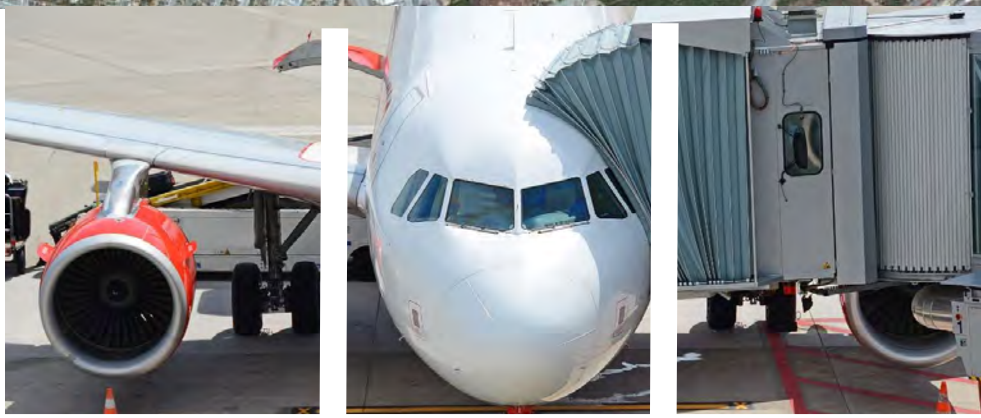
JANUARY 2017



ST. JOHN'S
International Airport Authority

REPORT N° 141-25347-01

AIRPORT MASTER PLAN UPDATE 2015-2035
ST. JOHN'S INTERNATIONAL AIRPORT

ST JOHN'S, NEWFOUNDLAND AND LABRADOR

St. John's International Airport Master Plan Update 2015 - 2035

Final Report
Prepared for the St. John's International Airport Authority
January, 2017

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International Airport Authority

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EXECUTIVE SUMMARY

An update to the Airport's official Master Plan was commissioned in 2014 by the St. John's International Airport Authority (SJIAA). Development of the updated Airport Master Plan was to consider the findings and recommendations produced from the multiple supporting studies that were completed for Airport Authority over the past 10 years. The update, described herein, is a comprehensive update of the 2002 Airport Master Plan. Included, as part of this Master Plan, is an update to the Airport's 2001 Land Use Plan.

St. John's International Airport (SJIA) serves as the premier gateway to Newfoundland and Labrador and plays a significant role in facilitating economic growth and development in the region. Approximately 70 percent of non-resident visitors arrive in the province via the Airport according to research cited by the SJIAA[1]. SJIA also serves as a major logistical and transport hub, serving smaller communities in Newfoundland and Labrador, as well as the off-shore oil and gas industry. The Airport covers approximately 639 hectares of land, which includes three (3) runways, associated taxiways, aprons, a passenger terminal building, and three (3) commercial development areas.

In 2009 it was estimated that every year the Airport generates in excess of $400 million in GDP to the Regional and Canadian economies, and contributes approximately 7,700 person-years of employment[2].

The primary goal of the Airport Master Plan is to provide the SJIAA with the framework to guide the development of the Airport over a 20-year planning horizon and ensure that future improvements are undertaken in a responsible manner with due regard for operational efficiency, safety, financial viability and the environmental compliance.

SJIA is located within the City of St. John at its north end, approximately 7 km from the city centre. To the north of the Airport is the community of Torbay. Access to the west side of the Airport and terminal area is from World Parkway, which in turn leads to Portugal Cove Road and from there to the Trans-Canada Highway. The facilities on the east side of the Airport are accessed from Torbay Road.

The Airport's three runways include: Runway 02-20, which measures 1,532.5 metres (5,028 feet) by 30.5 metres (100 feet), Runway 16-34, which measures 2,135.1 metres (7,005 feet) by 60 metres (197 feet), and Runway 11-29, which measures 2,591.4 metres (8,502 feet) by 60 metres (197 feet). The Airport is capable of supporting aircraft operations during instrument meteorological conditions down to Category IIIA instrument precision minima.

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[1] 2009 Economic impact Analysis of the St. John's International Airport, Strategic Concepts Inc. and Wade Locke, April 2011

[2] 2009 Economic impact Analysis of the St. John's International Airport, Strategic Concepts Inc. and Wade Locke, April 2011

In 2010 InterVISTAS Consulting Inc. prepared long term air traffic forecasts for St. John's International Airport, which included annual passenger volumes and aircraft movements at 5-year intervals from 2010 to 2020. In 2014 InterVISTAS undertook a review of these forecasts to assess their validity against recent economic developments.

