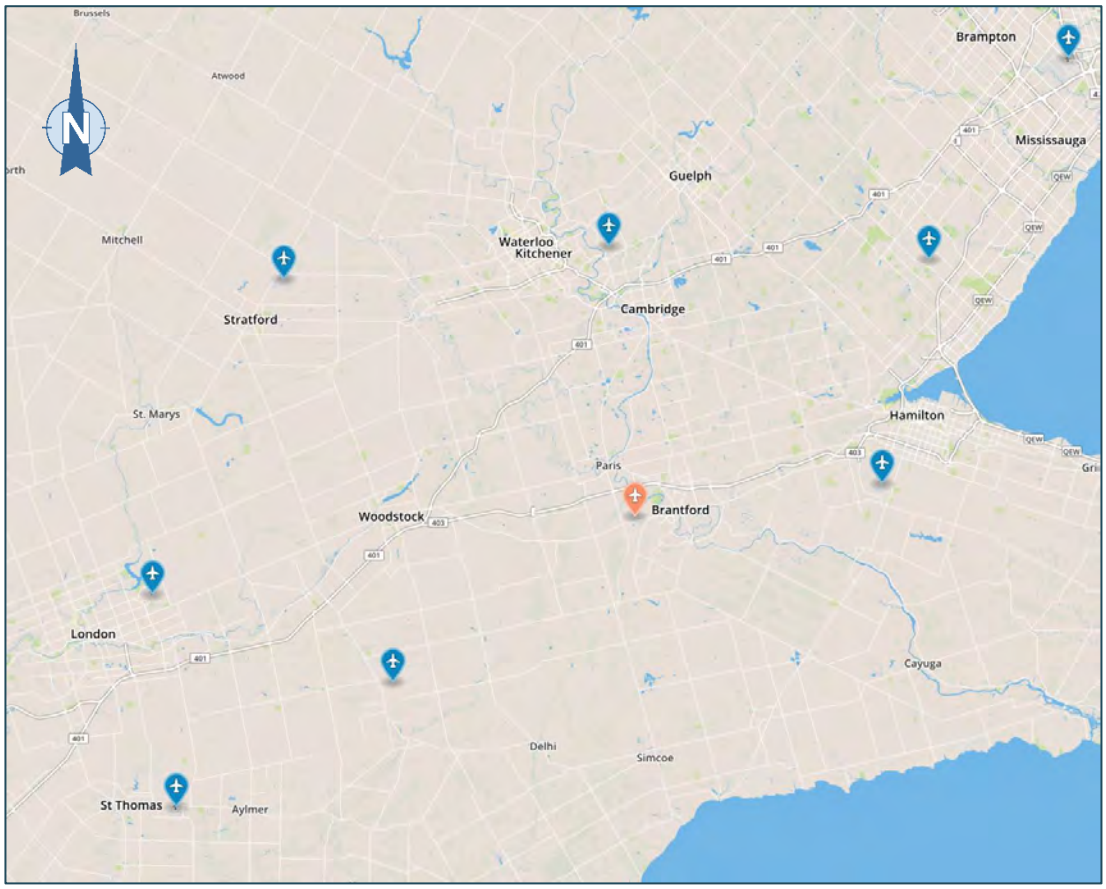
2.1 Location

The Brantford Municipal Airport (referred to herein as the Airport or YFD) is located at 43˚ 07' 57" North latitude, 80˚ 20' 29" West longitude, at an elevation of 248.41 metres (815 feet) above sea level (ASL).

The Airport is situated approximately 6.7 kilometres west of the Brantford city centre, immediately southwest of the Grand River.

The location of the Airport within the southwestern Ontario context is shown in Exhibit 2-1 including neighbouring public use airports. From a competitive standpoint, YFD is situated between three major international airports, namely John C. Munro Hamilton International Airport (YHM), Waterloo International Airport (YKF) and London International Airport (YXU), the closest being 50 kilometres away by road (or 35 minutes of drive time).

Exhibit 2-1 – Brantford Municipal Airport – Location Map



Source: Aviotec International Inc.

2.2 History

The original airfield, known as Commonwealth Flight Training Base No. 5, was constructed in 1940 by the Federal government to accommodate air force flight training during World War II. The airfield was configured in a 3-runway triangular configuration typical of military training airfields of the time. The Airport's current runways still assume the familiar triangular configuration. When the airfield was vacated by the military following the end of the war, the City of Brantford requested the Brantford Flying Club to relocate from Burtch Field and assume operation and management of the airfield.

On April 27, 1970, ownership of the airport facilities and lands was transferred from the Federal government to the City of Brantford under the proviso that the facility continue to be operated as a public use airport. The City of Brantford has recently confirmed that all restrictions imposed by the Federal government with respect to the ownership and operation of the Airport have been removed.

2.3 Governance

Management and operation of the Airport is under the control of the City of Brantford Council, who have delegated the responsibility of day-to-day operations to the City's Facilities Management Department within the Public Works Commission.

The City has contracted management of the airside operations and the regular inspection and maintenance of the airside property to the Brantford Flying Club (BFC). The contract was recently renegotiated in October 2015.

An appointed airport advisory board provides advice, guidance, oversight and special operations assistance to City Council and the Facilities Management Department. The board is comprised of four (4) members-at-large, a City of Brantford Council member and a Brant County Council member. The current governance structure reflects the fact that the Airport is solely supported by the City of Brantford, even though Brant County is represented because of the Airport's location within the County.

In recent years, the City has completed a number of management studies and business plans, many of which have discussed the possible divesture of the Airport. The outcome of many of these studies and plans has been City Council's commitment to the long-term operation of the Airport as a City asset.

For example, in May 2007, Brantford City Council held a public forum to canvass views on the Airport as an essential/necessary service for the City. Many public presentations made clear points that growing cities require airports as part of their fundamental infrastructure, to attract and retain corporate investment. As a result, in January 2008, Brantford City Council voted unanimously to support the inclusion of $1.9 million in planned airport infrastructure upgrades in the City's Capital Plan for Fiscal 2008.

2.4 Airport Lands

The total area comprising the Airport lands is 177.59 hectares (438.84 acres) and has remained unchanged since 1970 when the lands were transferred from the Federal government. The only exception to this are three (3) residential properties, now being used as affordable housing, located northeast of the Airport (on the east side of Greens Road), which were acquired by the City of Brantford in 1985 following extension of Runway 05/23.

2.5 Operating Conditions

The Airport is an uncontrolled, public use, Transport Canada registered facility, which is accessible on a 24-hours, seven (7) days per week basis.

Airport services are normally offered by the contract Airport operator (BFC) from 08:00 to 17:00, seven (7) days per week. Services include aircraft parking, fuelling, deicing and other Fixed Base Operator (FBO) services.

The local UNICOM[1] is monitored by the BFC during normal operating hours.

The Airport is designated by Canada Border Services Agency as an Airport of Entry/15 (AOE/15)[2] facility.

Aircraft repair, maintenance and avionics services are offered at the Airport by the BFC, as well as Brant Aero and Nelles Aviation Ltd.

2.6 Climatic Conditions

The Aerodrome Reference Temperature[3] for YFD is 25.8 degrees Celsius. The Airport receives about 770 mm of rainfall annually.

Brantford is known to be in a favourable location in terms of winter weather patterns, which makes the Airport more accessible during the winter months. As depicted in Exhibit 2-2 (on the following page), Brantford receives the lowest average annual snowfall accumulation and snowfall days in the region. In fact, among Canadian metropolitan areas with a population greater than 100,000, Brantford ranks the 6th lowest in terms of average annual snowfall.

2.7 Airport Role

The Brantford Municipal Airport is currently a Transport Canada registered aerodrome. With the rapid rate of residential and industrial development in the area surrounding the Airport, it is expected that at some point YFD will need to become certified, which will necessitate compliance with TP312 aerodrome design standards. Aerodrome certification is also a key requirement in order to permit scheduled air service for the public.

The Airport is strategically located in between southwest and central Ontario, with a total population base of 11.2 million persons, which is expected to increase to 14.5 million by 2035. It is only a 90 minute drive from downtown Toronto and a 75 minute drive from the United States border. The Airport is within minutes of Highway 403 and in close proximity to other 400 series highways. The Brantford to Ancaster section of Highway 403 is the quickest route between Detroit and Buffalo.

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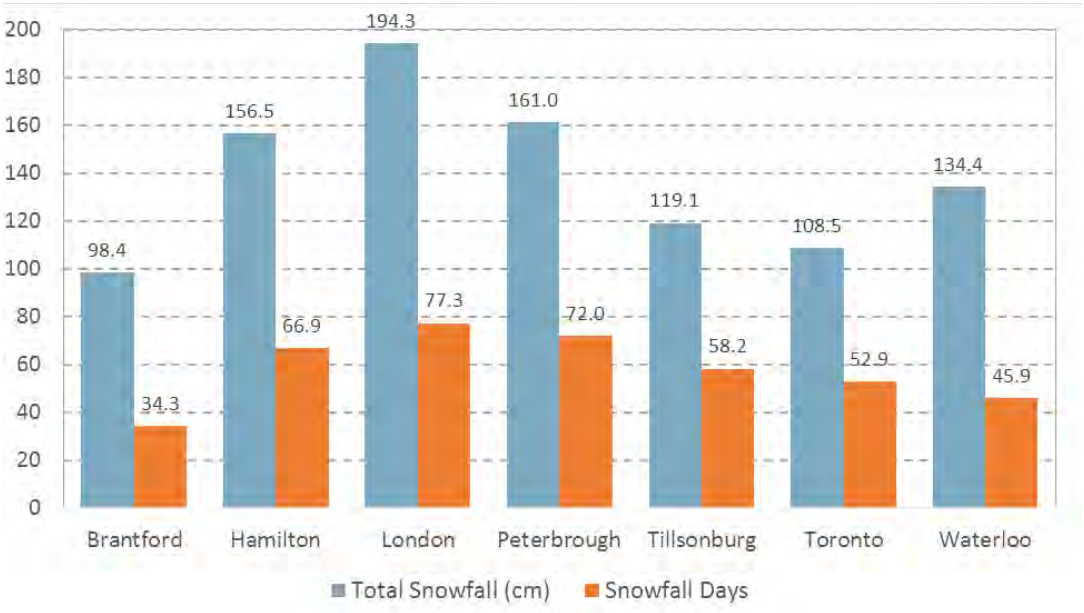
1 A Universal Communications (UNICOM) station is an air-to-ground radio communication facility operated by a non-air traffic control private entity to provide advisory service at uncontrolled aerodromes and airports.

2 An airport used solely for clearing persons arriving by general aviation aircraft (private or company) where the flights are unscheduled and the number of non-paying travellers on each flight does not exceed 15 (including the crew). Operators of these flights must obtain CBSA approval prior to entry into Canada, and they must land during CBSA hours of business.

3 Defined as the monthly mean of the daily maximum temperatures for the hottest month of the year at an aerodrome.

Exhibit 2-2 – Average Annual Snowfall Data – Select Ontario Cities/Towns



Source: Environment Canada, Meteorological Service of Canada.
Note: 1. Based on Canadian Climate Normals (1981-2010).

2.8 Airport Role

The primary role of the Airport is to serve the needs of the local general aviation (GA) community and the business/corporate air travel industry. Specifically, the Airport's role includes:

- A convenient and cost-effective base for local and transient private aircraft owners and operators;
- The provision of services to meet the needs of business/corporate aviation, associated with a growing list of North American and multinational companies with operations in the City of Brantford and Brant County;
- A base for a strong and growing private flight training market;
- A home to Aircraft Maintenance, Repair and Overhaul (MRO) and avionics companies offering services to local and international clientele;
- A growing base for innovative aviation and aerospace research and manufacturing companies, such as Solar Ship Inc.;
- A vital community link for emergency patient transfer services by air;
- A gateway for specialized passenger air charter services, such as for the W. Ross Macdonald School for the Blind (formerly the Ontario School for the Blind); and
- A unique environment for flim production.

Due to the Airport's close proximity to four major international airports offering a diverse range of scheduled and charter flights and destinations, YFD is not expected to provide commercial passenger air travel to any great extent.

2.9 Airport Tenants

The Airport is home to a diverse range of tenants who offer a host of aviation and non-aviation services. Aviation services provided by tenants include aircraft MRO, avionics, flight training, aircraft ground servicing and fuelling, and charter air services.

Although distinct in operation, several of the existing tenants provide an opportunity for growth and expansion of airport services which would generate direct revenue from leases but also draw additional traffic as they attract business.

The following subsections profile some of the main Airport tenants.

2.9.1 Brantford Flying Club

The Brantford Flying Club was formed in 1929 and is considered one of Canada's oldest established flying clubs. The Club's facilities at the Airport offer excellent opportunities for leisure flying, flight training and aircraft servicing.

The Brantford Flying Club is comprised of well over two hundred members, and has a fleet of Cessna 152s, Cessna 172s, and Cessna 172RG aircraft. The Flight Centre houses a well-equipped aircraft maintenance facility, terminal building, passenger lounge and ground school classroom. The Centre is also home to the Skyway Café, an on-site restaurant available in the Club's terminal building from 8:00 a.m. to 2:00 p.m. daily. The Skyway Café is a favorite destination amongst pilots in Southern Ontario.

The Flight Centre's aircraft are available for rental, charter, or contract aerial patrols. The Brantford Flight Centre is the Fixed Base Operator (FBO) at the Airport providing a variety of aircraft services including fuelling (100LL, Jet-A1, premium automotive fuel) and a wide variety of lubricants. They are also an approved Transport Canada aircraft maintenance and overhaul (AMO) company supporting both small private and commercial aircraft. They are capable of servicing many different models of aircraft for club members and non-members alike.

The Club also has a long-standing contract with the City for the operation and maintenance the airfield.

2.9.2 Brantford Air Centre Limited

The Brantford Air Centre Limited, operating as Brant Aero, has been in operation at the Airport since 1972 offering services and products to piston and turbine aircraft operators in Eastern Canada. Brant Aero is a Transport Canada certified AMO (#10-74) in the CAR 705 category of aircraft and Safety Management System (SMS) compliant.

Brant Aero is an authorized Cessna warranty and service centre, Beechcraft piston service centre and national warranty repair centre for Bose aviation headsets. They represent all leading avionics manufacturers, specialize in new panel installations, major modifications, avionics bench repairs and

maintenance. Brant Aero also offers aircraft sales including importing and exporting aircraft from around the world.

Brant Aero has a maintenance department which is trained on a vast selection of general aviation piston, turbo-prop and turbine aircraft. Their expanding AMO type ratings include Cessna 500/525 series, King Airs, and various military aircraft. Their business to business services include aircraft recovery and salvage responding to the needs of insurance companies, environmental and emergency first responders.

Brant Aero is a wholly owned subsidiary of the Progressive Air Group of Companies of Kamloops, British Columbia. They are located in the northern portion of Hangar Building No. 150 (with approximately 30,000 ft^2), and includes parts sales and a passenger lounge.

2.9.3 Aircraft Spruce

Aircraft Spruce & Specialty Co., established in 1965 in California, U.S.A., is renowned in North America for offering a wide range of products, parts and supplies for aircraft and pilots. The company carries everything a pilot could need, including pilot supplies and aircraft parts, and supply components for a wide variety of homebuilt aircraft including the Lancair, Vans Aircraft, Cozy, Starduster and Europa, as well as factory built parts for Cessna, Piper, Beech, and Mooney. Other products include Garmin avionics, tools, charts, propellers, spruce, software, instruments, aircraft engines, aviation headsets, landing gear components, and composite materials. They also carry a full line of aviation grade hardware, covering supplies, composite materials, airframe parts, electrical components, and steel and aluminum.

Aircraft Spruce Canada was opened in Toronto in December 2006 and then moved to the Brantford Municipal Airport in October 2008. They are currently located in the southern part of Hangar Building No. 150, but have plans to relocate to a new facility a short distance away at 140 York Road. Customers are able to drive-in or fly-in to their facility.

2.9.4 Solar Ship Inc.

Solar Ship Inc., founded in 2006, develop and build hybrid aircraft that are able to transport cargo to remote areas, which have poor or no roads. The hybrid, delta-shaped aircraft gain lift from both buoyant gas (helium), like an airship, and aerodynamics, like a bush plane. The inflated wing design provides a large surface area for solar electric power, allowing operations in remote areas without the use of fuels. The aircraft is able to travel 1,000 kilometres carrying up to 1,000 kilograms of cargo.

Solar Ship has been located at the Airport since 2011. Currently, they occupy space in three separate buildings, and conduct research and development, fabric production, aircraft assembly and flight testing. They just recently inaugurated a new hangar building at Site No. 140.

2.9.5 Nelles Aviation Ltd.

Located within Hangar Building No. 130 since 1989, Nelles Aviation Ltd. offers aircraft inspection, repair and modification services for all light aircraft weighing under 12,500 lbs. This includes servicing of privately owned piston aircraft, gliders and high performance gliders. In addition, they specialize in pre-war fabric aircraft inspection and repair, as well as, all Socata "EADS" Caribbean series aircraft.

2.9.6 Gilbert Custom Aircraft

Gilbert Custom Aircraft, offers a wide range of services to the homebuilt, owner maintenance and ultra-light markets. For the past 30 years, the owner, Darryl Gilbert, has been a part of the Brantford aviation community offering engine overhaul and maintenance service, as well as builder support and instruction in aircraft fabrication. Since that time, Gilbert Custom Aircraft has widened its scope and now offers a wide range of professional services. Their services include engine overhaul, fabric and paint, sheet metal structures, welding, rigging and avionics/electrical. They are located in Hangar Building No. 170.

2.9.7 Custom Stainless Works

Custom Stainless Works, established in 1993, specializes in custom stainless steel fabrication. They are located in the southern portion of Hangar Building No. 130, but do not have or require airside access.

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3 Market Profile and Air Traffic Forecast

In the field of air traffic forecasting, the strong correlation between growth in a region's income and demand for air travel to/from that region is both intuitive and borne out by experience. Put simply, at an economy's micro level: an individual's demand for air transport will increase in some proportion to an increase in that individual's income. For this reason, the natural starting point for an airport traffic forecast is to assess the socioeconomic prospects for the region in which the airport is located. Accordingly, this section begins by profiling the region's recent socio-economic trends and assessing the region's prospects for future economic growth.

3.1 Socio-Economic Profile

3.1.1 Background

The Brant census division consists of two single-tiered municipalities — Brant County and the City of Brantford. Brant County is a mix of urban and rural areas and includes the communities of Burford, Oakland, Glen Morris, Mount Pleasant, Onondaga, Paris, Scotland and St. George. The City of Brantford, identified as a Census Metropolitan Area (CMA), is a separate municipality centred within Brant County's boundaries.

Note that Brant and Haldimand-Norfolk census divisions comprise the Grand Erie Region of Southwestern Ontario and many of the socioeconomic metrics quoted in this report are given at this region-wide level of aggregation, as more disaggregated data at the county or municipal level are not available. Nevertheless, the region-wide measures are taken to be reasonable approximations/ barometers of economic activity at the county or municipal level.

Brantford, itself, is known as the Telephone City, as it was here in 1874 where Alexander Graham Bell first conceived the idea for the telephone. Since Bell's time, the City and surrounding region has metamorphosed from an agrarian economy to a prominent manufacturer of farming implements & machinery and then to a more diverse economy.

Table 3-1 – Major Brantford Area Employers

Company Name	Approx. Employees
Ferrero Canada Ltd.	800
S.C. Johnson and Son Ltd.	454
Apotex Pharmachem Inc.	418
Excel Canada (Proctor & Gamble)	410
Western Waffles Corporation	404
Aryzta Canada	335
Mitten Inc.	325
The Marco Corporation	267
Tigercat Industries Inc.	250
Mott Manufacturing	250

Source: City of Brantford Website (2014).

The evolution of the regional economy has, in part, been influenced by its strategic location. Specifically, the City of Brantford has strategic transportation links to both the Golden Horseshoe region and the United States. In fact, the City is situated along the quickest route through southern Ontario between Detroit and Buffalo and is located within a one-day drive of 190 million potential customers. This has enticed some notable companies to set up operations in Brantford: e.g., Procter & Gamble, Ferrero Canada and SC Johnson. Table 3-1 on the previous page lists the top ten Brantford area employers.

Located in the Greater Golden Horseshoe, designated as an urban growth centre in the Ontario Provincial Growth Plan, the City of Brantford is emerging as a destination of choice for families and companies looking to capitalize on the area's optimal location, diversified workforce and quality of life amenities.

3.1.2 Industry Composition

The Grand Erie economy is made up of many, diverse industry sectors, but the top five provide six out of every 10 jobs within the region. Manufacturing is the largest sector, providing almost one out of every six jobs.[4] Table 3-2 presents the top five industry sectors and the sub-sectors that comprise them.

Table 3-2 – Top 5 Priority Industry Sectors – Grand Erie

Agricultural Sub-Sectors	Health Sub-Sectors
Crop	Ambulatory care
Animal	Hospitals
Forestry and logging	Nursing and residential care facilities
Fishing, hunting and trapping	Social assistance
Arts and Entertainment Sub-Sectors	**Retail Sub-Sectors**
Amusement, gambling and recreation	Food and beverage
Performing arts, spectator sports & related	Motor vehicle and parts dealers
Heritage institutions	Machinery, equipment & wholesale suppliers
Manufacturing Sub-Sectors	**Accommodation & Food Service Sub-Sectors**
Fabricated metals	Accommodation
Machinery manufacturing	Food service and drinking establishments
Miscellaneous manufacturing	
Food manufacturing	
Wood product manufacturing	

Source: Workforce Planning Board of Grand Erie.

Over the last few years, large redevelopment projects undertaken by the public and private sectors has attributed to the development of Brantford's downtown core. In addition, the education/training sector is very important to Brantford's economy. There are three universities and colleges located within the Brantford-Brant region and several other educational facilities in close proximity within surrounding towns/cities. This provides a consistent flow of students and is also an indicator of future potential growth of new businesses, as witnessed just north in the so-called "Technology Triangle" region of the

[4] Workforce Planning Board of Grand Erie.

province. Brantford has three university/college satellite campuses located in its downtown core: Wilfred Laurier University (one of Canada's fastest growing campuses), Nipissing University, and most recently Conestoga College. The presence of these secondary institutions is expected to be a primary catalyst for future investment and development in the City of Brantford's downtown.

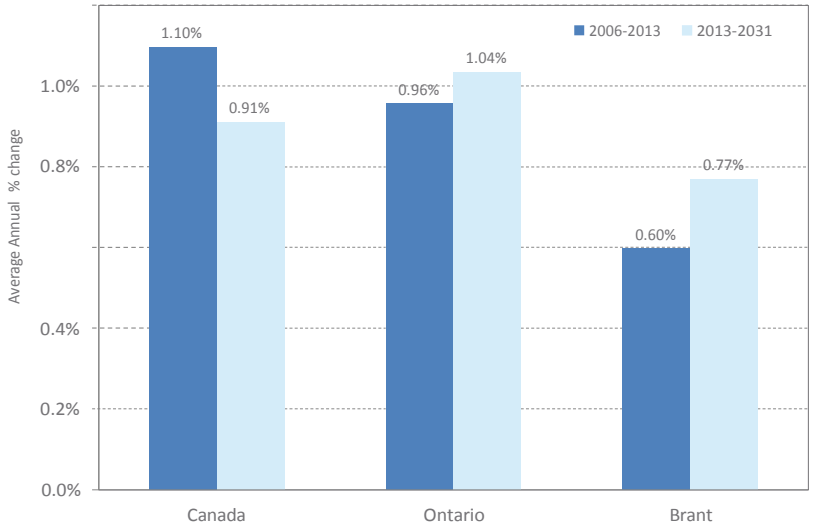
Another of the region's educational institutions of note is the W. Ross Macdonald School for the Blind, which was founded in 1872 in Brantford. The school, operated by the Province of Ontario, provides instruction from kindergarten to secondary school graduation for blind and deaf/blind individuals, and draws students from across the province and northeastern United States. In addition, the facility has residences to accommodate those that do not live in the local area. These residential students are flown in and out of Brantford to their home regions on a weekly basis through YFD.

3.1.3 Demographic Profile and Projections

Due to its rapid growth, Brantford was one of the six new CMAs that were added to the Federal Census in 2006. Since then, the City has continued to grow at an accelerated rate. According to the 2011 Federal Census, the population of the Brantford CMA was 135,501, an increase of 8.7% from 124,067 in 2006. The Six Nations of the Grand River First Nation borders the City of Brantford and is the most populous reserve in Ontario with a total population of 25,600 members.

For Brant County overall, however, the picture is quite different. As shown in the Exhibit 3-1, growth of Brant County's population has lagged behind that of both Ontario and Canada and this is projected to remain the case into the future.

Exhibit 3-1 – Average Annual Population Growth – Historical & Projected



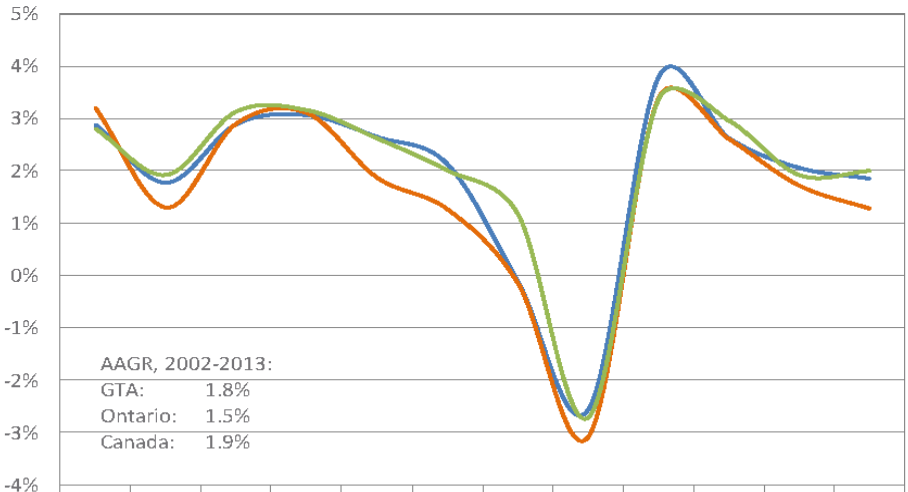
Source: Ontario Ministry of Finance.

3.1.4 Economic Performance & Outlook

Since a consistent and reliable set of Gross Domestic Product (GDP) data is not available for Brantford or Brant County, the Consultant Team used historical and projected growth trends in national GDP and population as benchmarks for corresponding activity at the level of Brant County.

To put matters into perspective, Exhibit 3-2 displays GDP growth comparisons for Canada, Ontario and the Greater Toronto Area, which is the engine of growth for the provincial economy. While we do not have a corresponding measure for Brant County, the fact that the region's population growth has been significantly lower than that of Ontario and Canada suggests that its economic growth has most likely been in the same relative order of magnitude. For example, if the region's population growth lags behind Ontario, its rate of growth in productivity would have to be higher than that of the provincial average in order for its rate of output to, at a minimum, keep pace with that of Ontario.

Exhibit 3-2 – Historical Average Annual GDP Growth – Toronto, Ontario & Canada



	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
GTA	2.9%	1.8%	2.9%	3.1%	2.7%	2.1%	-0.1%	-2.6%	3.8%	2.6%	2.1%	1.9%
Ontario	3.2%	1.3%	2.9%	3.1%	1.9%	1.3%	-0.1%	-3.1%	3.4%	2.6%	1.7%	1.3%
Canada	2.8%	1.9%	3.1%	3.2%	2.6%	2.0%	1.2%	-2.7%	3.4%	3.0%	1.9%	2.0%

Source: Statistics Canada and the Conference Board of Canada.

Moreover, for the same reasons cited above pertaining to comparative GDP growth rates, it is most likely that Brant County's income per capita lags behind that of Ontario and Canada. Also, while not absolutely definitive, measures of median income would tend to support this notion and, in that regard, the Workforce Planning Board of Grand Erie obtained statistics indicating that the Grand Erie region's median income is slightly lower than that of the province. More current information, reported through 2012 income tax return information, shows that income levels increased slightly, but continued to fall below Ontario (estimated at approximately $31,000).[5] Also, figures from Statistics Canada show that Ontario's median income was in line with that of the nation for the same period of time.

3.1.5 Growth Prospects for the Region

Based on discussions with local economic development groups, the Consultant Team understands that the regional economy has become more and more diversified over time. Nevertheless, there does not appear to be any one particular force (sector, initiatives, investments, etc.) that is expected to drive exceptional or notable growth in the regional economy. Specifically, there are no signs to indicate that

5 Ibid.

the Brantford-Brant region's economy should grow faster than that of the nation or Ontario. Again, this is due to the fact that its population is expected to grow at a much slower pace than the province or Canada overall and, at the same time, there is nothing to suggest that the region's productivity should grow any faster than the provincial or national average.

Nevertheless, there are some positive signs to indicate that the region's rate of growth in these metrics may, in the long-term, converge with that of the nation or the province. In that regard, the three post-secondary institutions located in the Brantford-Brant area provide the region with a vibrant and younger population base and this could help to stimulate investment in the local economy. In turn, this could boost average incomes, in-migration and diversification of the local economy.

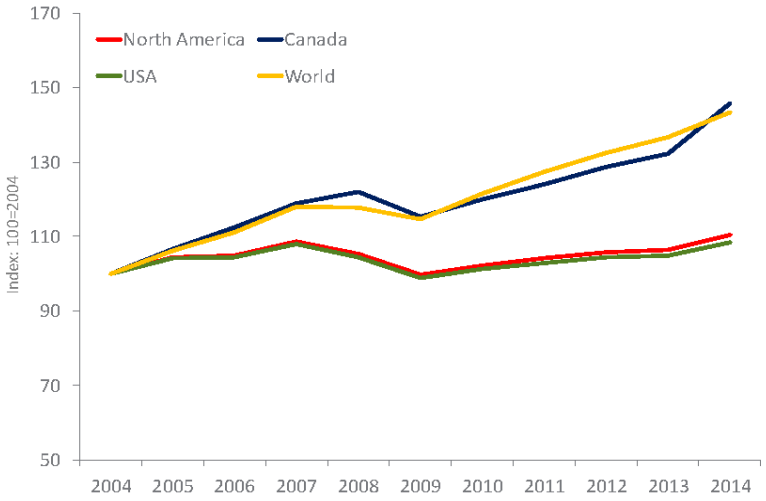
However, education levels in Grand Erie continue to lag behind the province, with between 52% and 54% of all residents having high school or less. Also, while education levels within the region have improved slightly (the number of post-secondary completions have increased by 5% since 2006) these gains have not kept pace with the demand for post-secondary education — 77% of all jobs are expected to need a post-secondary credential by 2031.[6]

3.2 Overview of the Air Transport Industry

3.2.1 Canada

According to Airports Council International (ACI), since 2004, the global air transport industry has grown annually by 3.7% and, as can be seen in Exhibit 3-3, North America has lagged, averaging 1.0%. In fact, if we exclude North America, the industry has grown by 4.7% since 2004. Within the North American market during this period of time, Canada accounted for about 10% of passenger demand. Despite this relatively small share, however, the country, led by a fairly strong economy, averaged annual growth of 3.9%, placing it among the developed economies' growth leaders.

Exhibit 3-3 – Historical Passenger Growth - Global

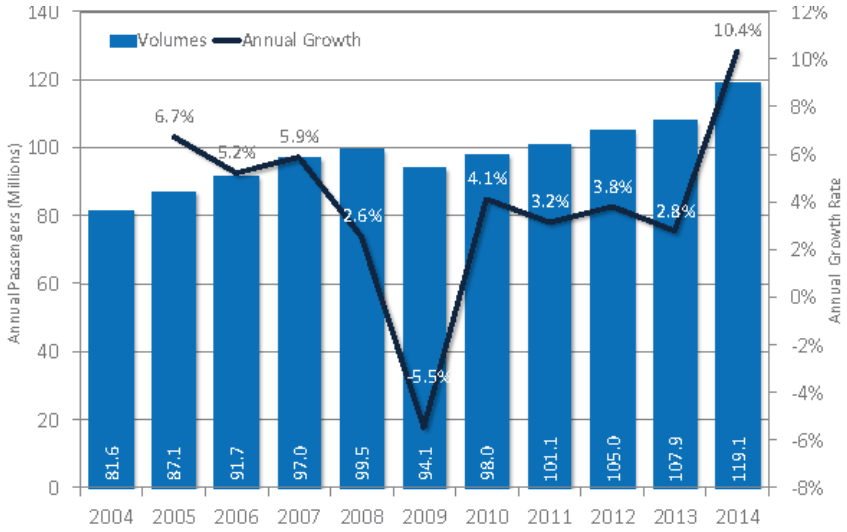


Source: DKMA analysis based on Airports Council International statistics.

6 Ibid.

Geographically, Canada is the second largest country in the world (only Russia is larger) with a relatively small population of 35 million (compared to about 314 million in the U.S.). The Canadian population is concentrated near the U.S. border, living in large city centres, such as Toronto or Vancouver. Most of these cities are fairly distant from each other and high speed rail does not exist in the country, meaning that Canadians rely upon air travel.

Exhibit 3-4 – Past Trends in Total Passengers – Canada (2004-2014)



Source: DKMA analysis based on Airports Council International statistics.

3.2.2 Ontario

Ontario is Canada's most populous Canadian province and the leading manufacturing province. As can be seen in the Exhibit 3-5, based on the latest 2014 Royal Bank of Canada (RBC) figures, Ontario accounted for 37.0% of Canada's economy. In terms of air traffic demand, according to ACI statistics, during the same period, Ontario generated 37.2% of all Canadian air traffic demand, which is in line with its economic activity.

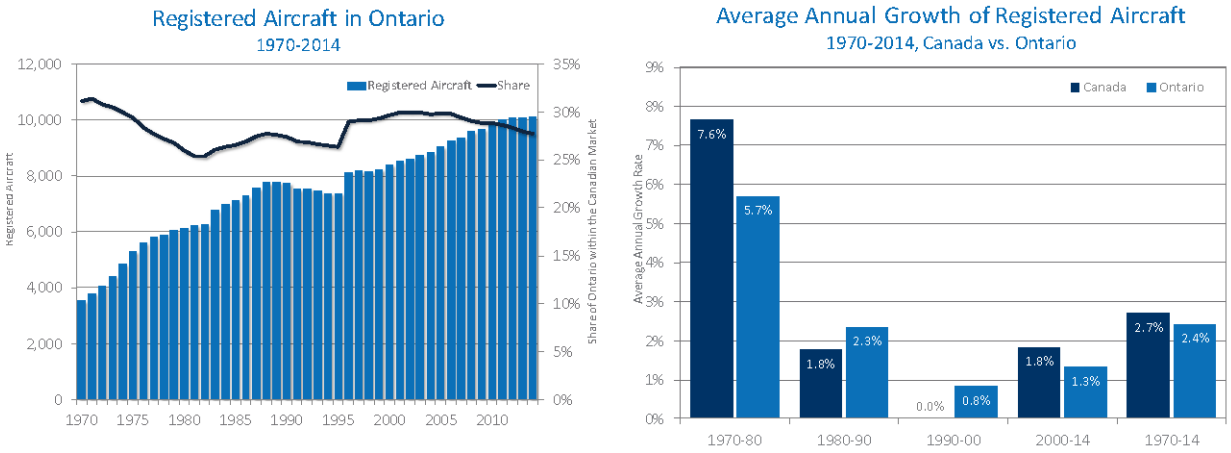
Exhibit 3-5 – Total Passengers & GDP – Ontario vs Canada (2014)

Source: Airports Council International and Royal Bank of Canada.

In terms of aircraft ownership, Statistics Canada published figures on registered Canadian civil aviation aircraft and, based on the agency's data for 2014, the Province of Ontario has the largest number of registered aircraft with a total of 10,092. In 2014, the Province accounted for 27.7% of all registered aircraft in Canada and this share is down from what it was in 2000 (29.7%).

During the 1970s, the aviation industry was still relatively new and the number of registered aircraft in Canada doubled during this period. However, since that time, growth has been much more modest as presented in Exhibit 3-6.

Exhibit 3-6 – Registered Aircraft – Ontario (2014)



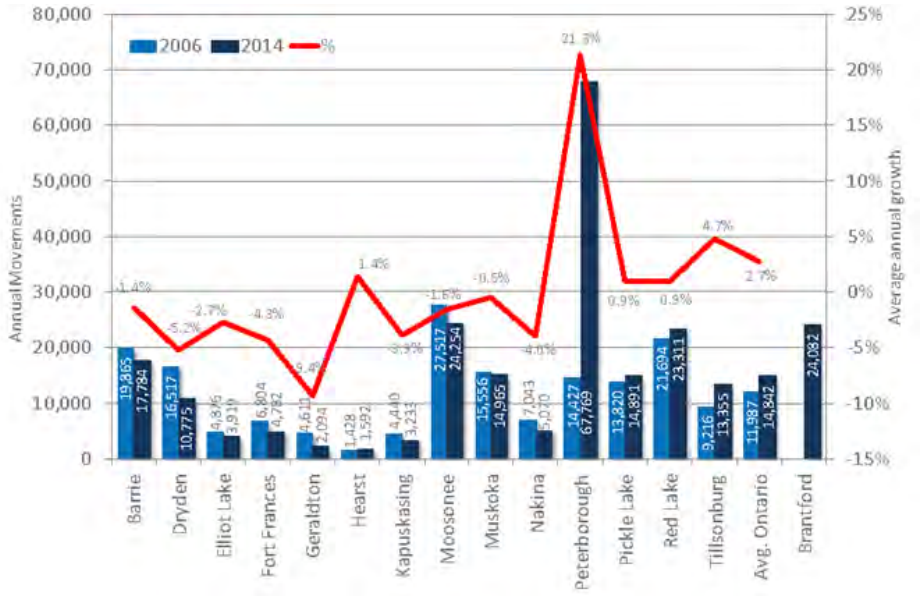
Source: Airports Council International and Royal Bank of Canada.

Statistics Canada also publishes figures on aircraft movements (landings and take-offs) for airports without air traffic control services. While the size and the nature of the service offered at these airports can vary greatly, they nevertheless offer a good point of comparison with Brantford Municipal Airport. Exhibit 3-7 on the following page, presents the number of aircraft movements and average annual growth between 2006 and 2014 for a selection of airports in Ontario without air traffic control services.

Peterborough, northeast of Toronto, is an exception both by its overall number of movements and by its growth since 2006. If we exclude Peterborough from the equation, we see that Brantford Municipal Airport is a relatively large airport compared to most others in its class, including Tillsonburg Regional Airport (which is situated about 50kms from Brantford Municipal Airport). Also, overall these airports have seen their aircraft movements increase by 2.7% annually and if we exclude Peterborough the group of airports has seen its movements decline annually by -1.1%.

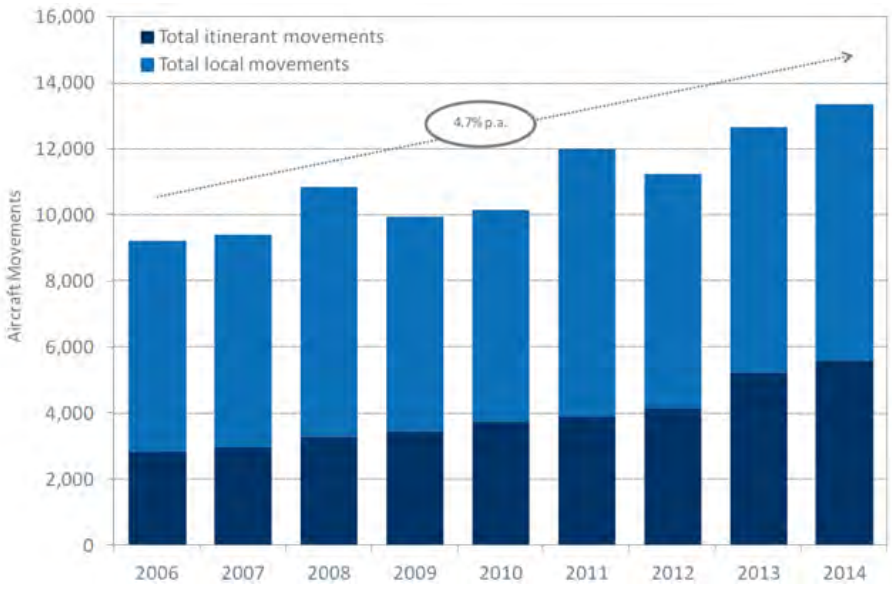
As a comparison, Tillsonburg Regional Airport (CNQ4) has much smaller traffic volumes than YFD (13,355 movements versus 24,082 in 2014); however, its growth has been dynamic in terms of development. As shown in Exhibit 3-8 on the following page, since 2006, aircraft movements at CNQ4 have grown annually by 4.7%, where local movements are more important than itinerant movements but the latter has expanded more rapidly during the last few years. More precisely, since 2006, local movements have grown annually by 2.5% versus 8.9% for itinerant movements meaning that the share of local movements at the airport is declining; it was 70% in 2006 and accounted for 58% of all movements in 2014. However, much of the recent growth in traffic at CNQ4 has been a result of aggressive pricing of service rates and charges which may not necessarily be sustainable.

Exhibit 3-7 – Total Aircraft Movements – Select Ontario Airports Without ATC (2006 vs 2014)



Source: Statistics Canada (Report No. 51-210) and the Brantford Flying Club.

Exhibit 3-8 – Aircraft Movements – Tillsonburg Regional Airport (2006 vs 2014)

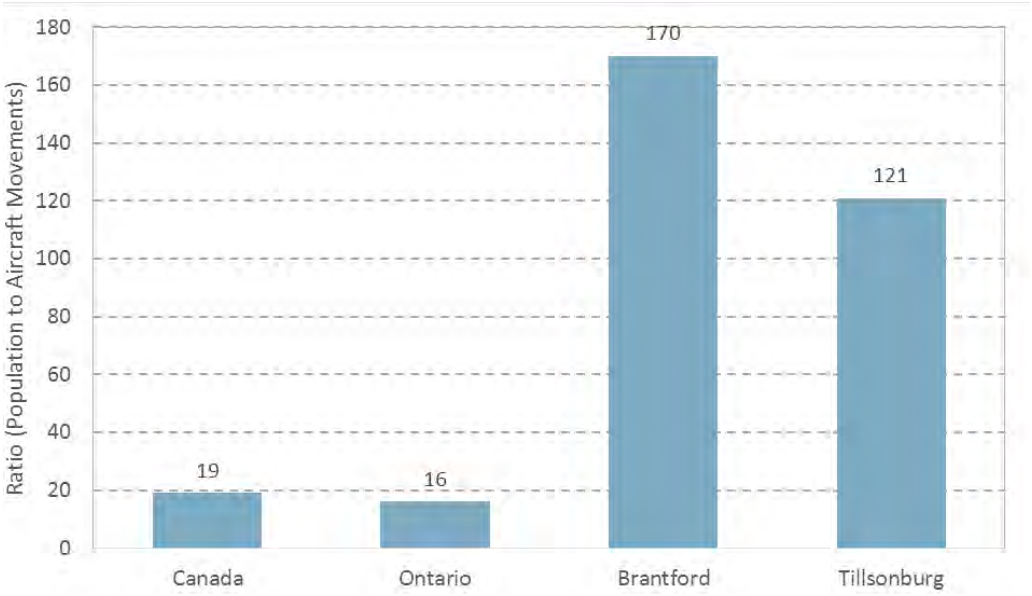


Source: Statistics Canada.

Based on information available from Statistics Canada, we are able to estimate a ratio of aircraft movements to population. Although this measure is imperfect, it gives an indication regarding the importance of the airport within the community.

At the Canadian and the Ontario Provincial level, we expect to observe that the ratios will be much lower than the ratios for Brantford and Tillsonburg, since many Canadians do not live in close proximity to airports. However, as depicted in Exhibit 3-9, comparing Tillsonburg with Brantford indicates that the latter has a much higher level of movements relative to the size of its population.

Exhibit 3-9 – Aircraft Movements vs. Local Population (2014)



Source: DKMA analysis based on Ministry of Finance, Statistics Canada and Brantford Flying Club data.
Note: 1. Aircraft movements are based only on airports without air traffic control services.
2. Population associated with Brantford Airport is based on Brant County data.

3.2.3 Brantford Municipal Airport

The City does not formally collect air traffic statistics for YFD; therefore, all estimates of YFD air traffic movements are based on data and opinions provided by the BFC and other Airport users.

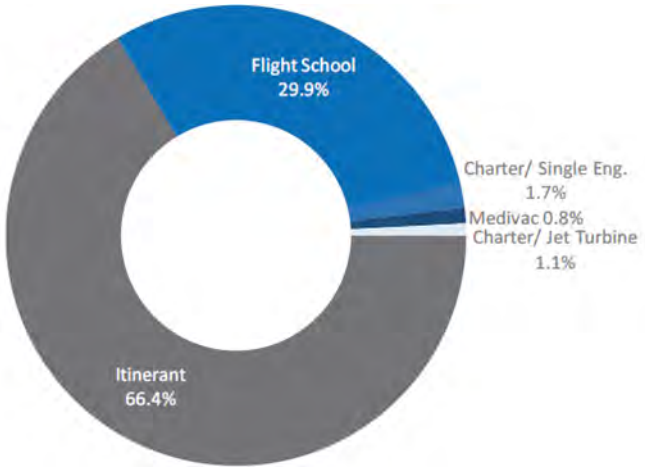
The BFC have a current fleet of six (6) aircraft (2-C152, 3-C172 and 1-C172RG), all based at the Airport. The BFC expect to increase their flight training activities during 2016, but no details were available. In addition, there are approximately 64 private based aircraft stored in various hangars around the airport. The based aircraft are comprised of small single- and twin-engine aircraft.

Another organization that uses the Airport's services is the W. Ross Macdonald School for the Blind. As mentioned previously, for a number of years, residential students attending the school have been transported from Brantford to various other airports in Ontario. The service is operated by Skyservice under contract with the Ontario Ministry of Education and Bearskin Airlines presently flies the routes using four (4) Fairchild Metro III aircraft. The flights depart on Friday afternoons to Ottawa, Pembroke-North Bay-Timmins, Sudbury, and Sault Ste. Marie-Thunder Bay, and the return flights occur on Sunday afternoons. The service currently operates ten (10) months of the year and is estimated to generate

about 2,600 annual passengers[7] and 688 annual aircraft movements (arriving and departing combined).

In terms of GA movements, in 2014, it is estimated that the Airport handled 24,082 aircraft movements of which an estimated 16,000 were itinerant (representing over 66% of all movements). Other movements, including those linked to the BFC, accounted for nearly 30% of the movements while the other activities were marginal (e.g., air ambulance, military, etc.). The estimated breakdown of YFD aircraft movements by type in 2014 is presented in Exhibit 3-10.

Exhibit 3-10 – Breakdown of Aircraft Movements by Type – YFD (2014)



Source: DKMA analysis based on data from Brantford Flying Club.

Year to date[8] figures for 2015 indicate that local movements (principally related to flight training) reached about 6,050 (arrival and departure) movements.

As shown in Exhibit 3-11 on the following page, the number of active members of the BFC has increased during the past few years, while flight training student enrollment has fluctuated greatly. The high number of students in 2011 and 2012 was exceptional and primarily due to the closure of training facilities at Hamilton International Airport. Nevertheless, the BFC do anticipate flight training enrollment to increase over the next few years.

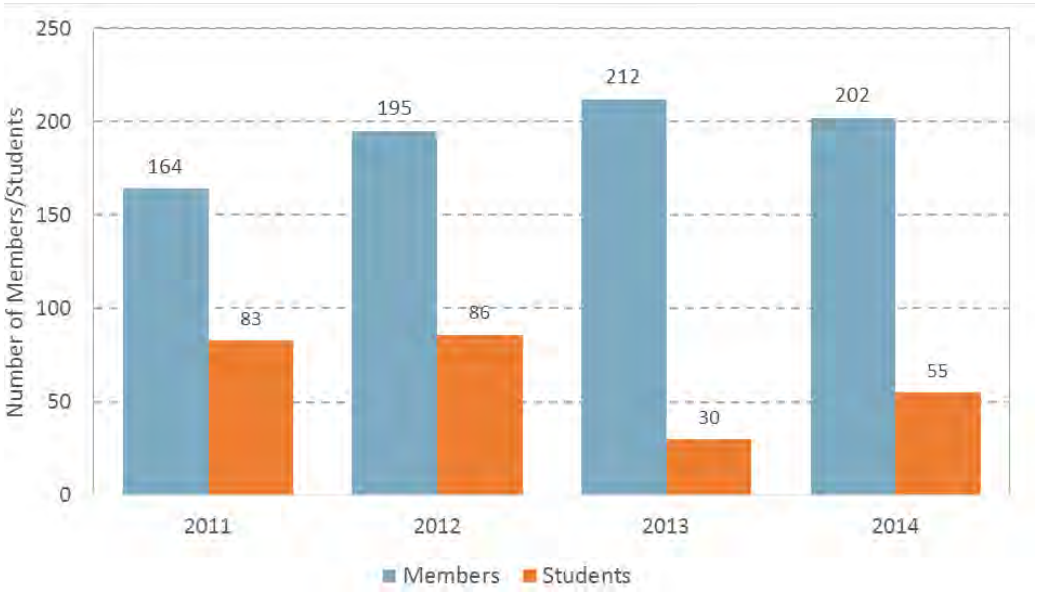
In terms of passenger volumes, the Consultant Team was not able to collect data from the available sources; therefore, we have assumed that each GA movement had an average of 1.25 passengers, to which we have add 2,636 passengers associated with the W. Ross Macdonald School air charters. The resultant estimate of passengers in 2014 is 15,921 passengers.

In terms of cargo volumes, there is also no data available; however, based on consultations with YFD operations staff, the volumes of air cargo passing through YFD is believed to be very small.

7 Neither the Province nor the charter operator (Skyservice) would disclose the number of annual passengers transported for the school.

8 To August 20, 2015.

Exhibit 3-11 – Breakdown of Aircraft Movements by Type – YFD (2014)



Source: DKMA analysis based on data from Brantford Flying Club.

3.3 Forecast Methodology and Assumptions

3.3.1 Methodology

Normally as a starting point the Consultant Team would have developed a 'top down' model, driven by classic 'macro' drivers, such as the economy. However, in the case of YFD, the Team did not have access to historical or forecast GDP data pertaining specifically to the City or to Brant County, and that information is required in order to develop a standard regression model.

Based on this, the Consultant Team instead developed a 'bottom-up' forecast model, where the key 'micro' traffic components are projected. Once these 'micro' traffic components are derived, they are then summed up to derive total airport activity.

3.3.2 Assumptions

In the case of YFD, the main 'micro' traffic components are as follows:

- Activity linked to the W. Ross Macdonald School for the Blind air charters;
- Activities linked to the Brantford Flying Club (e.g., number of students and number of members);
- Itinerant / transient aircraft activity; and
- Other GA activity, including the development of Solarship and Aircraft Spruce business ventures.

A key element which will impact all of the above assumptions is the competition from other airports

within the Southern Ontario region. Within this region, we have assumed that Hamilton International Airport will remain a key airport with regard to cargo activity (and to a lesser degree scheduled passenger activity). This means that the prospect for Brantford Municipal Airport to develop cargo activity is remote – today cargo activity at YFD is nearly non-existent.

Concerning commercial passenger service, while it exists, it is small and we have assumed that local demand for such services will continue to be served from competing airports in the region (e.g., Toronto-Pearson, Hamilton, Waterloo, London).

Tillsonburg Regional Airport has actively grown its user base recently, albeit at the cost of sustainable revenues, and we expect this trend to continue into the future. However, with the impending closure of Buttonville Airport (in Markham) in the fall of 2016 and other airports within the region become capacity constrained and less GA pilot friendly, it is believed that there will be a redistribution of GA activity to other airports in the region, including Brantford.

As mentioned earlier, for a number of years, some students attending the W. Ross Macdonald School have been transported from Brantford to various other airports in Ontario. In 2014, it is estimated that Skyservice, the operator of this service, handled about 2,600 annual passengers and about 344 annual flights. The School has been successful and there is talk of expanding the facility to accommodate more students from outside Ontario, and potentially even from other parts of Canada. This growth would necessitate further air charter activity. Although no precise figures were provided by the School regarding a possible expansion, we have assumed that over the next five (5) years, the number of students attending the school who require air service would increase annually by 10%. Today, we estimate that charter aircraft carry about 7.6 passengers (i.e., students) per flight. Over the next 20 years, we have assumed that this figure would increase annually by 0.5%. Lastly, moving beyond the School's expansion over the next five (5) years, we have assumed that the charter activity linked to the School would increase annually by 1%.

Activities linked to the Brantford Flying Club have the potential of increasing significantly over the next three (3) years due to the increasing lack of capacity at other local/regional airports within Southern Ontario, which will favor a transfer of activities to less crowded airports such as Brantford. This will mean a greater number of based aircraft (owned either by the BFC or by BFC members) and the BFC will also have the opportunity to train more students. The BFC has indicated that during the next three (3) year period, activities could increase annually by 15-20%, where we have assumed a figure of about 15%.

Beyond the next three (3) year period, growth is projected to be slower. Although congestion at other airports will continue to increase with time (which will favor YFD), the GA market is one that is considered mature and this will be reflected at the Airport over the long run.

It is not a perfect benchmark, however, the latest U.S. FAA Forecast (2014-2034), presented in Table 3-3 on the following page, indicates that the GA fleet in the U.S. will grow annually by 0.5% while the number of hours flown by that fleet will increase annually by 1.8%. An important driver of this growth is the business jet segment, which itself is projected to grow respectively by 3.0% and 4.2% which means that once excluded, the remainder of the GA market is slowing. YFD is not projected to attract a significant volume of business jet activity, and while the local economy will not see spectacular growth, we have assumed that activity linked to the BFC would grow annually by 1.9% beyond the next three (3) year period.

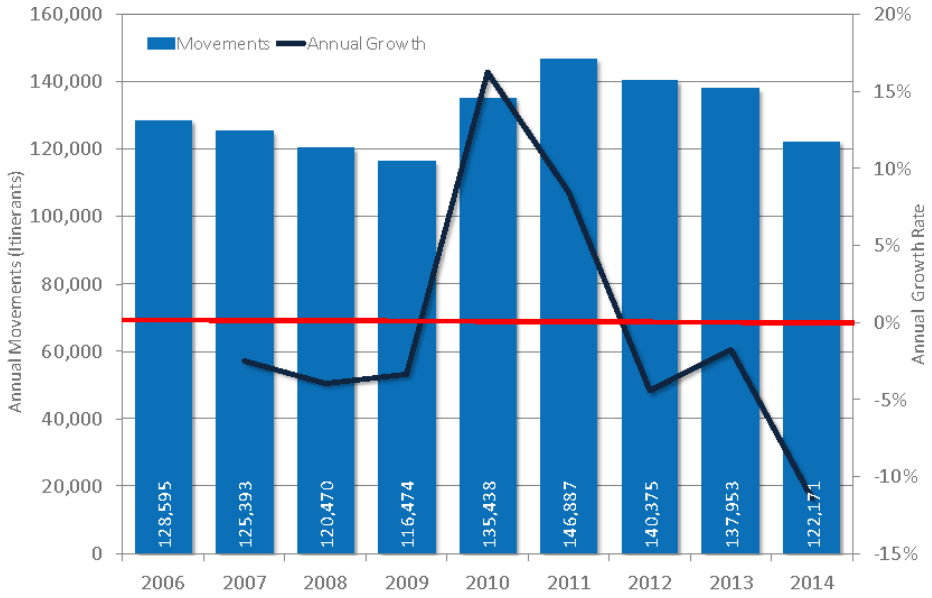
Table 3-3 – Historical & Forecast U.S. General Aviation Aircraft

Active U.S. General Aviation and On-Demand Part 135 Aircraft by Type (1980–2013) and Forecast (2014–2034)											
Year	Total Aircraft	Airplane			Rotorcraft		Balloons, Dirigibles, Gliders	Experimental	Light Sport Aircraft		
		Piston	Turboprop	Bus. Jet	Piston	Turbine			Total	Experimental	Special
1993-2013	0.6%	-0.4%	4.3%	5.9%	2.7%	4.3%	-0.8%	4.5%	n/a	n/a	n/a
2013-2034	0.5%	-0.4%	1.6%	3.0%	1.7%	3.0%	0.2%	1.5%	n/a	n/a	4.1%
U.S. General Aviation and On-Demand Part 135 Estimated Hours Flown by Type (1980–2013) and Forecast (2014-2034)											
Year	Total Aircraft	Airplane			Rotorcraft		Balloons, Dirigibles, Gliders	Experimental	Light Sport Aircraft		
		Piston	Turboprop	Bus. Jet	Piston	Turbine			Total	Experimental	Special
1993-2013	-0.3%	-2.2%	4.0%	5.4%	2.5%	2.9%	-4.5%	2.1%	n/a	n/a	n/a
2013-2034	1.8%	-0.6%	1.8%	4.2%	1.8%	3.1%	0.7%	2.6%	n/a	n/a	5.1%

Source: U.S. Federal Aviation Administration.

With regard to itinerant movements, we expect them to remain the largest component of movements at the Airport. However, since this activity is linked to the maturing GA segment, we have assumed that during the next 20 years, they will grow annually by 1.7%. To compare, in Ontario, itinerant movements have declined annually by 0.6% since 2006, as shown in Exhibit 3-12. Part of the reasoning for the assumed GA growth at YFD is a result of the anticipated congestion and discouragement of private GA activities at other larger airports in Southern Ontario.

Exhibit 3-12 – Historical Itinerant Movements – Ontario Airports with ATC (2006-2014)



Source: Statistics Canada.

With regard to ancillary aviation activities at YFD, such as by Solarship and Aircraft Spruce, we have assumed that their contribution to YFD over the long-term will be mixed. For example, in the case of Solarship, if it is a commercial success and enters into production of air ships, based on a competitive market, we assume that most fabrication would occur outside of Canada. Therefore, the ultimate

contribution of Solarship to aircraft movements and revenue generation will be minimal; however, it could potentially create some spin-off commercial opportunities at the Airport.

In the case of Aircraft Spruce, about 25% to 30% of their customer base fly-in directly to YFD. We have assumed that this activity would continue to grow in line with the overall growth of GA activity.

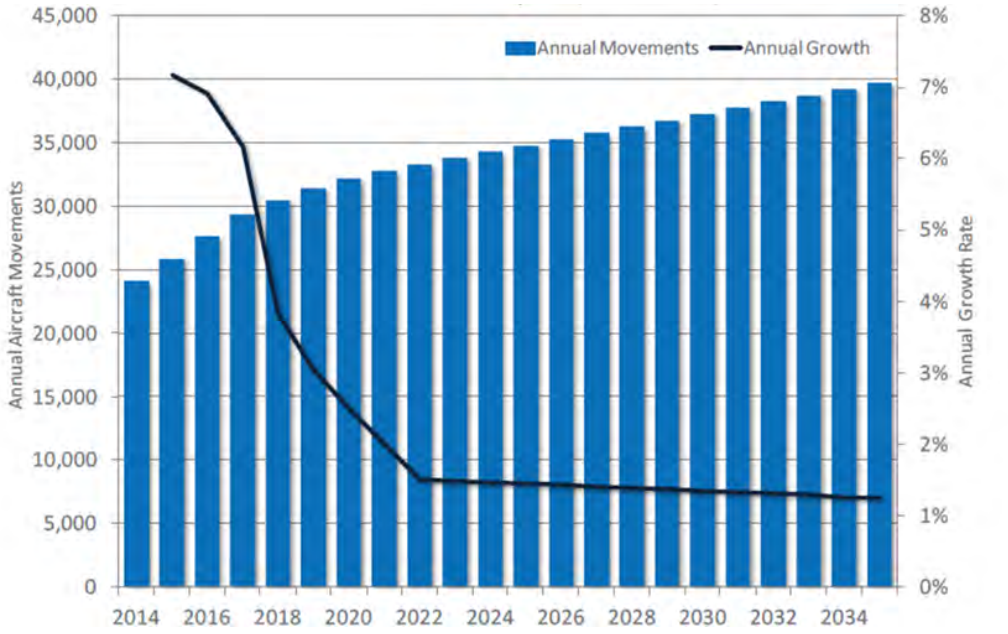
In general, the region's economy and its population are expected to grow at relatively modest rates. Moreover, as mentioned above, any passenger traffic demand stimulated by growth of the local economy will be serviced principally by larger international airports, given their proximity to Brantford. Hence, growth at YFD will in large part accrue from: 1) activities being relocated from constrained airports; 2) demand from organizations such as the W. Ross Macdonald School for the Blind; and 3) activities generated by the BFC.

3.4 Forecast Results

The annual baseline traffic forecast for YFD covers unconstrained passenger and aircraft movement traffic, where movements are further split between itinerant, based, commercial, private GA and others. The detailed forecast results are included as Appendix A to this report. BFC provided data estimates on the following movement categories which were presented in Section 3.2.3 above: Flight Training, Charter/Single Engine, Charter Jet/Turbine, Medivac, and Itinerant. Those categories, however, were re-categorized to align with specific movement categories that the Consultant Team was tasked with projecting.

Exhibit 3-13 highlights the long-term baseline aircraft movements forecast for the Airport. It is forecast that between 2015-2019, there will be a significant increase in movements at an Average Annual Rate (AAR) of 5.4%, reaching 31,335 movements by 2019. Beyond 2019, the AAR is expected to taper off to 1.5%, resulting in the Airport reaching 39,670 movements by 2035.

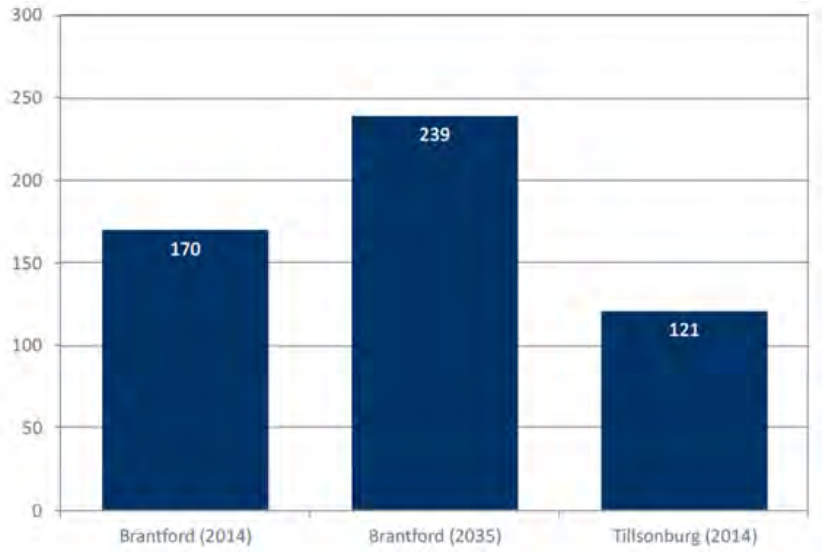
Exhibit 3-13 – Forecast Aircraft Movements – YFD (2014-2035)



Source: Statistics Canada.

Exhibit 3-14 presents the current and future ratio of aircraft movements to population, which the Consultant Team has used to benchmark the traffic forecast. During the planning period, the ratio will increase, indicating that the Airport's air traffic activities will develop more rapidly than the local population. YFD should continue to have a higher ratio as compared to some other Ontario airports, such as Tillsonburg, due to the high proportion of flight training activity.

Exhibit 3-14 – Ratio of Aircraft Movements to Population – YFD (2014 vs 2035)



Source: DKMA and Ontario Ministry of Finance.

As already mentioned in the report, there is reason to believe that economic activity in Brant County will be below the Ontario average and that, in any event, economic growth will not stimulate demand for air traffic services at the Airport. This said, in order to support the traffic projections, we have assumed that many surrounding airports will be constrained in the future and that, in tandem, the management at the Airport will capitalize on this situation by being more proactive than it has been in the past to market and develop the operations at the Airport.

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4 Existing Conditions

4.1 Airport Assessment

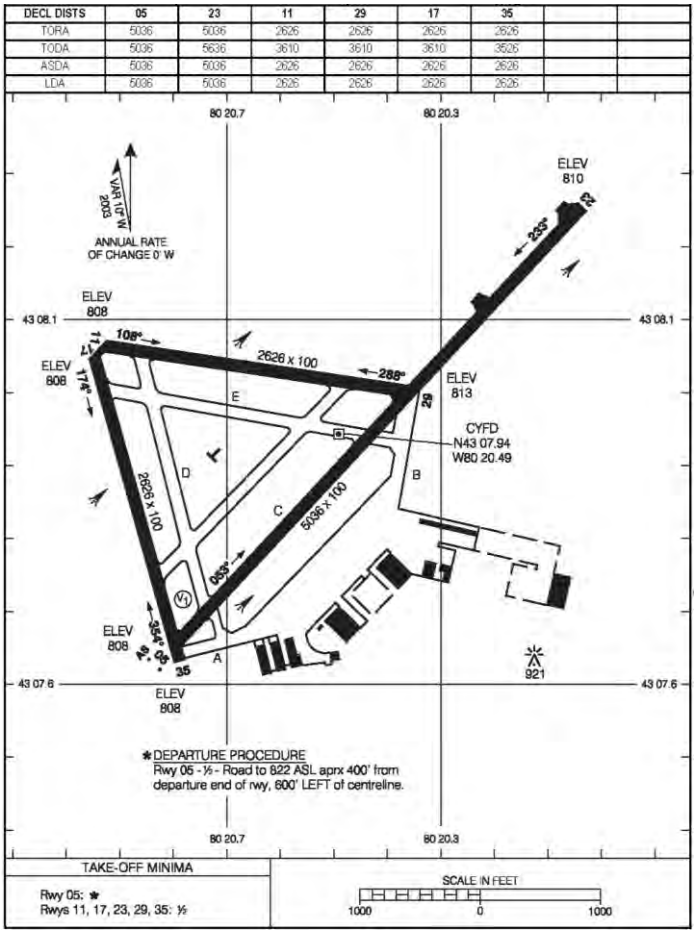
The Consultant Team undertook a cursory visual inspection of the Airport's infrastructure for the purpose of (i.) assessing their condition; and (ii.) ensuring regulatory compliance (i.e., CARs, TP312).

As well, the Team observed airport operations for the purpose of (i.) assessing their efficiency and appropriateness based on industry best practices; (ii.) identifying any airfield safety risks; and (iii.) ensuring regulatory compliance.

4.2 Airside Infrastructure

Exhibit 4-1 shows the YFD Airport layout as depicted in the Canada Air Pilot (published by Nav Canada).

Exhibit 4-1 – Aerodrome Chart for CYFD



Source: Canada Air Pilot (effective March 31, 2016), Nav Canada.

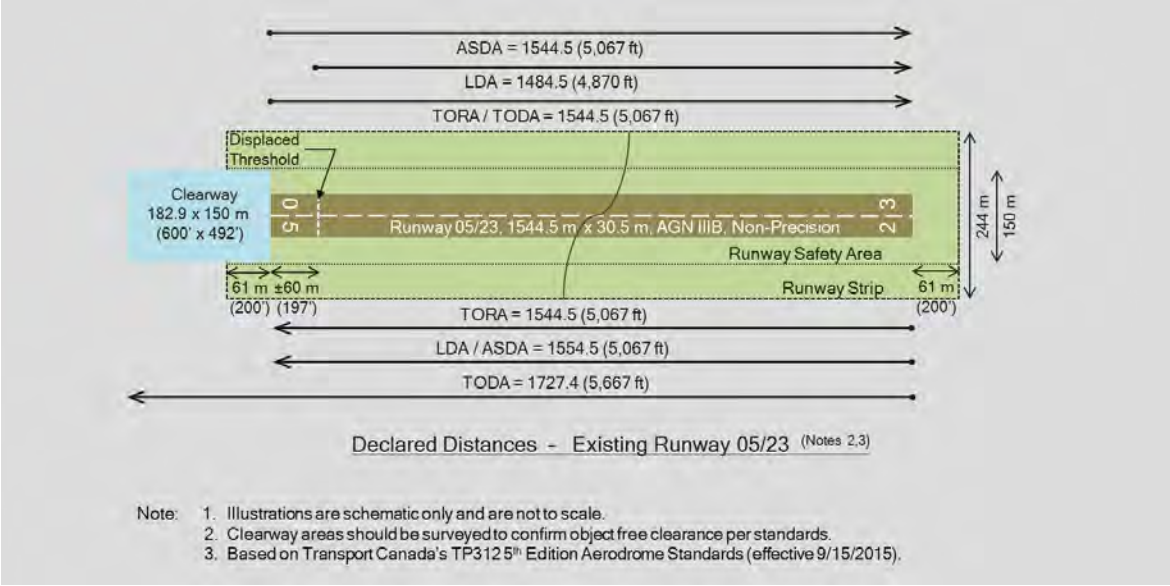
4.2.1 Runway 05/23

Runway 05/23, the primary runway at the Airport, has a published length of 1535.0 metre (5,036 ft) and width of 30.5 metre (100 ft). The approximate measured[9] length based on the actual runway pavement markings is 1484.5 metre (4,870 ft). The measured length is significantly shorter than the published length since the Runway 05 threshold marking is located east of Runway 17/35. In fact, the Runway 05 threshold should be officially published as displaced and markings/visual aids adjusted accordingly.

The runway is considered to have an Aircraft Group Number (AGN) of IIIB based on the critical design aircraft (refer to Section 6) and non-precision approaches. Based on information published in the Canada Air Pilot (CAP), the Runway 23 take-off path includes a 182.9 metre (600 ft) by 150 metre (492 ft) clearway.

Assuming a 60 metre (197 ft) displacement of the Runway 05 threshold and using the measured runway distance, Exhibit 4-2 illustrates the existing declared distances for Runway 05/23.

Exhibit 4-2 – Existing Runway 05/23 Declared Distances



Source: Aviotec International Inc.

The runway pavement was last rehabilitated in 2008 and currently appears to be in fair to good[10] condition. There is no Pavement Classification Number (PCN) published for the runway.

It is reported that the characteristics and bearing strength of the subsurface soils at the Airport are quite competent. Normally, full runway pavement rehabilitations are required every 10 to 15 years. Given the subsurface conditions and provided that annual crack filling and periodic spot repairs are undertaken, the runway may not require a full rehabilitation for at least a 10-year period. However, it is recommended that the City undertake a full assessment of the Runway 05/23 pavement, including a determination of

9 Measured from aerial image (Source: DigitalGlobe) which has not been ortho-corrected.

10 The condition rating of pavements is based on the methodology and rating system as contained in Transport Canada's Document No. AK-76-04 – Airport Facility Condition Inspection and Report Surveys.

the current runway PCN value (so that it may be published for use by aircraft operators).

It appears that the turf portions of the safety area south of Runway 05/23 exceed the maximum transverse and longitudinal slopes prescribed by TP312 (longit.: between +1.75% and -1.75%; transverse: between 0 and -2.5%). This area should be surveyed and any non-compliant areas regraded and turf re-established.

4.2.2 Runway 17/35

Runway 17/35, one of two cross-wind runways, has a published length of 800.4 metre (2,626 ft) and width of 30.5 metre (100 ft). The approximate measured length based on the actual runway pavement markings is only 791.5 metre (2,597 ft). The runway is considered to fall within AGN II based on the critical design aircraft (refer to Section 6) and non-instrument approaches.

The runway pavement was last rehabilitated in 2008, at the same time as Runway 05/23, and is currently in good condition. Other than regular annual maintenance and periodic localized pavement repairs, pavement rehabilitation is not expected to be required during the next 10-year period.

4.2.3 Runway 11/29

Runway 11/29, the Airport's other cross-wind runway, has a published length of 800.4 metre (2,626 ft) and width of 30.5 metre (100 ft). The approximate measured length based on the actual runway pavement markings is 704.5 metre (2,311 ft). The runway is considered to fall within AGN II based on the critical design aircraft (refer to Section 6) and non-instrument approaches.

The runway pavement was last rehabilitated in 2001 and is currently considered to be in fair to poor condition, with a few significant transverse cracks. Pavement rehabilitation is expected to be required within the next 5 to 7 year period. Although, it may be necessary to address the more serious transverse cracks much earlier. It is recommended that the City undertake a full pavement assessment of Runway 11/29.

4.2.4 Taxiways

As depicted in Exhibit 4-1, the Airport has five (5) taxiways (designated "A" through "E") providing efficient aircraft taxi routes to and from the commercial parking aprons and the various runway ends. All of the taxiways are 30.5 metre (100 ft) in width. According to TP312, the width of taxiways A and B could be reduced to 15.0 metre and the width of taxiways C, D and E could be reduced to 10.5 metre.

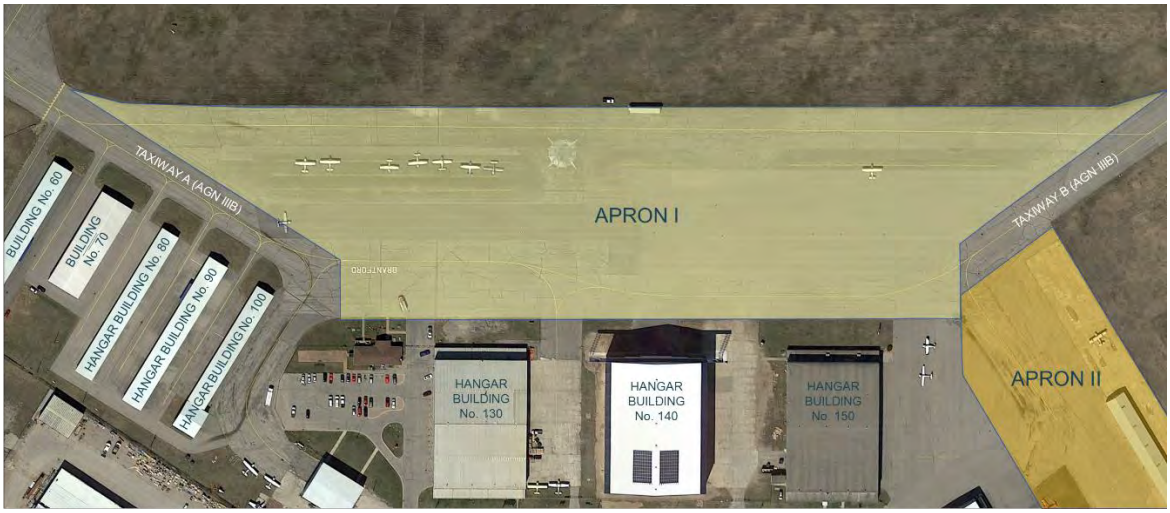
Most of the taxiways are in poor to very poor condition and have not been rehabilitated in well over 30 years, except for portions of Taxiways A and B. In fact, the taxiways located between the three runways are believed to still have a wooden subdrainage system from the original construction in the 1940's. Some of these subdrains have collapsed in the past, and currently Taxiway E is not useable due to a pavement sinkhole which is believed to have been caused by a collapsed wooden subdrain.

4.2.5 Aircraft Parking Aprons

The Airport has two commercial aircraft parking aprons as shown in Exhibit 4-3. Apron I, with an approximate area of 45,000 square metre (485,000 ft2), has tie-down spaces sufficient to accommodate a maximum of 40 light GA aircraft, as well as an additional 20 spaces for transient aircraft. Apron II, located at the east limit of the Airport's commercial area, is approximately 28,500 square metres (307,000 ft^2) and has no defined parking spaces or tie-down areas. Presently, Apron II is only used for aircraft taxiing to hangar buildings and for occasional overflow parking of larger transient aircraft. The

aircraft parking areas are neither clearly defined nor have safety clearance lines marked.

Exhibit 4-3 – Existing YFD Aircraft Parking Aprons



Source: Aviotec International Inc. and DigitalGlobe (image source).

Most of the original apron was constructed of Portland cement concrete and have since been overlaid with asphalt. A majority of Apron I was rehabilitated over a two-stage period in 2012 and 2014, in addition to reconstruction of associated storm sewers. The Apron I pavements are in good to very good condition with some areas (not previously rehabilitated) which are in fair condition and will most likely require localized repair or rehabilitation within the next 5 to 7 years. The northern half of Apron II ranges from good to poor condition, while the southern half is in poor to very poor condition with significant cracking and ravelling of the pavement surface.

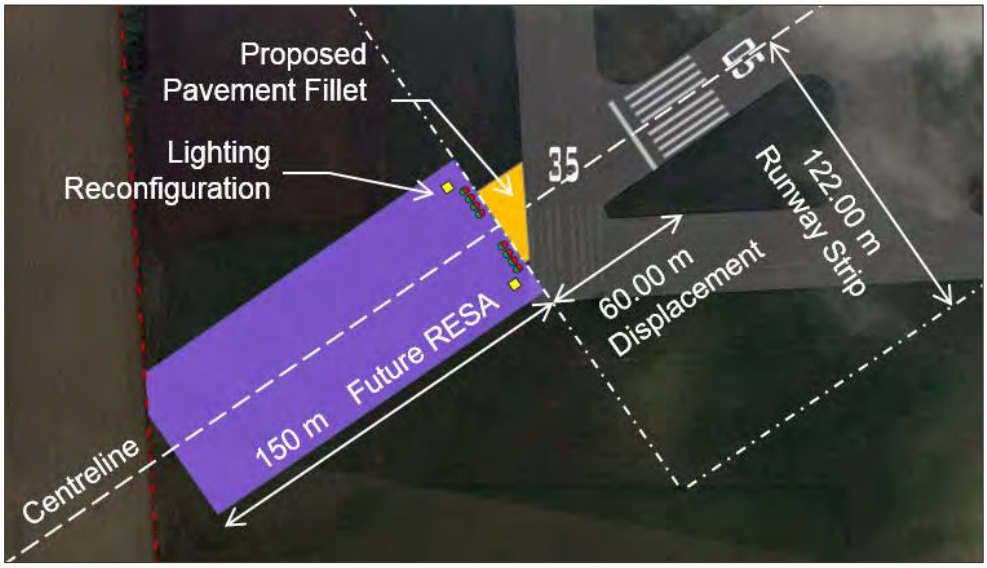
Considering the current use of Apron II, a full pavement rehabilitation is not warranted; however, some localized areas will require repair (particularly along the more commonly travelled taxi routes).

4.2.6 Runway Lighting

Runway 05/23 has medium intensity edge, end and threshold lighting, as well as Runway Threshold Identification Lights (RTIL). At the time of the site assessment, a number of the runway lights were damaged and one of the RTILs was inoperable. (It has been reported by the City that these lighting issues have been corrected since the assessment.) The age of the lighting system is not known, however, it is believed that much of the system is from the mid-1980's and therefore, some replacement, including cabling, is expected to be required within the next 1-2 years.

The end and threshold lights at the end of Runway 23 are not aligned square with the runway end, since the pavement limit is at about a 60 degree angle relative to the Runway 05/23 alignment. There is a concern that the existing lighting configuration may cause confusion to pilots during final approach as to the true alignment of Runway 05/23, particularly since there are no other visual approach alignment cues. It is recommended that a small 650 square metre pavement fillet be constructed at the runway end, as illustrated in Exhibit 4-4, and that the runway end, threshold and RTIL lights be reconfigured to be 90 degrees to the runway centreline and in compliance with TP312 standards.

Exhibit 4-4 – Proposed Runway 23 End Reconfiguration



Source: Aviotec International Inc.

Runway 11/29 and Runway 17/35 each have low intensity edge, end and threshold lighting. Like the primary runway, the lighting installations for the cross-wind runways are in poor condition and will need to be replaced over the short-term. However, should the City intend to use Runway 11/29 and Runway 17/35 strictly for day-time, VFR operations, then runway lighting would not be required.

4.2.7 Other Visual Aids

Wind Direction Indicators

The Airport has four (4) illuminated wind direction indicators – two serving each end of the primary runway, and one each for the cross-wind runways. Each of the wind direction indicators appear to be in good condition.

Visual Approach Slope Indictors

There exists a Visual Approach Slope Indicator (VASI) unit located on the south side of Runway 05/23 serving the Runway 23 approach; however, this unit is currently not operable.

Given the number of obstacles in close proximity to the Runway 05 and Runway 23 approaches, it is recommended that new Precision Approach Path Indicator (PAPI) units be installed to serve both runway approaches, including new cabling back to the electrical distribution room. These units should be located and configured based on the runway end and threshold changes recommended elsewhere in this report.

Airfield Guidance Signs

There are a number of internally illuminated and non-illuminated airfield guidance signs. Based on a cursory inspection, many of the signs are not properly located and/or have sign panels with colours and legends which do not comply with current TP312 standards. The City should undertake an assessment of

all airfield guidance signage to determine their condition, location and panel colours/legend (in accordance with current TP312 standards). At the very least, the guidance signs associated with Runway 05/23 should be upgraded or replaced within the next 5 years.

Airfield Lighting Distribution and Controls

The electrical distribution panel and regulators serving the airfield lighting system and other visual aids are located in a room at the northwest corner of Hangar Building No. 130. The room also includes lighting controls, which can be manually activated at the FBO/terminal building, or remotely by pilots using the Aircraft Radio Control of Aerodrome Lighting (ARCAL) system. It has been reported that there are no issues with the electrical distribution system or the airfield lighting controls.

4.3 Local Airspace & Zoning

4.3.1 Approach Procedures

The Airport has two published instrument approaches to Runway 05/23. These are (i.) an NDB approach to Runway 05 with a cloud ceiling minimum of 153.9 metre (505 ft) AGL and 2.4 kilometre (1-1/2 miles) visibility; and (ii.) an Area Navigation (RNAV) approach to Runway 23 with a cloud ceiling minimum of 130.5 metre (428 ft) AGL and 2 kilometre (1-1/4 miles) visibility.

The two cross-wind runways have no published instrument approaches and runway operations are conducted under Visual Flight Rules (VFR).

4.3.2 Air-to_Ground Communications

The CFS indicates that an Aerodrome Traffic Frequency (ATF) is active at YFD through a UNICOM (Universal Communications) station which is situated in the FBO building and monitored by the BFC. The ATF is established to provide a means for radio-equipped aircraft operating on the ground or travelling in the local airspace to communicate and listen on a common frequency. Given the level and mix of aviation activity at and near YFD, it is recommended that the City seek to have Transport Canada designate a Mandatory Frequency for the Airport.

4.3.3 Runway Approach and Take-off Zoning

Exhibits 8-3 and 8-4 of this report present the Obstacle Limitation Surfaces for the Airport. (These exhibits were prepared under the assumption that the approaches for Runway 11/29 and Runway 17/35 would be protected for future non-precision, instrument operations.)

Using available topographic mapping (Source: Brant County) for the Airport and surrounding lands, the Consultant Team assessed whether the existing runway approach and take-off paths (surfaces) are presently obstacle free. Based on the findings of the assessment, it appears that there may be infringements of both the Runway 05 and Runway 23 approach and take-off surfaces. The findings are summarized below.

Runway 05 Approach Surface

Currently, published aeronautical information for YFD does not indicate a displacement of the Runway 05 threshold, yet the actual pavement markings suggest a 60 metre (197 ft) displacement. Based on

this threshold displacement and the proposed pavement fillet, Exhibit 4-5 shows the Runway 05 approach surface and associated height limitation contours.

Exhibit 4-5 – Existing Runway 05 Approach Surface

Source: Aviotec International Inc. and DigitalGlobal (aerial image).

It appears from Exhibit 4-5 that the power lines running along the north side of Colborne Street West may be infringing into the Runway 05 approach surface (if the pole heights are greater than 10 metres above the road surface). As well, there may be trees or buildings within an existing agricultural property (located immediately to the west of YFD) which may be infringing the approach surface. Exhibit 4-6 contains a photograph of Colborne Street looking west and showing the power lines in question.

It is recommended that the City undertake a detailed survey of all potential obstacles along the approach path. Should obstacle(s) be infringing the approach surface, then the obstacles will either need to be removed or the Runway 05 threshold displacement increased.

Runway 23 Take-off Surface

According to the CAP, there is a 182.9 metre long clearway beyond the end of Runway 23. Based on this clearway, Exhibit 4-7 shows the Runway 23 take-off surface and associated height limitation contours.

Similar to the Runway 05 approach surface, it appears from Exhibit 4-7 that the power lines running along the north side of Colborne Street West may be infringing into the Runway 23 take-off surface (if the pole heights are greater than 10 metres above the road surface). As well, there may be trees or buildings within an existing agricultural property (located immediately to the west of YFD) which may be infringing the take-off surface.

Exhibit 4-6 – Photograph of Colborne Street Looking West

Source: Aviotec International Inc.

It is recommended that the City undertake a detailed survey of all potential obstacles along the take-off path. Should obstacle(s) be infringing the take-off surface, then the obstacles will either need to be removed or the Runway 23 clearway eliminated or reduced in length. Until such time that an obstacle survey can be completed, it is recommended that the clearway be removed and the published runway declared distance be adjusted.

Runway 23 Approach and Runway 05 Take-off Surfaces

Beyond the end of Runway 05, the existing terrain rises and there are trees and power lines within 200 metres. It is believed that there are trees and power lines running along Robinson Road which are 10 metres in height or greater. Given these heights, obstacles may be infringing into the Runway 23 approach and Runway 05 take-off surfaces by as much as 7 metres.

Elimination of these obstacles on private property and along a County road may be challenging to implement over the short-term. An alternative would be to reduce the runway length by about 286 metres, as shown on Exhibit 4-8. Correspondingly, the 286 metre section of existing runway could be converted into a stopway for Runway 05 take-offs, which would have the effect of maintaining the Runway 05 ASDA declared distance.

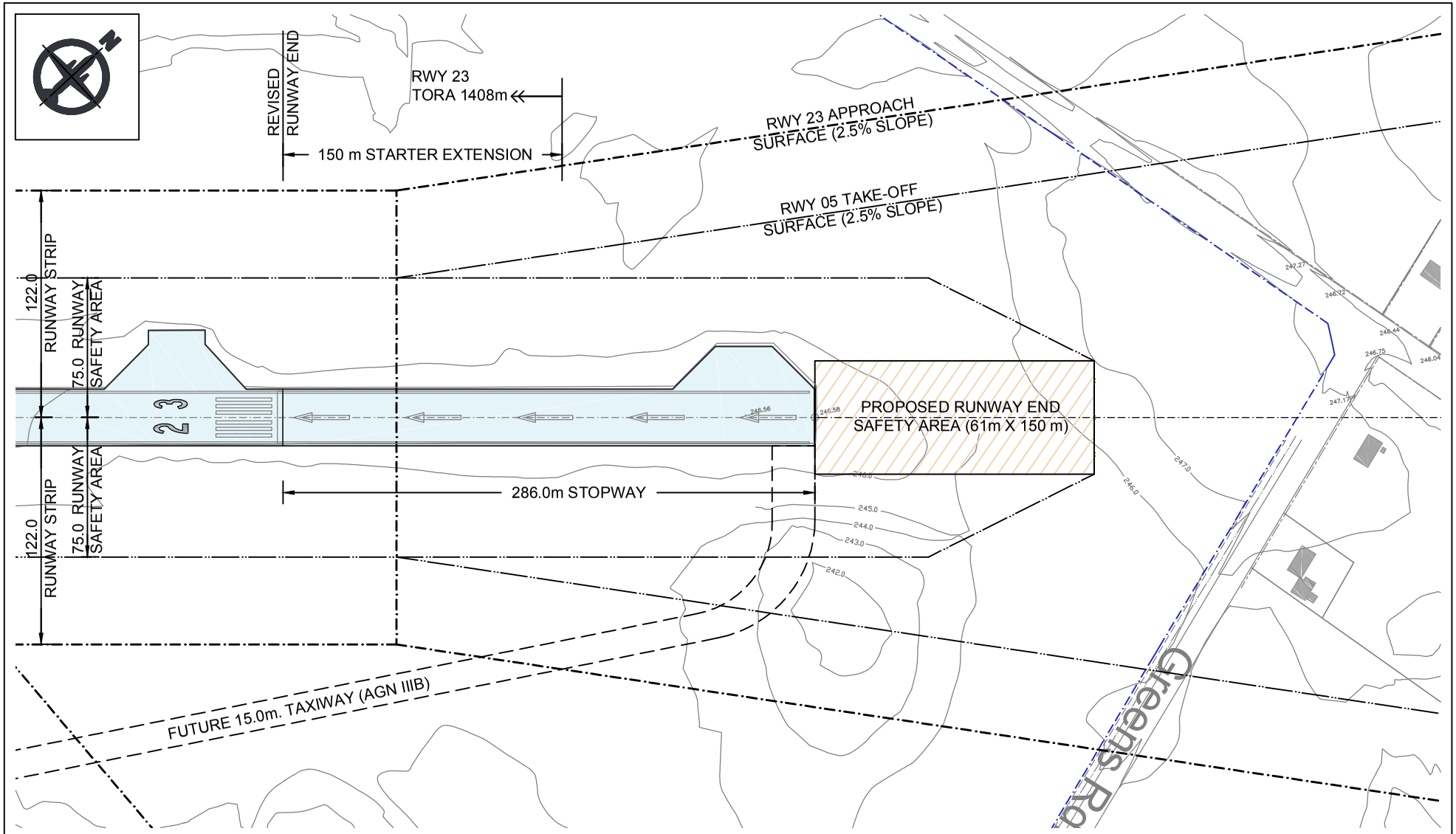
In order to maintain a reasonable Runway 23 take-off distance, it is proposed that a 150 metre (492 ft) runway starter extension (or sometimes called a starter strip) be implemented beyond the proposed Runway 05 end, as shown in Exhibit 4-8. A starter extension provides an area prior to the runway end for the initial aircraft take-off roll, thereby increasing the Runway 23 TORA/TODA declared distances. In the opposite direction, the starter extension cannot be used as part of the Runway 05 take-off length.

Exhibit 4-7 – Existing Runway 23 Take-off Surface

Source: Aviotec International Inc. and DigitalGlobal (aerial image).

Although the use of runway starter extensions is not officially endorsed by Transport Canada (TP312) or ICAO (Annex 14), it is an accepted practice in many countries including the UK, British Overseas Territories, Australia, New Zealand, United Arab Emirates, among others. The industry standard for a starter extension is a maximum of 150 metre length and two-thirds the width of the runway to indicate that it does not have the same safeguarding as a runway (i.e., runway strip width). The reduced safeguarding is reasonable due to the slow speeds involved during an initial take-off roll. Since YFD is currently not certified, the City could implement a starter extension for Runway 23 take-offs without seeking the approval of Transport Canada, until a more permanent solution can be planned and implemented.

In order to confirm the obstacle heights and the new runway declared distances, it is recommended that the City undertake a detailed survey of all potential obstacles northeast of the Airport along the Runway 23 approach and Runway 05 take-off paths.



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project title

BRANTFORD MUNICIPAL AIRPORT
MASTER PLAN

exhibit title

PROPOSED RUNWAY 05 STOPWAY

scale
(at 8.5" x 11" sheet size)

1cm = 30m

-30 0m 30 60 90 120

date	revision	project no.	exhibit
29 JULY 2016	2	AP1501	4-8

4.4 Airside Security

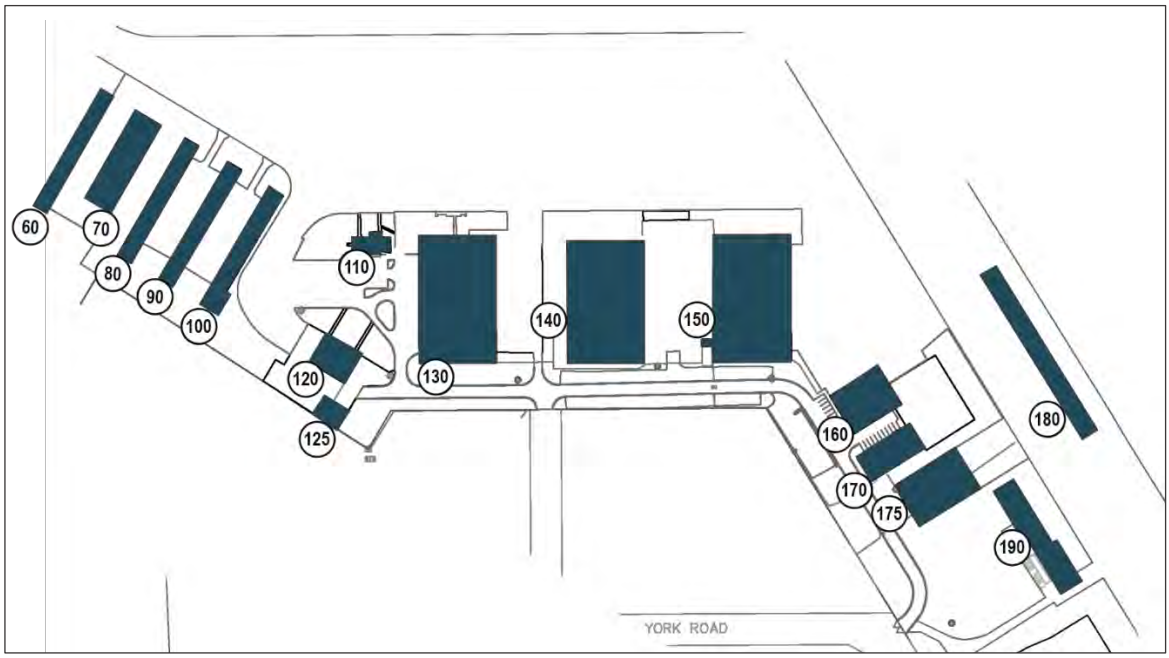
Within the commercial area of the Airport, there are sporadic sections of chain-link security fencing ranging in heights from 1.2 to 1.8 metres, including various manual swing gates. Beyond the commercial area, a majority of the Airport property boundary is demarcated by post and wire farm fence which is in various states of repair.

Based on site observations, a number of gates are regularly left opened, and users and the general public occasionally drive out onto the airside apron unchallenged. Such actions significantly increase safety and security risks on airside. It is recommended that the City commence a program to improve perimeter security infrastructure and strengthen security procedures for the Airport's airside areas.

4.5 Airport Building Facilities

The Airport lands include a combination of City-owned and privately-owned buildings, as shown in Exhibit 4-9, which are concentrated at the south end of the Airport property. All privately-owned buildings are constructed on City-owned lands and are under a long-term lease agreement (typically 20-years in duration).

Exhibit 4-9 – YFD Airport Building Numbering



Source: Adapted from City of Brantford drawing.

A list of all City-owned and privately-owned building facilities located within the Airport's boundaries are provided in Table 4-1 (the building numbers correspond with the numbering in Exhibit 4-9). The Consultant Team undertook a cursory visual inspection of each of the City-owned building structures and a condition rating was assigned to each. The key information and condition rating for each building are summarized in Table 4-1.

Table 4-1 – Airport Building Facilities – Key Information and Condition Rating

Building No.	Building Type / Description	Building Area (m^2)	Approx. Age (Years)	Ownership	Condition Rating
60	Small GA T-Hangar Complex (10 units)	978.0	1	City	Excellent
70	Small GA T-Hangar Complex (7 units)	1,030.4	3	City	Good
80	Small GA T-Hangar Complex (10 units)	1,059.1	7	City	Good
90	Small GA T-Hangar Complex (10 units)	1,114.8	11	City	Good to Fair
100	Small GA T-Hangar Complex (9 units)	1,486.4	25	Private	N/A
110	Terminal/FBO Building	260.1	+35	Private	N/A
120	Commercial Hangar – Aircraft Maintenance	585.3	+30	Private	N/A
125	Maintenance Equipment Storage Building	136.6	?	City	Good to Fair
130	Commercial Hangar (3 Separate Lease Areas)	3,886.1	+70	City	Fair
140	Commercial Hangar – Aircraft R&D / Produc.	3,760.9	0.5	Private	N/A
150	Commercial Hangar (3 Separate Lease Areas)	3,901.9	+70	City	Fair
160	Commercial Hangar	1,059.1	+10	Private	N/A
170	Commercial Hangar	752.5	+50	Private	N/A
175	Commercial Hangar – Aircraft R&D / Office	1,393.5	5	City	Excellent
180	Small GA Hangar Complex (10 units)	1,486.4	+55	City	Poor
190	Commercial Building – Municipal Storage	1,156.6	+70	City	Fair to Very Poor

Source: Aviotec International Inc. based on data from the City of Brantford and a visual assessment of City-owned building facilities.
Note: Condition rating legend: Excellent, Very Good, Good, Fair, Poor, Very Poor. N/A – Not Assessed (since privately owned).

The following subsections provide a description of each building facility, including their history, ownership, uses and features, as well as the findings from the visual condition inspection.

4.5.1 Terminal / FBO

The existing Airport terminal and FBO building (identified as Building No. 110) is owned by the Brantford Flying Club (BFC). The 260 m^2 (2,800 ft^2) structure was constructed in the early 1980's and serves a variety of purposes. These purposes include (i.) a base for airport operations and maintenance, (ii.) flying club member lounge and services, (iii.) transient pilot lounge and services, (iv.) flight training classrooms, (v.) flying club administration, and (vi.) a restaurant operation (by a third party under a concession with the BFC). The building is currently undergoing renovations and upgrades, and the BFC have suggested that there is interest from the membership to expand the building over the short-term.

4.5.2 General Aviation Hangars

City-Owned GA Hangars

The City owns a series of four (4) T-hangar buildings (identified as Building Nos. 60, 70, 80 and 90), at

the west end of the Airport's groundside area, that are rented on a monthly basis to private based aircraft owners. There are a total of 37 units distributed between the four buildings, each in a stacked t-shaped configuration and sized to accommodate the storage of a variety of small single- and twin-engine GA aircraft. The buildings, all constructed within the past 11 years, are of wood frame construction with sheet metal cladding and paved floors, as shown in Exhibit 4-10. Each hangar door provides a 13.4 metre (44.0 ft) horizontal clearance and a 4.27 metre (14 ft) vertical clearance, and a personnel access / egress door. The units are neither insulated nor heated. Each unit has interior T8 lighting and a duplex power outlet, as well as floodlighting on the exterior. All units have direct access to the airside via a dedicated taxilane. There is no dedicated groundside parking and, as a result, some tenants tend to drive onto airside areas to access their hangar units or park in the lot at the Terminal/FBO. The T-hangar buildings range in condition from good to excellent and are not expected to require capital repairs or replacement during the planning horizon.

Exhibit 4-10 – Typical City-Owned T-Hangar Building at YFD

Source: Unknown.

The City also owns a building comprised of ten (10) adjoining monthly rental hangars (identified as Building No. 180), situated at the east end of the groundside area, for small general aviation aircraft. The exact age of these hangars is not known, but it is estimated that the building is at least 55 years of age. The hangars are not connected to municipal services, power or natural gas. The hangars are generally in poor condition and a number of repairs and upgrades are planned during 2016. Even with these capital repairs, it is recommended that within the next 5 to 7 years, the hangars should be relocated and consolidated within the cluster of City-owned T-hangar buildings at the west end of the groundside area.

Privately-Owned GA Hangars

Immediately to the west of the BFC's Terminal/FBO building, exists a 9-unit privately owned T-hangar building (identified as Building No. 100), that was constructed in 1990 of similar construction type as the other T-hangars in the area. The land lease for this T-hangar building expired in 2015 and is currently under negotiation.