From 2010 to 2030 passenger activity is expected to increase by 81 percent, from approximately 1.45 million passengers to almost 2.5 million. The most significant areas of growth would be in the transborder and international sectors. During the same period, annual aircraft movements for Level I-III air carriers are projected to increase from approximately 25,000 to 40,000. Total aircraft movements are currently estimated to be close to 42,000 and are projected to increase to 56,000 by year 2035.

To meet the long-term activity demands, this Airport Master Plan identifies a number of potential infrastructure improvements. The Airport Master Plan is not a commitment on the part of the SJIAA to undertake any of these improvements. Rather, the improvements identified in this Master Plan would be triggered by specific activity demand or changes in use, and subject to available funding. Improvements are not tied to an explicit timeframe. The proposed improvements include:

Airside

- Extensions to both Runway 11-29 and Runway 16-34.
- Conversion of Runway 02-20 to a taxiway, to accommodate the expansion of the East Commercial development area.
- Provision for a full parallel taxiway for Runway 11-29.
- Extension of Taxiway Kilo to support expanded airside commercial development in the West Commercial Development Area
- Expansion of apron areas to accommodate continued expansion of the PTB and commercial areas.
- Expansion of the Central Deicing Facility (CDF) to improve capacity and throughput.
- Enhanced airside security measures for Tier 1 airports including enhanced perimeter security fence and detection measures, including a second NPSV facility and airside vehicle corridor to facilitate/connect traffic from Apron 2 entering Apron 1 Critical Restricted Area.

Passenger Terminal Building

- East expansion of the PTB to accommodate expanded check-in and pre-board passenger screening facilities, as well as an expanded baggage make-up area (currently underway).
- West expansion of the PTB to accommodate expanded international arrivals facility and expanded baggage claim area.

Groundside

- Expansion of terminal parking capacity.
- Improvements to access roads.
- Relocation of fuel storage facility.

Commercial Development

- Provision to accommodate aviation and non-aviation related commercial development with expansion of the East and West Commercial Development Areas and with the closure of Runway 02-22, the creation of a new South Commercial Development Area.

A key component of the Airport Master Plan is an updated Airport Land Use Plan. The purpose of the Land Use Plan is to provide a vision that allows for the rational development of the Airport to proceed while protecting its long term operational and commercial viability. The Land Use Plan for St. John's International Airport is illustrated in the following **Exhibit A3**.

LAND USE LEGEND

ITEM
AIRSIDE SYSTEM (AS)
AIRPORT RESERVE (AR)
TERMINAL RESERVE (TR)
AIRSIDE COMMERCIAL (AC)
GROUNDSIDE COMMERCIAL (GC)
RESTRICTED GROUNDSIDE COMMERCIAL (RGC)
NON-AVIATION GROUNDSIDE COMMERCIAL (NAGC)
OPERATIONS AND SUPPORT SERVICES (OASS)
PUBLIC ACCESS AND PARKING (PAAP)

LEGEND

ITEM	EXISTING	LONG-TERM	ULTIMATE
AIRPORT PROPERTY LINE		N/A	N/A
AIRFIELD PAVEMENT			
ROADWAY AND PARKING			N/A
BUILDINGS			N/A
RUNWAY END SAFETY AREA (RESA)			
AIRPORT SECURITY FENCE		N/A	
PAPI SYSTEM		N/A	N/A
ELECTRONIC PROTECTION AREA			
RUNWAY SAFETY AREA (RSA)	N/A		
RUNWAY/TAXIWAY STRIP	N/A		

No.	DATE	DESCRIPTION	BY	QA/QC
5	JAN. 2017	FINAL REPORT	JRM	JH
4	12/23/2016	FINAL REPORT	JRM	JH
3	12/31/2015	FINAL REPORT	JRM	JH
2	12/18/2015	FINAL	JRM	JH
1	12/11/2015	FIRST DRAFT FOR CLIENT REVIEW	JRM	JH

REVISION / ISSUE

Notes

1. DRAWING IS TO BE USED FOR PANNING PURPOSES ONLY.

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:7000

100 0 50 100 250 500 METRES

250 0 250 500 1000 1500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT LAND USE PLAN UPDATE 2015 - 2035 RECOMMENDED AIRPORT LAND USE PLAN

Project No. 141-25347-00

EXHIBIT A3

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\CYYT ALUP r3e.dwg
January 13, 2017