4.5.3 Commercial Aircraft Hangars

Building Nos. 130 and 150

Building Nos. 130 and 150 are approximately 3,716 m^2 (40,000 ft^2) commercial hangars, owned by the City, which were built during the early 1940's. The hangars are sub-divided into three separate spaces that are leased out to privately owned businesses. The buildings are similarly constructed of steel framing with metal cladding, and concrete floors. The buildings are equipped with radiant heating, manual 6.1 metre wide sliding doors, power outlets and interior T5 lighting, and are connected to municipal water and sewer services, natural gas and 600 amp electrical service. The hangar lease spaces each include offices, washrooms, direct apron access and dedicated groundside parking spaces.

Exhibit 4-11 – Image of Building No. 150 at YFD

Source: Aviotec International Inc.

The hangars are considered to be in fair condition. Portions of both buildings have been recently rehabilitated and upgraded by the City and by the individual tenants. Building No. 150 is expected to require a roof replacement within the next 5 years. Due to the age of the buildings, it is expected that further rehabilitation and upgrading will be required within the next 4 to 8 year period. In addition, it is recommended that a structural engineer assess the structural condition of both buildings as soon as feasible.

Building No. 140

In 2015, the City negotiated a land lease with Solar Ship Inc. for the Building No. 140 parcel. Solar Ship has recently completed construction of a new 3,761 m^2 (40,482 ft^2) steel frame and fabric structure which will be able to accommodate the next version of their aircraft with a span of 48 metres. The building has a 50 metre wide electrically operated hangar door and adjoining containerized office structures. The building will have no heating or municipal service connections. Electrical power will be supplied by solar panels mounted on the roof of the fabric structure and a back-up diesel generator.

Exhibit 4-12 – Image of New Building No.140 at YFD

Source: Legacy Building Solutions, Inc.

The Building No. 140 parcel previously contained a hangar building, similar in size and construction to Building Nos. 130 and 150, which was originally built during the 1940's. The hangar was demolished in the mid-1980's since it was in very poor structural condition.

Building No. 160

Building No. 160 is a 1,059 m^2 (11,400 ft^2), commercial hangar privately owned on City leased land. Approximately 10 years old, the building is used to store and maintain privately owned aircraft, and also includes office spaces and direct access to Apron II. The Consultant Team was not provided an opportunity to view the interior of this building.

Building No. 170

Building No. 170 is a 753 m^2 (8,105 ft^2), commercial hangar privately owned on City leased land. Approximately 50 years old, the building is used to store aircraft components and parts, and to maintain and rebuild small GA aircraft, and also includes office spaces and direct access to Apron II.

Building No. 175

Building No. 175 is a 1,394 m^2 (15,000 ft^2), commercial hangar developed by the City in 2010. It consists of a wide-span hangar space, office spaces, and a barrier free washroom. The building is a pre-engineered structure comprised of sheet metal with metal frame construction and a concrete floor. The building is equipped with an electric bi-fold door, and is connected to municipal water and sewer services, 600 Amp electrical service, and natural gas. The hangar has direct access to Apron II and has dedicated parking spaces on groundside. The building is in excellent condition.

The building is currently being used by the lease tenant (Solar Ship Inc.) for constructing and storing their aircraft prototypes, and for conducting various research and development activities. Solar Ship has indicated to the City that they would like mezzanine space constructed within the hangar in order to accommodate additional classroom and office spaces.

4.5.4 Other Facilities

Building No. 125

Building No. 125 is a 119 m^2 (1,280 ft^2), pre-engineered building owned by the City. It is used for storage of Airport maintenance equipment. The building is considered to be in good to fair condition and no repairs or replacements are anticipated during the planning horizon.

Building No. 190

Building No. 190, with a municipal address of 51 York Drive, is a 1,342 m^2 (14,445 ft^2) commercial/storage building owned by the City. The original 749 m^2 (8,060 ft^2) portion of the building on the north side is of timber frame construction with metal cladding and was built during the early 1940's and is currently being used for the storage of the City Parks Department's fleet of winter maintenance equipment. The southern portion of the building, added about 25 years ago, is constructed of steel frame and metal cladding and is currently being used for City of Brantford records storage. The property has direct access to Apron II. The building has electrical power and lighting, and a barrier free washroom situated in the portion connecting the newer to older sections of the building. The building has no fire protection but is equipped with monitored fire and security alarm systems. The building is connected to municipal water and sanitary sewer services.

The older portion of the building is considered to be in poor to very poor condition, and will require roof replacement, upgrading of electrical services and repainting over the short-term. In addition, due to the age of the timber frame construction, it is recommended that a structural engineer assess the building's structural condition as soon as feasible. The newer portion of the building is considered to be in fair condition.

Since the City no longer has vacant, serviced land available at the Airport for development of commercial hangars, it is recommended that the City explore relocating the current uses in Building No. 190 to off-site City-owned buildings, and marketing the property for immediate development. Under this scenario, the older portion of the building should be demolished prior to expending any further capital monies, with the newer portion being preserved for potential use by a prospective lease tenant.

Vacant Parcel

There exists a vacant parcel with no direct airside apron access fronting on York Drive (south of Building No. 190). A building previously existed on the property which was demolished, however foundation and floor slab remnants still remain. No environmental testing has yet been undertaken for this parcel.

The City is currently in the process of selling the parcel to Aircraft Spruce (Irwin International Inc.) to allow for development of a new distribution warehouse and public store. If the development occurs, Aircraft Spruce would relocate from their existing premises within Building No. 150. Construction is expected to commence in the summer of 2016.

4.6 Land Leases

4.6.1 Building Land Leases

As previously noted, the City currently has four (4) long-term land leases to separate, privately owned businesses which own their own buildings. Each of the parcels have direct access to airside. These

land leases are associated with Building Nos. 100, 140, 160 and 170. Refer to the descriptions of each above.

4.6.2 Agricultural Land Leases

The City leases approximately 40 hectares (100 ac.) of the airside area, as highlighted in yellow in Exhibit 4-13, to a local farmer for agricultural crop cultivation and production. Crops grown typically include soya, wheat and other grains which are not overly attractive to birds. The City monitors what crops are being cultivated in order to minimize bird activity in the area (and thus minimizing the risk to aircraft operations).

Exhibit 4-13 – Existing Agricultural Land Lease Areas - YFD

Source: City of Brantford.

Based on a review of the areas highlighted in Exhibit 4-13, it appears that the agricultural leases encroach into active areas of the runway strips and do not offer protection to equipment operating in these areas. Tilling of soils should never occur within the Runway Safety Areas (RSA), and should be avoided wherever possible within the remainder of the runway strip areas. (Nothing within the TP312 standards restricts tilling of soils outside of the RSA, provided that slopes are respected.) Unless the City is prepared to temporarily close runways, a Notice to Airmen (NOTAM), while a tenant farmer is operating equipment, agricultural leases should only be permitted within Airport lands where farm equipment will not infringe the Obstacle Limitation Surfaces (OLS). Typically, agricultural areas are

setback sufficiently from runways to protect equipment and vehicles, which usually have heights of up to 4.5 metres. The proposed Land Use Plan in Section 8 of this report presents the recommended limits for agricultural crop cultivation and production at YFD.

The Airport operator has suggested that there are occasionally communication issues with the tenant farmer while operating at the Airport. It is recommended that the City establish a procedure for communicating with the tenant farmer while they are operating on Airport lands, including a requirement to monitor the UNICOM radio frequency at all times.

4.7 Groundside

4.7.1 Roadways and Vehicle Parking

Aviation Drive, an 8.0 metre wide, asphalt paved roadway with barrier curbs, is the main access into the Airport lands and connects into two County roads – Airport Road and York Road. The roadway, owned by the City, is in good condition and is not expected to require major rehabilitation or replacement within the next 10-year period.

An asphalt-paved vehicle parking lot, with approximately 55 spaces, is provided fronting the Airport Terminal / FBO building. Parking lots are also provided fronting each of the commercial hangars. The only exception to this are the T-hangars to the west which have no dedicated parking spaces. These tenants tend to use the Terminal/FBO parking lot or park on airside next to their hangars. All of the vehicle parking pavements are considered to be in good condition and are not expected to require major rehabilitation or replacement within the next 10-year period.

4.8 Storm Drainage

Storm water from Aviation Drive and the Airport commercial area is collected by way of a series of catchbasins, and conveyed via concrete storm piping to a 600 mm diameter outlet to an open ditch at the southeast limit of the Airport property. The age and condition of the Airport's groundside storm sewer system is not known. The City should undertake a CCTV inspection of the storm sewer system.

4.8.1 Sanitary Sewage

The Terminal/FBO building and existing hangar buildings are connected to a 150 mm dia. sanitary sewer that runs along the north side of Aviation Drive. Airport generated sewage is outlet from the collection sewer to a 300 mm diameter trunk line (County-owned) at the intersection of Aviation Drive and York Road. The 300 mm diameter sewer conveys sewage in an easterly direction along a routing that traverses the Airport lands, and eventually outlets to a treatment facility situated 150 metres west of Greens Road. The existing T-hangars in the southwest quadrant of the Airport are not connected to the sanitary sewer.

It is reported that the County's sanitary sewer system and treatment facility (constructed in 2012) has ample capacity to handle a significant amount of industrial and commercial development within the larger area centred on the Airport.

4.8.2 Water Supply

Water supply for the Airport is feed from Colborne Street. Within the Airport property, the watermains,

constructed during the 1960s, range in size from 100 mm to 300 mm diameter. The water distribution main dead ends at the west end of the commercial area. All buildings on the Airport lands are serviced with water except for the T-hangars to the west and the east.

It is reported that the County's water supply system in the area of the Airport is currently having issues with system pressures and flows. Consequently, the County has stated that they will not approve additional development at the Airport until such time that improvements are made to the system. These improvements are currently being implemented by the County.

4.8.3 Electrical Supply

The Airport is feed from an 8 kV overhead transmission line, which is reported to have sufficient capacity to satisfy future development at the Airport. All buildings, except for the City-owned T-hangars to the east, are connected to the service via individual pole mounted transformers and are individually metered by Brant County Power.

4.8.4 Natural Gas Supply

Natural gas service is available within the groundside area of the Airport, but only a small number of the existing buildings are connected.

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5 Stakeholder Consultations

5.1 Consultations Process

The Consultant Team undertook consultations with the list of Airport stakeholders contained in Appendix B. The intent of the consultations process was to collect information regarding each stakeholders' response to the following generalized questions:

- Their current use of the Airport and its facilities and services;
- Physical or operational impediments inherent at the Airport which may be limiting user operations and the ability for growth in aviation activity at YFD;
- The key attributes and/or characteristics which attracted them to the Airport and resulted in their retention;
- Threats to the Airport's business and growth over the next 10 to 20 year period that they perceive or anticipate;
- Opportunities that they foresee for their business or overall activity at the Airport; and
- General suggestions for improving and growing the operations at the Airport.

Table 5-1 provides a select list of comments and suggestions which were offered by Airport stakeholders during the consultations process.

Table 5-1 – Select List of Airport Stakeholder Comments

STAKEHOLDER COMMENTS
• Pilots generally complain about the lack of a PAPI unit and well maintained centreline markings.
• Airside signage needs to be upgraded to meet Transport Canada's TP312 standards.
• There are regularly issues with non-aviation companies and the public driving onto the apron areas.
• Issues exist in communicating with the tenant farmer when working the agricultural lease lands.
• Off-airport developments are an eye-sore to the public when entering the Airport.
• There is no flight training near Hamilton, so most prospective pilots in the area come to YFD.
• The next stage commercial development at YFD should be targeted to hangars for larger turboprop and business jet aircraft.
• Groundside parking should be increased for tenant and visitor use.
• Improved on-site aircraft fuelling & de-icing should be explored which could increase itinerant traffic.
• The City should improve entrance signage and community awareness of the Airport.
• Airport should explore with County having foam capability at the nearby volunteer fire station.
• There is concern with residential developments being approved by the County near to the Airport.

STAKEHOLDER COMMENTS
• Some services provided by the County to the Airport are lacking or capacity-constrained (e.g. fire protection water flow/pressure not adequate for further development; fibre-optic services need to be extended to the Airport).
• The old wartime hangars have issues with high heating costs, leaking doors, etc. which will need to be addressed over the longer term.
• There is adequate industrial lands in the City and County; therefore, there is limited demand for non-aviation commercial development at the Airport.
• City should leverage existing regional partnerships to improve collaboration, funding and marketing of the Airport.

5.2 SWOT Analysis

Based on the information collected from the consultations process and the Consultant Team's own research and analysis regarding the Airport and its influences and drivers, the Consultant Team undertook a SWOT analysis; the results of which are presented in Exhibit 5-1.

Exhibit 5-1 – SWOT Analysis Conclusions

S **Strengths**	• Good Highway Access. • Decent Infrastructure (to expand from). • Positive Relationship with Operator (BFC). • Good Tenant Mix. • Stable Non-Aeronautical Revenues (Leases). • Strong Pilot Training Environment. • Close to County Business Park. • Within Large Concentration of Manufacturing and Distribution Companies.
W **Weaknesses**	• Lack of Regional Collaboration. • "Flying Club" Rather Than Regional Brand. • Poor Street-Front & Community Image. • Fire Protection Issues. • Financial Limitations for Strategic Investments. • Lack of Aircraft Support Services (GPUs, de-icing, fueling). • Limited External Funding Sources. • Not Certified Aerodrome. • Proximity To Competing Airports. • Ageing Hangar Buildings.
O **Opportunities**	• Improved Regional Collaboration. • Ability To Certify Airport. • Strengthen Regional Airport Branding and Marketing. • New Approaches to External Funding (ACAP, Regional Voice). • Pursue Corporate/Business Aviation Market. • Expand Flight & Maintenance Training Programs/Services. • Regional Redistribution of GA Users and Flight Training Demand.
T **Threats**	• Public and Aviation Community Support. • Existing User/Tenant Culture (Limiting Potential/Growth). • Lack of Regional Approach. • Encroaching Urbanization (Require Protections). • Competition From Other Airports • Do Nothing/Status Quo Approach.

Source: Aviotec International Inc.

6 Airport Demand/Capacity Analysis

The following section discusses the demand and capacity considerations relevant to determining the current and future infrastructure needs of the Brantford Municipal Airport.

6.1 Airside Demand/Capacity

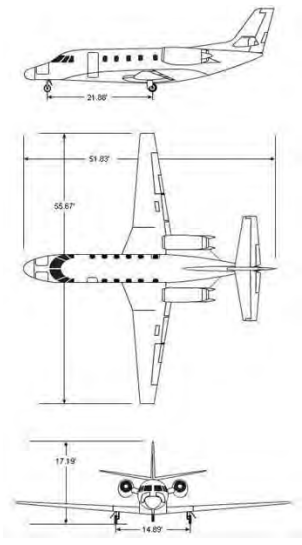
6.1.1 Design Aircraft

Airport infrastructure is designed to permit the regular operation of aircraft up to and including the most demanding aircraft in terms of size and performance characteristics, or also called the critical design aircraft. The choice of design aircraft is determined by not only the technical characteristics but the frequency of activity at the specific airport.

The airport currently handles a wide variety of piston, turboprop, and jet aircraft serving private and business aviation users. Since aircraft type and movement data is not collected at the Airport, no analysis is possible to determine the most common aircraft types in use. However, based on stakeholder consultations, the most common aircraft types currently using the Airport include the Cessna 152 and 172 (for flight training activity), Beechcraft King Air 100/200, Fairchild Metro III (for Bearskin Airline charters), Learjet 40/45, and Cessna Citation 560XL.

Table 6-1 – Cessna Citation 560XL Physical & Performance Characteristics

ADG (TC-ICAO)	II-B
Wingspan	17.17 m (56.3 ft)
Length	16.00 m (52.5 ft)
Overall (Tail) Height	5.23 m (17.1 ft)
Main Gear Width[2]	4.95 m (16.2 ft)
Passenger Capacity	12 (Passengers) + 2 (Crew)
Max. Take-off Weight (MTOW)	9,163 kg (20,200 lb)
Take-off Runway Length	1,085 m (3,560 ft)[3]
Landing Runway Length	969 nm (3,180 ft)[3]
Max. Operational Range	1,850 nm (3,441 km)[4]
Cruise Speed	816 km/h (507 mph)



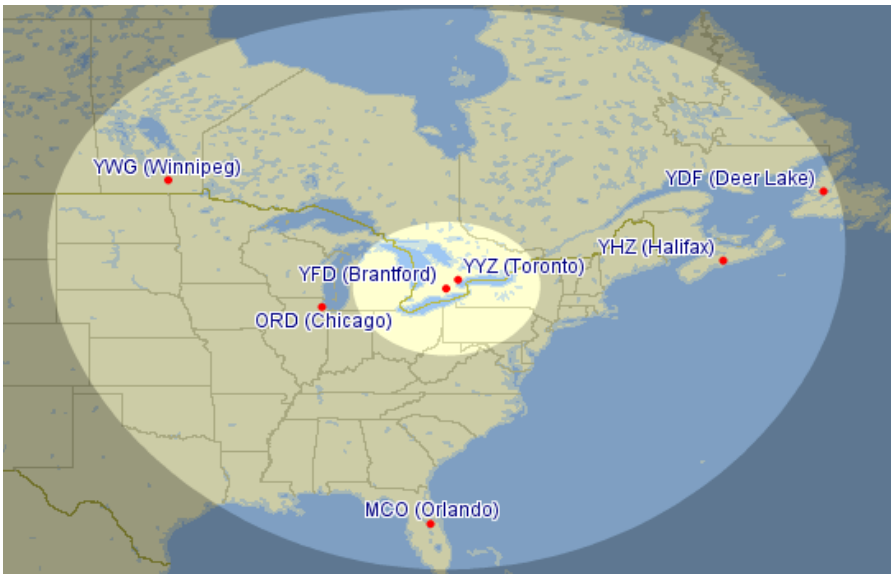
Notes: 1. Source – Cessna's aircraft specification manual (August 2014, Revision E).
2. From outer to outer main gear.
3. Based on maximum take-off weight at sea level, ISA, 15° flaps and no wind.
4. ±4%. Based on MTOW, full fuel, 100 nm alternate, maximum cruise, and optimal descent/climb.

Of the more common aircraft types currently operating to and from YFD, the Cessna Citation 560XL is the most demanding from a physical and operational standpoint experiencing weight or range limitations. It is therefore recommended that the Cessna Citation 560XL be selected as the critical design aircraft for airside planning purposes. (More demanding aircraft types can and do utilize YFD; however, these do so at a weight and/or range limitation.) The key physical and performance characteristics of the Cessna Citation 560XL are presented in Table 6-1 (on the previous page).

6.1.2 Aircraft Range Capabilities

Presently, most flight activity originating from or destined for YFD have a flight range of about 250 nm, as shown in Exhibit 6-1. The best performing single- and twin-engine piston aircraft can achieve a maximum flight range of about 1,050 nm at maximum cruising speed and up to 1,200 nm at lower power settings. At these ranges, piston aircraft can reach destinations such as Winnipeg (MB), Deer Lake (NL) or southern Florida, from YFD as shown in Exhibit 6-1.

Exhibit 6-1 – Representative Flight Ranges from YFD



Source: Aviotec International Inc. and Great Circle Mapper™.
Note: 1. The radii of the inner and outer circles shown represent a flight range of 250 nm and 1,050 nm respectively from YFD.

For the critical design aircraft (i.e., Cessna Citation 560XL jet), the aircraft's published maximum operational range is 1,850 nm which permits virtually unlimited transcontinental routes from YFD, except for areas of northern British Columbia and the Yukon. This type of range capability from YFD would satisfy the needs of most all private and business aircraft users.

6.1.3 Runway Operational Capabilities

The take-off and landing length requirements for the critical design aircraft (Cessna Citation 560XL), as

published by the aircraft manufacturer and using a "balanced field length"[11] approach, are provided in Table 6-1. However, actual runway length requirements vary depending on an airport's elevation, temperature, runway slope and wind conditions, and an aircraft's engine performance, payload, fuel load, and intended range. These variables affect runway take-off and landing performance and capabilities, and thus must be adjusted for the specific airport conditions. Aircraft manufacturers generally publish data based on sea level and International Standard Atmosphere (ISA; 15°C).

For planning purposes, published runway length requirements are typically adjusted using ICAO metholodogy (per Document No. 9157 - Aerodrome Design Manual, Part 1, Runways), which recommends increasing the runway length as follows:

- 7% for every 300 meters the runway elevation exceeds mean sea level;
- 1% for every 1° Centigrade (C) that the aerodrome reference temperature exceeds the temperature in the standard atmosphere for the aerodrome elevation (temperature at the airport will significantly affect runway length requirements);
- 10% for each 1% of positive (e.g., uphill) runway slope in the direction of takeoff; and
- 15% for wet runway conditions.

It should be noted that ICAO's methodology is considered to be somewhat conservative. Performing calculations using an aircraft's specific flight manual will generally result in a lower length requirement.

The balanced field length requirements for the Cessna Citation 560XL were adjusted to reflect local conditions at YFD in accordance with ICAO methodology. Based on MTOW and a peak summer condition (+30°C), the runway length required at YFD for the cirtical design aircraft, under dry and wet runway conditions, are 1332.3 metres (4,371 ft) and 1532.2 metres (5,037 ft) respectively. Therefore, the published runway length of 1532 metres (5036 ft) is just adequate to satisfy the needs of a Cessna Citation 560XL while only imposing very slight weight or range limitations during extreme take-off conditions (e.g., hot weather).

6.1.4 Future Runway Length Requirements

Table 6-2 on the following page lists additional types of turboprop and medium jet aircraft that are commonly used in North America. The take-off length requirements in the table are based on specific aircraft manufacturer's specifications and adjusted using ICAO metholodgy for local YFD conditions. Under extreme summer conditions (i.e., MTOW, +30°C, wet pavement), many of these aircraft types would require a longer runway length than is currently available at YFD.

It is important to remember that most aircraft operating from YFD will not be at MTOW since they are not necessarily travelling to the maximum flight range (thus carrying less fuel) nor carrying the maximum number of passengers and cargo. Therefore, a number of aircraft listed in Table 6-2 could potentially take-off safely from Runway 05/23 (5,000 ft) under appropriate local conditions.

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[11] The balanced field length requirement of an aircraft is the length where the accelerate-stop distance is equal to the takeoff distance (to an altitude of 35 feet above ground level). The accelerate-stop distance is the runway length required to accelerate an airplane to the takeoff decision speed, and assuming failure of the critical engine at the instant the takeoff decision speed is attained, to bring the airplane to a complete stop on the runway.

Table 6-2 – Take-off Runway Length Required from YDF for Various Aircraft Types

Aircraft Type[1]	Max. Take-off Weight	Take-off Field Length[2]	Adjusted Take-off Field Length[3]	Adjusted to 30°C & Wet Pavement	Operational Flight Range[4]
Mitsubishi MU-300	6,636 kg	1311 m (4,300')	1554 m (5,097')	1842 m (6,042')	1,510 nm (2796 km)
Beechjet 400A	7,303 kg	1271 m (4,169')	1506 m (4,942')	1732 m (5,684')	1,693 nm (3135 km)
Beech 1900D	7,766 kg	1162 m (3,813')	1378 m (4,520')	1584 m (5,198')	1,476 nm (2733 km)
Learjet 31A	7,801 kg	1158 m (3,800')	1373 m (4,505')	1579 m (5,181')	1,211 nm (2243 km)
Learjet 40XR	9,525 kg	1426 m (4,680')	1691 m (5,548')	1945 m (6,380')	1,723 nm (3191 km)
Learjet 45XR	9,752 kg	1536 m (5,040')	1821 m (5,975')	2094 m (6,871')	1,833 nm (3395 km)
Dassault Falcon 50	17,000 kg	1437 m (4,715')	1704 m (5,589')	1,959 m (6,427')	3,000 nm (5557 km)
Dassault Falcon 900C	20,640 kg	1269 m (5,215')	1504 m (6,182')	1,730 m (7,109')	3,995 nm (7400 km)
Cessna Citation 560XL	9,163 kg	1094 m (3,590')	1297m (4,256')	1,532 m (5,027')	1,850 nm (3441 km)

Notes:
1. Data from manufacturer's aircraft characteristics & performance manuals or website; dependent on aircraft variant.
2. Based on maximum take-off weight (MTOW) at sea level, ISA (15°C), and zero wind.
3. Represents published Take-off Field Length adjusted to local YFD conditions including elevation & runway slope.
4. Furthest flight range with maximum payload (including passengers and crew) and fuel reserves.

Based on consultations with YFD operations staff, there does not appear to be a high demand by mid-sized jet (> 9000 kg MTOW) operators to use the Airport. Moreover, such operators would tend to use nearby airports, such as Waterloo International (YKF), Hamilton International (YHM) or Toronto-Pearson (YYZ), which have longer runways with precision instrument landing systems. Therefore, it is believed that during the planning horizon, there would be insufficient demand generated from large turboprop and mid-sized jet operators to warrant the need for a longer runway.

Notwithstanding the above, it is prudent for the City to preserve and protect the lands necessary to develop a runway extension over the longer term (well beyond the planning horizon of this study) in order to meet the needs of more demanding turboprop and mid-sized jet aircraft. Based on an analysis of the most likely aircraft types to use the Airport over the long-term for transcontinental routes, it is recommended that the City plan for an ultimate runway length of between 1768 metres (5,800 ft) and 1829 metres (6,000 ft).

6.1.5 Runway Capacity

A runway's capacity is generally driven by the approach and departure separations between aircraft and by the required Runway Occupancy Times (ROT) of the aircraft operating on the runway. Arrival and departure ROTs are defined as follows:

- Arrival ROT begins when an arriving aircraft passes over the runway threshold and ends when it exits the runway.
- Departure ROT begins when a departing aircraft enters the runway and begins the take-off roll and passes over the threshold point at the opposite end.

For an average runway system and aircraft mix, the ROTs are typically in the range of 40 to 50 seconds for arrivals and 30 to 40 seconds for departures. ROTs during landing will vary depending on the location of the runway exits, wind speed and direction, runway surface conditions, and ground taxi patterns.

Given that YFD does not have a parallel taxiway for its main runway and there is a considerable amount of aircraft back-tracking on Runway 05/23 (for both departing and arriving aircraft), actual ROTs may be as much as 60% to 70% higher than the typical values. Nevertheless, Runway 05/23 does have a single 45-degree intermediate runway exit which does help with expeditious exiting of smaller GA aircraft (capable of landing on less than 2000 ft) when in a westerly traffic flow pattern.

Minimum aircraft separations for operations at YFD are assumed to be 4 nm or greater, particularly since there is no local air traffic control function to optimize operations.

Using methodology and criteria contained in the U.S. FAA's Advisory Circular 150/5060-5 - Airport Capacity and Delay, it is estimated that the theoretical runway saturation capacity for Runway 05/23 only is in the range of 56 to 60 movements (based on the current aircraft mix and estimated 35% local versus 65% itinerant movements). When both the main runway and at least one cross-wind runway is operational, the overall capacity only increases to between 61 and 65 since aircraft using the cross-wind runways must taxi across Runway 05/23.

The City does not collect data regarding arriving and departing aircraft movements at YFD. Based on stakeholder consultations, it is estimated that in 2015 a busy peak day experiences about 116 aircraft movements (arrivals and departures combined), while the average hourly movements is about 11.6. Experience shows that small, regional airports have an hourly peak factor of 1.35 resulting in an estimated 15.7 peak hour aircraft movements for YFD. It is projected that by 2025 and 2035, peak hour aircraft movements will increase to 18.8 and 22.6 respectively.

Based on the analysis, the current YFD runway system has ample capacity for the forecast activity levels (22.6 vs 56) without resulting in delays, even with only the main runway in operation.

6.2 Aircraft Parking and Storage

6.2.1 Aircraft Apron Parking

Aircraft apron parking spaces with tie-downs are provided for those aircraft that do not require hangar storage, do not desire to pay the cost for hangar storage or are on the Airport's hangar wait list. Space calculations for apron parking are typically based on 225 square metres for based aircraft and 300 square metres for itinerant aircraft for each aircraft tie-down space.

Typical peak period or peak hour demand should be used wherever possible for planning purposes, rather than annual figures.[12] Unfortunately, the City does not collect aircraft movement data and thus a more precise demand for apron parking space cannot be calculated.

Based on consultations with YFD operations staff, the demand for Apron I aircraft parking spaces occasionally reaches capacity (60 spaces) during busy peak periods. Assuming that the demand for apron parking spaces increases at the same rate as the growth in itinerant movements (i.e., 1.7% annually), then, by 2035, the Airport will require 84 aircraft parking spaces.

It is expected that with an optimization of the Apron I aircraft parking spaces and better utilization of the Apron II space, no additional apron area will need to be developed during the 20-year planning horizon.

[12] For airport forecasting and planning purposes, IATA defines the "busy day" as the second busiest day of the average week of the busiest month of the year.

6.2.2 GA Aircraft Storage Hangars

There are currently 56 T-hangar units at the Airport, of which 9 are privately owned. The most recent T-hangar building (10-unit), constructed by the City in 2015, is currently 70% occupied.

Based on the experience of the past 10 years, the uptake of T-Hangar units for small GA aircraft storage at YFD has been 3.25 units per year. The traffic forecast suggests that the growth in GA activity at the Airport over the next 3 to 5 years will actually be much stronger then the recent past. Therefore, it is recommended that the City plan for development of 13-unit T-hangar buildings approximately every four (4) years. Obviously, the exact timing of development must be determined by the actual demand expressed by the marketplace. (Most airports establish a waiting list for aircraft T-hangar units and then initiate development once at least half of the units are spoken for.)

6.3 Groundside Parking

The existing groundside parking lot serving the Airport Terminal/FBO building (highlighted in yellow in Exhibit 6-2) is about 2,300 square metres and can accommodate 54 public and staff vehicles. Although this parking lot principally serves the Airport Terminal/FBO building, the land and infrastructure are owned by the City. The parking lot tends to be near capacity during peak periods; however, some of the parking demand comes from the owners/users of the T-hangars situated to the west, since they do not have a parking area of their own.

Exhibit 6-2 – Existing Airport Terminal/FBO Parking Lot

Source: Aviotec International Inc.

As a result, it is recommended that a new parking lot be developed near the T-hangar area to the west (serving Building Nos. 70, 80, 90 and 100) in order to free up space within the Terminal/FBO parking lot. Typically, one (1) parking space should be allocated for every two T-hangar units, which in this case, equates to 19 new parking spaces.

Over the long-term, it is recommended that the existing BFC aircraft maintenance building be relocated to another area to free up space for future expansion of the terminal building and associated parking lot.

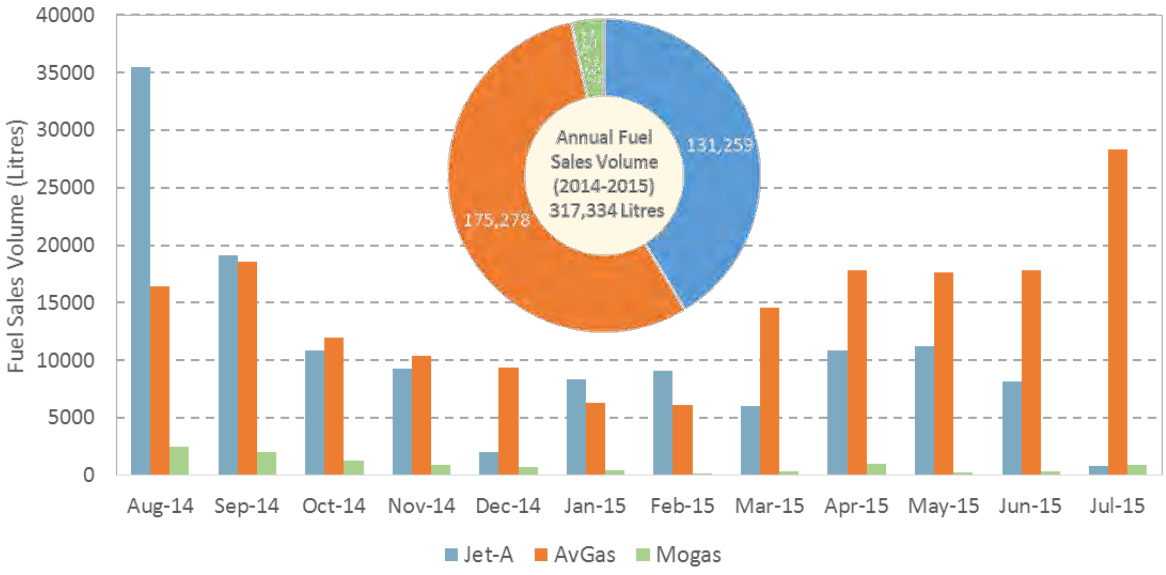
All other hangar buildings at the Airport have their own public and staff parking spaces, such as the 20 spaces for Building No. 130 as shown in Exhibit 6-2. There are total of 78 parking spaces between all of the hangar buildings (excluding the terminal). Consultations with airport tenants and stakeholder suggest that the numbers of groundside parking spaces for the various commercial hangar facilities are not adequate to satisfy the current and future needs. Based on the building areas and uses, it is recommended that an additional 22 spaces be created to satisfy the current tenant demand. (This will become even more important if security improvements limit the amount of vehicles accessing airside.)

6.4 Aviation Fuel

Historical fuel sales data was provided by BFC for a one-year period (August 1, 2014 to July 31, 2015). Exhibit 6-3 provides the annual and monthly breakdown of aviation fuel sales at YFD split by fuel type (Jet-A, Avgas and Mogas). There was an unusually high volume of Jet-A sales in August 2014; however, the reason for this anomaly is not known.

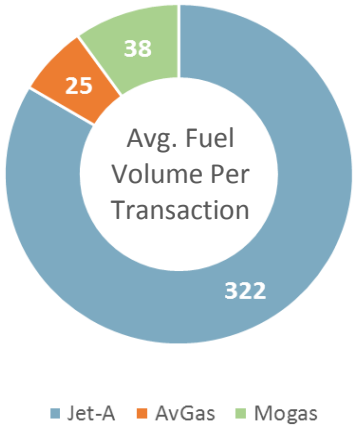
Exhibit 6-4 on the following page presents the average fuel volume sold per transaction during the same one-year period. The average volume for jet fuel transactions, which is significantly larger than the other types, is not unusual given that jet aircraft typically have much longer flight routings and fuel burn rates, thus requiring greater amounts of fuel. On the contrary, the average volume for Avgas transactions was lower than expected. It is believed that this low average volume is a result of the flight training activity which tend to "top-up" aircraft fuel tanks rather than deplete and replenish fuel.

Exhibit 6-3 – Annual and Monthly Aviation Fuel Sales Volumes – 2014-2015 -YFD



Source: Aviotec International Inc. analysis based on Brantford Flight Centre fuel sales data.

Exhibit 6-4 –Fuel Volume Per Transaction – 2014-2015 -YFD

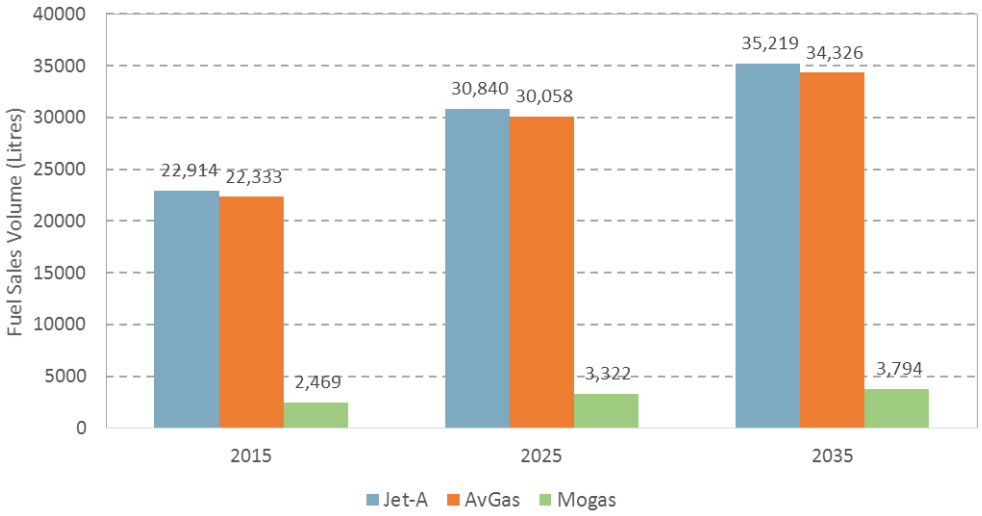


Source: Aviotec International Inc. analysis based on Brantford Flight Centre fuel sales data.

Normally, aviation fuel on-site storage facilities are sized for a 30-day fuel supply. Fuel storage demand is calculated by taking the second highest month of historical demand, applying a 20% peak factor and then projecting forward for at least a 20-year life span. It is assumed that the demand for aviation fuel will increase at the same rates as aircraft movements (average of 2.4% per annum for 2015-2035).

Exhibit 6-5 presents the current and projected 30-day aviation fuel demand (by type) for the purpose of determining fuel storage requirements. By 2035, the on-site storage requirement for Jet-A and Avgas is projected to be about 35,219 Litres (9,304 US Gallons) and 34,326 Litres (9,068 US Gallons) respectively. The 30-day demand for Mogas in 2035 is projected to be about 3,790 Litres (1,000 US Gallons).

Exhibit 6-5 – Projected 30-Day Aviation Fuel Demand – YFD



Source: Aviotec International Inc.
Note: 1. Fuel demand is assumed to increase at the projected rate of growth in aircraft movements at YFD.

7 Facility Requirements

The following section details the infrastructure needs to address projected growth related demand or regulatory changes during the planning period of the study (2016-2035).

7.1 Airside Requirements

7.1.1 Aircraft Group Number

The critical design aircraft for YFD, as discussed in Section 6, is the Cessna Citation 560XL with a wingspan of 17.17 metres and runway approach speed of 108 knots (Category B). Given these characteristics, in accordance with TP312, the Aircraft Group Number (AGN)[13] for Runway 05/23 should be II.

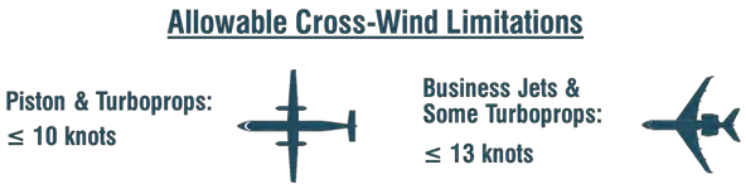
However, there are a number of business jets capable of operating from Runway 05/23, such as the Learjet 40/45, that have approach speeds exceeding 121 knots (falling into Category C), as well as, turboprop aircraft, such as the ATR 42 and Dash 8-100, that have wingspans exceeding 24.10 metres (falling into Group Number III). Therefore, it is recommended that Runway 05/23 be categorized as AGN IIIB, which will ensure operational flexibility during and beyond the planning horizon, without necessarily needing to extend the runway.

Given that the critical design aircraft for the cross-wind runways (Runway 11-29 and Runway 17-35) are single-engine piston or turboprop aircraft, such as the Cessna 208 Caravan, the runways should be categorized as AGN II.

7.1.2 Runway Usability

The theoretical usability of a runway is based on an analysis of the percentage of time when prevailing winds are in the direction of the runway and the cross-wind component does not exceed the capability of the aircraft mix using that runway.

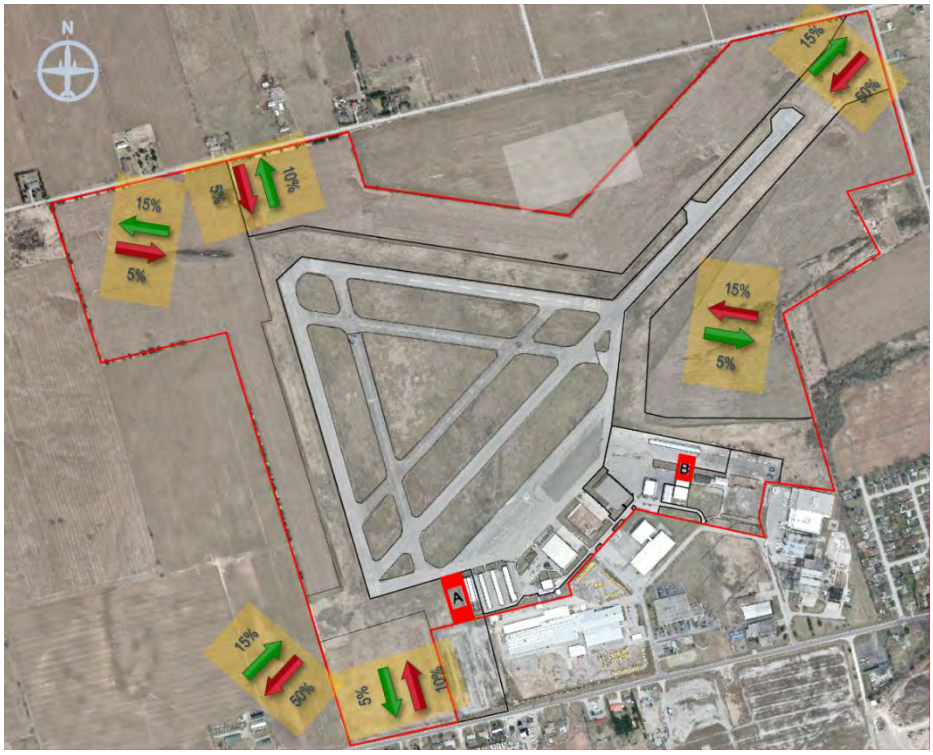
Transport Canada recommends that an airport's runway system be available to the aircraft mix for at least 95 percent of the time. It is obviously favorable to an airport operator and its users to achieve the maximum usability possible. Transport Canada has defined the maximum cross-wind components by aircraft size and performance capability as shown in the graphic below. (Note that Transport Canada's cross-wind group limitations are considered conservative, since there are actually a number of aircraft which are rated to handle higher cross-wind velocities.)



[13] The purpose of the AGN is to provide a simple method of interrelating the numerous technical specifications concerning the aerodrome and the characteristics of the critical aircraft using the aerodrome. The objective is to provide aerodrome facilities that are suitable for the aircraft that are intending to operate at the aerodrome.

Although historical aircraft movement data distributed by runway is not available, actual runway use, as presented in Exhibit 7-1, was estimated based on consultations with Airport operations staff and users.

Exhibit 7-1 – Estimate of Actual Runway Usage - YFD



Source: Aviotec International Inc. based on consultations with YFD operations staff and Airport users.

It is reported that a significant proportion of the activity using the cross-wind runways is associated with flight training circuits. Most other based and itinerant aircraft tend to use Runway 05/23 unless winds are unfavorable.

In late 2014, Environment Canada installed a meteorology monitoring station near the Airport. The hourly meteorological data for a full year (January 1, 2015 to December 31, 2015) was collected and analyzed by Aviotec; the results of which may be found in Appendix C. (Note that runway wind analyses are commonly undertaken using meteorological data for at least three consecutive years.)

Runway windrose diagrams were prepared to determine the theoretical percentage usage for each runway separately, as well as, for combinations of runways, under a 10-knot and 13-knot cross-wind limitation for all weather conditions. The windrose diagrams are included in Appendix C. The results of the analysis are summarized in Table 7-1.

The results indicate that Runway 05/23, by itself at a 10-knot cross-wind limitation, would not provide sufficient operational usability (> 95%). However, when Runway 05/23 is operated in combination with Runway 11/29, almost full usability (99.03%) is achieved even with a 10-knot cross-wind limitation. Therefore, from a purely technical standpoint, Runway 17/35 offers no additional accessibility to the Airport, and is thus considered to be redundant. It is however worth noting that the BFC have suggest that both cross-wind runways are important to their ability to operate efficient and flexible flight training circuits.

Table 7-1 – Theoretical Runway Usability - YFD

Runway Combinations	Cross-wind Limitation	
	10 knots	13 knots
05/23 Only	91.58%	96.06%
11/29 Only	88.96%	94.70%
17/35 Only	80.58%	89.01%
05/23 + 11/29	99.03%	99.86%
05/23 + 17/35	95.44%	98.84%
11/29 + 17/35	92.22%	96.91%
All Runways	99.78%	100.00%

Source: Aviotec International analysis based on Environment Canada meteorological data for CYFD (January 1 to December 31, 2015).

7.1.3 Runway 05/23

Runway Width

Runway 05/23 currently has a width of 30.5 metres (100 ft). Based on AGN IIIB, the existing width will be adequate during the planning horizon and will comply with TP312.

Runway Length

Based on the runway length analysis discussed in Section 6, no runway lengthening is anticipated during the 20-year planning horizon. Nevertheless, the City should begin the process of preserving, protecting and acquiring the lands necessary to accommodate a 305 metre (1000 ft) runway extension. Refer to the further discussion in Section 7.4.1 below.

As discussed in Section 4.2.6, a small pavement fillet is recommended at the Runway 23 end to resolve existing lighting configuration issues, and as shown in Exhibit 7-2 on the following page.

7.1.4 Runway 11/29

Runway Width

Runway 11/29 currently has a width of 30.5 metres (100 ft). Based on AGN II, it is recommended that the runway width be reduced to 23 metres during the next planned rehabilitation in order to realize capital and operational cost savings. At the same time, runway edge lighting would need to be replaced and relocated to the new runway edge alignment. However, edge lighting would only be required if Runway 11/29 were to serve night operations.

Runway Length

As was recommended for Runway 05/23, a pavement fillet should be constructed at the Runway 29 end in order to square off the pavement and allow for a proper end and threshold lighting configuration. In addition, the fillet will allow the runway length to be increased to 740 metres (2,428 ft).

7.1.5 Runway 17/35

Decommisioning and Conversion to Taxiway

Based on the runway usability analysis discussed in Section 7.1.2, it is recommended that Runway 17/35 be decommissioned and converted into a taxiway to serve the Runway 29 end. The new taxiway width should be 10.5 metres in width. As a result, the Airport would have one cross-wind runway as shown in Exhibit 7-2.

The conversion to a taxiway should be implemented immediately following the next planned rehabilitation of Runway 11/29. In this way, Runway 11/29 could be fully closed for rehabilitation while Runway 05/23 and Runway 17/35 remain operational.

7.1.6 Runway Visual Aids

Section 4 of this report provided a number of recommendations to repair, correct or upgrade the existing runway visual aids, including runway edge, end and threshold lights, RTILS, approach slope indicators, wind direction indicators and guidance signs. In addition to these visual aids, the following are recommended within the planning period, but not necessarily mandatory under TP312 standards.

Aerodrome Beacon

The Airport currently has no rotating beacon, which is used by pilots during nighttime, VFR operations to locate the aerodrome. Given the recent increase in development around the airport and prevalence of external light sources, it is recommended that an aerodrome rotating beacon be installed at the Airport, either on top of an existing building or on top of a new tower. The beacon should be high enough to ensure that it is not being obstructed from a pilot's field of view during an approach procedure.

Runway Approach Lighting

The Airport currently has no form of runway approach lighting. Given the number of obstacles in close proximity to the runway approaches and the growing number of external light sources in the area, it is recommended that both approaches to Runway 05/23 be equipped with an Omnidirectional Approach Lighting System (ODALS). ODALS are comprised of a series of five (5) sequenced flashing (strobe) lights which are mounted in front of the runway on its extended centerline. ODALS are designed to allow a pilot to quickly and positively identify visibility distances during approach in Instrument Meteorological Conditions (IMC), as well as provide runway alignment guidance.

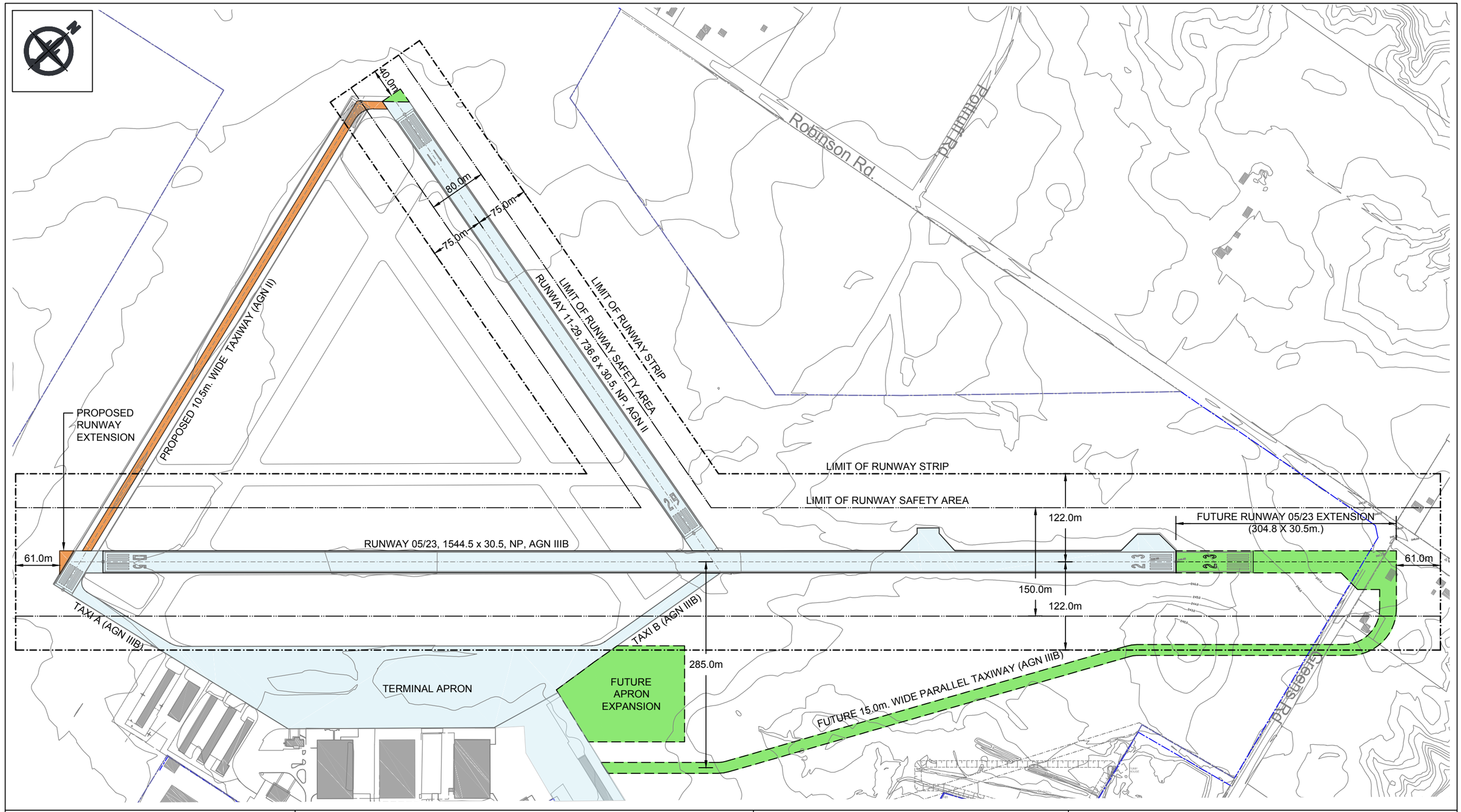
7.1.7 Taxiways

Decommisioning of Taxiways C, D & E

With the decommissioning and conversion of Runway 17/35, there will no longer be a compelling reason to maintain the series of parallel taxiways (Taxiways C, D, E) in the infield area between the three runways.

Due to their poor condition, Taxiways C and E should be decommissioned within the next 1 to 2 years. Taxiway D should remain in operation until such time that Runway 17/35 has been converted to a taxiway.

The City should explore the benefits of pulverizing the decommissioned taxiway pavements and harvesting the material for on-site uses, such as granular subbase or base stabilization.



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legend

- PROPOSED AIRSIDE INFRASTRUCTURE
- FUTURE AIRSIDE INFRASTRUCTURE
- EXISTING AIRSIDE INFRASTRUCTURE
- LIMIT OF RUNWAY SAFETY AREA
- LIMIT OF RUNWAY STRIP
- PROPERTY BOUNDARY LINE

FOR PLANNING PURPOSES ONLY

project title

BRANTFORD MUNICIPAL AIRPORT MASTER PLAN

exhibit title

PROPOSED AIRSIDE INFRASTRUCTURE

scale

1cm = 50m.
(at 11" x 17" sheet size)

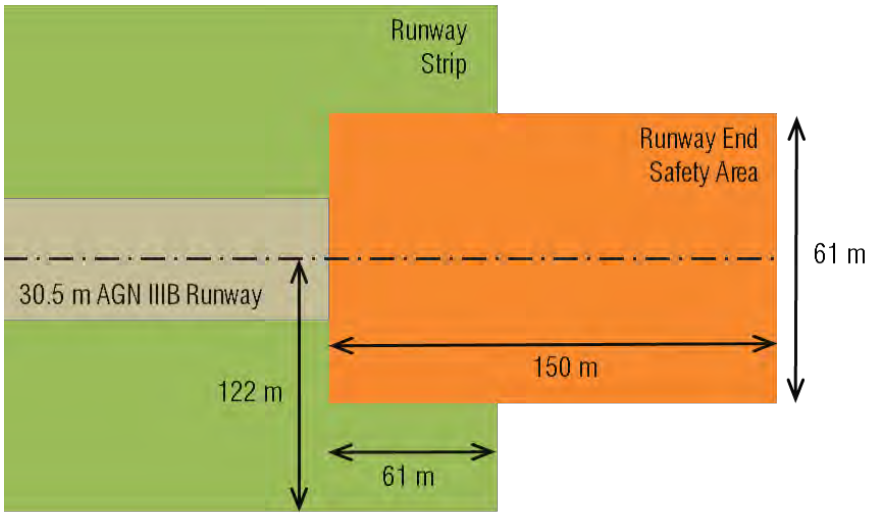
-50 0m 50 100 150 200

date	revision	project no.	exhibit
29 JULY 2016	3	AP1501	7-2

7.1.8 Runway End Safety Area (RESA)

Current Transport Canada standards require that a Runway End Safety Area (RESA) be established beyond the end of each runway in order to reduce the consequences of an aircraft overrunning the end of a runway during a landing or a rejected take-off, or undershooting the intended landing runway. Exhibit 7-3 illustrates the location and dimensions of a RESA for a 30.5 metres wide AGN IIIB runway.

Exhibit 7-3 – Proposed Runway End Safety Area



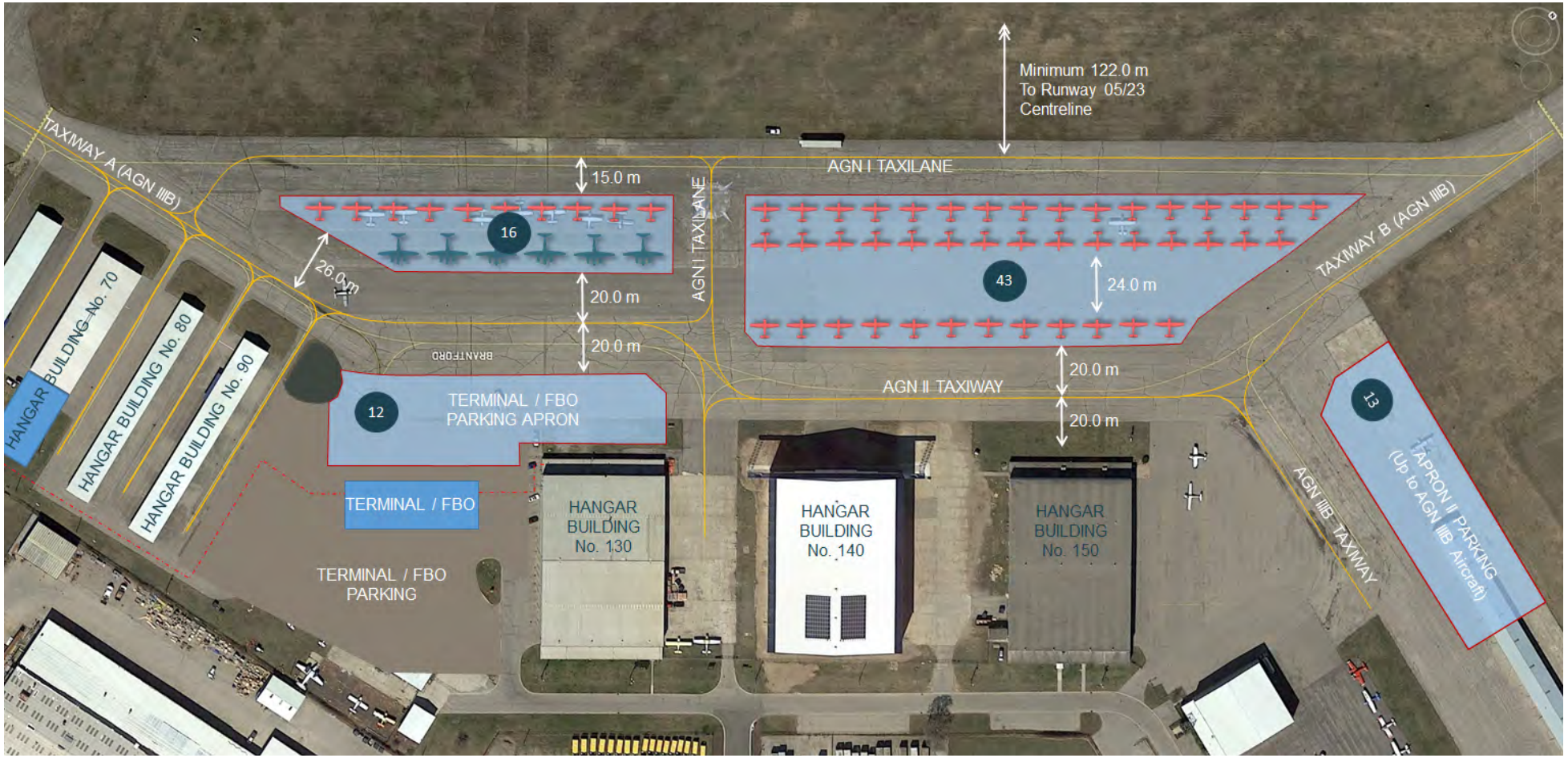
Source: Aviotec International Inc.
Notes: 1. Based on Section 3.2 of Transport Canada's TP312 (5th Edition).

For Runway 05/23, sufficient Airport lands exist toward the southwest and the northeast to implement a RESA beyond both runway ends. Since Runway 11/29 and Runway 17/35 are both non-instrument runways of less than 1200 metre length, no RESAs are required. The City should consider constructing the RESAs for Runway 05/23 concurrent with the timing for other runway works.

7.1.9 Aircraft Parking Aprons

Based on the analysis of current and future aircraft parking needs, as discussed in Section 6, it is estimated that the existing parking aprons – Apron I and Apron II – have sufficient area to accommodate up to 84 aircraft parking positions. However, the future demand for aircraft parking positions can only be met if the existing aprons are properly organized, parking spaces clearly delineated and safety clearance lines from the taxiways and taxilanes marked accordingly. In addition, it will be important for the City to begin tracking the frequency and type of aircraft operating at the Airport so that the appropriate number and size of parking positions can be planned and allocated.

Exhibit 7-4 presents the recommended aircraft parking apron plan and the associated taxiway and taxilane routes. The plan assumes that over the long-term, the existing terminal/FBO building and hangar building Nos. 100 and 180 will be demolished and relocated to the south and the west respectively. This will ensure that adequate apron parking areas and tie-downs will be available, and that taxi routes will have the required clearances to objects and buildings, in accordance with TP312 standards. Additional overflow parking of small GA aircraft could also be accommodated in the grass area east of Apron II.



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project title	exhibit title				
BRANTFORD MUNICIPAL AIRPORT MASTER PLAN	PROPOSED AIRCRAFT PARKING APRON PLAN				
scale (at 8.5" x 11" sheet size)	date	revision	project no.	exhibit	
NOT TO SCALE	29 JULY 2016	1	AP1501	7-4	

It is recommended that the main portion of the apron accommodate the parking of AGN I (wingspan up to 14.94 metres) and AGN II (wingspan up to 24.10 metres) aircraft. AGN III aircraft (wingspan up to 36.00 metres), such as the Gulfstream G550, will be able to access the apron from Taxiway A or Taxiway B, but will not be permitted to taxi through the Apron I area. AGN III aircraft will need to parking in designated areas at the western perimeter of the Terminal/FBO apron and at Apron II.

The land lease tenant for Building No. 140 (SolarShip) anticipates developing an aircraft with a wingspan of up to 48 metres. As a result, special provisions will need to be established in order to accommodate a taxi route from Hangar Building No. 140 to Runway 05/23, either toward the west along Taxiway A or toward the east along Taxiway B. This may necessitate the temporary closure of some apron parking spaces.

It is recommended that the City should protect the land area immediately to the east of Apron II (as shown in Exhibit 7-2) in order to permit the future expansion of the aircraft parking apron beyond 2035.

Presently, there is minimal illumination of the apron areas, except for a series of small floodlights attached to the various hangars and FBO building. Although full illumination of the parking aprons is not warranted, the City should explore options, and work with the contract operator (BFC), to at least improve the illumination levels (to minimum 10 lux horizontal illuminance) within the aircraft parking area fronting the Terminal/FBO building.

7.2 Aviation Fueling

7.2.1 Supply Tank Sizing

As noted earlier, the City desires to explore fixed tankage alternatives for the supply of aviation fuel at the Airport since the existing bowser truck system is neither cost effective nor reliable.

In Section 6 of this report, the 30-day demand for various types of aviation fuel at YFD were projected for the next 20-year period. On this basis, it is recommended that the City implement the following aviation fuel storage tank volumes:

- Jet-A - 37,855 Litres (10,000 U.S. Gallons);
- Avgas - 37,855 Litres (10,000 U.S. Gallons); and
- Mogas – 3,785 Litres (1,000 U.S. Gallons).

Prior to implementing a permanent fuel supply tank for Mogas[14] at YFD, the City should better understand the source of the demand (i.e., based versus transient aircraft) and determine whether or not some of the demand may be for ground vehicle use rather than for aircraft. Based on this review, there may be alternative approaches to supplying the needed Mogas.

It should be noted that in recent years the aviation industry has been working toward finding an alternative to leaded aviation gasoline, namely Avgas, that can meet today's more stringent environmental regulations while still providing protection against detonation in high-compression piston engines. After decades of research, the industry is confident that they have found an unleaded replacement fuel that

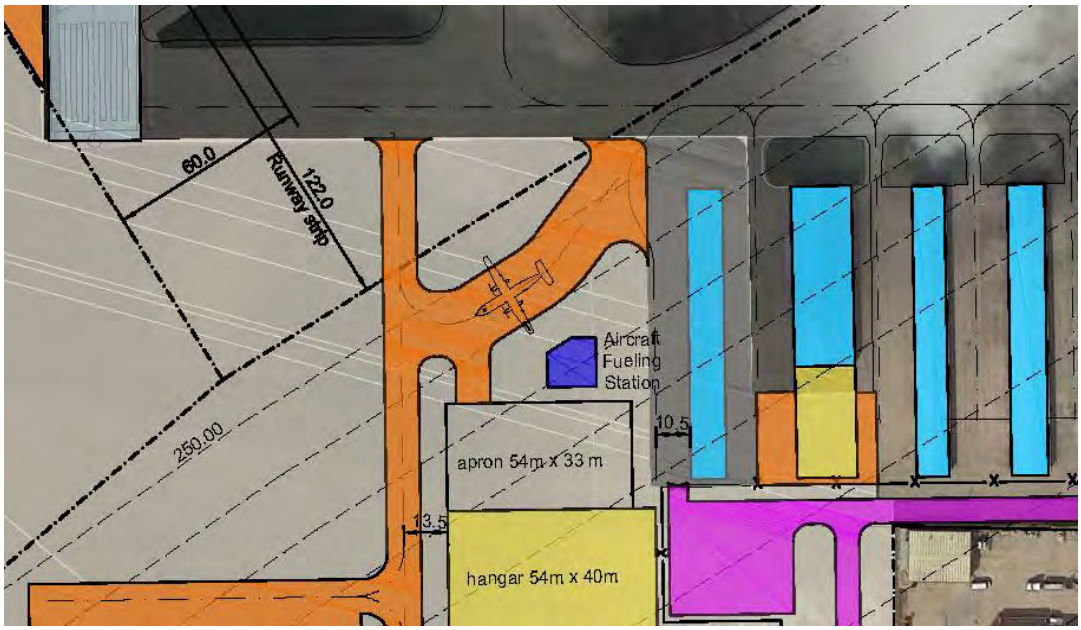
[14] Mogas is neither a recognized or approved fuel by piston engine manufacturers. Mogas is essentially standard motor vehicle gasoline and is used by some general aviation aircraft owners in order to reduce costs since it is usually cheaper than Avgas (which is a 100 octane fuel with a low lead content).

works without adverse impact on engines and fuel systems and which can be certified for the existing fleet of piston-engine aircraft without requiring engine modifications and added cost. It is expected that a certified 100 octane unleaded fuel may be commercially available for use by 2019 or 2020. Regardless, an industry-wide change to an unleaded Avgas in the future should not have a significant impact (either positive or negative) on the demand for Avgas or the supply tank sizing at YFD.

7.2.2 Fuel Facility Location

A number of airside locations were assessed for their suitability to accommodate an aircraft fueling facility. The recommended location is immediately west of the existing T-hangar area and south of Taxiway Alpha, as shown in Exhibit 7-5.

Exhibit 7-5 – Proposed Aviation Fueling Facility Location



Source: Aviotec International Inc.

The aircraft fueling apron would be sized to accommodate up to a Dash 8-300 aircraft and would need to be setback sufficiently from Runway 05/23 to ensure that aircraft tails (i.e., 7.5 m in the case of a Dash 8-300) do not infringe into the Runway 05/23 OLS.

The BFC has suggested that the new fuel facility should be located north of Hangar Building No. 130 adjacent to the terminal apron. However, given that the fuel facility must be a minimum of 15.2 metres from any building in accordance with National Fire protection Association (NFPA) standards, a fuel facility in this location would seriously limit the future flexibility of apron parking and aircraft taxi configurations. In addition, there are environmental monitoring and remedial issues with that site which have yet to be resolved.

The proposed fueling apron could also be configured to serve as a future dedicated location for aircraft deicing. The apron could be designed to include a collection system and underground storage tank to contain spent deicing fluid runoff from the deicing pad. The spent deicing fluid could then be collected by suction pump and trucked to a nearby facility for recycling.

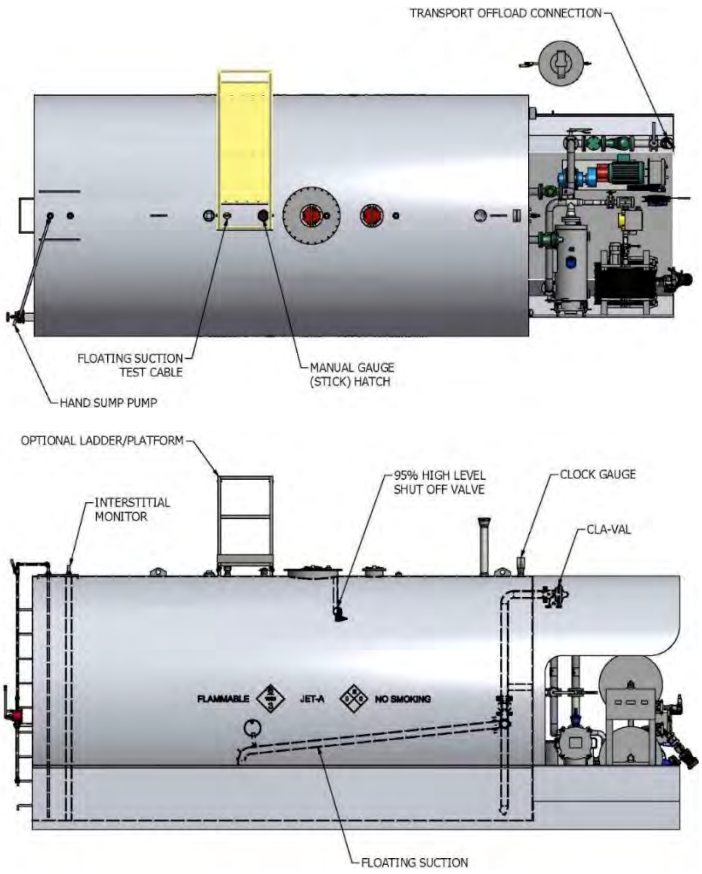
7.2.3 Fuel Facility Requirements

As a minimum, each proposed aviation fuel tank system should include:

- a truck off-loading system capable of 200 gpm;
- a double-wall steel system meeting NFPA 30/30A with appropriate sized venting;
- a positive displacement type fuel pump capable of 65 gpm;
- coalescer/separator type filtration system meeting API 1581, 5th Edition, Category C;
- fuel hoses meeting NFPA 407 and API 1529 (Type C) with cabinet mounted electric or air reel;
- distribution piping, being only stainless steel beyond the filters; and
- deadman and emergency shutoff controls.

In the case of the Jet-A fuel tank, additional requirements should include epoxy-coated lining of the steel tank and the use of a floating suction pump.

Exhibit 7-6 – Typical Aviation Fuel Equipment Arrangement



Source: Fuel Tech Inc.

In order to minimize the staffing demands of the fueling operation, consideration should be given to permitting full or after-hours self-fueling. Self-fueling will require cardlock equipment with a credit card option, and published self-fueling procedures. The Airport should also implement a self-fueling permit process which will users to receive minimum training in self-fueling operations and safety.

Exhibit 7-7 – Typical Self-fueling Arrangement

Source: Fuel Tech Inc.

7.3 Airside Security

The Canadian Aviation Security Regulations, 2012 (CASR, SOR 2011-318) set out the security requirements for designated Class 1, 2 and 3 aerodromes in Canada, as well as for all other aerodromes under Part 7 of the Regulations. For purposes of the CASR, YFD is designated a Class "Other" Aerodrome, and as such, the applicable security requirements are substantially reduced when compared to the requirements for the higher class designated aerodromes (Class 1, 2, 3).

A number of tenants and Airport operations staff have suggested that in the past, members of the public have driven or walked onto active areas of the apron (either knowingly or unknowingly), which is considered a serious safety and security concern. A contributing cause has been the number of existing access gates that are periodically left opened and accessible to the general public. The Airport does have sporadic sections of security fencing and gates but in the most part they are only 1.2 to 1.8 metres in height. There is also sections of 3 wire farm fence along the Airport boundary.

Although Airport operations staff suggest that the incidence of wildlife incursions at the Airport is relatively low; wildlife do traverse the site. No wildlife incursion or bird strike data was provided to the Consultant Team. Typically, the most critical wildlife hazards come from birds, such as gulls, crows, etc. Other common wildlife in the area include deer, fox and coyote. Perimeter security fencing, when installed at a suitable height, can help to reduce the number of wildlife incursions.

Therefore, it is recommended that the City undertake an Airport Security Enhancement Program (ASEP) comprised of:

- Implementation of airside perimeter security fence and gate infrastructure for the Airport property;
- Implementation of restricted area signage;
- Establishment of tenant and user security protocols and promoting their use; and
- Establishment of a Transport Canada style Airside Vehicle Operator's Program (AVOP) scaled to the size and complexity of operations at YFD.

Until such time that more stringent security requirements are to be met at YFD, the objectives of the ASEP should be to act as a strong deterrent to unauthorized entry by the general public and to increase the level of safety and security in airside areas. Nevertheless, any permanent security related infrastructure, such as fences and gates, should meet an appropriate minimum standard in order to avoid the need for upgrading in the future.

7.3.1 Security Fencing Requirements

The philosophy of airside access control should be to limit the number of access points to as few as reasonably controllable, and entry only permitted to persons with a demonstrated need and right to access. It is recommended that four (4) security access points be implemented in the groundside commercial area at the following locations:

- Main access gate (east of existing Terminal/FBO building);
- West T-hangar Area Access Gate (adjacent to Hangar Building No. 60);
- East hangar access gate (between Hangar Building Nos. 150 and 160); and
- At a new road to be implemented south of Building No. 190 in order to access the east side of the East Hangar Area.

For tenant buildings with direct access to airside, security fencing should be positioned in a manner that permits tenants to access their facilities from groundside without the need for specific security measures/devices. Each tenant should be solely responsible for establishing security procedures and controlling access where their building facilities cross the primary security line (between groundside and airside).

Due to the quantity of fencing and capital investment required to provide perimeter security for the entire Airport, it is recommended that the implementation be undertake in phases. The initial phase should focus on implementing fencing from the terminal building to Hangar Building No. 160, followed by the West and East hangar areas, and then eventual the full Airport perimeter.

The perimeter security fencing should be a minimum of 2.4-metre high chain-link topped with three strands of barbed wire. The primary gate access points should be comprised of 6.1 metre wide, motorized cantilever type sliding gates with card reader access, intercom (with a connection back to the Terminal Building) and provisions for future CCTV surveillance. In addition, the City may want to consider a number of lockable 6.1 m wide double swing gates strategically located to allow access to the airfield for operations, maintenance and emergency access.

7.4 Groundside Requirements

7.4.1 Terminal/FBO Area

The existing Terminal/FBO area is constrained between Hangar Building No. 130 to the east and the T-hangar area to the west. The privately-owned Terminal/FBO building and the associated parking lot are nearing capacity and may need to be improved and expanded within the planning horizon.

Should the Terminal/FBO building be redeveloped, it is recommended that the building be relocated about 25 metres to the south, as shown in Exhibit 7-4, to permit the expansion of the parking apron areas and ancillary aircraft services. However, in order to provide the land area necessary to accommodate the future Terminal/FBO needs, it is recommended that Building No. 100 (privately-owned T-hangar), No. 120 (BFC Maintenance Hangar) and No. 125 (Airport maintenance equipment storage) be relocated to a new development area to the west of the T-hangar area.

7.4.2 General Aviation Hangar Area

Presently, the Airport has the bulk of the GA T-hangar buildings situated to the west of terminal area. It has been recommended that the single 10-unit hangar complex located adjacent to the Apron II area be reconstructed and consolidated within the western T-hangar area.

It is estimated that within the next 20-year period, there could be demand for an additional 65 hangar units for GA piston and turboprop aircraft, and some small business jets. As shown in Exhibit 7-8, land is available to expand the existing T-hangar area to the west and the south; however, it is limited by the approach and take-off surfaces for Runway 17/35.

Although, the size and types of hangars to be developed will be highly dependent on the actual market demand and a business case analysis, Exhibit 7-8 presents a possible schematic layout of the potential hangar buildings and the associated airside access routes. A new north-south AGN II taxiway, connecting to Taxiway Alpha, would need to be developed to serve the new GA hangar area.

If Runway 17/35 is decommissioned as recommended, then the GA hangar area could be further expanded toward the west (on the opposite side of the new AGN II taxiway) as shown in Exhibit 7-9.

The building structures to be development in the area, would be a combination of conventional T-hangar complexes for smaller GA aircraft and adjoining hangar units for turboprop and business jets. Exhibit 7-10 illustrates a typical 15-unit T-hangar complex with dimensions of 102 metres by 15 metres. The adjoining hangar units should each have minimum dimensions of 16.5 metres by 16.5 metres.

7.4.3 Aircraft Maintenance Facility

There are currently four companies at the Airport that offer various types of aircraft maintenance and repair services. It is believed that new or expanded services will occur within the study planning horizon. In addition, it has been recommended that the existing BFC Maintenance Hangar be relocated to the west to make room for the Terminal/FBO area.

It is therefore recommended that the City allocate a parcel to the west of the T-hangar area to accommodate for a new aircraft maintenance and repair facility as shown in Exhibit 7-8. Based on the potential market and aircraft types, it is recommended that the parcel be approximately 4,500 square metres to accommodate a building and aircraft parking apron.

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legend

- FUTURE HANGARS
- EXISTING HANGARS
- TAXIWAY/TAXILANE CENTRELINE
- AIRPORT PROPERTY BOUNDARY
- NEW AIRSIDE PAVEMENTS
- NEW GROUNDSIDE PAVEMENTS

project title: BRANTFORD MUNICIPAL AIRPORT MASTER PLAN

exhibit title: GENERAL AVIATION HANGAR AREA - INITIAL DEVELOPMENT PLAN

scale: 1cm = 20m. (-20 0m 20 40 60 80)

date	revision	project no.	exhibit
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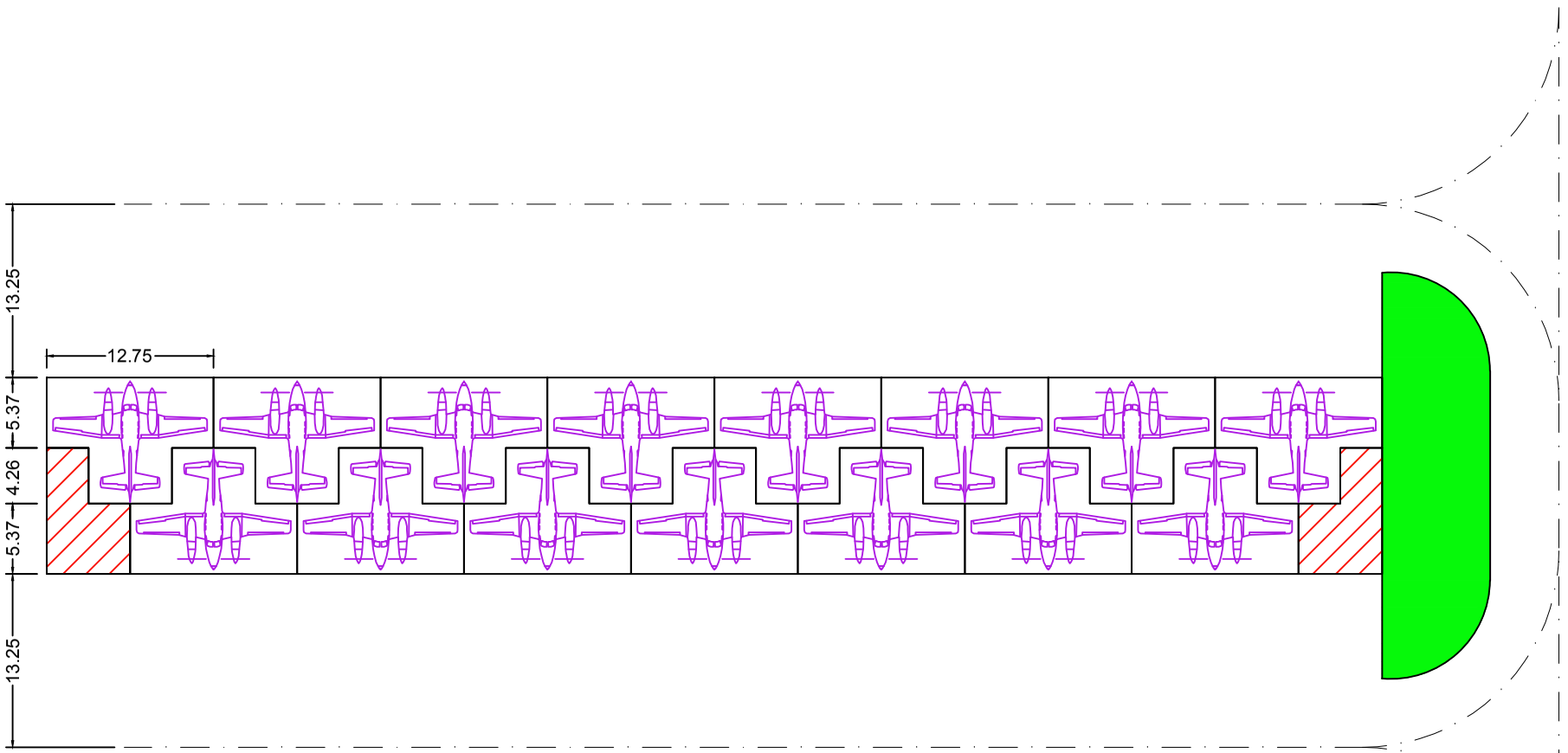
- NEW GROUNDSIDE PAVEMENTS

project title: BRANTFORD MUNICIPAL AIRPORT MASTER PLAN

exhibit title: GENERAL AVIATION HANGAR AREA - ULTIMATE DEVELOPMENT PLAN

scale: 1cm = 20m (-20 0m 20 40 60 80)

date	revision	project no.	exhibit
29 JULY 2016	1	AP1501	7-9



legend

STORAGE

TAXILANE CENTRELINE

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project title

BRANTFORD MUNICIPAL AIRPORT
MASTER PLAN

exhibit title

TYPICAL GENERAL AVIATION
T-HANGAR ARRANGEMENT

scale
(at 8.5" x 11" sheet size)
1cm = 5m

-5 0m 5 10 15 20

date	revision	project no.	exhibit
29 JULY 2016	1	AP1501	7-10

7.4.4 Groundside Roads and Parking

In order to serve the existing T-hangar buildings and proposed GA hangar area and aircraft maintenance facility to the west and south, it is recommended that Aviation Drive be initially extended toward the west as shown in Exhibit 7-8, and then ultimately connected to Colborne Street West, as shown in Exhibit 7-9. Should the hangar area be developed further to the west (with the closure of Runway 17/35), then an additional groundside road will be required to connect to Colborne Street West.

With the extension of Aviation Drive, the existing water, sanitary and storm sewer services will also need to be extended to the serve the new development area. The 300 mm diameter watermain will need to eventually connect to the watermain on Colborne Street West in order to provide a looped water system.

A common-use 30-vehicle parking lot should be developed to serve the existing T-hangars and the new aircraft maintenance facility, as shown in Exhibit 7-8. Space should be allocated on the west side of the south leg of Aviation Drive in order to accommodate tenant parking for the new hangar developments.

7.5 Future Airside Requirements

The following subsections address airside requirements which may be required over the longer term – beyond the 20-year planning horizon of this study. It is important to understand the planning considerations and associated infrastructure for these longer term requirements so that the necessary lands and infrastructure may be preserved and protected.

7.5.1 Runway 05/23 Extension

Section 6 of this study addressed the runway length requirements based on the Airport's future role and market. As a result, it is recommended that the City plan for an ultimate Runway 05/23 length of 1828.8 metres (6,000 ft).

An extension of the Runway 05 end, toward the southwest, is not feasible given its current proximity to Colborne Street West (County Road 53).

An extension of the Runway 23 end, toward the northeast, is feasible, however, it is limited by the Grand River, an existing north-south flowing water course, and existing terrain which tends to rise going toward the northeast. Nevertheless, an assessment of a proposed 305 metre (1,000 ft) runway extension indicates that the development would impact a number of existing residential properties and area roads, including Robinson Road, Greens Road and a small portion of Kirby Crescent, as shown in Exhibit 7-11. As well, the Runway 23 threshold would need to be displaced by 198.0 metres (650 ft) in order to provide for minimum runway approach surface clearances to trees and other obstacles which may exist in the area bounded by Kirby Crescent and Robinson Road. Such a runway threshold displacement would not affect the accessibility of aircraft types anticipated to use YFD in the future, since they would all be capable of landing within a runway length of 1631 metres (5,350 ft).

The key planning parameters and features anticipated for the future runway extension are as follows:

- Runway Length – The assessment confirms the viability of at least a 305 metre (1,000 ft) extension of the Runway 23 end; however, any further lengthening would be technically challenging and prohibitively costly due to the existing terrain in the area of Kirby Crescent.

- Runway Width – The width of the runway extension would need to be 30 metres (as per existing) since the Airport Group Number is not anticipated to change in the ultimate configuration.

- Runway Approach/Take-off Surface – The slope of the runway approach/take-off surfaces would be 2.5% for non-precision runways.

- Runway End Safety Area – A RESA with dimensions of 150 m (long) and 61 m (wide) would be required starting at the end of the extended runway.

- Clearance to Vehicles, Trees and Other Objects – The planning assumes that tree heights beyond the revised airport boundaries would be limited to 30 metres above ground surface (which is typically the case for trees in Southern Ontario). Robinson Road has been realigned sufficiently to provide a 4.3 metre clearance between any road pavement surface and the lower limit of the runway approach/take-off surfaces.

- Aircraft Turning Pad – An aircraft turning pad would be provided on the east side of the Runway 23 threshold, and would be configured to tie into a future parallel taxiway.

Exhibit 7-12 presents a horizontal and vertical development concept for the future runway extension. The proposed runway elevations have been established to ensure near balanced earthworks quantities (cut and fill) in order to minimize capital cost.

The Airport property boundaries would need to be reset sufficiently distant from the extended Runway 05/23 in order to allow the City to have full control over areas which could potentially have objects (i.e., trees) that might impact the integrity of the Runway 05/23 Obstacle Limitation Surfaces (OLS). The proposed Airport boundaries are shown in Exhibit 7-13.

The future runway development concept is anticipated to have the following impacts on area roadways, and as illustrated in Exhibit 7-13.

- A portion of Greens Road would need to be closed between Robinson Road and just north of the sanitary sewage station. A cul-de-sac would be required at the road's termination point. A small 0.13 hectare parcel would need to be transferred to the County in order to allow for development of the cul-de-sac. The cul-de-sac would also be a good location for an airside gate to access the northeastern portion of the Airport lands.

- Due to the proposed closure of a portion of Greens Road, a new collector road would need to be developed east of the revised Airport boundary in order to interconnect Colborne Street West and Robinson Road.

- Robinson Road would need to be realigned around the revised Airport boundary sufficiently distant from the extended runway.

- A portion of Kirby Crescent would need to be relocated in order to permit a logically structured intersection between Robinson Road, Kirby Crescent and the proposed new collector road.

Note that the proposed roadway concept was not vetted with the County's Transportation Planning Department. The concept is merely intended to portray a single viable concept based on available information. There may be other considerations which the Consultant Team have not been made aware of that could negate the proposed roadway concept.

Based on the future runway development concept, the City would need to acquire approximately 16.443

hectares (40.63 acres) of privately held lands, as illustrated in Exhibit 7-13, and in the accompanying table of affected land parcels. The existing road right-of-ways affected by the development would need to be transferred from the County to the City. Note that the City already owns 5.926 hectares (14.64 acres) of the affected lands. Considering that the runway development is not anticipated to be required until beyond the 20-year planning horizon of this study, it is recommended that the City acquire the needed lands using a methodical and opportunistic approach (i.e., acquire the lands only as they become available for sale on the open market).

7.5.2 Runway 05/23 Parallel Taxiway

The demand/capacity analysis of the existing runway system (as presented in Section 6) suggests that a parallel taxiway serving the Runway 23 threshold is not warranted during the 20-year planning horizon. However, there are other considerations which should be taken into account when assessing the need for a parallel taxiway to serve Runway 05/23.The most important of these considerations should be the level of safety risk which pilots are exposed to during back tracking to the Runway 23 threshold. In the case of YFD, the level of risk is elevated by the fact that:

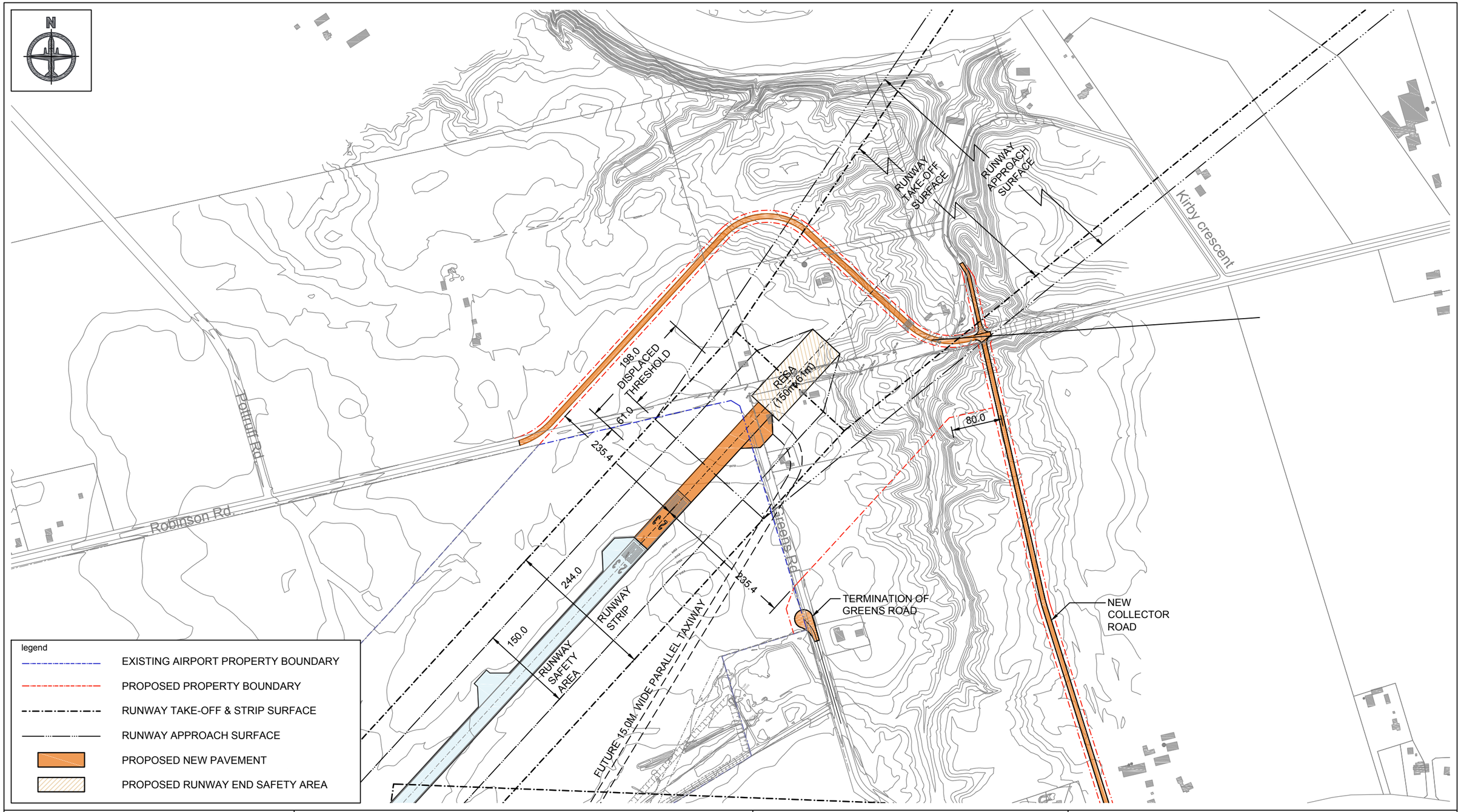
- Runway 23 is the primary end for take-offs and landings (approximately 50% of all movements);
- Nighttime operations are conducted on Runway 05/23;
- There is no local air traffic control service (YFD is an uncontrolled aerodrome); and
- Air-to-ground communication is via a local UNICOM station (a mandatory frequency may well be warranted at YFD and would improve the level of safety).

It is recommended that the City undertake an aeronautical study to determine whether a parallel taxiway is warranted at YFD. In order to undertake the study, the City will need to collect aircraft movement data for at least a one-year period.

Exhibit 7-2 presents a concept for the future parallel taxiway assuming extension of Runway 05/23; however, the taxiway could be developed in phases; initially connecting into the existing Runway 23 threshold. The parallel taxiway would need to be 15 metres in width to accommodate AGN IIIB aircraft.

Where the parallel taxiway ties into the existing terminal apron, the taxiway-to-runway centreline separation will need to be a minimum of 285.0 metres in order to ensure that aircraft tails clear the Runway 11/29 approach and take-off surfaces. This separation distance will accommodate maximum aircraft tail heights of 8.5 metres (e.g., tail height of a Bombardier Q-400 is 8.4 metres) and assumes that Runway 11/29 may well have non-precision, instrument approaches in the future.

Future development of the parallel taxiway will necessitate that the existing City-owned hangars immediately east of Apron II will need to be decommissioned and relocated to the west (as recommended in Section 4).



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notes
1. Property boundary mapping sourced from County of Brant.

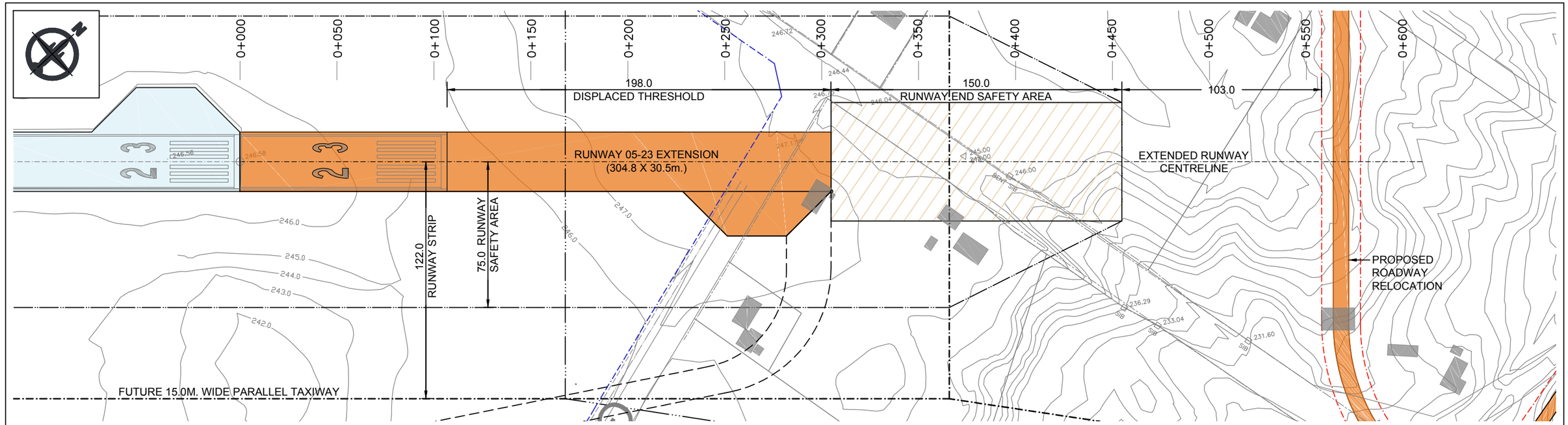
FOR PLANNING PURPOSES ONLY

project title
BRANTFORD MUNICIPAL AIRPORT MASTER PLAN

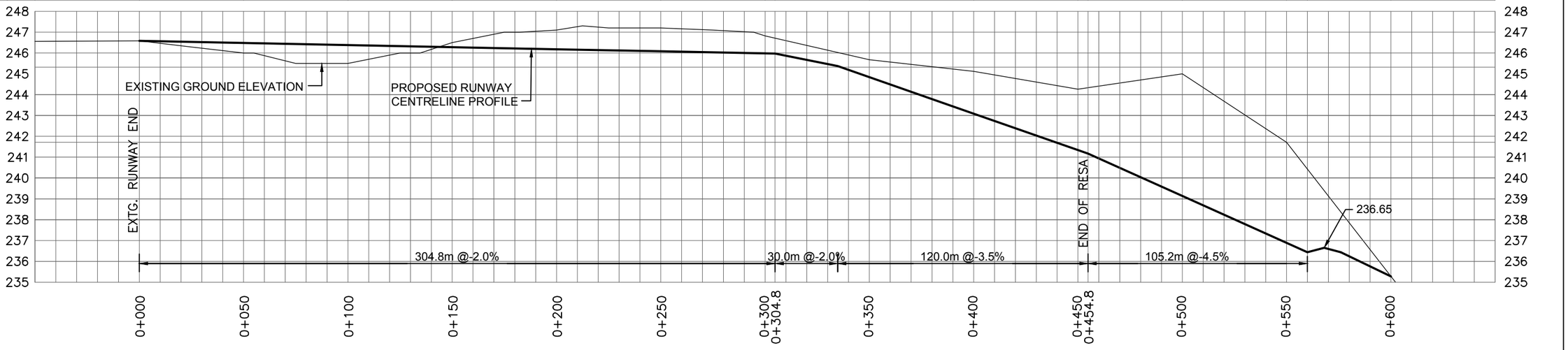
exhibit title
FUTURE RUNWAY EXTENSION - LAYOUT

scale
1cm = 60m
(at 11" x 17" sheet size)
-60 0m 60 120 180 240

date	revision	project no.	exhibit
29 JULY 2016	3	AP1501	7-11



		0+000	0+050	0+100	0+150	0+200	0+250	0+300	0+350	0+400	0+450	0+500	0+550	0+600
RUNWAY CENTRELINE	EXTG. ELEV.	246.56	246.58	246.00	245.50	246.50	247.10	247.20	246.82	245.68	245.12	244.26	245.32	241.71	235.28
	PROP. ELEV.	246.56	246.58	246.48	246.38	246.28	246.18	246.08	245.98	245.97	244.84	243.09	241.34	241.17	239.14	236.44



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notes
1. Property boundary mapping sourced from County of Brant.
2. Dimensions and elevations are in meters unless otherwise indicated.
3. The runway profile elevations are indicative only and should be confirmed during detailed design based on final airfield layout, earthworks quantities, and existing site conditions.

FOR PLANNING PURPOSES ONLY

project title
BRANTFORD MUNICIPAL AIRPORT
MASTER PLAN

exhibit title
RUNWAY 05-23 EXTENSION
PLAN AND PROFILE

scale
1cm = 20m
(at 11" x 17" sheet size)
-20 0m 20 40 60 80

date	revision	project no.	exhibit
29 JULY 2016	3	AP1501	7-12

legend

- FULL LAND ACQUISITION
- PARTIAL LAND ACQUISITION
- LAND DIVESTMENT
- TRANSFER OF COUNTRY ROAD ALLOWANCE
- PROPOSED PAVEMENTS
- OWNED BY CITY OF BRANTFORD

N

Kirby crescent

Powerline Rd.

Robinson Rd.

Green Rd.

0.1329 ha

PROPERTY REQUIREMENTS				
PROPERTY ID	MUNICIPAL ROLL NUMBER	MUNICIPAL STREET ADDRESS	FULL/PARTIAL ACQUISITION	APPROX. AREA REQUIRED (ha)
3	292000401028700	299/301 Oakhill Drive	Partial	5.2558
4	292000401024760	53 Kirby Crescent	Full	3.2799
5	292000401024750	101 Robinson Road	Full	3.4624
7	292000401024600	135 Robinson Road	Partial	3.2865
8	292000401024800	---	Partial	1.0538
9	292000401028700	---	Partial	0.1047

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notes
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FOR PLANNING PURPOSES ONLY

project title
BRANTFORD MUNICIPAL AIRPORT MASTER PLAN

exhibit title
PROPOSED PROPERTY REQUIREMENTS

scale
1cm = 60m
(at 11" x 17" sheet size)
-60 0m 60 120 180 240

date	revision	project no.	exhibit
29 JULY 2016	3	AP1501	7-13

8 Airport Land Use

8.1 Introduction

The previous Airport Master Plans in 1983 and 1991 addressed land use considerations in a very cursory manner.

The land use component of a Master Plan should address the airport site and surrounding lands to ensure that both the essential core uses of an airport and surrounding uses can continue to exist in harmony. A land use plan must examine current airside land capacity and projected future requirements, assess the need for additional services and facilities such as fuelling facilities, general hangar space, commercial development and other secondary uses associated with an airport. It must also address existing and needed facilities required for day-to-day operations of the airport and incorporate policies to support the continued existence and growth of tenants requiring airside access.

The land use plan addresses groundside operations, having regard for current and projected land capacity, identification of lands which should be reserved to support core operations and administration needs. The plan establishes policies to ensure the highest and best use of lands associated with the airport and provide guidelines for interim and long term ancillary uses of the airport lands such that these uses may exist or develop without interfering with the core operations of the airport.