1. INTRODUCTION AND GUIDING PRINCIPLES

1.1 INTRODUCTION

The current Airport Master Plan was prepared in 2002 and provided the Airport with a 15-year planning horizon (2001 – 2015). Since the 2002 Airport Master Plan was prepared, a number of infrastructure improvements have been undertaken. These include expansion of the terminal building and associated groundside infrastructure, construction of a remote aircraft deicing facility, implementation of a Category II Instrument Landing System for Runway 29, and improvements to infrastructure in order to support Category IIIA instrument approaches to both Runway 11 and 29 in 2016. In addition to these Airport-sponsored initiatives, there have been a number of developments by the private sector. These developments include the construction of new hangars, support facilities and recently a hotel.

To ensure the long-term operational and financial viability of the Airport is not compromised by short-term development, it is prudent for the Airport Authority to have in place a long-term Master Plan that will guide development of the Airport over the next 20-years, with consideration for additional growth well beyond the planning horizon. With the planning horizon closing on the current Airport Master Plan it is important that it be replaced with a new Airport Master Plan that looks forward to the next 20 years of development. As part of its obligations to Transport Canada described in the terms of the ground lease, the Airport Authority must also maintain a Land Use Plan describing the allowable developments and have it filed with Transport Canada.

An update to the Airport's official Master Plan was commissioned in 2014 by the St. John's International Airport Authority (SJIAA). Development of the updated Master Plan was to consider the findings and recommendations produced from the multiple supporting studies that were completed for Airport Authority over the past 10 years. The update, described herein, is a comprehensive update of the 2002 Airport Master Plan. In preparing the update, WSP re-examined all components and areas and choose to evaluate in detail several key areas of particular importance to the Airport; including:

1. Terminal area expansion
2. Central De-icing facility requirements;
3. Runway system requirements;
4. Commercial development requirements; and
5. Land Use.

Included as part of this Master Plan Update is an update to the Airport's 2001 Land Use Plan. The St. John's International Airport Land Use Plan Update 2015-2035 was developed in conjunction with this Master Plan Update as a standalone document. The report has been included as an attachment to **Appendix H – Supporting Documentation** and forms a significant component to the Master Plan.

1.2 BACKGROUND

St. John's International Airport (SJIA) serves as the premier gateway to Newfoundland and Labrador and plays a significant role in facilitating economic growth and development in the region. Approximately 70 percent of non-resident visitors arrive in the province via the Airport according to research cited by the SJIAA[3]. SJIA also serves as a major logistical and transport hub, serving smaller communities in Newfoundland and Labrador and the off-shore oil and gas industry.

In 2009 it was estimated that every year the Airport generates in excess of $400 million in GDP to the regional and Canadian economy and contributes approximately 7,700 person-years of employment.[4]

Given the significant importance of the Airport to the region and its economic contribution, it is important that the development of the Airport be guided in a manner that ensures that the short- to long-term operational and business objectives of the SJIAA are achieved, and that the Airport meets the ongoing needs of the region.

1.3 AIRPORT VISION, VALUES AND KEY STRATEGIC ISSUES

1.3.1 Vision

The Vision Statement for the St. John's International Airport Authority is:

> "We will create an exceptional airport experience at Newfoundland and Labrador's Premier Gateway"

1.3.2 Core Values

The core values of the St. John's International Airport Authority are as follows:

- Safety and Security
  - "We focus on safety and security in everything we do"
- Accountability
  - "We hold ourselves responsible for our actions"
- Integrity
  - "We act with respect, honesty, and transparency"
- Quality and Continuous Improvement
  - "We are dedicated to excellence in operations and customer service"

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[3] 2009 Economic Impact Analysis of the St. John's International Airport, 2011

[4] 2009 Economic Impact Analysis of the St. John's International Airport, 2011

- Environment
    - “We are committed to environmental sustainability”
- Collaboration
    - “We work as a team with our stakeholders to exceed our customers’ expectations.

1.3.3 Strategic Issues

The following list of strategic issues represents the top 10 issues prioritized in order of importance to SJIAA (starting with the highest) that must be addressed in support of achieving the Airport’s Vision:

1. Matching airport capacity to demand
2. High property tax (Municipal)
3. Effective financing capital program
4. Planning and managing aviation risk with capital projects
5. Lack of resources (human and financial)
6. Passenger service
7. Terminal building congestion (operational and during construction)
8. Airport Culture
9. Labour Relations
10. Airport Authority office and other workspace functional and space constraints

Of particular importance to the Master Plan are issues one and four above, which if left unaddressed, could limit the growth of the Airport and the stifle economic growth within the region.

1.4 GOALS AND OBJECTIVES

The primary goal of the Airport Master Plan is to provide the SJIAA with the framework to guide the development of the Airport over a 20-year planning horizon and ensure that future improvements are undertaken in a responsible manner with due regard for operational efficiency, safety, financial viability and environmental compliance. The intent of the Airport Master Plan is to provide recommendations regarding short- (1-5 years), medium- (6-10 years) and long-term (11-20 years) improvements while also considering the ultimate development of the Airport.

The primary objectives of the Airport Master Plan include the following:

1. Conduct an assessment of existing infrastructure and identify potential deficiencies;
2. Update the existing airport layout plan to reflect the current status of the Airport.
3. Review historical activity levels and prepare forecasts of future demand;
4. Identify infrastructure requirements to meet proposed activity demands and commercial opportunities;

5. Develop an Airport Land Use Plan that accommodates infrastructure requirements in an efficient and cost effective manner, while protecting the long-term viability of the airport in a safe and environmentally responsible manner;
6. Provide a phasing plan that optimizes airport development in a manner that meets the financing capacities of the Airport Authority; and
7. Optimize opportunities for aviation and non-aviation commercial development as a means of enhancing airport revenues.

1.5 PLANNING PRINCIPLES, CRITERIA, AND REGULATORY REQUIREMENTS

The Airport Master Plan was prepared in accordance with Canadian industry best practices. This includes all existing regulatory standards and recommendations. Additionally, for planning and design purposes, some key guidance materials were also referenced and utilized in the preparation of the Airport Master Plan and airport layout plans as best practice and widely acceptable methods used within the aviation industry. The following list includes but is not limited to:

- Canadian Aviation Regulations;
- TP312 4th and 5th Editions – Aerodrome Standards and Recommended Practices;
- TP1247 9th Edition – Aviation Land Use in the Vicinity of Airports;
- TP308 Change 6.0 – Criteria for the Development of Instrument Procedures;
- ICAO Annex 14 Aerodromes – Volume 1 Aerodrome Design and Operations;
- ICAO Doc 9184 – Airport Planning Manual;
- ICAO Doc 9137 – Airport Services Manual;
- ICAO Doc 9157 – Aerodrome Design Manual;
- IATA Airport Development Reference Manual;
- FAA AC 150/5060-5, Airport Capacity and Delay;
- FAA AC 150/5070-6B, Airport Master Plans; and
- FAA AC150/5300-13, Airport Design.

1.6 NEW TP312 5TH EDITION COMPLIANCE

Effective September 15, 2015 Transport Canada TP 312 5th Edition became the standard document for airport design in Canada. In the previous editions of TP 312, including the 4th Edition, airport design/infrastructure requirements were specified based on the physical characteristics of runway length and aircraft size. The new 5th Edition of TP 312 revises this approach to associate airport design/infrastructure requirements with aircraft performance and type of operation, in addition to the physical characteristics of aircraft size.

Transport Canada has indicated that the 5th Edition of TP 312 aims to address issues commonly experienced at Canadian aerodromes. These include challenges associated with changing levels of service and the type of traffic using airport facilities. The modifications contained in TP 312 5th Edition were done to ensure consistency in the operational concepts within North America and to harmonize, where possible, with current ICAO specifications, the latest in instrument procedure design criteria, and advances in airfield technology.

It is important to note that the 5th Edition of TP 312 contains 'Standards' only. The recommendations previously contained in TP 312 4th Edition have either been removed or adopted as standards. Where certain recommendations are found to be of use to airports in adopting a best practices approach, the information is released in the form of Advisory Circulars or simply by reference to ICAO Annexes and Aerodrome Design/Service Manuals.

The key principle of 5th Edition is that the certification level of service will be established based on the aircraft using the facility or in some cases planned usage as declared by the airport operator. Runway length will no longer be of prime consideration in application of the standards. In the future, the certification level of service will be published in the Aeronautical Information Publication (AIP), Canada Flight Supplement (CFS) and Canada Air Pilot (CAP) for use by aircrews in determining the suitability of the aerodrome for the intended operation pursuant to CARs 602.96(2b).