8.2 Brant County Land Use Controls

8.2.1 Official Plan

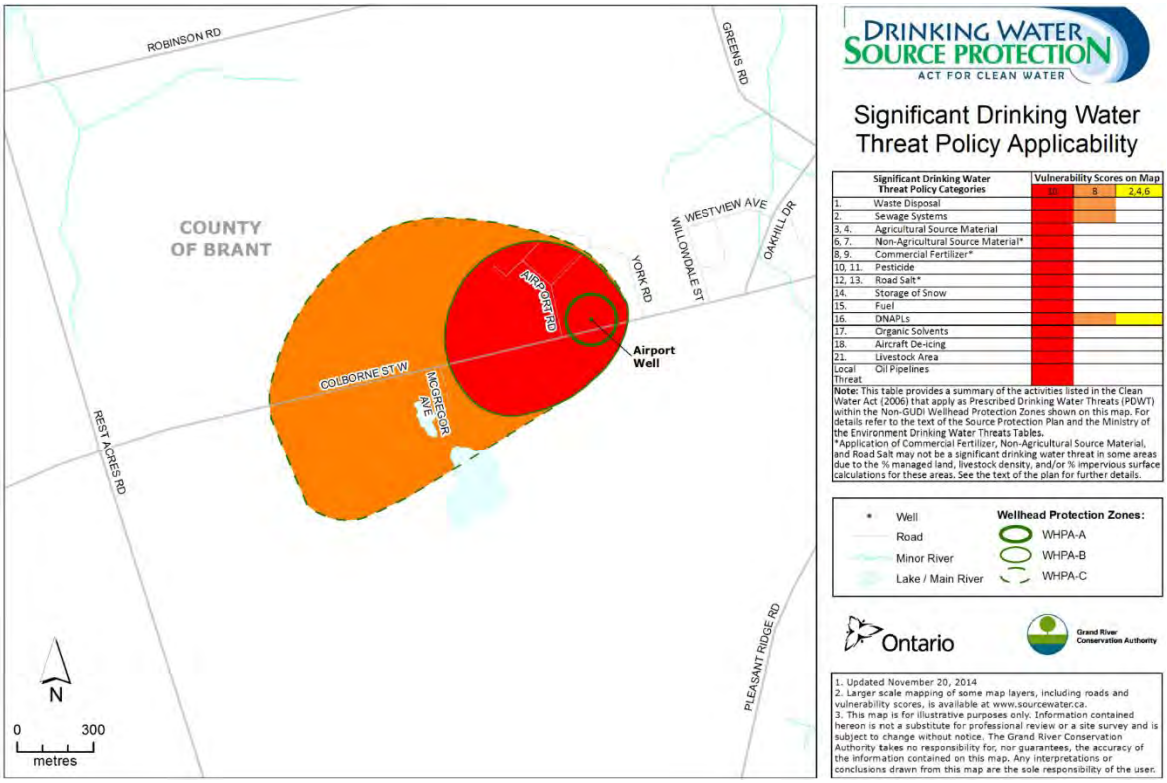
The Brant County's Official Plan (OP) recognizes the lands as employment with a site specific policy area. The OP's Site Specific Policy Area 15 states that:

> "*Site Specific Policy Area 15 shall also apply to the area including and abutting the Brantford Airport. It is recognized that the Brantford Municipal Airport is a multi-use facility owned and operated by the City of Brantford. Nothing in this Plan shall inhibit its use for activities related to its function as an airport including the operation, repair, maintenance and storage of aircraft and ancillary functions such as private clubs and commercial aircraft or related companies. The restrictions noted in Site Specific Policy Area 15 are not intended to impact upon the operations of the Brantford Airport".*

A portion of the Airport lands are identified as Wellhead Protection Area (WHPA), as shown in Exhibit 8-1. The County depends on groundwater and aquifers for the supply of all of the community's water needs, base flow for creeks and streams, and water sources for ponds and wetlands. WHPAs are of particular concern with respect to the protection of groundwater from contamination. Identified WHPAs and groundwater recharge areas should be considered in order to ensure the protection of the County's water supply sources.

In July of 2016, the source water protection policies will come into effect and any development on the lands within the WHPA will require a risk assessment in accordance with the source water policies. The risk assessment must demonstrate that groundwater quality and quantity will not be negatively impacted; this will be required for site plan applications and in advance of building permit applications on the lands.

Exhibit 8-1 – Brant County – Airport Well Water Supply Protection Area



Source: Government of Ontatio and Grand River Conservation Authority.

The County's Official Plan prohibits some uses within the wellhead protection areas which are at the southwest corner of the Airport lands. Within an identified WHPA and groundwater recharge area, the following uses are not permitted:

- underground transmission of oil, gasoline, or other petroleum liquid products;
- commercial wood preserving and treating;
- furniture and wood stripping and refinishing;
- outdoor storage of road salt, or other de-icing materials and dumping of salt-laden snow;
- petroleum product refining and manufacturing;
- landfills;
- chemical/biological laboratory;
- chemical manufacturing/industrial areas;
- disposal of leachable waste;
- electroplaters and metal fabricators;

- facilities generating, treating or disposing hazardous wastes;
- automobile wrecking yards;
- bulk fuel oil storage yards;
- car washes;
- cemeteries;
- dry cleaning facilities;
- gasoline service stations; and
- underground storage tanks.

Prior to the approval of an application for any industrial or commercial uses within the WHPA, a developer will be required to outline the nature of the business, details of the operation, specify if any chemical substances are used or stored on site, and the measures proposed for spill containment.

It is understood that any future gasoline holding and service areas would be limited to outside of the wellhead protection area. This may preclude the development of an aviation fuel facility within the southwest quadrant of the Airport.

8.2.2 Zoning By-Law:

The current zoning provision for the Airport lands in the Brant County Zoning By-law is under M2-10. We note that the County is currently undertaking a comprehensive zoning by-law review. The permitted use in the current zoning by-law for the airport lands are:

M2-10 (AIRPORT)

Notwithstanding the provisions of Section 36(2) of this By-Law to the contrary, within any area zoned M2-10 on Schedule "A" hereto, the permitted uses shall be limited to an airport owned by the City of Brantford including the operation, repair, maintenance and storage of aircraft and ancillary functions such as private clubs and commercial aircraft or related companies and industrial uses involved with manufacturing, assembly, repair, fabricating, storage and/or technical services which rely on a location adjacent to an airport. Furthermore, no lands may be used for any of the following uses or activities:

- the underground transmission of oil, gasoline, or other petroleum products;
- wood preserving and treating;
- outdoor storage of road salt, or other de-icing materials or the dumping of salt laden snow;
- petroleum production, refining, or manufacturing;
- furniture and wood striping and refinishing;
- horticultural nurseries;
- landfills;

- chemical/biological laboratory;
- disposal of leachable waste;
- electroplaters and metal fabricators;
- asphalt/concrete/tar plants;
- automobile salvage yards;
- car washes;
- dry cleaning facilities;
- cemeteries;
- gasoline service stations; and
- storage tanks.

In reviewing the permitted uses under M2-10 zoning, there are already current uses at the Airport which may fall outside of the permitted uses. These are:

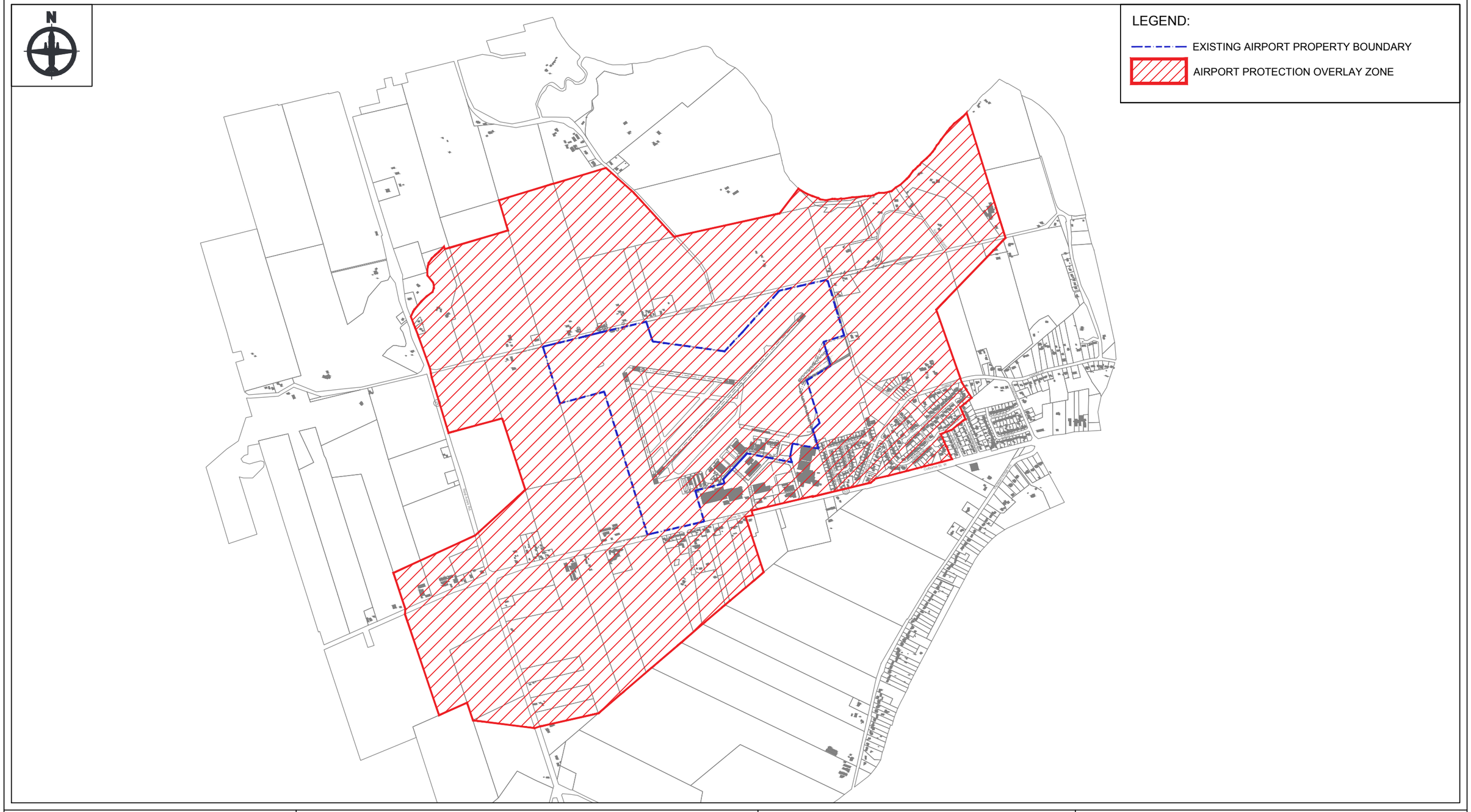
- outdoor storage of road salt, or other de-icing materials or the dumping of salt laden snow;
- furniture and wood striping and refinishing; and
- electroplating and metal fabrication.

The County intends to make no changes to the Airport's permitted uses listed above as part of the comprehensive zoning by-law (ZBL) review currently underway. The County has suggested that any changes beyond simple "house-keeping" items related to permit uses will be a challenge to address at this point in the ZBL update process.

The Consultant Team also reviewed Schedule "D" of the current ZBL entitled "Height Restrictions in the Vicinity of the Brantford Airport" and found the height limitation surfaces to be incorrectly presented and excludes the "horizontal surface" which is a flat plane 45.0 metres above the Airport's reference elevation.

The Consultant Team, under the direction of the City, met with the Brant County Planning Department in December 2015 to present and discuss proposed amendments to the ZBL including the mapping for Schedule "D". The County was receptive to updating the mapping in Schedule "D" of the ZBL. The updated mapping is presented and discussed in Section 8.3 below.

The Consultant Team also requested the inclusion of a new map in the updated ZBL entitled "Airport Overlay Protection Zone". The purpose of the Overlay Protection Zone, as presented on Exhibit 8-2, is to control (i.) residential development in areas where it may be incompatible with aircraft operations (i.e., noise impacts) and (ii.) industrial development which may cause a visual obstruction and/or hazard to aviation resulting from smoke, steam, dust or heat plumes, or from glare or excessive light emissions. Any residential/industrial development application within the Overlay Protection Zone would be required to undertake a study to ascertain whether the development is incompatible with airport operations and/or could create a hazard to aviation.



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notes
1. Property boundary mapping sourced from County of Brant.

project title
BRANTFORD MUNICIPAL AIRPORT
MASTER PLAN

exhibit title
AIRPORT PROTECTION OVERLAY ZONE

scale
1cm = 250m
(at 11" x 17" sheet size)
-250 0m 250 500 750 1000

date	revision	project no.	exhibit
29 JULY 2016	2	AP1501	8-2

The County was receptive to incorporate the new "Airport Overlay Protection Zone" map but only as it relates to controlling incompatible residential development which may be impacted by aircraft noise.

The following is the County's proposed final draft wording for Airport related clauses within the updated ZBL:

> *4.15.2 Brantford Municipal Airport Height Restrictions*
>
> *Notwithstanding Section 4.15,1 above, all development within the area affected by the ground surface projection of the Brantford Municipal Airport Obstacle Limitation Surface shall comply with the height restrictions as shown on Schedule "B" of this By-Law.*
>
> *4.15.3 Brantford Municipal Airport Protection Overlay*
>
> *The Brantford Municipal Airport Protection Overlay shall apply to all lands within the Brantford Municipal Airport Protection Overlay as shown on Schedule "C" of this By-Law.*
>
> *Any development within the Brantford Municipal Airport Protection Overlay as shown on Schedule "C" shall require a noise study to be completed by a qualified professional and approvals from Transport Canada.*

In summary, the City should continue discussions with the County regarding the update to the zoning by-law and ensure that the regulations meet the long term goals of the Airport and protect the Airport from incompatible land uses in the vicinity of the Airport. The City should also request to be circulated on any development application within 500 metres of the Airport Protection Overlay Zone and should comment on those applications.

8.3 Airport Obstacle Limitation Surfaces

Obstacle Limitation Surfaces (OLS) are a set of surfaces in space which extend beyond the boundary of the airport, the penetration of which represent an obstacle to air navigation. The objectives of the OLS are to define the airspace around aerodromes to be maintained free of obstacles so as to permit the intended aircraft operations at the airport to be conducted safely and to prevent the airport from becoming unusable by the growth of obstacles around it.

Infringements of the OLS may be permitted following an assessment of the safety, regularity and efficiency impacts of the proposed obstacle, as well as any marking and/or lighting requirements for the obstacle.

In accordance with Transport Canada's TP312 Standards, the OLS is comprised of (a.) approach and take-off surfaces, (b.) transitional surfaces, and (c.) a horizontal surface. Where two or more surfaces overlap, the lower surface is to be used as the controlling obstacle limiting surface.

In Canada, the Federal Aeronautics Act regulates lands at and adjacent to airports. The Act provides for the implementation of zoning regulations that restrict the heights of structures for the protection of airport approach surfaces and the protection of navigational aids. Note that these regulations do not exercise control over what can be constructed, only their heights. The only exception to this control is the placement of wildlife attractants (landfill, etc.). Otherwise, land planning control adjacent to airports rests at the provincial and municipal level.

As noted above, the building height limitations associated with the Airport in the current County ZBL were incorrectly prepared. As a result, the City requested the Consultant Team to prepare a current Airport Obstacle Limitation Surfaces plan in order to replace the current Schedule 'D' map. The updated

OLS plans are presented in Exhibit 8-3 and Exhibit 8-4.

At present, Runway 05/23 is operating with non-precision approaches, while Runway 11/29 and Runway 17/35 are operating with non-instrument approaches. However, for the purposes of the OLS plan, all runways were assumed to be categorized as non-precision in order to protect for any future runway operational upgrades.

8.4 Aircraft Noise

Transport Canada provides guidelines, in their Document No. 1247 (latest edition 2013/2014) with respect to land use on and adjacent to airport lands, and specifically to aircraft noise and its community impacts. In its guidelines, Transport Canada recommends that new residential construction or development should not be undertaken in areas with Noise Exposure Forecast (NEF) metric of 30 or greater. Transport Canada does say however that if a responsible authority (typically the municipality) chooses to proceed contrary to the recommended guidelines, residential construction or development between NEF 30 and 35 should not be permitted to proceed until the responsible authority is satisfied that:

- Appropriate acoustic insulation features have been considered in the building, and
- A noise impact assessment study has been completed and shows that this construction or development is not incompatible with aircraft noise.

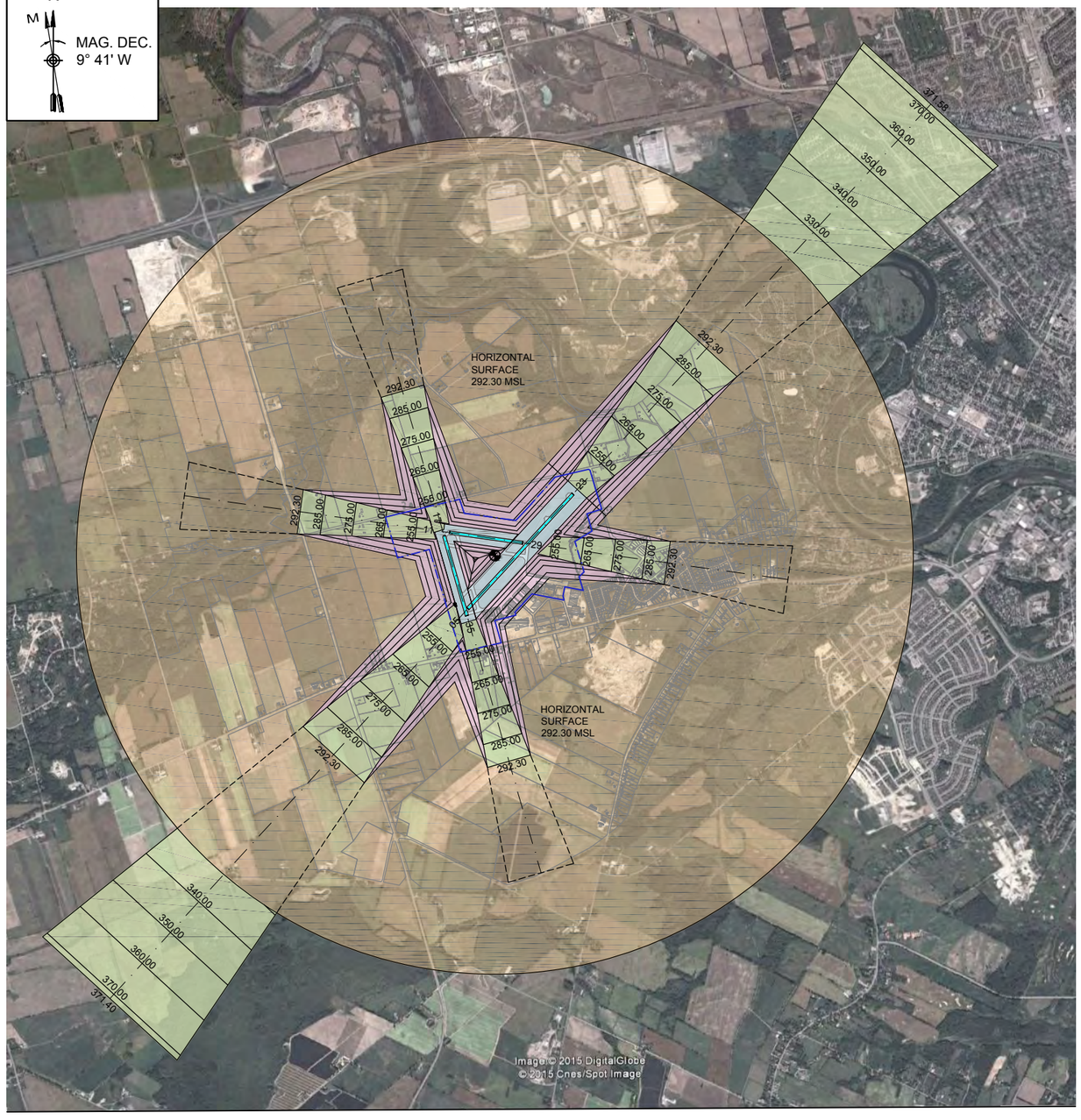
Notwithstanding the latter point, the property developer should still be required to inform all prospective tenants or purchasers of residential units that speech interference and annoyance caused by aircraft noise are, on average, established and growing at NEF 30 and are very significant by NEF 35. Nevertheless, there is a provision in the Aeronautics Act which permits the Minister of Transport to enact a compatible use zoning regulation where all attempts to convince a city or town not to allow incompatible development have been unsuccessful. The Minister may implement emergency regulations to prevent such use. However, this power has never been exercised in Canada.

Although, neither a province nor a municipality can regulate aircraft noise or airports, they can regulate land uses proposed for areas near, or which would be affected by, aircraft noise. At the provincial level, there are two policy and guideline documents that are applicable to the establishment of aircraft noise assessment criteria – Ontario Ministry of Municipal Affairs and Housing (MMAH) Provincial Policy Statement (2014) and the Ontario Ministry of Environment (MOE) Guideline NPC-300 – Environmental Noise Guideline (August 2013).

The MMAH Provincial Policy Statement (2014) states that:

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

- *prohibiting new residential development and other sensitive land uses in areas near airports above 30 NEF/NEP;*
- *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*
- *discouraging land uses which may cause a potential aviation safety hazard."*



legend

- APPROACH SURFACE
- TRANSITIONAL SURFACE
- RUNWAY STRIP
- AIRPORT REFERENCE POINT
- 280.00 OBSTACLE HEIGHT LIMITATION CONTOUR
- AIRPORT PROPERTY BOUNDARY

RUNWAY DATA

RUNWAYS			05	23	11	29	17	35
PHYSICAL CHARACTERISTICS								
Aircraft Group Number			IIIB	IIIB	II	II	II	II
Instrument Approach Type (Note i)			Non-Precision	Non-Precision	Non-Precision	Non-Precision	Non-Precision	Non-Precision
Precision Approach Category			--	--	--	--	--	--
Orientation - True/Magnetic North [degrees]			065°/055°	245°/235°	125°/115°	305°/295°	185°/175°	005°/355°
Runway Dimensions	Length [m/ft]		1,484.5 / 4,870.5		704.5 / 2,311.2		791.5 / 2,596.8	
	Width [m/ft]		30.5 / 100.0		30.5 / 100.0		30.5 / 100.0	
Threshold	UTM Coordinates	N	4775213.486	4776307.336	4775939.470	4775842.400	4775906.956	4775145.886
		E	553167.343	554171.000	552993.162	553690.906	552939.657	553157.068
	Latitude/Longitude	N	43°07'40.055"	43°08'15.255"	43°08'03.630"	43°08'0.308"	43°08'02.591"	43°07'37.866"
		W	80°20'46.864"	80°20'02.062"	80°20'54.320"	80°20'23.474"	80°20'56.702"	80°20'47.342"
	Elevation (MSL) [m]		246.400	246.580	246.260	247.830	246.300	246.030
Runway Strip	Length [m]		1,606.5		824.5		911.5	
	Width [m]		244		150		150	
OBSTACLE LIMITATION SURFACES								
Approach Surfaces	Length of Inner Edge [m]		244	244	150	150	150	150
	Distance from Threshold		61	61	60	60	60	60
	Divergence [%]		15%	15%	10%	10%	10%	10%
	First Segment - Length [m]		720	720	2,500	2,500	2,500	2,500
	First Segment - Slope [%]		2.5%	2.5%	3.33%	3.33%	3.33%	3.33%
	Second Segment - Length		4,280	4,280	0	0	0	0
	Second Segment - Slope		2.9%	2.9%	0.0%	0.0%	0.0%	0.0%
	Total Approach Length [m]		5,000	5,000	2,500	2,500	2,500	2,500
Transitional Surfaces	First Segment - Slope [%]		25.0%		25.0%		25.0%	
	Second Segment - Slope		14.3%		14.3%		14.3%	
Horizontal Surface	Elevation (MSL) [m]		292.300		292.300		292.300	
	Radius [m] (Note ii)		4,000		4,000		4,000	
OBSTACLE IDENTIFICATION SURFACES								
Approach ID Surface	Length of Inner Edge [m]		244	244	150	150	150	150
	Distance from Threshold		61	61	60	60	60	60
	Divergence [%]		15%	15%	10%	10%	10%	10%
	Length [m]		5,000	5,000	2,500	2,500	2,500	2,500
	Slope [%]		2.5%	2.5%	3.33%	3.33%	3.33%	3.33%
Outer ID Surface	Elevation (MSL) [m]		292.300		292.300		292.300	
	Radius [m]		4,000		4,000		4,000	

AERODROME DATA

Aerodrome Reference Temperature	26.9°C	Mag. declination - IGRF-12 (2015)				9.6833° W	
Aerodrome Reference Point	UTM Coordinates	N	4775717.14	N	43°07'56.33"		
		E	553424.630	W	80°20'35.30"		
	Reference Point Elevation (MSL) [m]					247.30	

Note: (i.) Runways 11-29 and 17-35 are currently operating as non-instrument facilities; however, the OLS is protecting for future upgrading of these runways to non-precision facilities.

(ii.) The horizontal surface is centred about the aerodrome reference point.

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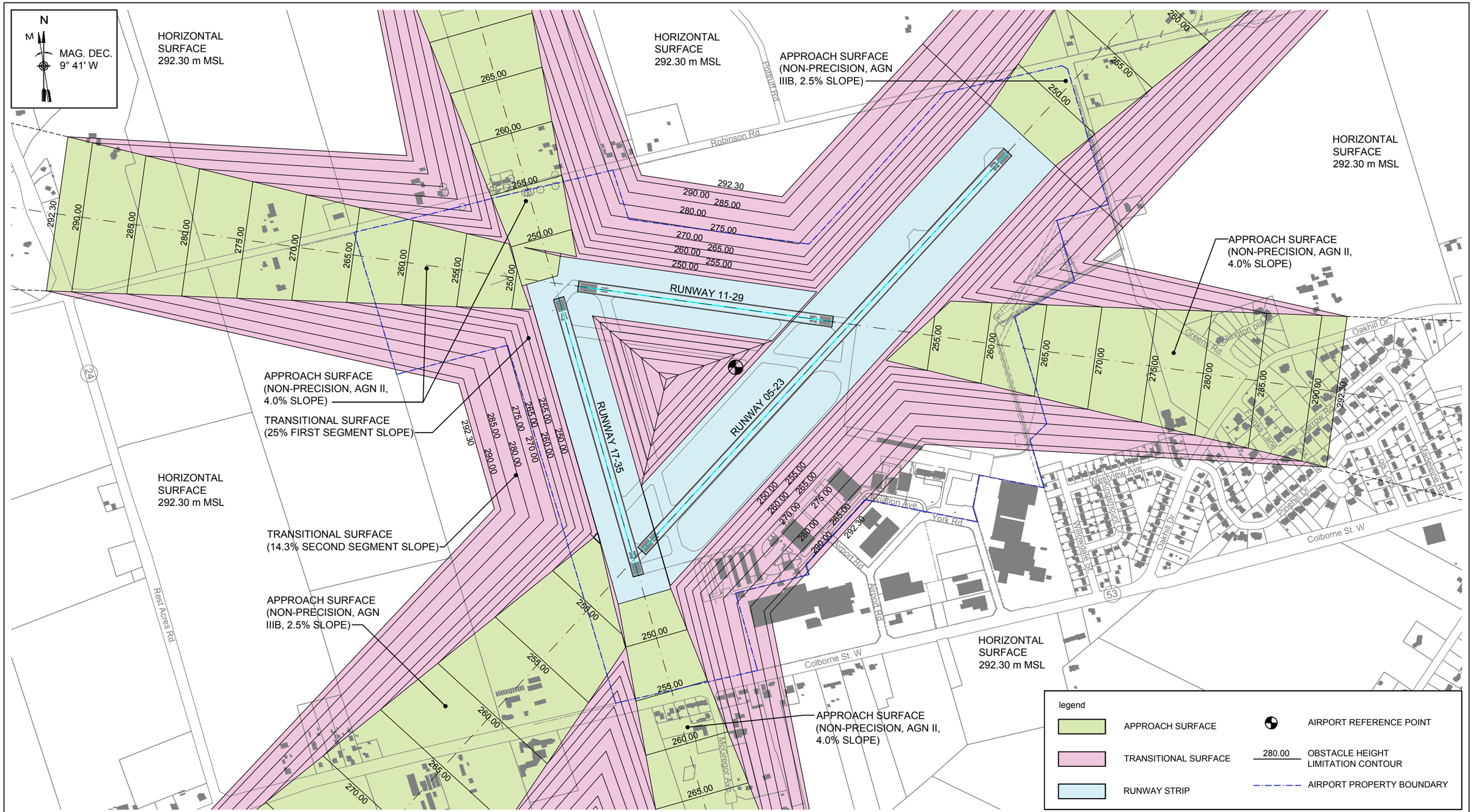
notes
1. Unless otherwise noted, dimensions are in meters and the elevations are referenced to Mean Sea Level (MSL).
2. Runways 11-29 and 17-35 are currently operating as non-instrument facilities; however, the OLS is protecting for future upgrading of these runways to non-precision facilities.
3. The horizontal surface is centred about the aerodrome reference point.

project title
BRANTFORD MUNICIPAL AIRPORT
MASTER PLAN

exhibit title
AIRPORT OBSTACLE LIMITATION SURFACES

scale
1cm = 500m
(at 11" x 17" sheet size)
-500 0m 500 1000 1500 2000

date	revision	project no.	exhibit
29 JULY 2016	3	AP1501	8-3



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notes
1. Unless otherwise noted, dimensions are in meters and the elevations are referenced to Mean Sea Level (MSL).
2. Runways 11-29 and 17-35 are currently operating as non-instrument facilities; however, the OLS is protecting for future upgrading of these runways to non-precision facilities.
3. The horizontal surface is centred about the aerodrome reference point.

project title
BRANTFORD MUNICIPAL AIRPORT
MASTER PLAN

exhibit title
CURRENT OBSTACLE LIMITATION SURFACES
IN AIRPORT VICINITY

scale
1cm = 100m
(at 11" x 17" sheet size)
-100 0m 100 200 300 400

date	revision	project no.	exhibit
29 JULY 2016	3	AP1501	8-4

The stated objective of the MOE Guideline NPC-300 is to "*address the proper control of sources of noise emission to the environment" through the provision of "advice, sound level limits and guidance that may be used when land use planning decisions are made under the Planning Act" and "Specifically, it may be applied to planning decisions concerning noise sensitive land uses that are proposed adjacent to facilities such as … airports …*". The MOE Guideline is consistent with and references the MMAH PPPS as establishing the applicable development criterion of 30 NEF/NEP or greater for prohibiting new residential development and other sensitive land uses.

The Brant County's current Official Plan and ZBL are silent with regard to aircraft noise and land use controls related to airport or aircraft noise.

As a result, the City requested the Consultant Team to undertake aircraft noise modelling for YFD under the current (2015) and future (2035) traffic levels and operational conditions. The results of the modelling were then used to prepare noise exposure contour mapping using the Transport Canada NEF metric. The noise exposure mapping for 2015 and 2035 are presented in Exhibits 8-6 and 8-7 respectively.

8.5 Property Acquisition

The Airport lands are currently a total of 177.59 hectares (438.84 acres), which is small in comparison to other municipal/regional airports with multiple runways. These airports tend to average about 285 hectares (700 acres) in size.

The Master Plan presents a plan for the phased development and expansion of the commercial area (on the south side of the Airport) during the next 20-year period. However, it is highly likely that the South Commercial Area will be nearly fully built-out by the end of the 20-year planning horizon. It is, therefore, recommended that the City commence the planning and acquisition of lands necessary for Airport commercial development beyond the next 20-year period.

Exhibit 8-5 on the following page presents two properties of interest for future acquisition by the City, in addition to the lands which were identified in Section 7.5.1 for a future runway extension. The property to the southwest is 32.3 hectares and has direct access to Colborne Street, while the property to the north is 18.2 hectares and has direct access to Robinson Road.

It is recommended that the property to the southwest be prioritized for acquisition for the following reasons:

- The parcel would allow the City to have better control over obstacles below the Runway 05/23 approach and departure paths.
- The parcel would allow for a secondary access road from Colborne Street.
- Taxiway infrastructure (in the form of converted Runway17/35) would already be in place for access from the parcel's commercial development lots.
- The proposed parcel would have unimpeded access to the ends of Runway 05/23 and Runway 11/29 (as opposed to the parcel to the north which would be cut off from the existing commercial development area to the south.
- The parcel would be perfectly suited for locating a future Air Traffic Control / FSS building.

Exhibit 8-5 – Adjacent Properties of Interest

Source: Brant County.

8.6 Land Use Planning Policy and Framework

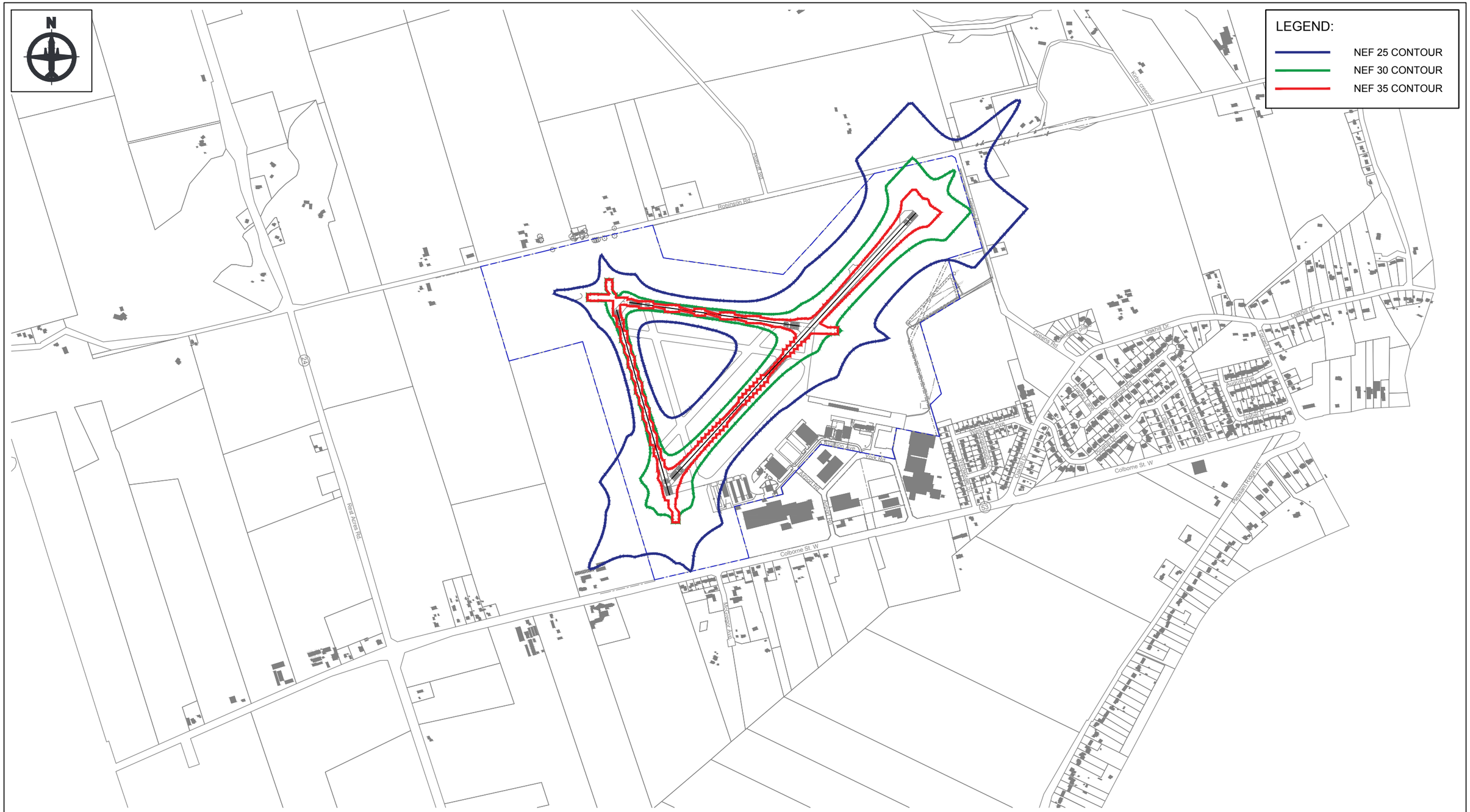
8.6.1 Airport Business Park Concept

It is recommended that the City bring forward the concept of an "Airport Business Park" and work towards implementation of the park for new hangars and industrial / commercial tenants. The Business Park would include areas within which to locate aviation related industrial and commercial uses, groupings of institutional training and research related uses and support services for private aircraft.

The City could work with the County to incorporate the Airport Business Park concept into the existing Development Agreement process for the Airport lands.

The Business Park should meet the following objectives:

- Protect the core operations of the airport and encourage the establishment and growth of compatible uses;
- Promote the future acquisition of lands to allow for future Airport growth and expansion.
- Allow greater potential for the marketing of aviation-related industrial opportunities;
- Provide opportunities for more land leases and thus additional revenues in order to making the Airport self-sustaining; and



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notes

1. Property boundary mapping sourced from County of Brant.
2. Aircraft and helicopter movement data, and runway and flight path assignments are based on user surveys and consultations.
3. All runway approaches are assumed to be flown at a 4.5 degree glide slope for local circuits, 5.0 degree glide slope for helicopters and 3.0 degree glide slope for all other aircraft.
4. NEF contours have been computed using Transport Canada's NEFCALC_2_0_6 modelling software.
5. Nighttime operations are defined as aircraft operations occurring between 2200 and 0659 local time.

project title

BRANTFORD MUNICIPAL AIRPORT
MASTER PLAN

exhibit title

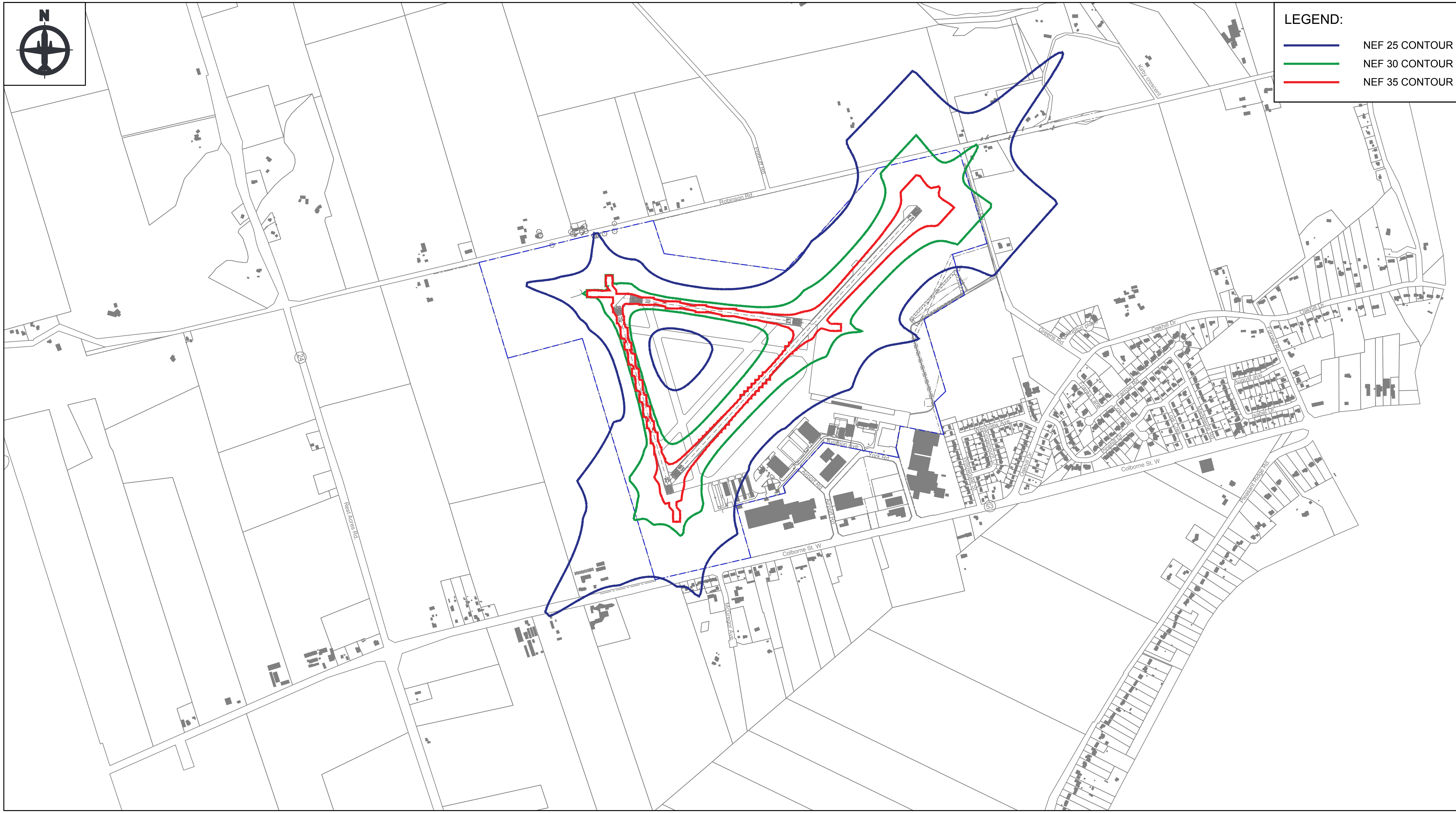
YEAR 2015 NOISE EXPOSURE MAPPING

scale

1cm = 150m
(at 11" x 17" sheet size)

-150 0m 150 300 450 600

date	revision	project no.	exhibit
29 JULY 2016	2	AP1501	8-6



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notes

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3. All runway approaches are assumed to be flown at a 4.5 degree glide slope for local circuits, 5.0 degree glide slope for helicopters and 3.0 degree glide slope for all other aircraft.
4. NEF contours have been computed using Transport Canada's NEFCALC_2_0_6 modelling software.
5. Nighttime operations are defined as aircraft operations occurring between 2200 and 0659 local time.

project title	exhibit title
BRANTFORD MUNICIPAL AIRPORT MASTER PLAN	YEAR 2034 NOISE EXPOSURE PROJECTION

scale	date	revision	project no.	exhibit
1cm = 150m (at 11" x 17" sheet size); -150 0m 150 300 450 600	29 JULY 2016	2	AP1501	8-7

- Provide additional opportunity and flexibility to attract new business ventures to the community.

8.6.2 Land Use Designations

A series of Land Use Designations have been established to differentiate the several different types of land use which occur or may be desirable to establish within the Airport Business Park. These designations are listed as follows:

- Core Aviation Area;
- Terminal/FBO Area;
- General Aviation Area;
- Aviation Related Commercial Area;
- Non-Aviation Related Commercial Area;
- Open Space and Agricultural Lease Area; and
- Protected Environmental Areas (Wellhead Protection Area).

The recommended permitted uses within the areas defined are described below.

Core Aviation Area

The Core Aviation Area includes all of the airside and landside operations and facilities essential for the safe and efficient operation of aircraft and the normal day to day operation of an active commercial airport including: runways, taxiways, aprons, navigational aids and lighting, grassed areas, storm water storage, signage, service roads, aircraft parking facilities, and associated ancillary uses.

Terminal / FBO Area

The Terminal / FBO Area would include the existing terminal/FBO area and encompass a portion of the existing T-hangar area. Permitted uses would include Airport administration and operations, Airport maintenance equipment storage and maintenance, passenger lounge facilities, airline/air charter operations, flight training facilities, aircraft parking, aircraft fueling, deicing and other servicing, other FBO operations and services, cargo/courier operations, restaurant/retail, vehicle rental and public gatherings.

General Aviation Area

This area would be distinct from the Aviation-related Commercial Area since it would be designated specifically for catering to the needs of small, private aircraft owners and operators. Permitted uses under this designation would include: aircraft storage (hangars), flight training facilities, aircraft maintenance and repair, and aircraft fueling, deicing and other servicing.

Aviation-Related Commercial Area

Several areas of the land base have potential for commercial / industrial use. Permitted uses under this designation would include: aviation related research facilities, institutional uses related to aviation education, flight training facilities, hangars, machine shops, aircraft parts, service, maintenance and

manufacturing; cargo, courier operation warehouse, storage and warehousing, cartage express and air freight facilities, helicopter operations and services, offices, retail services serving the travelling public, air traffic control services.

Open Space Area

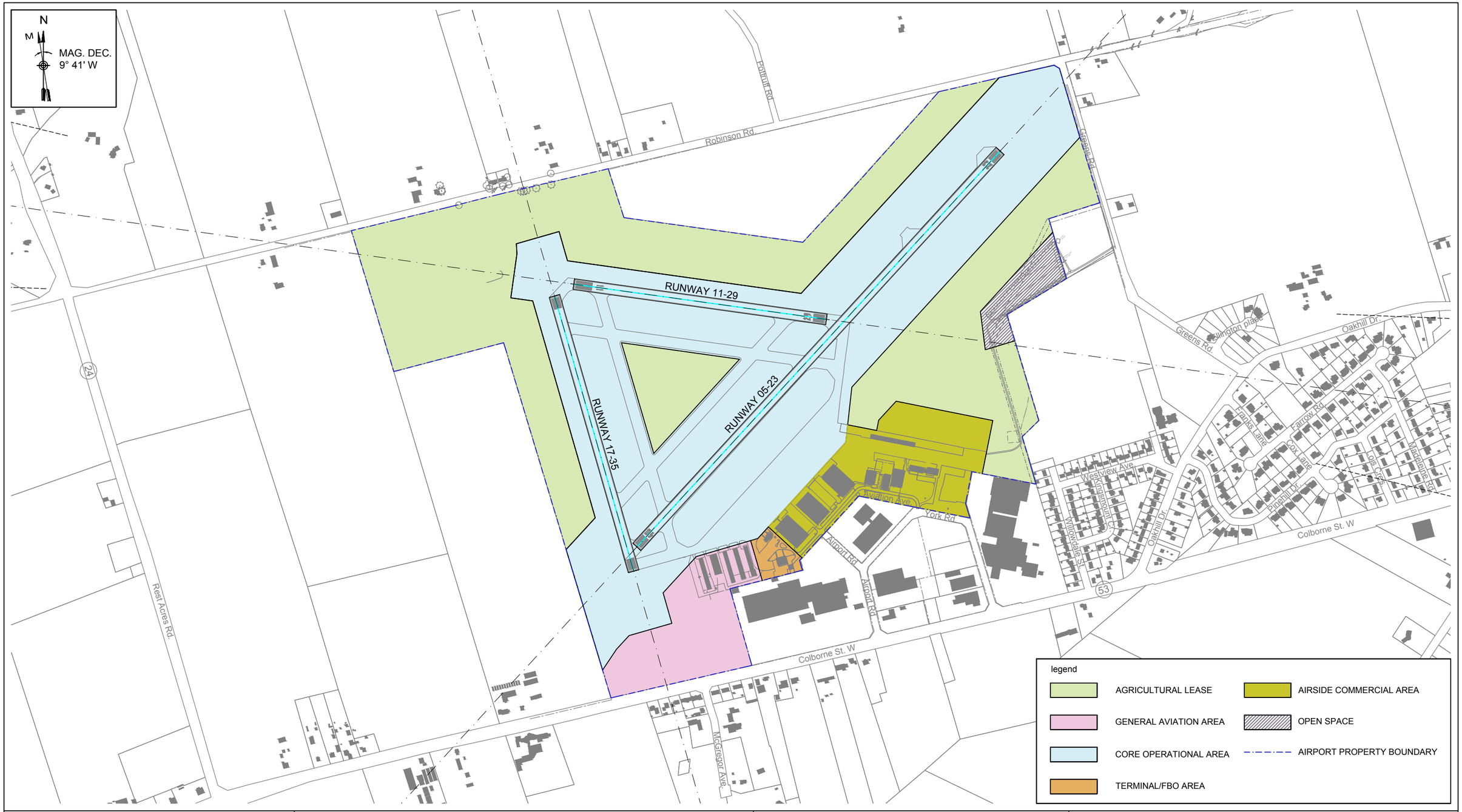
This designation would cover areas unsuitable for development, environmental sensitive areas, and areas required to buffer the Airport from adjacent land uses. Development would not be permitted within this area. Permitted uses would only include those essential for operation and maintenance of the Airport.

Agricultural Lease

This designation would be for lands suitable for agricultural cultivation and production under a short-term lease. These areas could also be reverted to an Open Space Designation

8.6.3 Proposed Land Use Plan

Exhibit 8-8 presents the proposed Current Land Use Plan based on the recommended Airport Business Park concept described above. Meanwhile, Exhibit 8-9 presents the proposed Ultimate Land Use Plan assuming implementation of the proposed Capital Plan and acquisition of the parcel of land immediately to the southwest of the Airport.



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notes
1. Property boundary mapping sourced from County of Brant.

project title
BRANTFORD MUNICIPAL AIRPORT
MASTER PLAN

exhibit title
CURRENT LAND USE PLAN

scale
1cm = 100m
(at 11" x 17" sheet size)
-100 0m 100 200 300 400

date	revision	project no.	exhibit
29 JULY 2016	1	AP1501	8-8

N

M

MAG. DEC.
9° 41' W

RUNWAY 11-29

RUNWAY 05-23

Robinson Rd

Pottruff Rd

Greens Rd

Oakhill Dr

Kilvington place

Parrow Rd

Cox Lane

Hanks Lane

Madelene Rd

Lower Cox Lane

Westview Ave

Kingsmount Ct

Willowdale Cres

Oakhill Dr

Prenelli Dr

Colborne St. W

York Rd

Aviation Ave

Airport Rd

Airport Rd

Rest Acres Rd.

McGregor Ave

24

53

legend

- AGRICULTURAL LEASE
- AIRSIDE COMMERCIAL AREA
- GENERAL AVIATION AREA
- GROUNDSIDE COMMERCIAL AREA
- CORE OPERATIONAL AREA
- OPEN SPACE
- TERMINAL/FBO AREA
- AIRPORT PROPERTY BOUNDARY

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notes
1. Property boundary mapping sourced from County of Brant.

project title
BRANTFORD MUNICIPAL AIRPORT
MASTER PLAN

exhibit title
ULTIMATE LAND USE PLAN

scale
1cm = 100m
(at 11" x 17" sheet size)
-100 0m 100 200 300 400

date	revision	project no.	exhibit
29 JULY 2016	1	AP1501	8-9

9 Capital Plan

Based on the development planning recommendations contained in this report, this section provides a summary of the capital development needs anticipated over a 10-year planning horizon, as well as the probable capital costs for each.

9.1 Basis of Estimation of Probable Capital Costs

The estimation of probable capital costs herein are based on the following assumptions and exclusions:

- The opinion of probable capital costs have been prepared in accordance the Treasury Board of Canada's Class "D" estimation methodology, which are suitable for project planning and concept evaluation, and are indicative of the probable cost of construction which may be incurred based on limited information and engineering assessment.
- All costs are in Year 2016 Canadian dollars and exclude all goods and services tax.
- Each noted construction project will be based on an assumption of a single construction contract.
- The cost estimations include all costs related to labour, material, equipment, shipping, storage, mobilization/demobilization, supervision, testing, surveying, security, commissioning, overhead, profit, bonds, permits and duties.
- The cost estimations do not allow for environmental testing and/or remediation, project financing costs, municipal building permits, municipal development charges, Owner's direct labour costs, and premiums for construction phasing (unless indicated otherwise).
- The cost estimations are based on recently bid projects, recently built projects, estimates from local contractors and professional experience.
- Project management & engineering costs have been assumed to be 12% of the estimated construction cost for civil works and 15% for building facility works and renovations, and include for pre-engineering surveys, geotechnical investigations, architectural/engineering design, approvals, tendering, construction supervision and inspections, and commissioning and certification.
- Project and construction contingencies have been assumed to be 10% of the estimated construction costs. Project and construction contingencies are for design changes and unforeseen site conditions.

9.2 Proposed Airport Capital Program

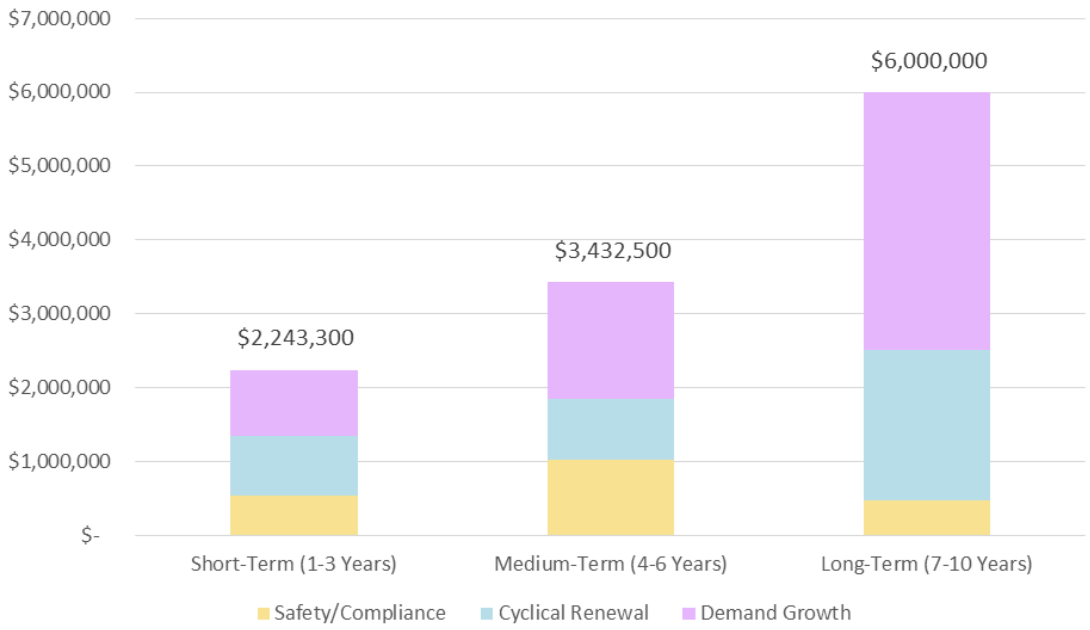
In order to aid the City in prioritizing the proposed Airport Capital Program, each capital item has been categorized as:

- An aviation safety or regulatory compliance item;
  - These are capital works required (a.) to meet applicable Transport Canada TP312 5th Edition aerodrome standards and Canadian Aviation Regulations, (b.) to allow for future certification of the Airport, or (c.) to address specific airfield safety risks identified by the Consultant Team.

- A cyclical infrastructure renewal item;
  - These are capital works which are required in order to replace or rehabilitate infrastructure or building facilities on a recurrent basis due to age, wear and tear, etc.
- A demand growth related item.
  - These are capital works which are required (a.) to eliminate capacity constraints, such as a shortfall of apron parking spaces or hangar units, (b.) allow access to a certain market sector, such as a runway extension to allow access to larger, more demanding aircraft, or (c.) to facilitate new or improved services, such as an aircraft fuelling station or aircraft deicing area.

The total probable cost of the proposed 10-year capital program is $11,675,800 in current 2016 dollars. The costs for specific capital works are listed in Table 9-1 on the following page. Exhibit 9-1 below graphically presents the capital cost amounts broken down by category and by time period, where the time periods are short-term (1-3 years), medium-term (4-6 years) and long-term (7-10 years).

Exhibit 9-1 – Proposed YFD Capital Expenditures by Time Period



Source: Aviotec International Inc.

Exhibits 9-3 through 9-5 present the proposed capital program, overlaid on the airport layout plan, and propose a logical sequence and timing for implementation of the capital items. Each capital item has been colour coded according to its category type and the I.D. number corresponding to the numbering in Table 9-1.

Table 9-1 – Proposed 10-Year Capital Program Summary

I.D. No.	Capital Work Description	Probable Capital Cost (2016)	Capital Implementation Timing									
			2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
PART A - AVIATION SAFETY AND REGULATORY COMPLIANCE												
2	Reconfigure Runways 05 and 35 Intersection and New RESA	$ 134,000		$ 134,000								
3	Airport Vicinity Obstacle Survey and GIS Survey of Airside Surfaces	$ 15,000		$ 15,000								
10	Repairs to Airfield Lighting and Replacement of VASIS Units	$ 200,000		$ 200,000								
4	Airport Perimeter Security Fencing and Vehicle Access Gates	$ 781,000		$ 40,000	$ 154,000			$ 587,000				
7	Decommission Taxiway C and Portion of Taxiway E	$ 288,000				$ 288,000						
8	Correct Grading Within Runway 05-23 Strip	$ 140,000						$ 140,000				
22	Decommission Taxiway D and Convert Runway 17/25 to Taxiway	$ 479,000								$ 40,000	$ 439,000	
	Part A - Aviation Safety & Regulatory Compliance - Subtotal	**$ 2,037,000**	**$ -**	**$ 389,000**	**$ 154,000**	**$ 288,000**	**$ -**	**$ 727,000**	**$ -**	**$ 40,000**	**$ 439,000**	**$ -**
PART B - CYCLICAL INFRASTRUCTURE RENEWAL												
1	Building #180 & #190 - Miscellaneous Repairs and Refurbishment	$ 100,300	$ 100,300									
5	Building #150 - Roof Replacement	$ 657,000		$ 657,000								
12	Rehabilitate Taxiway Bravo and lighting replacements	$ 382,000			$ 45,000	$ 337,000						
13	Building #130 - Miscellanous Repairs and Refurbishment	$ 221,500				$ 221,500						
17	Rehabilitate Eastern Hangar Area Taxiway and Apron Entrances	$ 340,000							$ 40,000	$ 300,000		
18	Building #150 - Miscellaneous Repairs and Refurbishment	$ 745,500								$ 375,500		$ 370,000
15	Miscellaneous Terminal Apron and Runway 11/29 Repairs	$ 370,000				$ 270,000					$ 100,000	
21	Rehabilitation of Runway 11/29 and lighting replacements	$ 670,000							$ 55,000	$ 615,000		
23	Replacement of Hangar Door (20 ft Clear Height)	$ 180,000							$ 180,000			
	Part B - Cyclical Infrastructure Renewal - Subtotal	**$ 3,666,300**	**$ 100,300**	**$ 657,000**	**$ 45,000**	**$ 828,500**	**$ -**	**$ -**	**$ 275,000**	**$1,290,500**	**$ 100,000**	**$ 370,000**
PART C - DEMAND DRIVEN INFRASTRUCTURE												
6	Building #70 - T-Hangar Expansion	$ 472,000		$ 472,000								
9	Aviation Avenue Extension to GA Hangar Area (Phase 1)	$ 390,000		$ 50,000	$ 340,000							
11	New Taxiway to GA Hangar Area	$ 515,500			$ 36,000	$ 269,000				$ 210,500		
14	New Nested T-Hangar Building (102 m x 15 m, 15 units)	$ 1,250,000				$ 60,000	$1,190,000					
16	Road Access To Eastern Hangar Development	$ 655,000						$ 70,000	$ 585,000			
19	Aviation Avenue Extension to GA Hangar Area (Phase 2)	$ 160,000								$ 160,000		
20	New Medium GA Hangar Building (100 m x 33 m, 12 units)	$ 2,530,000								$ 180,000	$2,350,000	
	Part C - Demand Driven Infrastructure - Subtotal	**$ 5,972,500**	**$ -**	**$ 522,000**	**$ 376,000**	**$ 329,000**	**$1,190,000**	**$ 70,000**	**$ 585,000**	**$ 550,500**	**$2,350,000**	**$ -**
PROPOSED AIRPORT CAPITAL PROGRAM - TOTALS		**$ 11,675,800**	**$ 100,300**	**$1,568,000**	**$ 575,000**	**$1,445,500**	**$1,190,000**	**$ 797,000**	**$ 860,000**	**$1,881,000**	**$2,889,000**	**$ 370,000**

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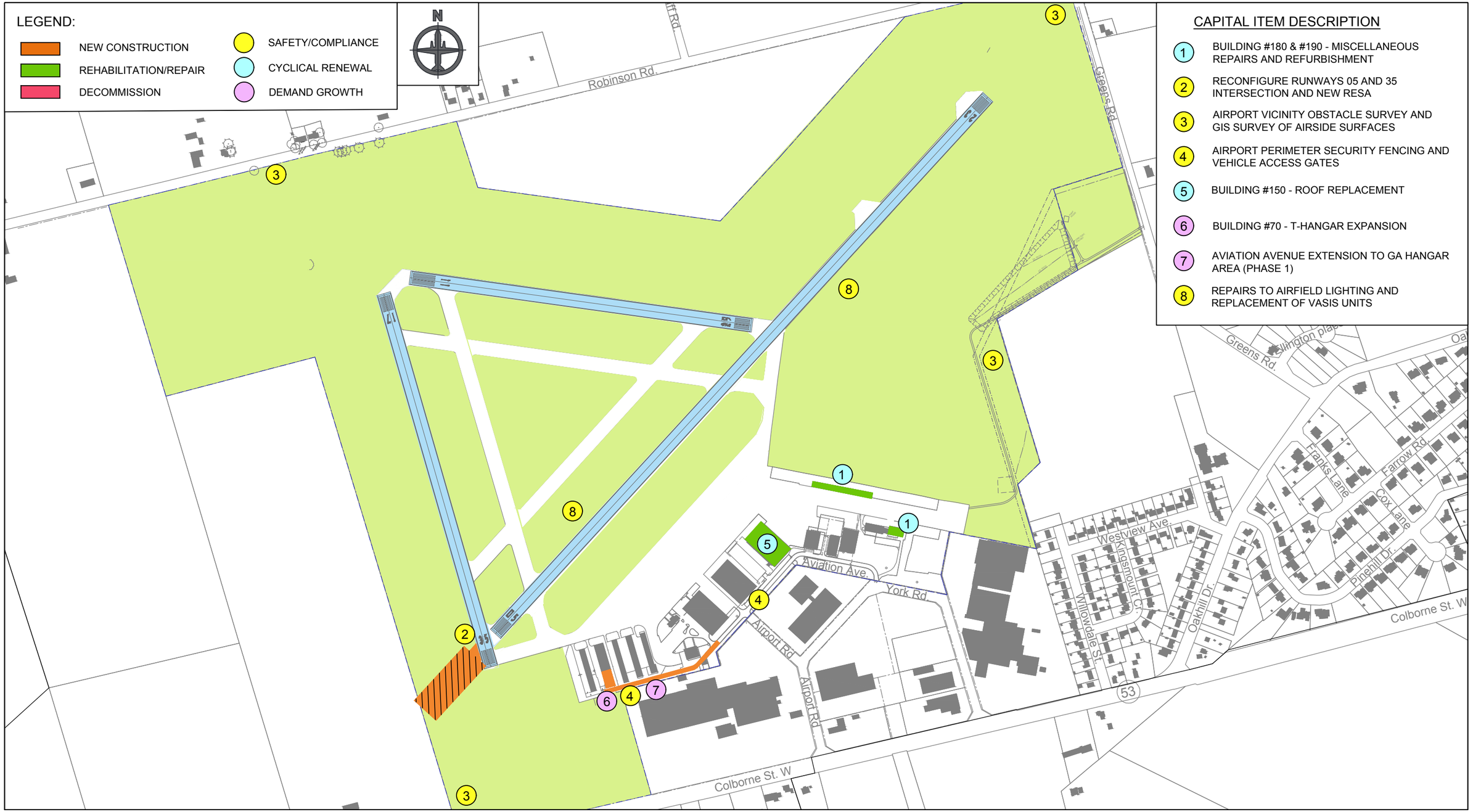
LEGEND:

- NEW CONSTRUCTION
- REHABILITATION/REPAIR
- DECOMMISSION
- SAFETY/COMPLIANCE
- CYCLICAL RENEWAL
- DEMAND GROWTH

N

CAPITAL ITEM DESCRIPTION

1. BUILDING #180 & #190 - MISCELLANEOUS REPAIRS AND REFURBISHMENT
2. RECONFIGURE RUNWAYS 05 AND 35 INTERSECTION AND NEW RESA
3. AIRPORT VICINITY OBSTACLE SURVEY AND GIS SURVEY OF AIRSIDE SURFACES
4. AIRPORT PERIMETER SECURITY FENCING AND VEHICLE ACCESS GATES
5. BUILDING #150 - ROOF REPLACEMENT
6. BUILDING #70 - T-HANGAR EXPANSION
7. AVIATION AVENUE EXTENSION TO GA HANGAR AREA (PHASE 1)
8. REPAIRS TO AIRFIELD LIGHTING AND REPLACEMENT OF VASIS UNITS



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notes
1. Property boundary mapping sourced from County of Brant.

project title
BRANTFORD MUNICIPAL AIRPORT MASTER PLAN

exhibit title
PROPOSED CAPITAL PLAN 2016 - 2018

scale
1cm = 75m
(at 11" x 17" sheet size)
-75 0m 75 150 225 300

date	revision	project no.	exhibit
29 JULY 2016	3	AP1501	9-2

LEGEND:

- NEW CONSTRUCTION
- REHABILITATION/REPAIR
- DECOMMISSION
- SAFETY/COMPLIANCE
- CYCLICAL RENEWAL
- DEMAND GROWTH

N

CAPITAL ITEM DESCRIPTION

4 AIRPORT PERIMETER SECURITY FENCING AND VEHICLE ACCESS GATES

9 DECOMMISSION TAXIWAY C AND PORTION OF TAXIWAY E

10 CORRECT GRADING WITHIN RUNWAY 05/23 STRIP

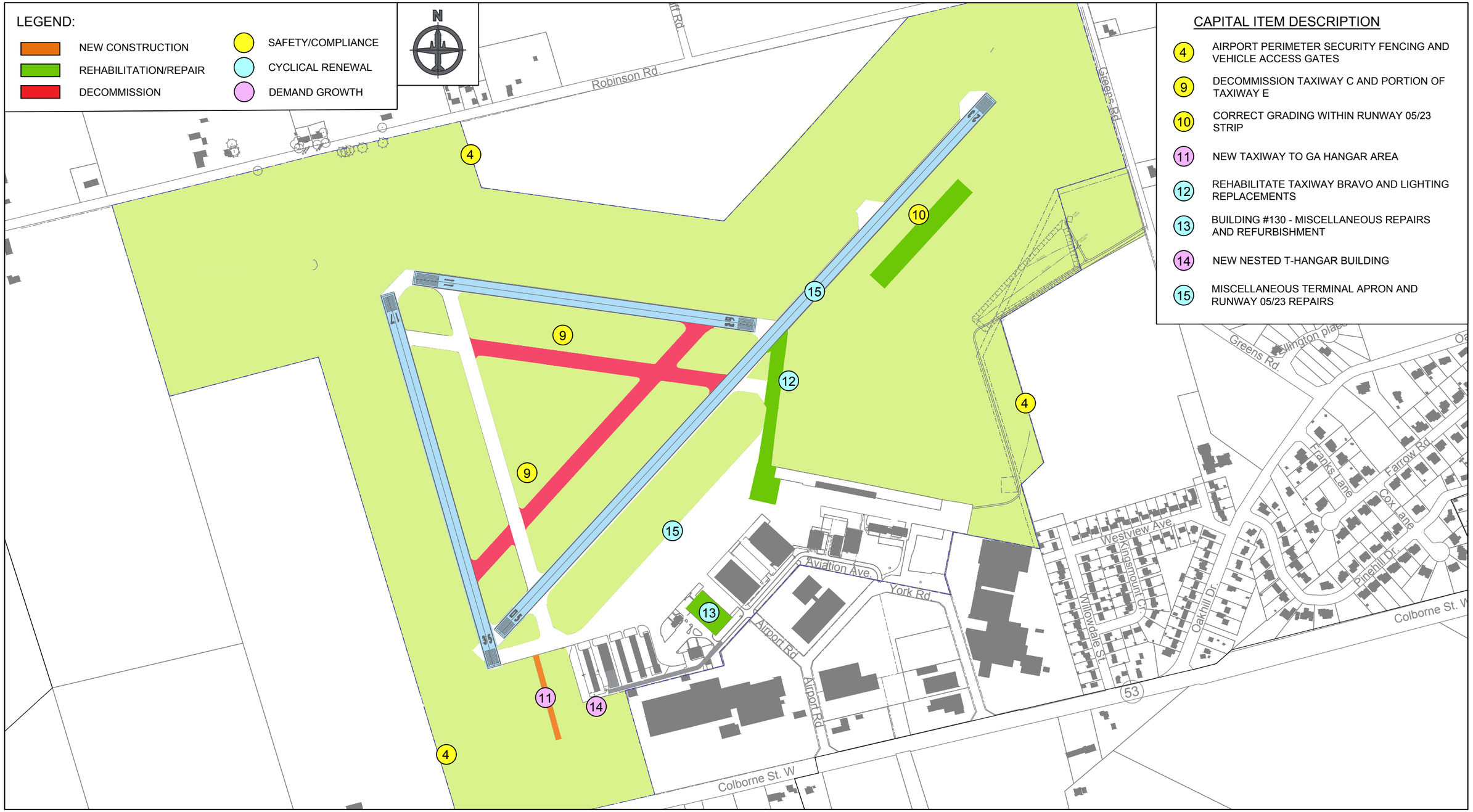
11 NEW TAXIWAY TO GA HANGAR AREA

12 REHABILITATE TAXIWAY BRAVO AND LIGHTING REPLACEMENTS

13 BUILDING #130 - MISCELLANEOUS REPAIRS AND REFURBISHMENT

14 NEW NESTED T-HANGAR BUILDING

15 MISCELLANEOUS TERMINAL APRON AND RUNWAY 05/23 REPAIRS



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notes
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project title
BRANTFORD MUNICIPAL AIRPORT
MASTER PLAN

exhibit title
PROPOSED CAPITAL PLAN
2019 - 2021

scale
1cm = 75m
(at 11" x 17" sheet size)
-75 0m 75 150 225 300

date	revision	project no.	exhibit
29 JULY 2016	3	AP1501	9-3

LEGEND:

- NEW CONSTRUCTION
- REHABILITATION/REPAIR
- DECOMMISSION
- SAFETY/COMPLIANCE
- CYCLICAL RENEWAL
- DEMAND GROWTH

N

CAPITAL ITEM DESCRIPTION

11 NEW TAXIWAY TO GA HANGAR AREA (PHASE 2)

15 MISCELLANEOUS TERMINAL APRON AND RUNWAY 05/23 REPAIRS

16 ROAD ACCESS TO EASTERN HANGAR DEVELOPMENT

17 REHABILITATE EASTERN HANGAR APRON TAXIWAY AND CONNECTIONS

18 BUILDING #150 - MISCELLANEOUS REPAIRS AND REFURBISHMENT

19 AVIATION AVENUE EXTENSION

20 NEW MEDIUM GA HANGAR BUILDING

21 REHABILITATE RUNWAY 11/29 AND LIGHTING REPLACEMENTS

22 DECOMMISSION TAXIWAY D AND CONVERT RUNWAY 17/35 TO TAXIWAY

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notes
1. Property boundary mapping sourced from County of Brant.

project title
BRANTFORD MUNICIPAL AIRPORT MASTER PLAN

exhibit title
PROPOSED CAPITAL PLAN 2022 - 2025

scale
1cm = 75m
(at 11" x 17" sheet size)
-75 0m 75 150 225 300

date	revision	project no.	exhibit
29 JULY 2016	3	AP1501	9-4

10 Financial Analysis

10.1 Introduction

To support the 10-year capital program proposed for YFD, as presented in Section 9, a financial analysis has been undertaken to evaluate various scenarios. Building off of a baseline assessment, four (4) alternative funding scenarios have been developed to outline the implications of various funding commitments.

While not exhaustive, the scenarios explore the potential impacts of:

- securing third party funding through the Transport Canada's Airports Capital Assistance Program (ACAP);
- a contribution from the Brant County via a transfer of equivalent tax contributions;
- a shared service agreement (similar to the existing governance and funding agreements in place for Ambulance, Housing and Long-Term Care) between the City of Brantford and Brant County; and
- the development and collection of enhanced revenues through development charges.

10.2 Baseline Conditions

For context, a baseline assessment and forecast founded on current airport revenues and expenses was undertaken. Under this scenario, the 10-year capital program priorities were limited to only the safety/compliance and cyclical renewal projects, which would be funded through existing sources of revenue, as well as, debt financing.

This scenario recognized that there is limited revenue collection to support enhanced or additional services. The focus for capital delivery is toward state of good repair and mandatory or health and safety related projects only. The baseline scenario results in total projected debt funding (borrowing) needs of approximately $2.13 million over the 10-year forecast and estimated debt servicing requirements of approximately $173,000, when principal repayment begins at the end of the capital program in 2026 (refer to Exhibit 10-1). Overall, the baseline scenario demonstrates the City's ability to support mandatory or critical capital projects while maintaining an operating surplus. However, the Airport's profitability will be reduced roughly by 70% during the 15-year financing period. It should be noted that the capital program being delivered under this scenario will not increase revenues nor expand capacity of the Airport.

Exhibit 10-1 – Baseline Operating Financial Summary

Item	2016 (Budget)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Capital Plan Req'mt	$100,300	$1,046,000	$154,000	$509,500	$45,000	$1,334,000	$275,000	$1,330,500	$539,000	$370,000	$0	$0
Annual Borrowing Need	$0	$452,184	$0	$0	$0	$613,753	$0	$877,801	$187,968	$0	$0	$0
Total Revenue	$705,040	$718,941	$733,120	$747,582	$762,334	$777,380	$792,728	$808,382	$824,350	$840,637	$857,250	$874,195
Total Expense	$529,751	$539,474	$562,641	$572,757	$583,075	$593,600	$622,318	$633,268	$670,156	$687,056	$808,823	$820,675
Surplus/Deficit	**$175,289**	**$179,467**	**$170,479**	**$174,825**	**$179,259**	**$183,780**	**$170,410**	**$175,114**	**$154,194**	**$153,581**	**$48,427**	**$53,520**

Source: Stantec Consulting Ltd.

10.3 New Revenue Opportunities

Given the more significant capital requirements of airport operations and the essential role these projects have on safety, it is important for airport operators to seek diverse revenue opportunities to support their financial requirements. As such, several new revenue generating opportunities have been identified and included in subsequent analyses. These opportunities include:

- Parking revenues;
- Office leases;
- Airport maintenance fees;
- Fuel sales;
- Advertising;
- Snow removal.

In addition to the new revenue opportunities identified above, it is important for the City to receive full value for their existing and future rental agreements. With this in mind, it is recommended that the City adjust their rental agreements to reflect not just the building footprint, but to assess fees for the apron space adjacent to terminals or buildings, as this is essentially designated space that requires on-going maintenance such as resurfacing, maintenance and snow removal.

Beyond the existing revenue opportunities, the proposed development of a new 15 unit T-Hangar and 12 unit GA Hangar will provide additional revenue generating potential. Based on a cursory analysis, the proposed hangar development appears favourable; however, a more comprehensive business case should be completed prior to pursuing these projects. Generally speaking, new hangar development has the potential to increase the City's bottom-line post financing, while also establishing a larger tax base for the Brant County.

10.4 Financial Scenarios

10.4.1 Scenario 1 – Equivalent Tax Contributions + ACAP Funding

Scenario 1 outlines the implications of securing equivalent tax contributions from Brant County along with federal ACAP funding for eligible projects. Assuming that the Airport is able to secure ACAP eligibility in 2019 for funding (based on having the requisite number of scheduled passengers), the Capital Plan projects identified in Table 10-1 could be considered for funding. This scenario is also predicated on the premise that the Brant County would make a financial contribution to the airport equal to the amount of the property taxes received.

With new sources of capital funding, Scenario 1 demonstrates a total borrowing requirement of approximately $3.32 million to support the added costs of the additional growth projects and accommodation of the priority projects within the baseline assessment (refer to Exhibit 10-1).

Table 10-1 – Potential ACAP Eligible Projects

Project I.D.	Eligible Year(s)	Capital Cost
4	2021	$587,000
8	2021	$140,000
12	2020/2021	$382,000
17	2022/2023	$340,000
15	2021/2024	$370,000
21	2022/2023	$670,000
11	2023	$210,500

Source: Stantec Consulting Ltd.
Note: The Project ID numbers correspond with the capital plan projects listed in Section 9.

The premise is that increased revenue can be gained through the expansion or installation of new facilities. In 2026, the annual debt servicing requirements are projected to be approximately $269,000 with completion of the capital program. By 2027, when the proposed GA hangars, if constructed, could be fully occupied[15], the Airport is projected to reach an operating surplus of roughly $182,000 with financial benefits to be realized upon debt repayment. Meanwhile, Brant County's investment in the airport operations and capital would result in a significant increase to the future tax revenue received from the airport (approximate double current revenues).

Exhibit 10-2 – Scenario 1 Financial Summary

Item	2016 (Budget)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Capital Plan Req'mt	$100,300	$1,568,000	$530,000	$838,500	$1,235,000	$1,404,000	$860,000	$1,881,000	$2,889,000	$370,000	$0	$0
Annual Borrowing Need	$0	$744,748	$0	$206,066	$595,767	$0	$0	$0	$1,769,409	$0	$0	$0
Total Revenue	$705,040	$917,237	$938,160	$959,584	$981,523	$1,023,588	$1,067,392	$1,113,004	$1,160,496	$1,242,036	$1,305,059	$1,370,264
Total Expense	$529,751	$616,974	$650,263	$661,960	$679,929	$748,923	$763,844	$779,195	$794,995	$967,937	$1,162,948	$1,188,330
Surplus/Deficit	**$175,289**	**$300,263**	**$287,897**	**$297,624**	**$301,594**	**$274,665**	**$303,548**	**$333,809**	**$365,501**	**$274,099**	**$142,111**	**$181,934**

Source: Stantec Consulting Ltd.

10.4.2 Scenario 2 – Shared Service Agreement + ACAP Funding

Scenario 2 is modeled on similar shared service agreements (SSA) between the City of Brantford and Brant County where costs and revenues are shared 71%/29% by the City and County respectively. Essentially, the objective of this scenario is to enable a comparison of the equivalent tax contributions assumed in Scenario 1 (refer to Exhibit 10-2). This comparative analysis will ensure recommendations that are in the best interest of the City and Brant County.

[15] Assumes new hangar developments implemented in 2020 (charged at $379 per month and adjusted for inflation and cost recovery) and in 2024 (charged at $530 per month and adjusted for inflation and cost recovery).

Exhibit 10-3 – Comparative Analysis of SSA vs. Equivalent Tax Contributions

Item	2017	2018	2019	2020	2021	2022	2023	2024	2025
Capital Plan Req'mt	$1,568,000	$530,000	$838,500	$1,235,000	$1,404,000	$860,000	$1,881,000	$2,889,000	$370,000
29% Contribution	$345,897	$63,882	$150,526	$250,863	$0	$89,627	$141,789	$692,574	$0
Equivalent Tax Contribution	$108,640	$110,813	$113,029	$115,290	$150,434	$153,443	$156,512	$159,642	$241,033
Net Financial Position	$237,257	$46,931	$37,497	$135,573	$150,434	$63,816	$14,723	$532,932	$241,033
Cumulative Financial Position	**$237,257**	**$190,326**	**$227,823**	**$363,396**	**$212,962**	**$149,146**	**$134,423**	**$667,355**	**$426,322**

Source: Stantec Consulting Ltd.

Overall, Scenario 2 demonstrates a financial benefit of $426,322 for Brant County by pursuing equivalent tax contributions over a shared service agreement. While Brant County would achieve the same net increase in their tax base, contributing 29% of the capital requirements is less favourable to Brant County and is particularly influenced by the significant capital requirements in 2024. Based on these results, Scenario 2 is not recommended. However, this approach is consistent with existing agreements of shared service delivery between the City and County.

10.4.3 Scenario 3 – Equivalent Tax Contributions Only

With the understanding that growth will provide Brant County with an increased tax revenue base and that equivalent tax contributions are the County's most favourable funding alternative, Scenario 3 is intended to outline the implications of the Airport not becoming eligible for ACAP funding. Specifically, this scenario demonstrates the implications of funding all projects in the proposed capital program without qualifying or receiving ACAP funding contributions.

Without ACAP funding, the City would assume a total debt of approximately $5.73 million in order to fund the recommended capital program (refer to Exhibit 10-4). With a resulting annual debt servicing requirement of roughly $464,000, the Airport would incur annual operating deficits of approximately $10,000 when all hangar units are fully occupied in 2027. Ultimately, Scenario 3 demonstrates the critical importance of securing ACAP funding should the City elect to pursue all of the capital projects through a debt financing model.

Exhibit 10-4 – Scenario 3 Financial Summary

Item	2016 (Budget)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Capital Plan Req'mt	$100,300	$1,568,000	$530,000	$838,500	$1,235,000	$1,404,000	$860,000	$1,881,000	$2,889,000	$370,000	$0	$0
Annual Borrowing Need	$0	$638,238	$0	$199,825	$632,963	$739,404	$180,431	$1,168,547	$2,171,027	$0	$0	$0
Total Revenue	$705,040	$917,237	$938,160	$959,584	$981,523	$1,023,588	$1,067,392	$1,113,004	$1,160,496	$1,242,036	$1,305,059	$1,370,264
Total Expense	$529,751	$616,974	$647,142	$658,839	$675,529	$745,582	$782,133	$802,737	$852,741	$1,037,414	$1,354,948	$1,380,331
Surplus/Deficit	**$175,289**	**$300,263**	**$291,018**	**$300,745**	**$305,994**	**$278,006**	**$285,259**	**$310,267**	**$307,755**	**$204,622**	**$ (49,889)**	**$ (10,067)**

Source: Stantec Consulting Ltd.

10.4.4 Scenario 4 – Private Development Charges

With Scenario 3 outlining the importance of securing third party ACAP funding in an environment where the City relies on debt financing, Scenario 4 outlines the potential of implementing and receiving private development charges for third party hangar development. While the Airport will forego future revenues from these facilities, the total borrowing requirements of $2.92 million would be supported by development

fees of approximately $374,000 and no commitment from Brant County (refer to Exhibit 10-5). In 2026, annual debt servicing requirements would be roughly $236,000 and the Airport's profits would exceed today's current environment at roughly $185,000, with recognition for new revenue streams.

Exhibit 10-5 – Scenario 4 Financial Summary

Item	2016 (Budget)	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Capital Plan Req'mt	$100,300	$1,568,000	$530,000	$778,500	$45,000	$1,404,000	$860,000	$1,701,000	$539,000	$370,000	$0	$0
Annual Borrowing Need	$0	$853,388	$70,499	$195,485	$0	$482,386	$371,156	$946,091	$0	$0	$0	$0
Total Revenue	$705,040	$917,237	$938,160	$959,584	$981,523	$1,004,594	$1,028,264	$1,052,551	$1,077,475	$1,105,247	$1,133,369	$1,162,628
Total Expense	$529,751	$616,974	$653,446	$667,209	$684,867	$701,970	$728,616	$752,252	$792,990	$827,105	$948,502	$962,983
Surplus/Deficit	**$175,289**	**$300,263**	**$284,714**	**$292,375**	**$296,656**	**$302,624**	**$299,648**	**$300,299**	**$284,485**	**$278,142**	**$184,867**	**$199,645**

Source: Stantec Consulting Ltd.

10.5 Evaluation and Conclusions

Since Scenario 2 is not being recommended due to the less favourable position for Brant County, the 2016 budget, baseline scenario, and three (3) remaining financial scenarios were evaluated against the following four (4) criteria:

- Municipal tax base;
- Airport profitability;
- Total airport debt; and
- Potential profitability.

While it is recognized that a number of additional criteria could be considered, including overall risk, airport capacity to support growth, and demand for hangar development, among others, the four criteria identified above will establish a strong basis for decision-making. The results of the evaluation of the three financial scenarios is summarized in Table 10-2.

Table 10-2 – Summary of Financial Scenarios Evaluation

Criteria	2016 Budget	Baseline	Scenario 1	Scenario 3	Scenario 4
Municipal Tax Base (projected 2027)	$106,510	$132,432	$250,771	$250,771	Airport: $132,432 3rd Party: $118,339
Operating Surplus/Deficit (projected 2027)	$175,289	$53,520	$181,934	$(10,067)	$199,644
Total Airport Debt	n/a	$2,131,706	$3,315,990	$5,730,435	$2,919,005
Potential Profitability (post financing)	n/a	$226,126	$450,432	$450,432	$435,998

Source: Stantec Consulting Ltd.

Based on a cursory analysis, Scenario 1 'Equivalent Tax Contributions + ACAP Funding' and Scenario 4 'Private Development Charges' are the most appealing alternatives. When comparing these scenarios, it is important to note that Scenario 4 does not include federal ACAP funding, which is dependent on the Airport's capacity and the involvement of third party developers. From the City's perspective, Scenario 4 may be the most favorable based on overall risk; however, there is some uncertainty associated with the projected future profitability of the proposed new hangar development. More specifically, the heuristic approach to this analysis demonstrates only moderate profitability of the new hangar development for YFD. Going forward, a more comprehensive business case should be conducted to assess this opportunity and establish a strategic direction. From Brant County's perspective, Scenario 4 will be more appealing scenarios since the County would have the potential to achieve the same overall tax base without actually contributing to the capital program.

In conclusion, a number of alternative funding scenarios are capable of supporting the Airport's capital program. In the short-term, the Airport can benefit by implementing new revenue generating programs to proactively address capital requirements, while initiating a more comprehensive assessment of new hangar development. Based on the results of this assessment, the City may wish to maintain ownership of these facilities and would require external funding to achieve beneficial results. Both ACAP funding and equivalent tax contributions from Brant County have been identified as potential sources of funding. Under this scenario, Brant County would forego mid-term tax revenues with a roughly 10-year payback period post project completion. In the event that new hangar development is not in the City's best interests, both the City and Brant County should consider collaborating to attract third party developers under a new development charge scenario.

11 Business Strategy and Marketing

11.1 Governance and Setting Direction

11.1.1 Setting a Strategic Direction

The Airport requires a regional focus and is conflicted by its ownership and locational challenges. The recent Memorandum of Understanding (MOU) within the boundary discussion agreement signed in January 2016 between the City of Brantford and the Brant County addresses land transfers to accommodate the growth projections of the City of Brantford out to 2041. Although the MOU did not directly address the Airport lands, it does reference it as an area of discussion and possible future consideration for improved cooperation, collaboration and mutual benefit (identified within the MOU as a joint venture area). The concept of shared services and the County and City working together through joint ventures to service and develop lands to achieve mutual economic benefits was considered in a broad sense in the MOU for future discussion.

The Airport and its longer term strategic plan can best be aligned with the City and the County interests if there is a shared stake in the assets and operations. The Master Plan addresses the capacity requirements necessary to accommodate improvements in the infrastructure, as well as, the protections necessary to accommodate future growth and activity at the Airport in order to serve the region. The demand is market driven and requires careful business development and marketing. This can only be achieved through a common vision and ability to execute that vision. Based on the findings of this study, our recommendation is that the existing operating model is not conducive to executing and financing the required improvements in neither the airport infrastructure nor the strategic investments targeting demand in the facility to improve the Airport's economic impact across the Brant/Brantford region.

The Airport and surrounding region would benefit from formalizing the governance and responsibility into a shared asset and operating model, and the MOU and other shared facility agreements in the region provide examples of the success of the collaboration. There are variants of the model that can include items such as a cost sharing model (similar to that of other City/County joint service agreements, for example population based financial splits of 70%/30% for example) and in-kind recognition of services provided to the Airport by both the City and the County. This also has the advantage of improving the level of service for the Airport in areas such as groundside maintenance and emergency response that can potentially be better supplied by the County and its maintenance and emergency response capabilities in the vicinity. While the County does have representation on the Airport Board, to date the financial obligations and responsibilities falls solely on the City of Brantford. The saying 'form follows function' speaks to governance and correctly asserts that the appropriate governance structure can best be structured once the functional areas that are needed are determined, including who is to provide what support and services. This means that the formal structure will evolve as discussion and agreements are put into place for the functional areas of service and support required for the shared vision of the Airport.

The financial model in Section 10 refers to a shared ownership concept that can fully implement the Master Plan capital priorities and combines this with revenue improvements (assumptions are identified). The future success of the Airport and a strengthened regional presence depends on clarity of the role the Airport is to serve in the region and establishing future directions that can be achieved through strong leadership and stewardship on behalf of the constituents and aviation community.

11.1.2 Oversight and Control

The second principle of governance is to provide oversight and control and the two key aspects are accountability and responsibility. The airport and its governance model should be accountable to its owners and their constituents and have clarity on what are the areas of responsibility to be performed by the scarce resources available. The MOU may provide an opportunity for this aspect of the governance model and form to be reviewed.

The operating costs, as well as, the capital investments require clarity on both the accountability and responsibility for the Airport. The Airport includes several large and high value facilities, such as the old wartime hangars, which at some point will require replacement or major upgrades. While the City has been able to maintain assets as best as possible with limited financial resources, significant capital needs and backlogs exist that will put extreme pressure on the Airport budget. It should be noted, that this capital investment is required to sustain Airport operations and it will be necessary to provide the levels of service expected by tenants.

11.2 Improving the Service Delivery Model

11.2.1 Fees and Charges Assessment – Southern Ontario

The Brantford Airport has maintained a fee structure for aeronautical activity that is competitive in the region (refer to Tables D.1 to D.4 in Appendix D) but there is room for minor improvements that will increase overall revenues. It should be noted that current rental rates, while generally consistent with other airports in the region, does not take into account the significant deferred capital (or capital backlog). Hence, rental rates at the current level are likely not adequate to bring the buildings and site to a proper state of repair. The Airport does not charge a landing fee or assess terminal fees (other than for commercial turbine aircraft) due to the lack of regular scheduled service. Aircraft parking is an opportunity to generate additional revenues and parking charges could be collected for aircraft parking over 2 hours (unless they are purchasing fuel) as an example of an approach for additional revenues.

The Airport's non-aeronautical fees and charges include competitive land lease rents with other airports in Southern Ontario of similar role and size. Nevertheless, there are aspects of the rent determination that could be improved, including adding escalating rental clauses and the introduction of an Airport Maintenance Charge. The vehicle parking is also free and there is no parking plan or fees for tenant or employee parking (although there is some reference in the leases, it is not clear as to the overall parking for tenant customers and rate reviews). The Airport, although likely needing to maintain free parking for the area around the flying club facility and the restaurant, should include a revised approach to parking vehicles and designate spots to tenants (both electrified or no power stalls) to use for employees and visitors. This could also consider a pay and display system for stalls.[16] This approach also should extend to the T-hangar areas and establish 'groundside' parking stalls for the occupants/tenants and have a monthly fee for the lot to be pro-rated (or on a designated stall basis). This would also work to support and complement the improved airside security enforcement that is needed at the Airport. Other potential Airport fees would include advertising for businesses in the region, such as hotels and tourism locations and other common services such as snow removal.

The facilities at the Airport are largely owned by the City of Brantford and the 'improvements' are not

[16] The enforcement of a parking system would fall under the Brant County and would require further discussion.

fully compensated by the tenants to a level that ensures land rents/space rent, utilities/common area charges and taxes are paid. This would require a well communicated, phased in approach to implementing for existing tenants. It is highly recommended that the Airport maintain the property ownership it presently has and work to accommodate the future compatible development of tenant improvements with lease terms that are favourable to the development and its financing arrangements. The Airport (and City) may want to consider selling the improvements and implementing land leases (facilities) to tenants (as is) to further solidify the tenancy commitment and transfer the development and maintenance costs to the tenants. Favourable leases could be committed to for the land lease terms. The avoidance of future capital costs in older facilities and a longer term commitment from tenants is a lower risk approach although fewer revenues are available (this was not considered as a scenario). If there are circumstances that can facilitate a 'fee simple' sale of land and a severing of property from the site, it should be within areas deemed surplus to the airport site, generally at the peripheral and, if airside access is required, there should be a 'through the fence' licence fee implemented for the development. However, the City should give serious consideration to the development capacity of the site prior to deeming any land surplus within the current airport property. The 'through the fence' arrangements are not the norm and not common as the best practice is to own the land and lease to tenants. In some cases, though it can make sense and in these cases, the licence fee is set to recover all costs associated with maintaining the access and fence line of airside area but the maintaining of the area for snow clearing, etc. as well as a fee for the use of the airport. This would require a separate calculation based on the method selected. It could be a per-use fee or an annual licence fee for the right to have a gate and access whether it is used or not. This can be revoked if the off-site tenant does not comply with the Airport policies.

11.2.2 Airport Model for Success

The review and analysis of the market (including services, fees and charges), and the stakeholder inputs and independent assessment of the existing airport environment has identified eight core areas of focus as key factors for success the Airport (as presented in Exhibit 11-1 and described below).

Exhibit 11-1 – Recommended Airport Model for Success

Source: Aviotec International Inc.

1. A Diversified Revenue Stream – the aeronautical and non-aeronautical revenues both have areas noted in the previous section added into the financial plan projections. The airport can benefit from increased activity from the flying club, tenant development, new revenues through parking, on site fuelling services, advertising and cost recovery items such as snow clearing.

2. A Strong Regional Brand – the Airport is largely 'flying under the radar' in the region and can improve its marketing through a strong identity and brand that is supported through signage and a marketing program that increases traffic for the site. The program should really target the general aviation community both in the US and Canada as a stop enroute for travels around the Great Lakes. The support for maintenance availability is also a key element of this program.

3. Awareness of its Regional Economic Catalyst Role – the airport is a contributor to the region directly as well as indirectly on a tertiary basis. The airport creates jobs and supports the region and its business and public sector partners through its airfield. As an example, the W. Ross Macdonald School for the blind and blind/deaf is the only school of its kind in Canada and is a strong benefactor of the airport's services to fly in and out its students from all regions of Ontario as well as other provinces or territories in Canada. The airport needs to establish its economic impact through an economic impact study and include it in all promotion to build regional support for the airport. This should be conducted at a point when the governance issues are resolved to optimize the regional benefits.

4. High Standards of Facilities and Services – the level of service for the site can be enhanced in several areas and this can translate into higher fees and revenue while improving the reputation of the site for the general aviation community. The investment for the facilities improvements requires a careful review and may consider private investment by tenants in return for new lease term arrangements. The service delivery model can also benefit from provision of some local Brant County services that would be both responsive and provide an alternative cost effective approach. This would include the parking enforcement, snow clearing, fire response, and other items.

5. A Corporate and Business Aircraft Friendly Environment – the improved facilities, publishing available on site fuelling, strong reputation for aircraft maintenance services, combined with a very reliable air space and a friendly airport community with easy to find and affordable accommodations, will provide the foundation for a strong option for GA pilots and potentially corporate aircraft in future.

6. Efforts to Recognize Commercial Flights as Scheduled Service – this is a significant challenge to establish the requirements for eligibility for the airport capital assistance program (ACAP) as the airport must have 3 years of scheduled passenger traffic of 1,000 passengers or higher for eligibility. The effort to establish the requisite activity level is of great value as it provides substantial capital funding support to the Airport.

7. An Aviation Business Park – there is a critical mass of industrial and commercial development businesses adjacent to the Airport. The industrial areas are busy both on and off the airport entrance way but there is little 'business park' locational information and acknowledgement for the proprietors and occupants to enhance the land values and clustering benefits for the airport. This is a new marketing opportunity that will be further addressed in the next section.

8. Protection of the airport area and its surrounding lands with appropriate land use and controls – the airport has a caveat to protect the lands it owns but the adjacent lands can be an extension of airport compatible development or it can be a threat to the airport. The land use both on the

airport and in the vicinity of the airport requires address to protect the long term investment of the airport and its airfield assets (the City of Brantford did acquire a few residential properties beyond the Runway 23 threshold and this was a positive development).

11.2.3 Business Development Priorities

The success factors, described above, are the basis for the business development priorities for the Airport. It is recommended that the most significant success factor is to establish a revamped governance model for the airport. The ability to implement and finance the infrastructure improvements is enhanced through a regional and collaborative structure. This can be implemented through an extension of the approach outlined in the early 2016 MOU between the County and City. It should be noted that the highest cost after the management contract is the airport property taxes paid by the City of Brantford and airport tenants to the County. The payment of taxes is a potential area for future discussion related to the governance model and roles of the County and City.

The second part of the governance equation is to determine the operational oversight and management of the airport. The BFC is the current airside operator and, if third party airside management is to be continued, there is a requirement to be very clear on the contract terms, expectations and responsibilities. It is a management contract and the investments in new facilities should be carefully separated from the management contract. As an example, there are proposals from the BFC to develop the fueling facilities and this should be made by the Airport rather than the management contractor.

The work on the other success factors can also commence quickly with efforts to establish the key resources for planning and coordination. The success factors all require shared equity in time as well as investments and the time element is needed first to formalize the specific plan details for several initiatives.

Revenue diversification areas, as per the financial plan, will require a formal implementation plan and phased in update to the fees and charges publication for the site. This will require a timeline for approvals for the updated fees as well as proper communication with tenants of any revised fees. In some cases, the fees will require service improvements or new program prior to implementation. The parking fees, for example, will require the establishment of a parking plan for the airport and a development plan for expanding the program to T-hangar tenants once the facilities are in place.

The commercial land development and lease management areas hold good potential for the airport but do require physical changes to the existing infrastructure to fully pursue the development. It should be noted that the existing transfers to reserves based on revenue projections do not address the future capital program requirements and the financial plan developed for this report addresses this short coming. In advance of the physical changes and investment, the planning and preparation can be started and this would include survey work as well as servicing analysis and, in some cases potential demolition. Once this work is completed, the following commercial efforts can be fully developed:

- Reorganize terminal area (relocate AMO, fuel facility, and create better tenant access to T-hangars).
- With the proposed Rwy17/35 closure, ability to develop additional T-hangar areas.
- Redevelopment for future large-scale hangar facility to the east area of site upon relocation or removal of City records/ equipment storage facility. This would include the T-hangar building to be demolished and redeveloped with expansion. The apron will require rehabilitation.

- Begin planning for new hangar line developments with interested parties (Aircraft Spruce).

Another challenge is that the rents and charges for some space have evolved to a 'net' arrangement rather than a transparency for the rates and value of the airport's main terminal space and use of the asset. The City has indicated that the rent arrangement with the BFC has been adjusted with full value established for the terminal space and the management contract also reflecting the real costs of managing the airport. In short, the BFC is paying a land lease for the space their facilities are occupying outside of the current airside operations contract.

Areas such as cost recovery can be improved through full metering and leases that state cost recovery terms and conditions. Service offerings such as snow clearing can be priced and promoted for the upcoming season. Advertising is an opportunity that can be outlined but will need to be coordinated with the value added in the site through increased awareness and brand development. There is also a benefit to assess the concession programs, which are currently run by the BFC, at the airport and look at the hours of operation and other ways to complement the restaurant offerings at the site. This could include the City taking a more active leadership role on the provision of concession services. However, this would also require additional capital as the City does not currently have space to offer these services, Coordination of services and response times should also be examined as part of the 'governance inputs and contributions' for the airport from both the city and County. In a simplistic way, the administration, accounting, property management and revenue development or City responsibilities and consideration under a new governance model could see maintenance support in some areas from the County which will potentially reduce the management costs for the site.

The Brand Development program will be explored in the marketing area but would be enhanced with the establishment of a 'Regional Marketing Team' to brainstorm the elements of the program and steps to move forward. Part of the Brand also benefits from the strength of the airport's economic impact for the region. This is an important aspect of connecting with the local community and political leaders. If an economic impact study has not been completed for the airport, this is a lower cost investment that can be initiated in the immediate term.