1.6.1 Implementation Schedule

Transport Canada describes the implementation of TP 312 5th Edition over a three (3) year time period with several milestones, which are described as follows:

<u>Year 1 – ending December 31st 2016</u>

A. Transport Canada will publish the following Advisory Circulars:
    - Grandfathering at Airports pursuant to CAR 302.07;
    - Methodology for the identification of the Aircraft Group Number (AGN); and
    - Introduction of TP312 5th edition, including:
        - Identification of the Aircraft Group Number (AGN)
        - Aeronautical publication changes
        - Airport Operations Manual (AOM) changes
        - Airport improvements following the introduction of TP312 5th edition

B. Airport Operators are asked to commence the process of identifying the AGN for each part of the maneuvering area and include this information in the Airport Operations Manual (AOM) prior to the end of 2017.

<u>Year 2 – ending December 31st 2017</u>

A. Transport Canada will publish Advisory Circulars in reference to CARs Parts VI, and VII – Changes to Aeronautical Information for certified aerodromes.

B. Transport Canada will also update Aeronautical Information Manual (AIM) and Aeronautical Information Publication (AIP) of Canada to advise ICAO and the international community of the introduction of the operational concept and the publication changes to aerodrome information.

Year 3 – ending December 31st 2018

A. NAV CANADA to publish of airport certification level (Aircraft Group Number, level of service, aerodrome visibility) on a common AIRAC date in the Canada Flight Supplement (CFS). This is planned to occur on AIRAC date of January 3rd, 2019. To achieve this publication date, airport operators have been advised that all the necessary information must be submitted to NAVCANADA prior to October 1st, 2018.

B. Transport Canada to convene a Focus Group for the 1st amendment to the 5th Edition.

1.6.2 Grandfathering Under Previous Version of TP 312

Transport Canada has indicated that TP 312 5th Edition will be enacted via Canadian Aviation Regulations (CARs) Section 3*02.07 – Obligations of Operators*, which states:

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

Section 302.07 is generally referred to as the "grandfathering" clause. Compliance with the most recent edition of TP 312 has not typically been required until such time as the operator undertakes the reconstruction, replacement or improvement of the specific facility (i.e. airfield electrical rehabilitation, taxiway reconstruction) to which the standard is applicable. Transport Canada has indicated that routine maintenance activities such as crack sealing and repaving are not considered triggers for compliance with the latest edition of TP 312.

Since the official release of TP 312 5th Edition in September 2015, Transport Canada has provided some clarification regarding the applicability of the new standards. The clarification is found in Advisory Circular (AC) No. 302-018 *Grandfathering at Airports Pursuant to Canadian Aviation Regulation (CAR) 302.07*. The AC identifies which specific activities will trigger compliance with the TP312 5th Edition. In addition to AC No. 302-018, Transport Canada has published the following ACs in order to clarify the implementation process and advise airports on the major changes to standards as contained in TP 312 5th edition:

- AC No. 302-021 Introduction of TP 312 5th Edition;
- AC No. 302-019 Methodology for the Identification of the Aircraft Group Number; and
- AC No. 302-020 Mixed Operations at an Airport.

1.7 ASSUMPTIONS AND QUALIFICATIONS

This master plan update has been developed with consideration to the findings and recommendations identified in multiple supporting studies.

These studies include:

- West Commercial Area servicing studies, 2014 and 2015
- St. John's International Airport 2015-2019 Strategic Business Plan, 2014
- St. John's European Air Service Development Strategy, 2014
- St. John's International Airport Air Traffic Forecast Review, 2014
- St. John's International Airport Strategic Terminal Plan, 2007, 2008, 2011, 2012, & 2014
- 2009 Economic Impact Analysis of the St. John's International Airport, 2011
- Air Cargo Study for St. John's International Airport, 2010
- Joint Funding Proposal for Airfield Accessibility and Aviation Safety Improvements at St. John's International Airport, 2009
- St. John's European Air Service Development Strategy, 2009
- Airport Accessibility Infrastructure Improvement Project – Technical Brief, 2009
- St. John's Accessibility Business Case Briefing, 2009
- St. John's Accessibility Business Case, 2009
- St. John's International Airport Runway 11-29 Extension Assessment, 2007
- Torbay Road North Commercial Area studies, 2007
- Central De-icing Facility Design Development Report, 2006
- St. John's International Airport Master Plan 2002-2015
- St. John's Airport – Master Plan 1984
- St. John's Airport – Master Plan Amendment, 1986
- St. John's Airport Usability Study, 1985

In considering the above, WSP acknowledges the work undertaken by others but does not take ownership of their work. Rather, this Airport Master Plan builds upon and synthesizes this previous work into the current plan.