The service levels may have to be implemented in phases as the management services are clarified and some important and visible infrastructure and programming changes are put in place. An early signal of change in operations is the area of security and the program can be documented and start with fencing to introduce the changes. The installation of additional security equipment can be added as the program expands including secure access gates and access card systems. Other areas such as fuel facilities and requirements can be planned (through separate planning study) and will require the installation of the facilities before they can be introduced.

The targeting of the corporate and general aviation market will require a detailed plan and timing aligned with its existing and future investments in service expansion initiatives. This initiative will benefit from the key GA tenant service companies' participation and ideas. The establishment of a core group can be initiated immediately.

Scheduled passenger service establishment is an initiative that may not be possible in the short term but the awareness of the issues and alternatives to access available federal funding associated with a registered airport is an important starting point. The Build Canada fund may provide some critical airport infrastructure support that will leverage both Provincial support and the collaborative municipal funding efforts to accelerate the Master Plan infrastructure priorities as identified in the Financial Plan. There was a scenario provided in the Financial Plan that did not access ACAP funding and achieved a sustainable program for the future. The airport and its previously suggested 'Regional Marketing Team' can also pursue some commercial services efforts that could supplement the contract for the school or

provide regular service for the region, including First Nations. A survey of the local community air service connections may be beneficial in determining a good destination such as Ottawa.

The communication and efforts to build off the rebranding and integrate/coordinate the industrial businesses in the adjacent properties at the airport into an airport industrial park can commence immediately. The formal development of the brand will be required prior to the design of signage and promotion material. The conversations and selling of the concept and benefits can be started once the airport marketing team is established.

Lastly, the protection of the airport is essential and the planning bylaws as well as coordinated vicinity planning that extends beyond the airport boundaries is needed. This is another area that can be developed consistent with the Master Plan future planning requirements. It should also identify the protection areas for long-term development and acquire land as it becomes available. This would include acquiring lands beyond the Runway 05/23 ends to protect for future commercial development.

11.3 Recommended Marketing Program

11.3.1 Building Awareness

Linkages and Synergy

Linkages to other organizations that can build synergy and awareness is important for the airport. The airport currently has some of these in place but lacks in establishing the 'value added' regional connections with hotels, tourism organizations and other regional services that both serve the region and differentiate it from other GA airport markets. The airport marketing program benefits from outreach with these strong organizations and regular communications and information exchange. The connection to the website will also be noted in the brand development.

Formalize Partnerships

Formalizing partnerships (possibly with First Nations, education, industrial parks) is essential to a strong marketing program and sustainable airport. An airport can gain valuable support and leveraged resource access to talent and contacts that will build the demand for the services offered. The airport and its revamped governance model must identify the key organization resources to reach out to these organizations as it is not appropriate to have this assigned in the management contract. This is a senior responsibility that the owner should take on and there needs to be clarity of the role and 'what the ask is' in establishing the partnerships.

Airport Business Association

Create an airport business association for airport marketing. The airport should establish this as a broader tenants association that can expand and connect with the adjacent industrial businesses as part of a concentration of activity in an 'Airport Business Park'. This can include monthly electronic updates to all members as well as meetings and cooperative marketing efforts as well. It again is built on the leveraged support that the members can bring to the airport and the expanded word of mouth in the community through positive messaging.

Signage & Way-finding

Once the airport network has expanded through linkages in the community, exploring and formalizing

the partnerships, and establishing an Airport Business Association, the Airport and its expanded marketplace would really benefit from the investment in branded Signage and a wayfinding program to raise awareness for the airport. This program should be built on the brand and be reviewed by all the partners but the design should be created by professional brand experts and approved through the new governance organization. For example, the Niagara District Airport, in St. Catharines, has recently implemented signage to address very similar conditions and challenges (refer to Appendix D.4).

11.3.2 Brand Development

Website Evaluation

The existing website is an outdated and static site that is not positioned as an active part of the site marketing efforts. It is not an interactive site and has dated information, including the airshow from 2015 still listed on the site. The front page of the site should be clean and easy to connect to tabs that transfer the user to the section or contact or information that is necessary. Some good sites have key personnel linked through to clicks with e-mail links, Linked-in hyper-links, contact phone numbers as well as digital business cards on the site. The rates and charges, as well as hours of operation, should be clearly displayed.

The site does not have clear directions as to how to get to the airport or a google map link. It also would benefit from connecting to the local market and have information and hyper-links to local hotels or accommodations as well as restaurants and other tourism related services. This can eventually be paid advertising or click through referrals.

The airport website should incorporate the airport revitalized brand as a main visual statement for the site.

The Regional Marketing Team

A 'Regional Marketing Team' should be established with the regional and City economic development officers supplemented by a marketing coordinator position and representation from the tenants. This team would be engaged to establish the new brand, be tasked with the revamping of the website and overseeing initiatives noted in the previous section such as a local market survey (through the revamped website and/or through other household mailers linked to on-line tools such as survey monkey). The marketing team, upon establishing its role, can lead other areas of airport development for the region such as air service development and general aviation marketing and support to the aircraft maintenance efforts of the core of tenants in this area of specialization already situated at the airport as an anchor business activity.

11.4 Recommended Action Plan

Based on the foregoing discussions and recommendations, Table 11-1 on the following page presents the consolidated Airport Business Development and Marketing action plan for the City including proposed timing.

Table 11-1 –Business Development and Marketing Action Plan

	AIRPORT INITIATIVES	TIMING
A.	**Governance and Setting Direction**	
1)	Establish a shared services/ownership model for the Airport.	Q4 / 2016
2)	Determine services for Management Contract.	Q3 / 2016
3)	Finalize Management Contract.	Q3 / 2016
4)	Review and expand the Advisory Role of the Airport Board.	Q1 / 2017
B.	**Business Development Priorities**	
1)	Establish and approve Master Plan and associated Land Use Plan.	Q2 / 2016
2)	Initiate Airport Business Park Concept with on and off airport tenants.	Q3 / 2016
3)	Finalize development plan with Aircraft Spruce (note this will determine whether a 'through the fence' arrangement is required).	Q3 / 2016
4)	Update the inventory of assets and establish a current asset condition report.	Q4 / 2016
5)	Initiate work on establishing a parking program and plan for airport and tenants.	Q4 / 2016
6)	Develop the airfield fencing and security program for Year 2017 Capital Plan.	Q4 / 2016
7)	Evaluate and prepare safety program and fire protection upgrades for the airport for Year 2017 Capital Plan.	Q1 / 2017
8)	Review the costs associated with common areas and establish an AMC for land uses.	Q3 / 2016
9)	Revisit land rents and provide annual rate increases to CPI.	Q3 / 2016
10)	Undertake a business case analysis for on-site aircraft fuelling facility.	Q1 / 2017
11)	Establish an airport advertising program for both on-site and online ads.	Q1 / 2017
12)	Initiate an Economic Impact Study to utilize in the branding and positioning of the Airport in 2017 and beyond.	Q3 / 2016
13)	Identify sensitive lands outside of Airport for airport upcoming additional planning opportunistic acquisition.	Q3 / 2016
14)	Initiate legal survey work for land development as well as servicing capacity analysis/assessment for future development (this can also include IT requirements)	Q4 / 2016
15)	Establish a demolition plan for removal of old structures.	Q1 / 2017
16)	Commence discussions with community partners and contract carrier for expansion into limited scheduled service.	Q1 / 2017
C.	**Marketing Strategies**	
1)	Establish a regional marketing team with Economic Development officers and Public Relations communications staff from the City, County and aviation community.	Q3 / 2016
2)	Establish a refreshed "Brand" – more than a tagline but who you are.	Q3 / 2016

AIRPORT INITIATIVES	TIMING
3) Develop website and keep current in news and information and communications position.	Q4 / 2016
4) Build the outreach and partnerships with airport community, First Nations and local industrial park.	Q4 / 2016
5) Develop and initiate new signage and way-finding program for the Airport.	Q1 / 2017
6) Develop promotional material targeting the general and corporate aviation community.	Q3 / 2016

Source: Stantec Consulting Ltd.

APPENDIX A – 20-Year Air Traffic Forecast Results

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Project Name: AP1501-Aviation Forecast (Brantford Municipal Airport)

Date Prepared: October 6th, 2015

Author: DKMA

Baseline Forecast

	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2014-19	2014-35
P.1 Total Passengers																								
P.1.1 Commercial	2,636	2,914	3,222	3,561	3,937	4,353	4,440	4,529	4,620	4,713	4,807	4,904	5,002	5,103	5,205	5,310	5,416	5,525	5,636	5,749	5,864	5,982	10.6%	4.0%
P.1.2 General Aviation & Others	9,520	11,043	12,700	14,287	15,144	15,750	16,223	16,547	16,795	17,044	17,293	17,542	17,791	18,040	18,289	18,538	18,786	19,034	19,281	19,528	19,774	20,019	10.6%	3.6%
P.1.3 Total	12,156	13,957	15,921	17,849	19,082	20,103	20,663	21,076	21,415	21,757	22,100	22,446	22,793	23,143	23,494	23,847	24,202	24,559	24,917	25,277	25,639	26,002	10.6%	3.7%
M.1 Total Aircraft Movements																								
M.1.1 Passengers																							-	-
M.1.2 Full-freighter																							-	-
M.1.3 Non-commercial & Local																							-	-
M.1.3.1 Based	7,616	8,835	10,160	11,430	12,115	12,600	12,978	13,238	13,436	13,635	13,834	14,033	14,233	14,432	14,631	14,830	15,029	15,227	15,425	15,623	15,819	16,016	10.6%	3.6%
M.1.3.2 Itinerant	16,000	16,480	16,908	17,306	17,704	18,102	18,500	18,874	19,161	19,448	19,736	20,024	20,313	20,601	20,890	21,178	21,466	21,754	22,041	22,327	22,613	22,898	2.5%	1.7%
M.1.3.3 Sub-total	23,616	25,315	27,068	28,736	29,819	30,702	31,479	32,112	32,597	33,084	33,570	34,058	34,545	35,033	35,521	36,008	36,495	36,981	37,466	37,950	38,432	38,914	5.4%	2.4%
M.1.3.4 Commercial	266	293	322	354	389	428	435	441	448	455	462	468	475	483	490	497	505	512	520	528	536	544	10.0%	3.5%
M.1.3.5 Private GA																							-	-
M.1.3.6 Others (Medivac)	200	201	202	203	204	205	205	206	207	208	208	209	210	210	211	211	211	212	212	213	213	213		
M.1.3.7 Sub-total	466	494	524	557	593	633	640	648	655	662	670	677	685	693	700	708	716	724	732	740	748	757	6.3%	2.3%
M.1.4 Total	24,082	25,808	27,592	29,292	30,413	31,335	32,119	32,759	33,252	33,746	34,240	34,735	35,230	35,726	36,221	36,716	37,211	37,705	38,198	38,690	39,181	39,670	5.4%	2.4%
C.1 Total Cargo (volumes)																							-	-

APPENDIX B – List of Study Stakeholders Consulted

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Table A-1 – List of Stakeholders Consulted

Name and Title	Company/Organization	Telephone	E-mail Address	Type
Lise Sordo, Facilities Management Specialist	City of Brantford, Facilities Management	519-759-4222, Ext 5836	lsordo@brantford.ca	F
Jim Quin, Manager of Facilities	City of Brantford, Facilities Management	519-759-4222, Ext 5575	jquin@brantford.ca	F
Geoff Linschoten, Director	City of Brantford Facilities and Asset Management	519-751-7269	glinschoten@brantford.ca	F
Paisley MacKenzie Senior Development Officer	City of Brantford Economic Development	519-751-9900 Ext 301	pmackenzie@brantford.ca	F
John Frabotta, Director	City of Brantford Economic. Dev. and Tourism	519-751-9900 Ext 303	jfrabotta@brantford.ca	F
Ron Gasparetto Manager	City of Brantford Real Estate	519-759-4222, Ext 5407	RGasparetto@brantford.ca	F
Steve Killaire	County of Brant – Transportation	519-442-6324	Steve.killaire@brant.ca	F
Michael Buranyi	County of Brant – Planning	519-442-6324	michael.buranyi@brant.ca	F
David Johnston	County of Brant – Economic Dev	519-442-6324	david.johnston@brant.ca	F
Dave Puskas	Aircraft Spruce Canada	519-759-5017	davepuskas@aircraftspruce.ca	F
Heather McNally Airside Manager	Brantford Flying Club (Brantford Flight Centre	519-753-2521	hmcnally@flybfc.com	F
Shawn Broughton	Brantford Flying Club (Brantford Flight Centre)	519-753-2521	---	F
Jay Godsell	Solar Ship Inc.	416-368-3336	jgodsall@solarship.com	F
Darryl Gilbert	Gilbert Custom Aircraft	519-751-1398	---	F
John Starr	Custom Stainless Works Inc.	519-752-6515	john@customstainless.ca	F
Bob Nelles	Nelles Aviation	519-758-0490	mail@bobnelles.com	F
Edie Craddock	Brant Air Centre Ltd. (Brant Aero)	519-753-7022	edie@brantaero.com	F
Colleen Miller	Chamber Of Commerce Brantford-Brant	519-753-2617	colleen@coleenemiller.com	F
Bob Coyne	Airport Board Chair	519-732-7367 519-752-7967	bobcoyne@sympatico.ca	F
Councillor Brian Coleman	County of Brant – Councillor/ Airport Board	519-938-4863	brianatbridgeview@gmail.com	F
Councillor Greg Martin	City of Brantford/Airport Board	519-751-7269	163261@rogers.com	F
Jim Muir	Private Aircraft Owner		jmuir@caramedic.ca	F
Gary Walsh	Private Aircraft Owner		gary_walsh@dlitools.com	F
Jeff McAllister	Private Aircraft Owner		jeff@cornellconstruction.ca	F

Legend: F – Face-to-face or telephone consultation
L – Letter correspondence
O – On-line questionnaire

APPENDIX C – Airport Windrose Analysis Results

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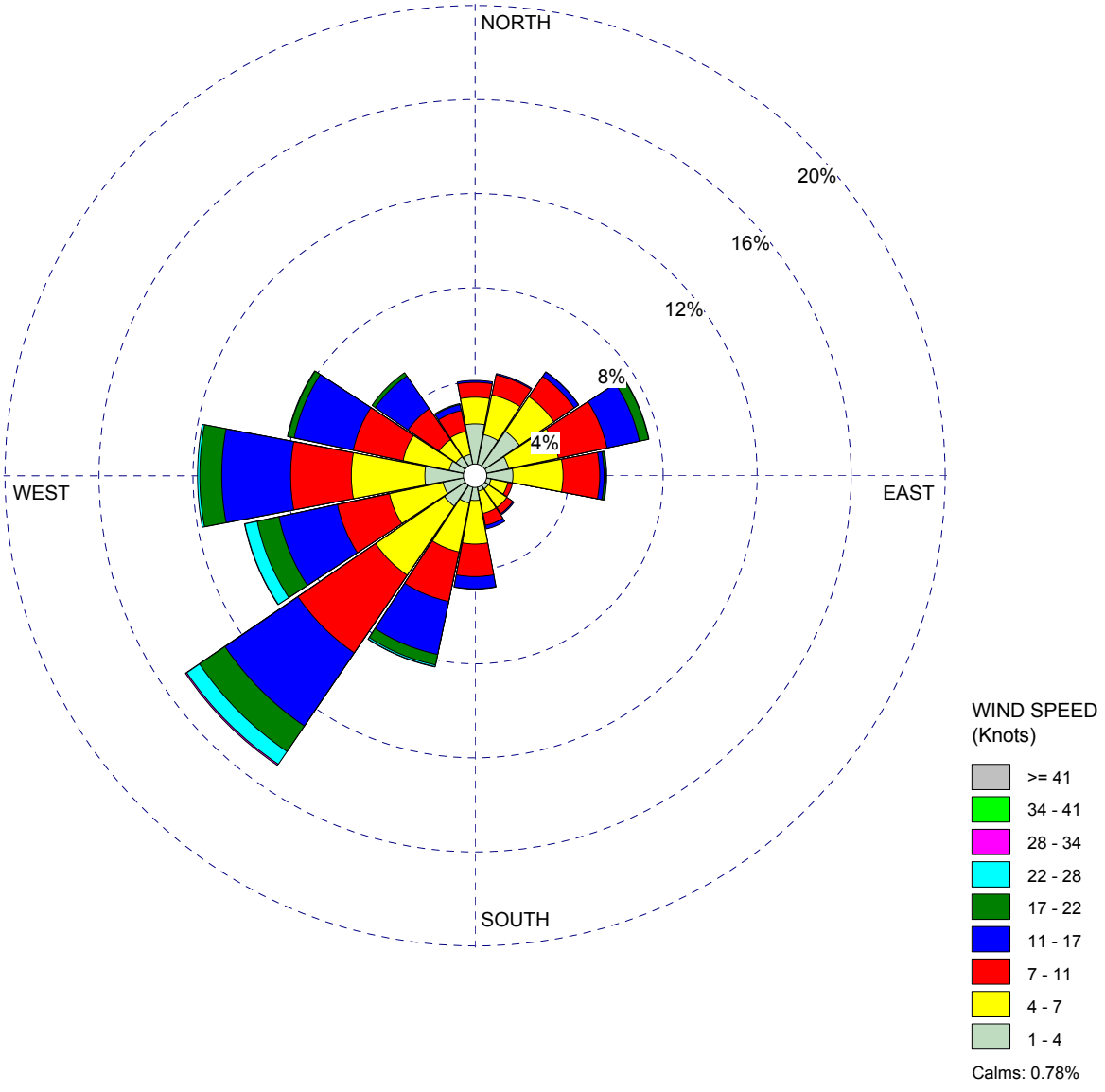
WIND ROSE PLOT:

ALL WEATHER
Station #71602 - Brantford Airport, Ontario

DISPLAY:

Wind Speed
Direction (blowing from)



COMMENTS:

Data Source: Environment Canada

Calm winds defined as less than 2 km/hr (1 kt) per ICAO Annex 3 to the Convention on International Civil Aviation, Part II, Appendix 5 (18th edition).

DATA PERIOD:

Start Date: 01/01/2015 - 00:00
End Date: 31/12/2015 - 23:00

CALM WINDS:

0.78%

AVG. WIND SPEED:

7.60 Knots

COMPANY NAME:

Aviotec International Inc. 5915 Airport Road, #200
Mississauga, Ontario, Canada, L4V1W1

MODELLER:

Mathew Zachariah

TOTAL COUNT:

8428 hrs.

DATE:

14/01/2016

PROJECT NO.:

AP1501

Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION: 43.5 DEGREE
CROSSWIND COMPONENT: 10.0 KNOTS
TAILWIND COMPONENT: 60.0 KNOTS

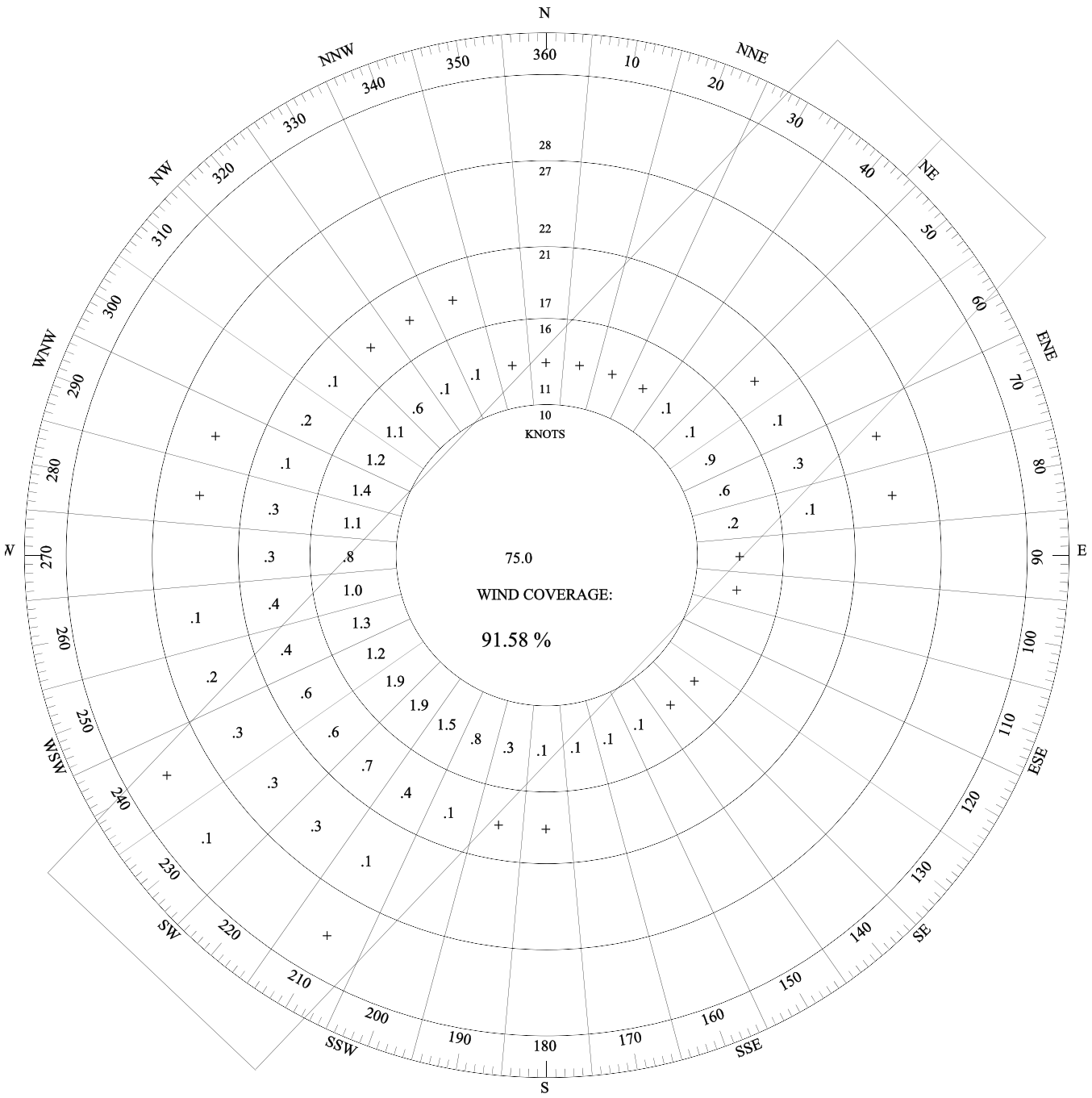
WIND COVERAGE: 91.58 %

HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
60°	73	94	86	72	12	0	0	0	0	337
70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
200°	47	86	62	71	6	0	0	0	0	272
210°	53	93	119	122	33	6	1	0	0	427
220°	61	155	186	156	56	26	0	0	0	640
230°	71	144	150	161	54	29	5	0	0	614
240°	66	116	104	104	49	26	2	0	0	467
250°	51	80	86	110	30	19	0	0	0	376
260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
290°	47	81	88	115	5	2	0	0	0	338
300°	48	87	94	101	17	0	0	0	0	347
310°	41	43	73	92	10	0	0	0	0	259
320°	41	31	61	50	4	0	0	0	0	187
330°	47	47	44	12	3	0	0	0	0	153
340°	31	37	32	10	1	0	0	0	0	111
350°	37	29	21	4	0	0	0	0	0	91
360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

REFERENCE: Appendix 1 of AC 150/5300-13, Airport Design, including Changes 1 through 17.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16
11
10
KNOTS
75.0
WIND COVERAGE:
91.58 %

Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION: 43.5 DEGREE
CROSSWIND COMPONENT: 13.0 KNOTS
TAILWIND COMPONENT: 60.0 KNOTS

WIND COVERAGE: 96.06 %

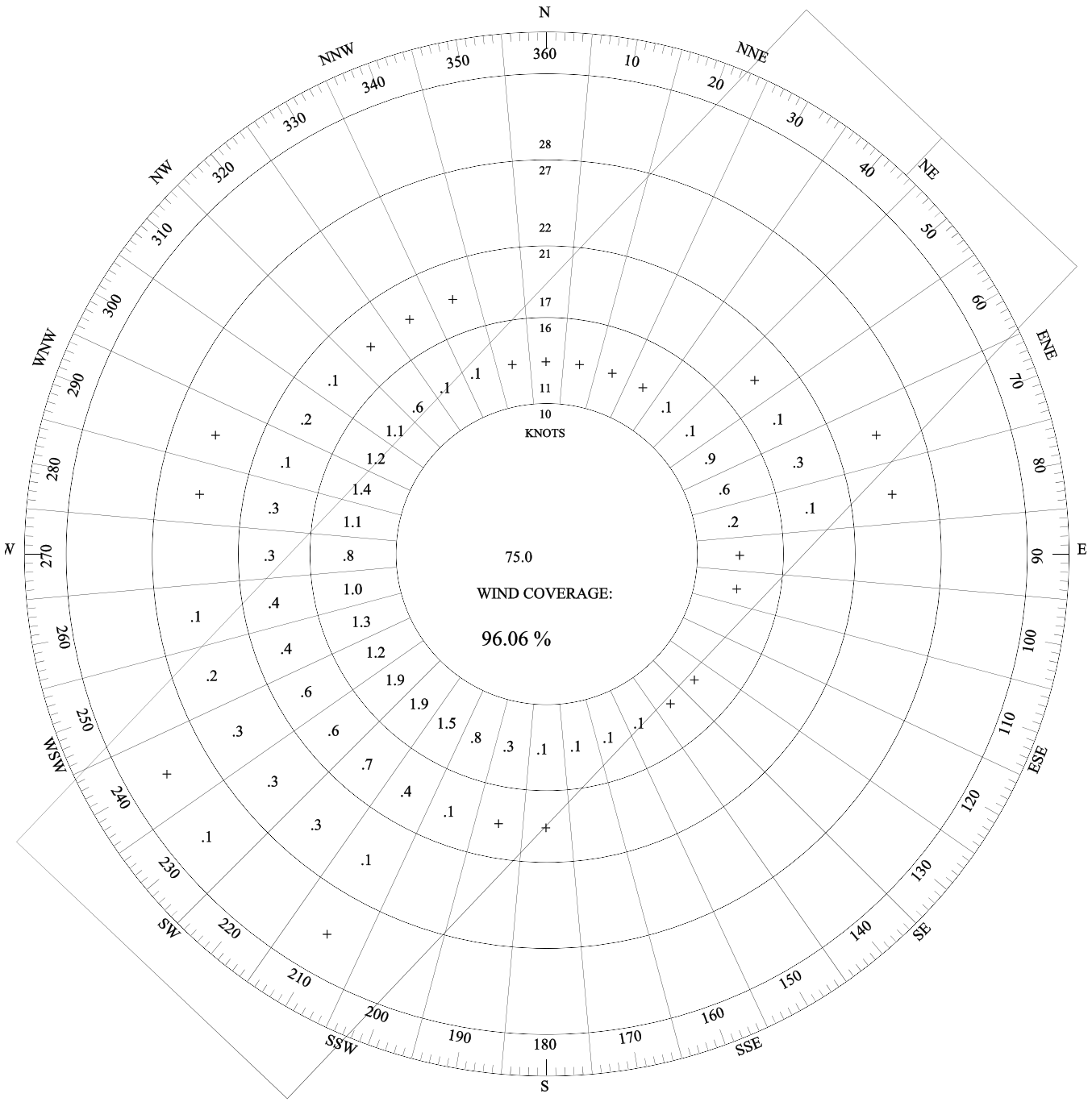
HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
60°	73	94	86	72	12	0	0	0	0	337
70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
200°	47	86	62	71	6	0	0	0	0	272
210°	53	93	119	122	33	6	1	0	0	427
220°	61	155	186	156	56	26	0	0	0	640
230°	71	144	150	161	54	29	5	0	0	614
240°	66	116	104	104	49	26	2	0	0	467
250°	51	80	86	110	30	19	0	0	0	376
260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
290°	47	81	88	115	5	2	0	0	0	338
300°	48	87	94	101	17	0	0	0	0	347
310°	41	43	73	92	10	0	0	0	0	259
320°	41	31	61	50	4	0	0	0	0	187
330°	47	47	44	12	3	0	0	0	0	153
340°	31	37	32	10	1	0	0	0	0	111
350°	37	29	21	4	0	0	0	0	0	91
360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

REFERENCE: Appendix 1 of AC 150/5300-13, Airport Design, including Changes 1 through 17.

Rwy 05/23 - 13 kts



Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION: 99.0 DEGREE
CROSSWIND COMPONENT: 10.0 KNOTS
TAILWIND COMPONENT: 60.0 KNOTS

WIND COVERAGE: 88.96 %

	HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)									
DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
60°	73	94	86	72	12	0	0	0	0	337
70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
200°	47	86	62	71	6	0	0	0	0	272
210°	53	93	119	122	33	6	1	0	0	427
220°	61	155	186	156	56	26	0	0	0	640
230°	71	144	150	161	54	29	5	0	0	614
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260°	59	82	81	85	34	7	0	0	0	348
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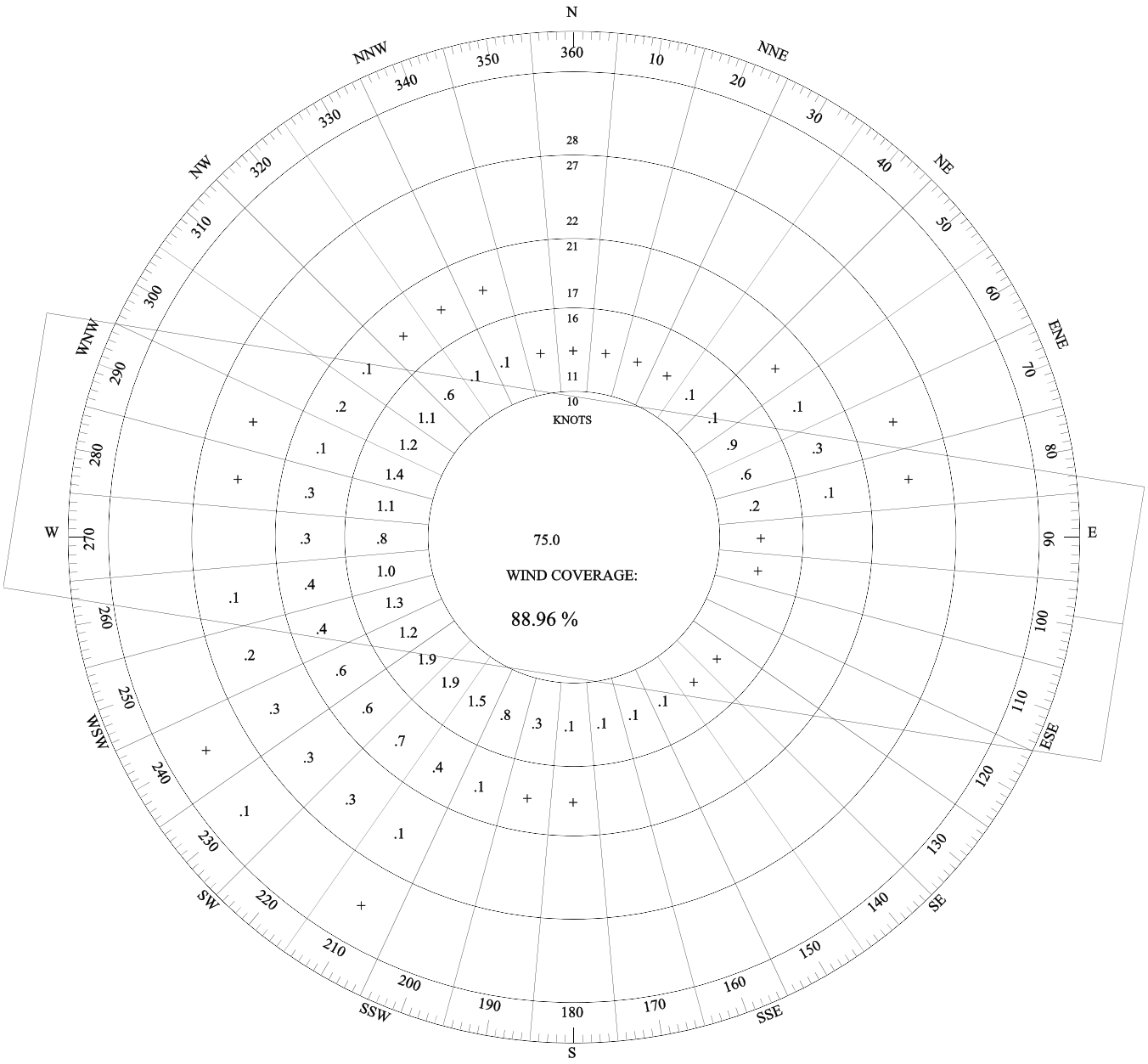
290°	47	81	88	115	5	2	0	0	0	338
300°	48	87	94	101	17	0	0	0	0	347
310°	41	43	73	92	10	0	0	0	0	259
320°	41	31	61	50	4	0	0	0	0	187
330°	47	47	44	12	3	0	0	0	0	153
340°	31	37	32	10	1	0	0	0	0	111
350°	37	29	21	4	0	0	0	0	0	91
360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

REFERENCE: Appendix 1 of AC 150/5300-13, Airport Design, including Changes 1 through 17.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21
17
16
11
10
KNOTS
75.0
WIND COVERAGE:
88.96 %

Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION: 99.0 DEGREE
CROSSWIND COMPONENT: 13.0 KNOTS
TAILWIND COMPONENT: 60.0 KNOTS

WIND COVERAGE: 94.7 %

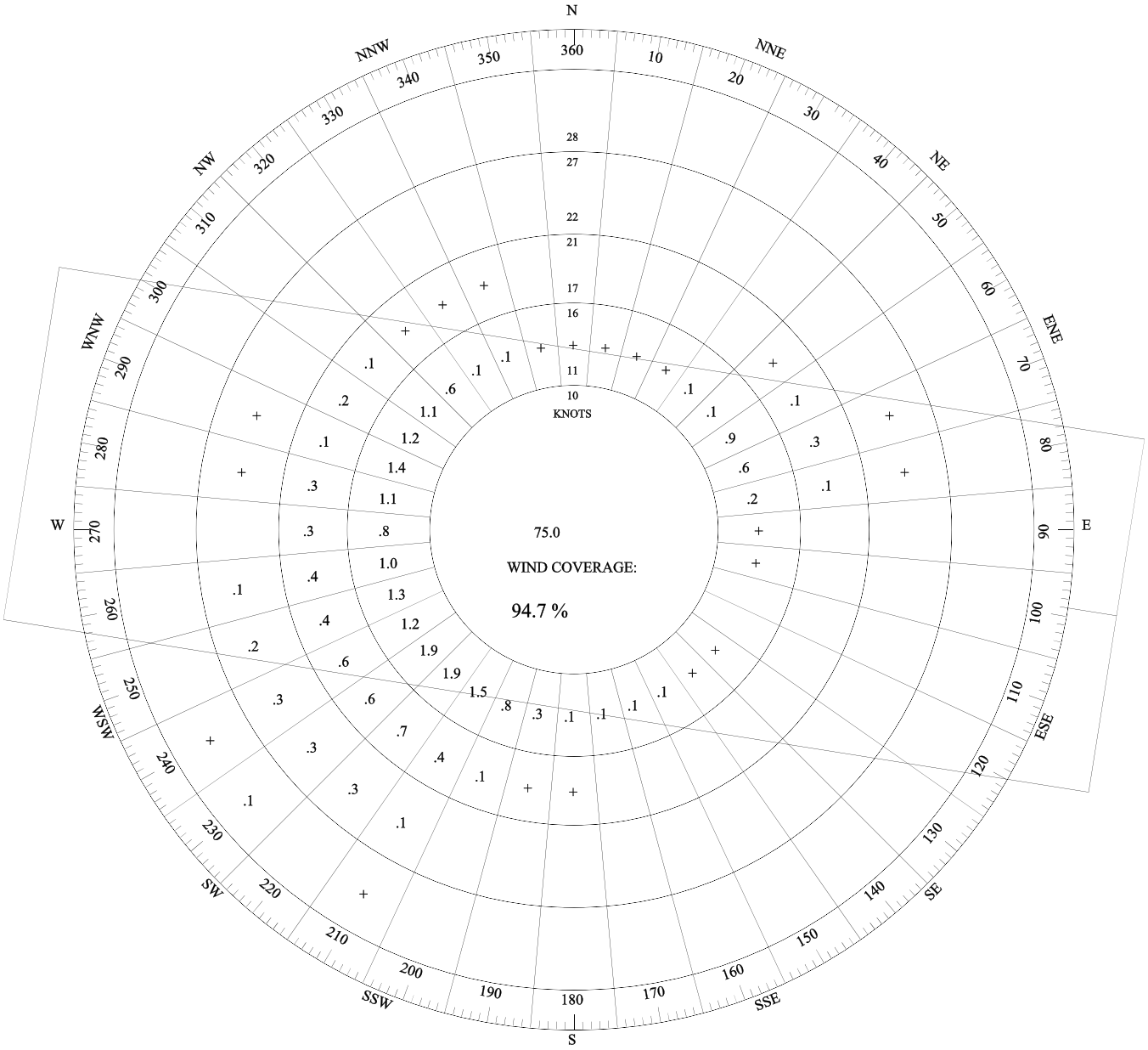
HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
60°	73	94	86	72	12	0	0	0	0	337
70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
200°	47	86	62	71	6	0	0	0	0	272
210°	53	93	119	122	33	6	1	0	0	427
220°	61	155	186	156	56	26	0	0	0	640
230°	71	144	150	161	54	29	5	0	0	614
240°	66	116	104	104	49	26	2	0	0	467
250°	51	80	86	110	30	19	0	0	0	376
260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
290°	47	81	88	115	5	2	0	0	0	338
300°	48	87	94	101	17	0	0	0	0	347
310°	41	43	73	92	10	0	0	0	0	259
320°	41	31	61	50	4	0	0	0	0	187
330°	47	47	44	12	3	0	0	0	0	153
340°	31	37	32	10	1	0	0	0	0	111
350°	37	29	21	4	0	0	0	0	0	91
360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

REFERENCE: Appendix 1 of AC 150/5300-13, Airport Design, including Changes 1 through 17.

Rwy 11/29 - 13 kts



Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION:	164.0 DEGREE
CROSSWIND COMPONENT:	10.0 KNOTS
TAILWIND COMPONENT:	60.0 KNOTS

WIND COVERAGE: 80.58 %

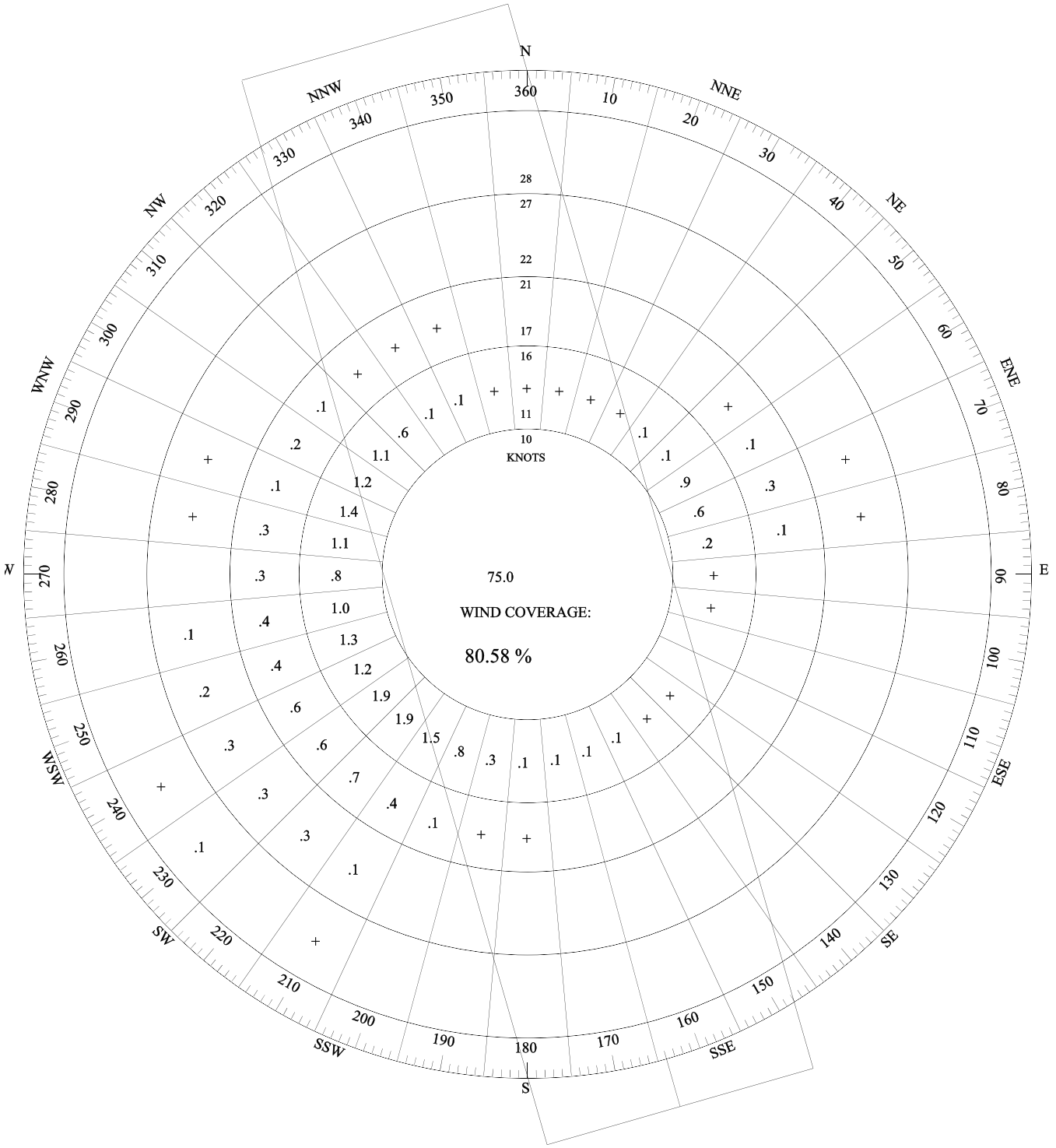
HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
60°	73	94	86	72	12	0	0	0	0	337
70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
200°	47	86	62	71	6	0	0	0	0	272
210°	53	93	119	122	33	6	1	0	0	427
220°	61	155	186	156	56	26	0	0	0	640
230°	71	144	150	161	54	29	5	0	0	614
240°	66	116	104	104	49	26	2	0	0	467
250°	51	80	86	110	30	19	0	0	0	376
260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
290°	47	81	88	115	5	2	0	0	0	338
300°	48	87	94	101	17	0	0	0	0	347
310°	41	43	73	92	10	0	0	0	0	259
320°	41	31	61	50	4	0	0	0	0	187
330°	47	47	44	12	3	0	0	0	0	153
340°	31	37	32	10	1	0	0	0	0	111
350°	37	29	21	4	0	0	0	0	0	91
360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

REFERENCE: Appendix 1 of AC 150/5300-13, Airport Design, including Changes 1 through 17.

Rwy 17/35 - 10 kts



Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION: 164.0 DEGREE
CROSSWIND COMPONENT: 13.0 KNOTS
TAILWIND COMPONENT: 60.0 KNOTS

WIND COVERAGE: 89.01 %

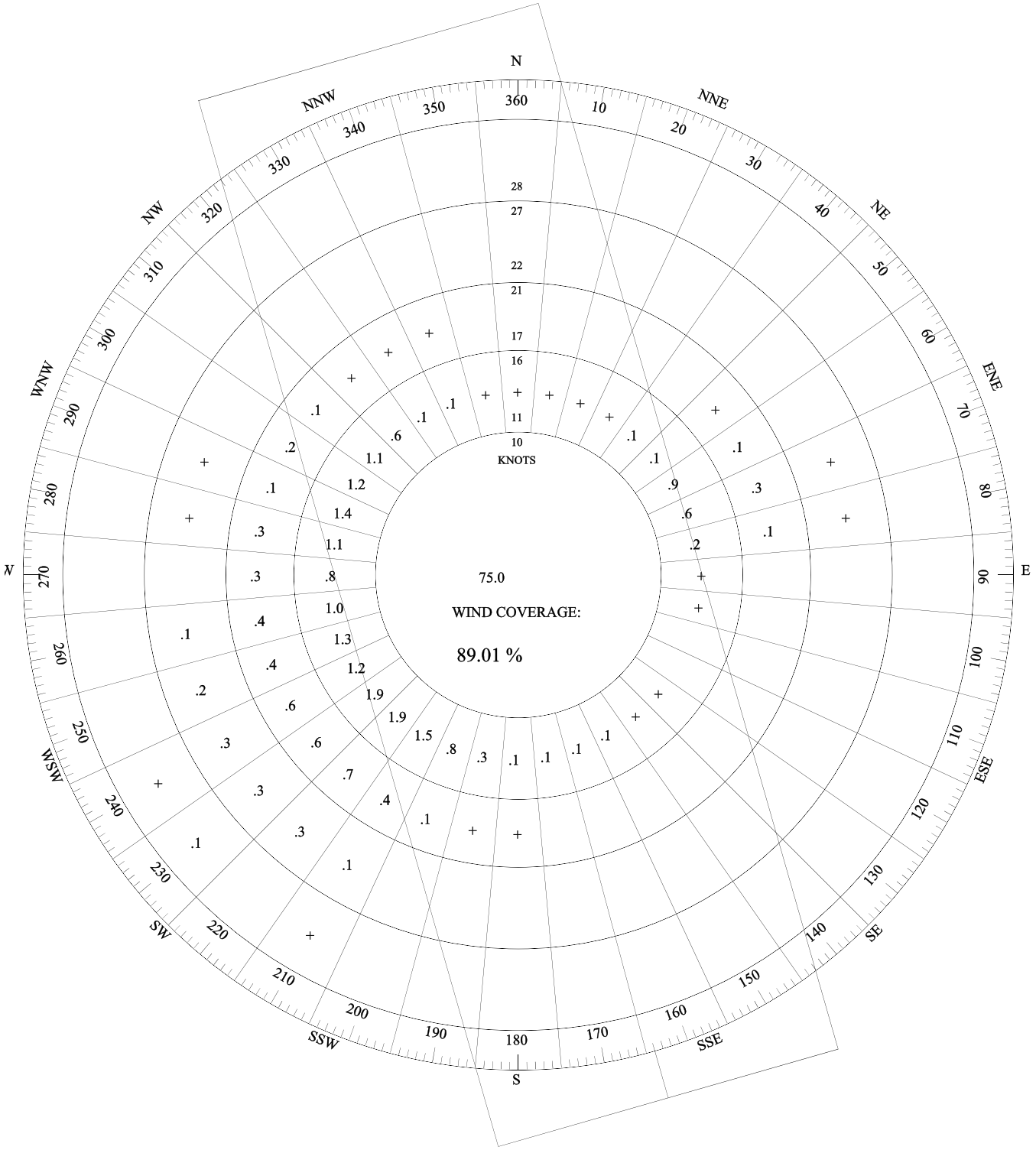
HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
60°	73	94	86	72	12	0	0	0	0	337
70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
200°	47	86	62	71	6	0	0	0	0	272
210°	53	93	119	122	33	6	1	0	0	427
220°	61	155	186	156	56	26	0	0	0	640
230°	71	144	150	161	54	29	5	0	0	614
240°	66	116	104	104	49	26	2	0	0	467
250°	51	80	86	110	30	19	0	0	0	376
260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
290°	47	81	88	115	5	2	0	0	0	338
300°	48	87	94	101	17	0	0	0	0	347
310°	41	43	73	92	10	0	0	0	0	259
320°	41	31	61	50	4	0	0	0	0	187
330°	47	47	44	12	3	0	0	0	0	153
340°	31	37	32	10	1	0	0	0	0	111
350°	37	29	21	4	0	0	0	0	0	91
360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

REFERENCE: Appendix 1 of AC 150/5300-13, Airport Design, including Changes 1 through 17.

Rwy 17/35 - 13 kts



Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION:	43.5	99.0	DEGREE
CROSSWIND COMPONENT:	10.0	10.0	KNOTS
TAILWIND COMPONENT:	60.0	60.0	KNOTS

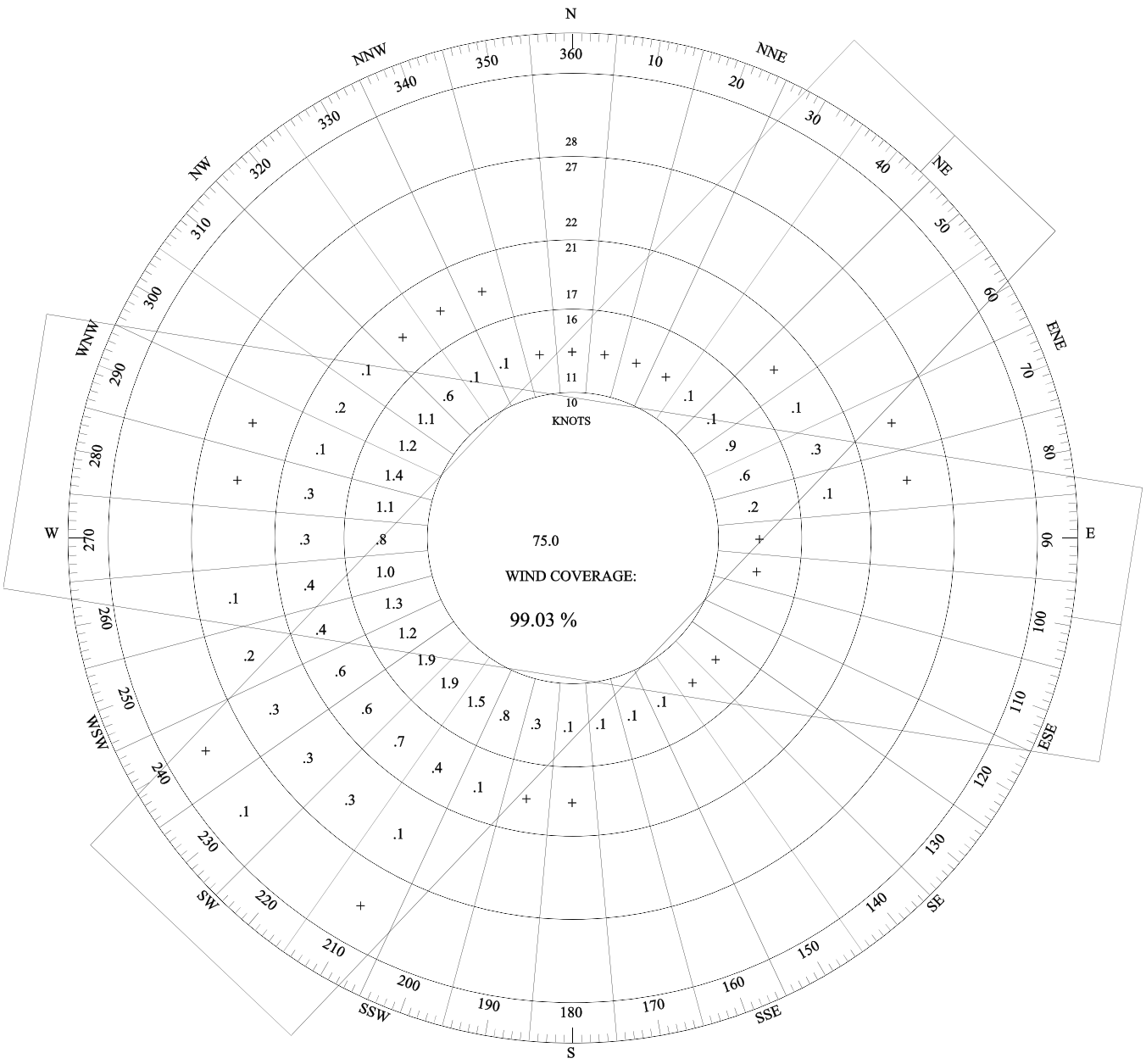
WIND COVERAGE: 99.03 %

HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
60°	73	94	86	72	12	0	0	0	0	337
70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
200°	47	86	62	71	6	0	0	0	0	272
210°	53	93	119	122	33	6	1	0	0	427
220°	61	155	186	156	56	26	0	0	0	640
230°	71	144	150	161	54	29	5	0	0	614
240°	66	116	104	104	49	26	2	0	0	467
250°	51	80	86	110	30	19	0	0	0	376
260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
290°	47	81	88	115	5	2	0	0	0	338
300°	48	87	94	101	17	0	0	0	0	347
310°	41	43	73	92	10	0	0	0	0	259
320°	41	31	61	50	4	0	0	0	0	187
330°	47	47	44	12	3	0	0	0	0	153
340°	31	37	32	10	1	0	0	0	0	111
350°	37	29	21	4	0	0	0	0	0	91
360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

REFERENCE: Appendix 1 of AC 150/5300-13, Airport Design, including Changes 1 through 17.


N
NNE
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350
28
27
22
21
17
16
11
10
KNOTS
75.0
WIND COVERAGE:
99.03 %

Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION:	43.5	99.0	DEGREE
CROSSWIND COMPONENT:	13.0	13.0	KNOTS
TAILWIND COMPONENT:	60.0	60.0	KNOTS

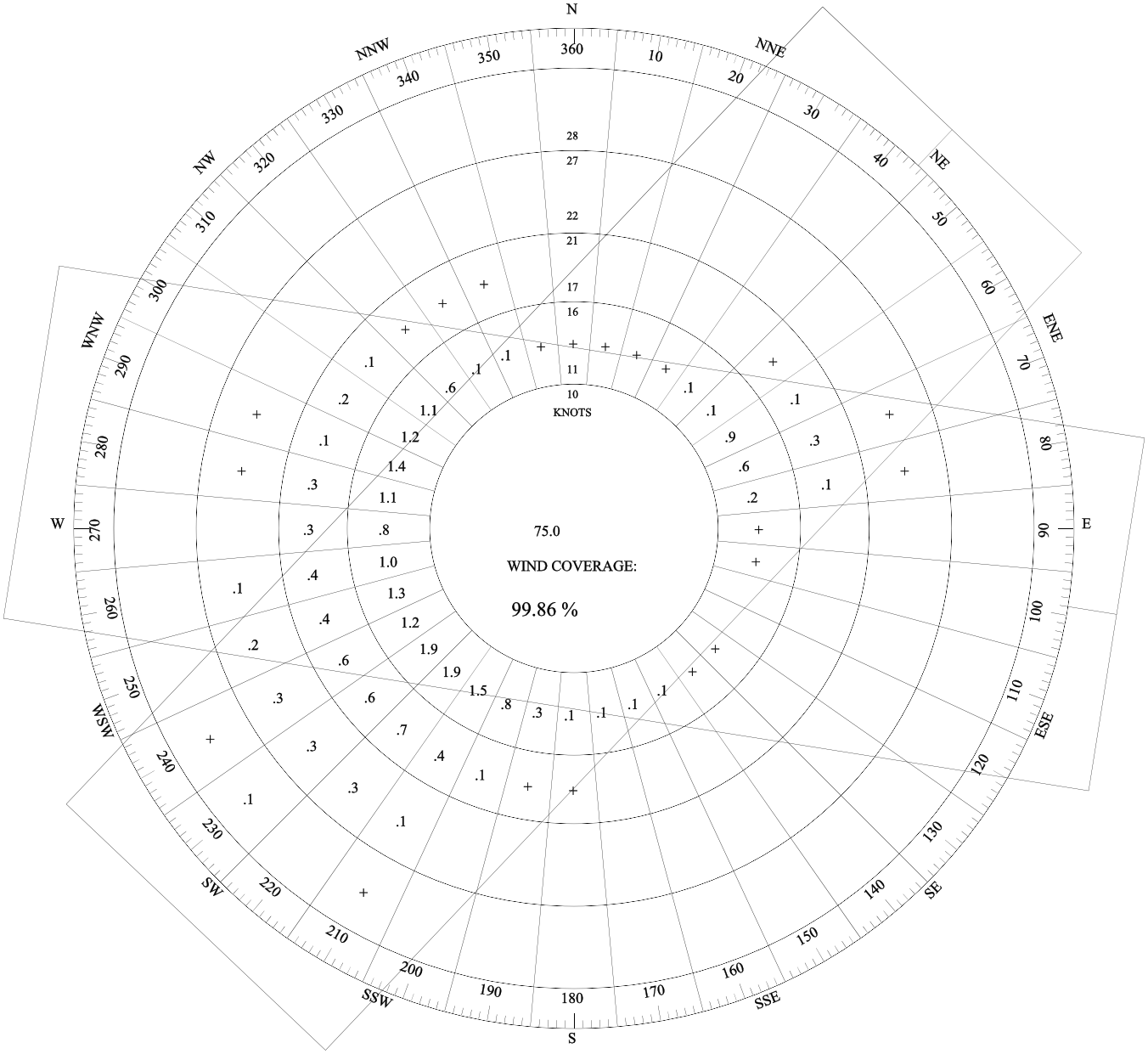
WIND COVERAGE: 99.86 %

HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
60°	73	94	86	72	12	0	0	0	0	337
70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
200°	47	86	62	71	6	0	0	0	0	272
210°	53	93	119	122	33	6	1	0	0	427
220°	61	155	186	156	56	26	0	0	0	640
230°	71	144	150	161	54	29	5	0	0	614
240°	66	116	104	104	49	26	2	0	0	467
250°	51	80	86	110	30	19	0	0	0	376
260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
290°	47	81	88	115	5	2	0	0	0	338
300°	48	87	94	101	17	0	0	0	0	347
310°	41	43	73	92	10	0	0	0	0	259
320°	41	31	61	50	4	0	0	0	0	187
330°	47	47	44	12	3	0	0	0	0	153
340°	31	37	32	10	1	0	0	0	0	111
350°	37	29	21	4	0	0	0	0	0	91
360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

REFERENCE: Appendix 1 of AC 150/5300-13, Airport Design, including Changes 1 through 17.


N
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240
250
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310
320
330
340
350
28
27
22
21
17
16
11
10
KNOTS
75.0
WIND COVERAGE:
99.86 %

Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION:	43.5	164.0	DEGREE
CROSSWIND COMPONENT:	10.0	10.0	KNOTS
TAILWIND COMPONENT:	60.0	60.0	KNOTS

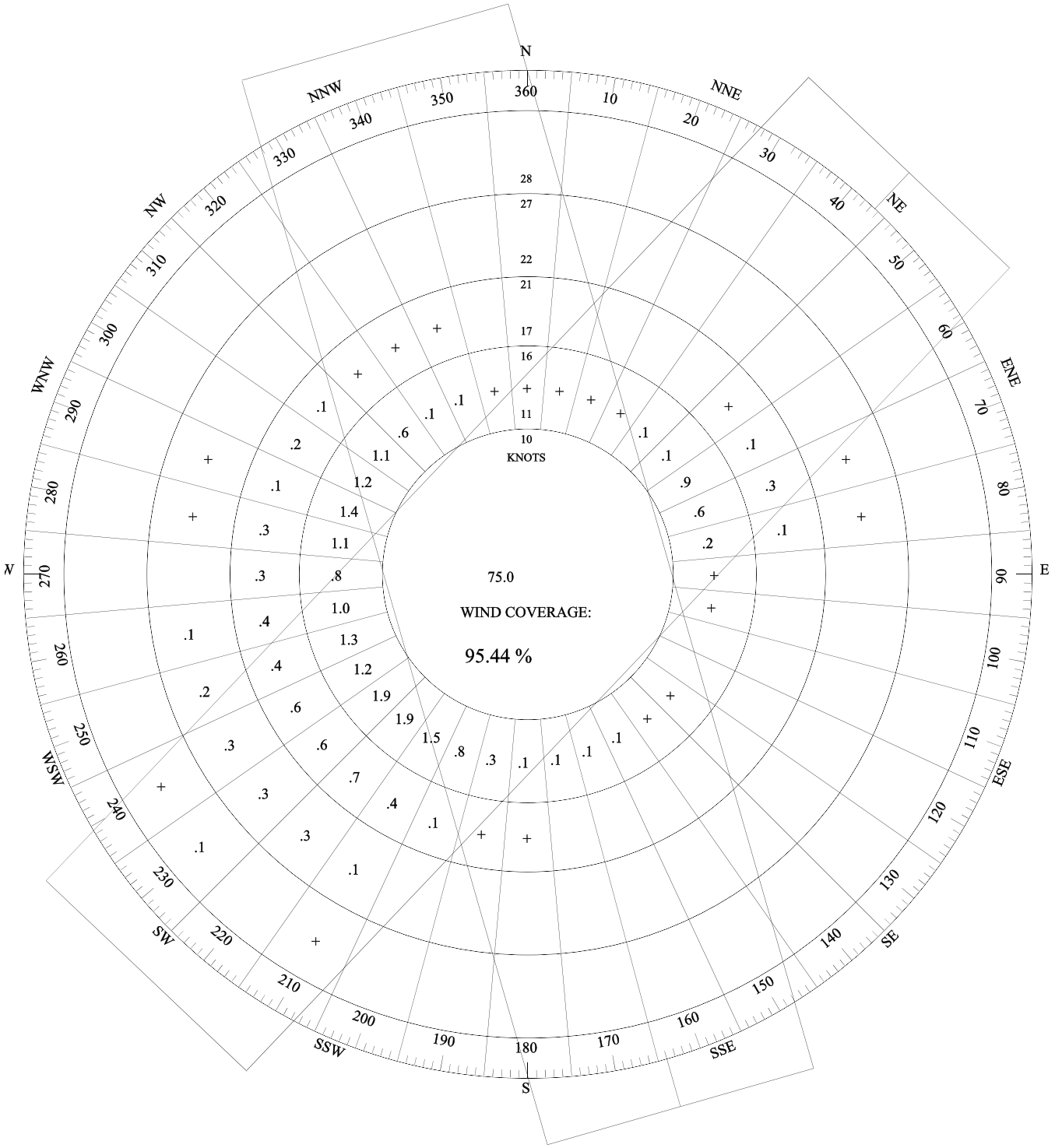
WIND COVERAGE: 95.44 %

HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
60°	73	94	86	72	12	0	0	0	0	337
70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
200°	47	86	62	71	6	0	0	0	0	272
210°	53	93	119	122	33	6	1	0	0	427
220°	61	155	186	156	56	26	0	0	0	640
230°	71	144	150	161	54	29	5	0	0	614
240°	66	116	104	104	49	26	2	0	0	467
250°	51	80	86	110	30	19	0	0	0	376
260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
290°	47	81	88	115	5	2	0	0	0	338
300°	48	87	94	101	17	0	0	0	0	347
310°	41	43	73	92	10	0	0	0	0	259
320°	41	31	61	50	4	0	0	0	0	187
330°	47	47	44	12	3	0	0	0	0	153
340°	31	37	32	10	1	0	0	0	0	111
350°	37	29	21	4	0	0	0	0	0	91
360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

REFERENCE: Appendix 1 of AC 150/5300-13, Airport Design, including Changes 1 through 17.


N
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240
250
260
270
280
290
300
310
320
330
340
350
28
27
22
21
17
16
11
10
KNOTS
75.0
WIND COVERAGE:
95.44 %

Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION:	43.5	164.0	DEGREE
CROSSWIND COMPONENT:	13.0	13.0	KNOTS
TAILWIND COMPONENT:	60.0	60.0	KNOTS

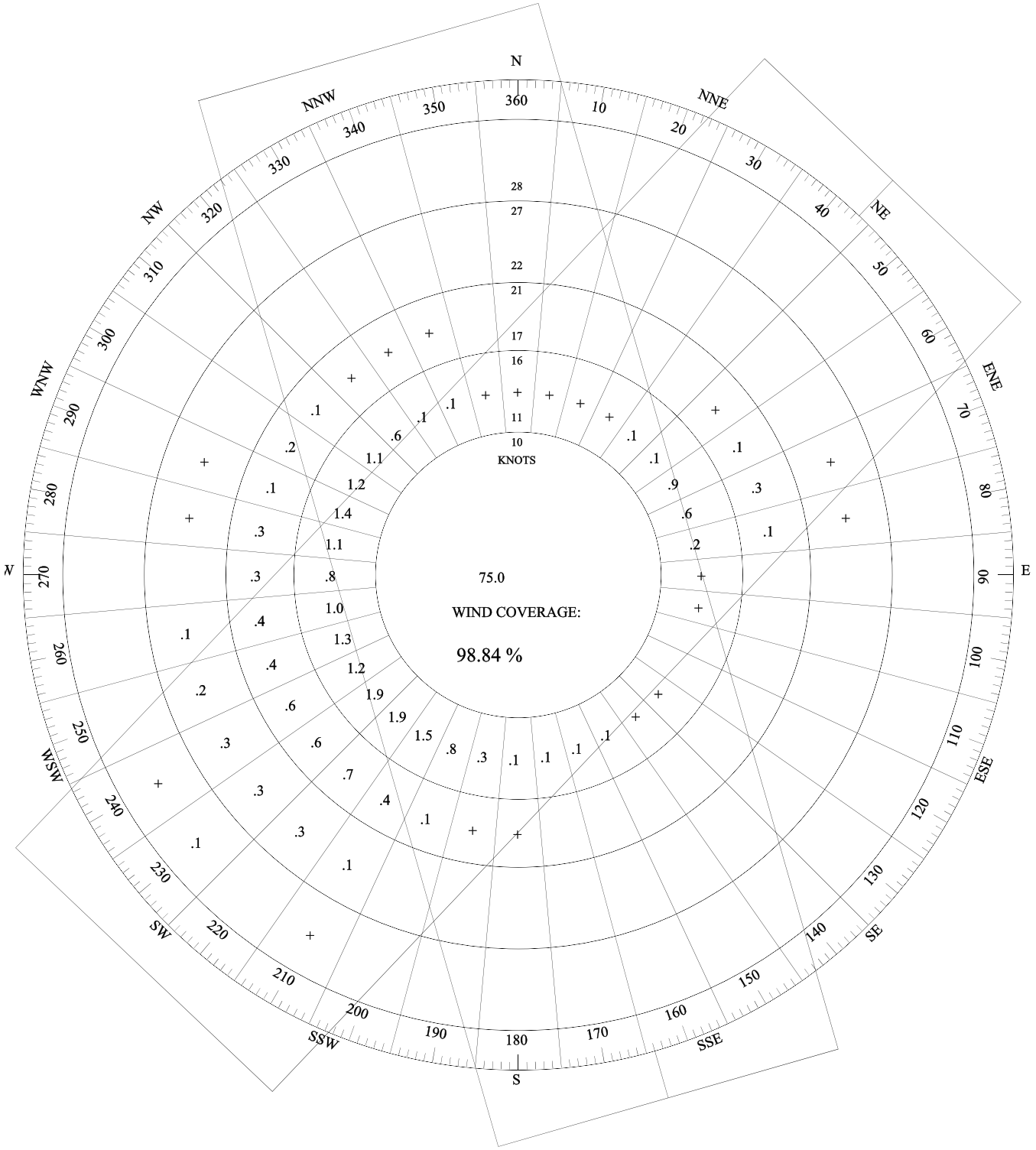
WIND COVERAGE: 98.84 %

HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
60°	73	94	86	72	12	0	0	0	0	337
70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
200°	47	86	62	71	6	0	0	0	0	272
210°	53	93	119	122	33	6	1	0	0	427
220°	61	155	186	156	56	26	0	0	0	640
230°	71	144	150	161	54	29	5	0	0	614
240°	66	116	104	104	49	26	2	0	0	467
250°	51	80	86	110	30	19	0	0	0	376
260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
290°	47	81	88	115	5	2	0	0	0	338
300°	48	87	94	101	17	0	0	0	0	347
310°	41	43	73	92	10	0	0	0	0	259
320°	41	31	61	50	4	0	0	0	0	187
330°	47	47	44	12	3	0	0	0	0	153
340°	31	37	32	10	1	0	0	0	0	111
350°	37	29	21	4	0	0	0	0	0	91
360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

REFERENCE: Appendix 1 of AC 150/5300-13, Airport Design, including Changes 1 through 17.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KNOTS
75.0
WIND COVERAGE:
98.84 %

Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION:	99.0	164.0	DEGREE
CROSSWIND COMPONENT:	10.0	10.0	KNOTS
TAILWIND COMPONENT:	60.0	60.0	KNOTS

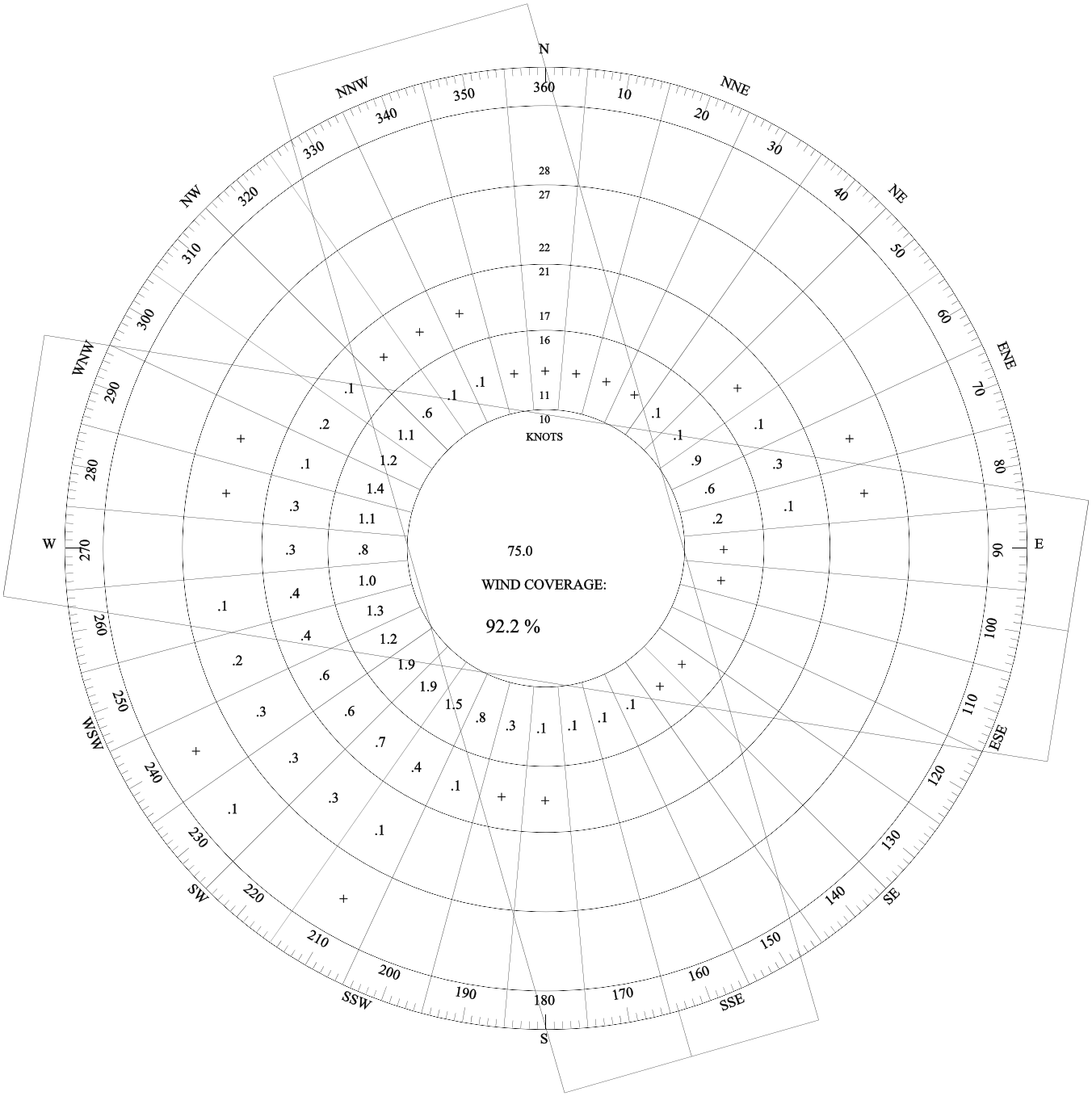
WIND COVERAGE: 92.2 %

HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
60°	73	94	86	72	12	0	0	0	0	337
70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
200°	47	86	62	71	6	0	0	0	0	272
210°	53	93	119	122	33	6	1	0	0	427
220°	61	155	186	156	56	26	0	0	0	640
230°	71	144	150	161	54	29	5	0	0	614
240°	66	116	104	104	49	26	2	0	0	467
250°	51	80	86	110	30	19	0	0	0	376
260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
290°	47	81	88	115	5	2	0	0	0	338
300°	48	87	94	101	17	0	0	0	0	347
310°	41	43	73	92	10	0	0	0	0	259
320°	41	31	61	50	4	0	0	0	0	187
330°	47	47	44	12	3	0	0	0	0	153
340°	31	37	32	10	1	0	0	0	0	111
350°	37	29	21	4	0	0	0	0	0	91
360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

REFERENCE: Appendix 1 of AC 150/5300-13, Airport Design, including Changes 1 through 17.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KNOTS
75.0
WIND COVERAGE:
92.2 %

Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION:	99.0	164.0	DEGREE
CROSSWIND COMPONENT:	13.0	13.0	KNOTS
TAILWIND COMPONENT:	60.0	60.0	KNOTS

WIND COVERAGE: 96.91 %

HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
60°	73	94	86	72	12	0	0	0	0	337
70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
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210°	53	93	119	122	33	6	1	0	0	427
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240°	66	116	104	104	49	26	2	0	0	467
250°	51	80	86	110	30	19	0	0	0	376
260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
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300°	48	87	94	101	17	0	0	0	0	347
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320°	41	31	61	50	4	0	0	0	0	187
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340°	31	37	32	10	1	0	0	0	0	111
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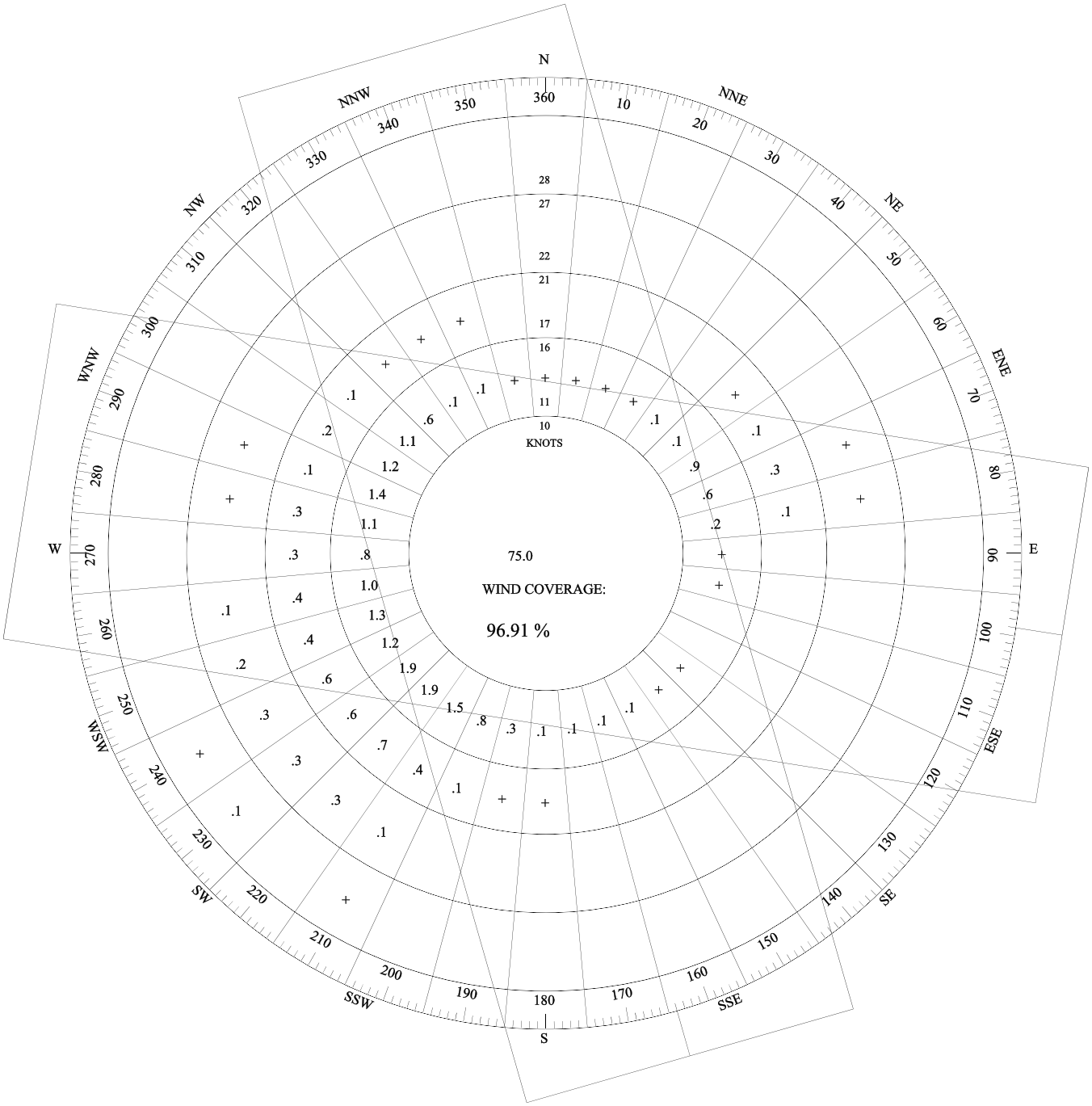
360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

REFERENCE: Appendix 1 of AC 150/5300-13, Airport Design, including Changes 1 through 17.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KNOTS
75.0
WIND COVERAGE:
96.91 %

Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION:	43.5	99.0	164.0	DEGREE
CROSSWIND COMPONENT:	10.0	10.0	10.0	KNOTS
TAILWIND COMPONENT:	60.0	60.0	60.0	KNOTS

WIND COVERAGE: 99.78 %

HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
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40°	99	61	44	8	0	0	0	0	0	212
50°	93	89	44	11	1	0	0	0	0	238
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70°	50	88	92	46	21	2	0	0	0	299
80°	57	56	63	13	6	3	0	0	0	198
90°	36	74	50	2	0	0	0	0	0	162
100°	43	49	18	1	0	0	0	0	0	111
110°	31	35	13	0	0	0	0	0	0	79
120°	28	26	4	0	0	0	0	0	0	58
130°	31	39	13	4	0	0	0	0	0	87
140°	27	41	13	1	0	0	0	0	0	82
150°	33	49	25	7	0	0	0	0	0	114
160°	24	32	19	6	0	0	0	0	0	81
170°	18	31	23	9	0	0	0	0	0	81
180°	24	52	32	12	1	0	0	0	0	121
190°	47	73	61	22	1	0	0	0	0	204
200°	47	86	62	71	6	0	0	0	0	272
210°	53	93	119	122	33	6	1	0	0	427
220°	61	155	186	156	56	26	0	0	0	640
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250°	51	80	86	110	30	19	0	0	0	376
260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
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300°	48	87	94	101	17	0	0	0	0	347
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320°	41	31	61	50	4	0	0	0	0	187
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360°	99	32	16	1	0	0	0	0	0	148
Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

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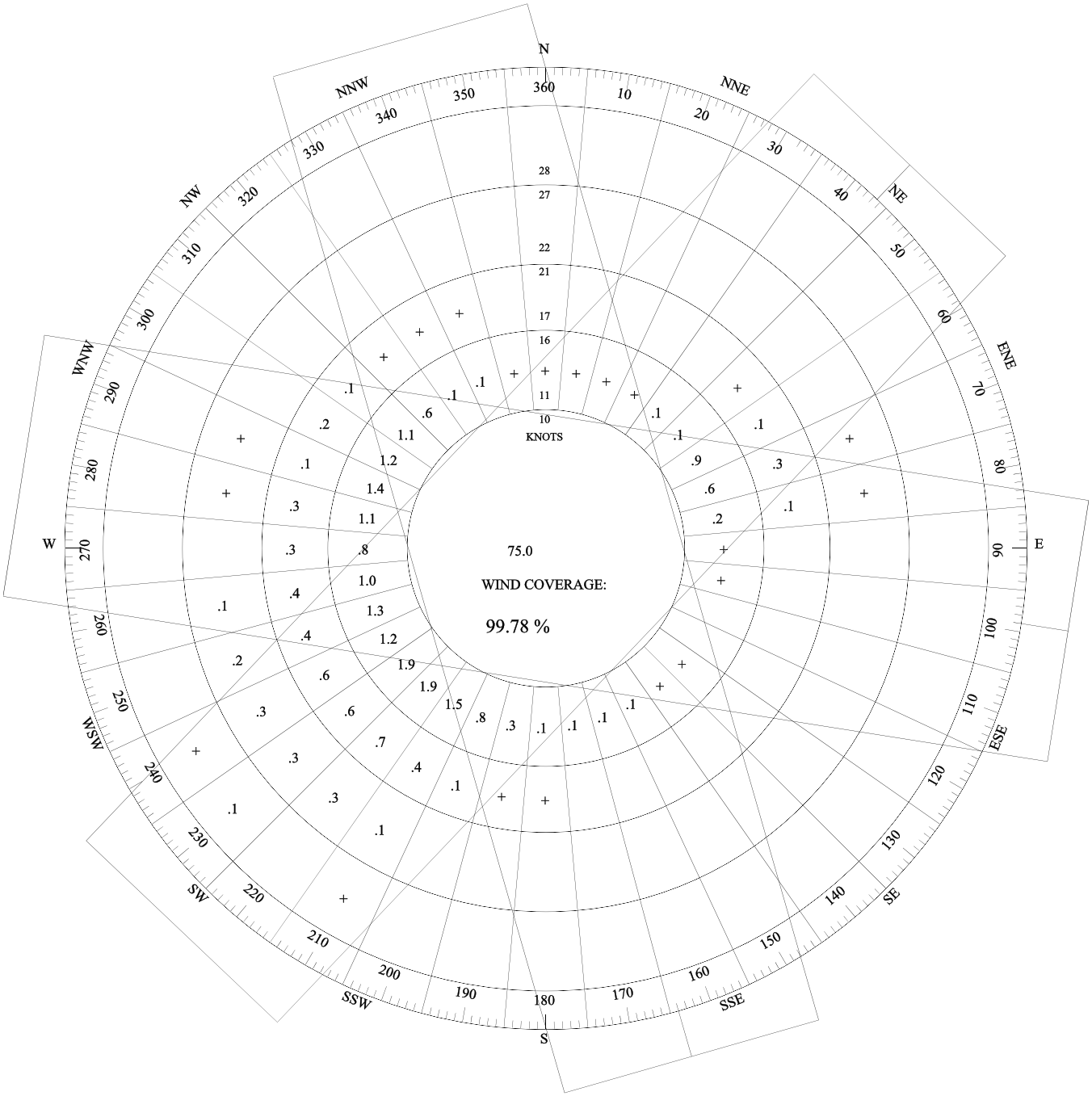
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KNOTS
75.0
WIND COVERAGE:
99.78 %

Standard Wind Analysis Results for ALL_WEATHER

TITLE: Brantford Municipal Airport

RUNWAY ORIENTATION:	43.5	99.0	164.0 DEGREE
CROSSWIND COMPONENT:	13.0	13.0	13.0 KNOTS
TAILWIND COMPONENT:	60.0	60.0	60.0 KNOTS

WIND COVERAGE: 100.0 %

HOURLY OBSERVATIONS OF WIND SPEED (KNOTS)

DIRECTION	0-3	4-6	7-10	11-16	17-21	22-27	28-33	34-40	> 41	TOTAL
10°	50	34	16	2	0	0	0	0	0	102
20°	56	69	32	2	0	0	0	0	0	159
30°	94	76	41	3	0	0	0	0	0	214
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180°	24	52	32	12	1	0	0	0	0	121
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210°	53	93	119	122	33	6	1	0	0	427
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260°	59	82	81	85	34	7	0	0	0	348
270°	53	98	64	70	24	0	0	0	0	309
280°	68	83	72	91	21	1	0	0	0	336
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300°	48	87	94	101	17	0	0	0	0	347
310°	41	43	73	92	10	0	0	0	0	259
320°	41	31	61	50	4	0	0	0	0	187
330°	47	47	44	12	3	0	0	0	0	153
340°	31	37	32	10	1	0	0	0	0	111
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Calm	0									0
TOTAL	1834	2392	2042	1576	389	121	8	0	0	8362

SOURCE: Environment Canada

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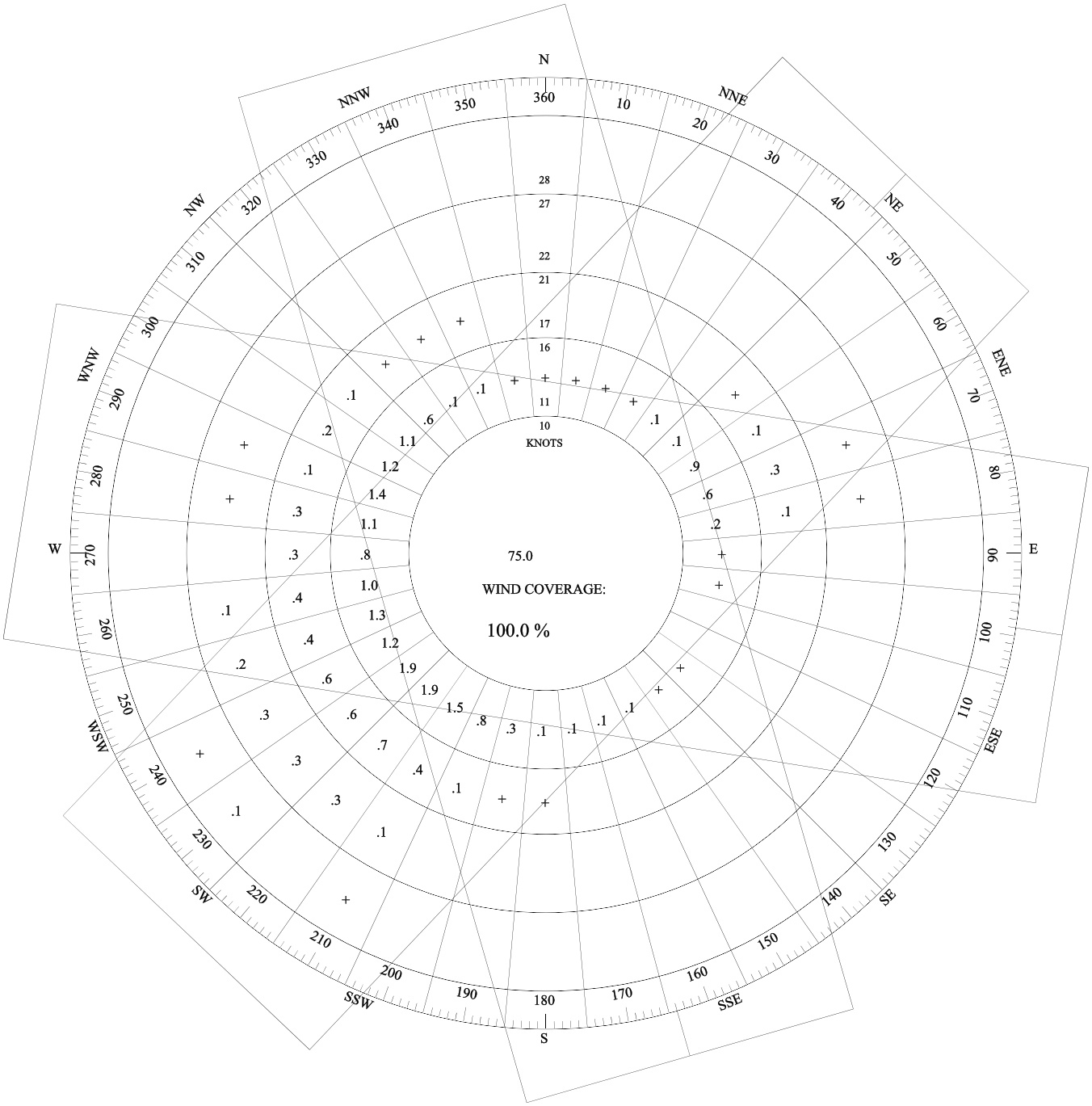
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KNOTS
75.0
WIND COVERAGE:
100.0 %

APPENDIX D – Market Competitive Analysis Tables

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D.1 COMPETITIVE RATES AND CHARGES

Airport	Land Lease	Maintenance Fee	How is the lot priced?	Automobile Parking
Brantford (CYFD)	$0.38 per ft²	$0.38 per ft²	5' perimeter	No details
St-Thomas (CYQS)	*$0.21 per ft²	Snow removal: $80 / hr Grass cutting: $128 / season	*Entire lot	Free Parking
Kincardine (YKD)	*$0.33 per ft²	N/A	2' buffer around hangar	Free Parking
Wingham (CPR7)	*$0.227 per ft²	N/A	*Small perimeter	Free Parking
Huronia (CYEE)	$0.38 per ft²	N/A	*5 ft perimeter around hangar	$120 per year or Free
Brampton (CNC3)	$4.92 per ft² commercial $1.74 per ft² (private)	Snow Removal $350 per year or $35 per removal	Footprint	Free
Kitchener/Waterloo (CYKF)	$0.06 per ft² (commercial) $0.115 per ft² (special commercial)	$0.09 per ft² Snow removal: $250 / hr Apron sweeping: $125 / hr	*5 foot perimeter	90 minutes free then $4/hr, $8/day or $56/week. Taxes included
London (CYXU)	*$0.09 - $0.11 per ft²	*$0.09 per ft²	*Footprint	No details
Brantford (CYFD)	$0.38 per ft²	$0.38 per ft²	5' perimeter	No details
Niagara District (CYSN)	*$0.267 per ft²	$0.267 per ft²	10' perimeter	No details
Stratford (CYSA)	$0.30 per ft²	$0.30 per ft²	15' buffer	Free parking
Wiarton (CYVV)	*$0.31 per ft²	N/A	3' perimeter	Free parking
Lindsay (CNF4)	N/A	N/A	N/A	Free parking
Collingwood (CNY3)	*$0.3725 per ft²	N/A	4 foot buffer around building	Free parking
Parry Sound (CNK4)	*$0.80 per ft²	Hydro and Snow plowing included	Footprint	$250/year $175/season $50/month $10/week $2/day

Airport	Land Lease	Maintenance Fee	How is the lot priced?	Automobile Parking
Burlington Executive (CZBA)	*$2.75 per ft^2 (recreational) *$4.52 per ft^2 (commercial)	*Included	*1' perimeter around building	Free Parking
Tillsonburg (CYTB)	*$0.2952 per ft^2	$100 per year for grass cutting and snow removal	*Footprint	Free Parking
Barrie-Lake Simcoe (CYLS)	*$0.318 per ft^2 (serviced lots) $0.138 per ft^2 (unserviced lots)	Snow removal: $150 / hour Apron Sweep: $150 / hr Water / Sewer connection: $20,000 (one-time fee) Fire service connection: $2,500 (one-time fee) General maintenance: $0.10 per ft^2	Defined by the lot	Free Short and Long Term
Peterborough (CYPQ)	$0.2816 per ft^2 + $0.08 per year per ft^2	$75/hour for a 2-hour minimum + $25/hr for additional work	Defined by the lot	Free Parking

**Denotes 2012 values as 2016 values were not available.*

D.2 AIRPORT HANGAR RATE COMPARISONS

Airport	Quantity	Type or Size of Hangar	Prices
Brantford	10	Recreational Hangars	$270 / month
	20	T-Hangars (Small)	$379.27 / month
	7	T-hangars (large)	$530.45 / month
	9	Commercial hangar space	$3.21 / ft^2
Oshawa	3	Buildings with 15 T-hangars (Cold storage)	$6.00 / ft^2
	3	10 000 square foot hangars (Heated)	$1.40 / ft^2
	1	15 000 square foot hangars (Heated)	$1.40 / ft^2
	1	30 000 square foot hangars (Heated)	$1.40 / ft^2
	8	50 x 150 square foot hangars (privately owned)	N/A
Dunkirk	6	T-Hangars	$250 / month + utilities
	7	60 x 60 square foot hangar	$3.00 / ft^2
	1	60 x 66 square foot hangar	$1500 + utilities
	1	160 x 250 square foot hangar	$160 to $250 / month
Barrie	4	30 000 square foot hangar	$12.00 / ft^2
Ashtabula	2	14 x 44 square foot hangar	$585 / month
	2	12 x 42 square foot hangar	$229 to $308 / month
	2	T-hangar	$176 / month
Chatham-Kent	1	Cessna 150 (5 spots)	$200 / month per spot
Ste-Catharines	1	12 000 square foot hangar	$5.40 / ft^2

D.3 COMPETITIVE LAND RATES

Airport	Land	Size of land	Price
Brantford	Airside	450 acres – only 80 acres rented	$0.37 / ft²
	Landside	20 acres (not developed)	$0.83 / ft²
Oshawa	Airside	21 hectares + North side 4.9 hectares, west side tie downs not assessed	N/A
	Landside	16.75 acres	$21 900 / year
Dunkirk	Airside	80 acres (airport)	N/A
		9 acres leased to businesses	N/A
	Landside	65 acres golf course	N/A
		100 acres no service	N/A
Barrie	Airside	80 acres	$0.318 / ft² (serviced) $0.138 / ft² (unserviced)
Ashtabula	Airside	620 acres for airport (not divided)	Owned by county
Chatham-Kent	Airside	422 acres	N/A
Ste-Catharines		329 acres	~$0.26 / ft²
Peterborough	Airside		$0.25 / ft² + water and sewage fee
Kitchener/Waterloo		1,000 acres	Private: $0.29/ ft² Commercial: $0.29/ ft² Special Commercial: $0.435/ ft²

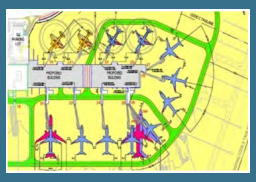
D.4 FEES and Charges Comparison

Airport	Landing fees	Tie down fees	100 LL price	Jet A1 price	Fuel call out fee	De-icing services	Towing fees	Apron Parking
Brantford (CYFD)	Free for private planes, $40 for a jet turbine	N/A	$1.72/L	$1.69/L	$120	N/A	$20/month with a hangar, otherwise free	No charge
St-Thomas (CYQS)	Ranges from $11 to $115	$17.50 per day	$1.35/L (before tax)	$1.00/L (before tax)	Free	$128 + $8/L for Type 1	$31	$17.50 / day
Kincardine (YKD)	Commercial aircraft over 3000 kg is $92 + tax	$51 to $76.50 + tax depending on grass/pavement area and if you need electricity or not.	$2.68/L (tax included)	$1.67/L (tax included)	N/A	N/A	N/A	$51.98
Wingham (CPR7)	No fees	N/A	$1.75/L (tax included)	$1.23/L (tax included)	N/A	N/A	N/A	
Huronia (CYEE)	$40 + tax	Daily: $7 + HST Weekly: $18 + HST Monthly: $50 + HST	$1.81/L	$1.81/L	N/A	N/A	N/A	Daily $7.00 + HST, Weekly: $18.00 + HST, Monthly: $50 + HST,
Brampton (CNC3)	$75 for commercial aircraft	$87 - $160 +tax	$1.88/L (tax included)	N/A	N/A	$60 for defrost + $20 per hand spray	$10 to $20	$15/night single engine $20/night multi
Kitchener/Waterloo (CYKF)	$6.50 per 1000 kg	Free with fuel or $3.30 to $4.50 per 1000 kg.	$1.68/L + surcharge of $0.05/L	$1.28/L + surcharge of $0.045/L	N/A	N/A	$30 per pushback	$10 to $60 per day based on weight
London (CYXU)	N/A	N/A	$1.73/L	$1.33/L	N/A	N/A	N/A	N/A
Brantford (CYFD)	N/A	N/A	$1.72/L	$1.69/L	N/A	N/A	N/A	N/A

Airport	Landing fees	Tie down fees	100 LL price	Jet A1 price	Fuel call out fee	De-icing services	Towing fees	Apron Parking
Niagara District (CYSN)	< 4000 kg is free 4000 to 13,360 kg is $57.50 Over 13360 kg is $115	$90 to $230 per month	$1.81/L	$1.59/L	N/A	N/A	N/A	$9.20 to $27.60 per night, or $70 to $210 per month.
Stratford (CYSA)	Private is free $50 for commercial planes	$6 per night $67 per month	$1.46/L (before tax)	$1.23/L	Not offered	Not offered	N/A	No charge
Wiarton (CYVV)	Private free 3000 to 8000 kg is $28 >8000 kg is $40	Free with purchase of fuel or $10 to $20 for overnight depending on weight	$1.77/L (tax incl)	$1.38/L	Not offered	Not offered	$10	Free with purchase of fuel or $10 to $20 for overnight depending on weight
Lindsay (CNF4)	$25/day for large commercial aircraft	$55.00/ month grass $65/month pavement	$1.65/L (tax incl)	$1.35/L	Not offered	N/A	N/A	$10 + HST per night. 3 day weekend: $20 + HST. Weekly: $25 + HST, Monthly: $65 + HST for paved, $55 + HST for grass. Commercial aircraft is $25 + HST per day.
Collingwood (CNY3)	Free for private planes	$60/month Tarmac $50/month grass	$1.62/ L	$1.38/L	N/A	N/A		Single engine: $9 + HST, with hydro $15 + HST. Free

Airport	Landing fees	Tie down fees	100 LL price	Jet A1 price	Fuel call out fee	De-icing services	Towing fees	Apron Parking
							$40 afterhours	parking if fuel is purchased. Twin is $15 + HST, $20 + HST with hydro. Free parking if fuel is purchased. Jet/Turbo prop is $50 to $66 for parking.
Parry Sound (CNK4)	Private free $6 per 1000 kg for commercial	$550.00/year $375.00/season $120.00/month $50.00/week $8.50/day	$1.62/L (before tax)	$1.28/L (before tax)	$75	N/A	Can be arranged on site	Free
Burlington Executive (CZBA)	N/A	N/A	$1.69/L	$1.29/L	N/A	N/A		N/A
Tillsonburg (CYTB)	No Landing fees	$6/day, $42/month	$1.39/L (no tax) $1.57/L (after tax)	$1.19/L (no tax) $1.34/L (with tax)	Variable	N/A	free	Free
Barrie-Lake Simcoe (CYLS)	$5.50 to $7.50 per 1000 kg	Free with purchase of fuel or $3.30 to $4.50 per 1000 kg	$1.59/L (before tax)	$1.28/L (before tax)	Included	$100 + $8/L type 1	Minimum of $20 per tow	Done by aircraft weight $3.30 per 1000 kg
Peterborough (CYPQ)	Under 4082 kg is free. Above this weight ranges from $20 to $100	$65 / month (no hydro) $105 / month (hydro)	$1.79/L (before tax)	$1.55/L (before tax)	Included	$300 + $12/L Type 1/ 4	N/A	$10 to $80 per day depending on weight or $100 to $600 per month.

Project Management
Feasibility Studies
Master & Facility Planning
Operational Analysis
Concept & Detail Designs



IT Assessment & Planning
Network Infrastructure
WIFI/Wireless Infrastructure
Common-Use Systems
Revenue/Mgmt. Systems

Terminal Security Consulting
Security Systems Design
Special Terminal Systems
Baggage Handling Systems
Cargo & Hold Bag Screening

Terminal Gate Planning
Airside Design & Modelling
Aircraft Servicing Design
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