Where feasible, data has been updated to reflect current conditions. In some cases the development of this Master Plan has relied on data, findings and/or recommendations from studies completed several years prior. In these cases, WSP has reviewed these studies for applicability.

1.8 CONSULTATIONS AND INPUT

In undertaking the preparation of this Airport Master Plan, consultations were held with various airport stakeholders including representatives from the surrounding communities. Key stakeholders included:

- Airport tenants and fixed-base operators;
- Air service providers;
- Aircraft catering and ground support companies;
- Car rental companies;
- De-icing service provider;
- NAV CANADA;
- Transport Canada;
- City of St. John's;
- Neighboring communities of Torbay and Portugal Cove-St. Philips; and
- Local business and tourism representatives.

A complete list of stakeholder consultations for both the Airport Master Plan and Land Use Plan (joint consultation) can be found in Appendix I.

1.9 AIRPORT PROFILE

St. John's International Airport is ranked 12th among the busiest airports in Canada based on annual passenger volumes. Located approximately 7 kilometers north of the St. John's central business district, the Airport covers approximately 639 hectares of land. The Airport is served by six major scheduled airlines as well as seasonal leisure air carriers. Direct routes include major centres in Canada and the United States, as well as seasonal destinations in Europe and the Caribbean. In addition to scheduled passenger service, the Airport supports a robust general aviation sector that includes corporate aviation, aircraft maintenance, fixed base operators, air ambulance services, helicopter operators, government and military operations, and air charter companies.

1.10 ST. JOHN'S INTERNATIONAL AIRPORT AUTHORITY

Established in 1998, St. John's International Airport Authority (SJIAA) is a private not-for-profit corporation. The creation of the Airport Authority was in response to the Federal Government's 1994 National Airport's Policy which saw the operation of National Airport System (NAS) airports transferred from Transport Canada to local airport authorities. Although the federal government retains ownership of the airport, the SJIAA, under a long-term ground lease agreement established in 1998, is responsible for the finance, operation and continued development of the St. John's International Airport (SJIA) until November 30th, 2078. Under the land lease agreement, the SJIAA pays rent to the federal government on an annual basis.

The SJIAA has a diverse 12-member Board of Directors who are nominated by various stakeholders in the region including the Federal Government, Province of Newfoundland and Labrador, and the Cities of St. John and Mount Pearl. The Board comprises of three committees. Current Board Committees include:

1. Governance;
2. Finance and Audit; and
3. Development.

Ad-hoc committees may also be established by the Board on an as needed basis to address situations or issues that may fall outside the prevue of any one committee.

2. Socio-Economic Profile

2.1 AIR SERVICES

Airline seat capacity at St. John's International Airport has grown significantly over the last number of years, with new airlines providing service to more destinations. Since 2008, St. John's International Airport has had the third highest growth in airline seat capacity among medium to large-sized airports in the country. This represents an approximate 40% increase, totaling more than 2 million seats available annually for purchase to and from the airport.

The major air carriers serving the airport include Air Canada, WestJet and Porter Airlines. Provincial Airlines and Air Labrador provide regional air service to communities within the province, and Sunwing and Air Transat provide sun charter service during the winter months. In addition, Sunwing provides scheduled service to and from central Canada during the summer months.

Key year-round markets served by direct air service from SJIA include Toronto (33 percent of seat capacity), Halifax (30 percent of seat capacity), and Montreal (5 percent of seat capacity). St. John's International Airport serves as hub for regional air service to smaller communities on the island and in Labrador. These communities include Gander, Deer Lake, Stephenville and St. Anthony. Approximately 10 percent of the airline seat capacity serving the Airport is regional air service to smaller communities within the province. WestJet also provides year-round service to Orlando, Florida and seasonal service to Tampa, Florida.

The greatest growth in new services over the last few years has been in the international market. During six months of the year, there are three daily services to Europe: Air Canada offers direct flights to London Heathrow year-round, while WestJet provides summer service to both Dublin and London Gatwick.

Given St. John's geographical location, a number of locations in Europe can be served using narrow-body aircraft. With the extended range of the next generation of narrow-body aircraft soon to be introduced, direct flights to much of Europe and the Mediterranean would be achievable. Potential target markets include Paris, Frankfurt, and Amsterdam. In addition to serving the local market, SJIA could serve as a hub, receiving traffic from other cities in Atlantic Canada, Ontario and Quebec as is the case with the existing European services.

On a typical day, there are approximately 90 arrivals and departures by scheduled airlines.

2.2 DEMOGRAPHICS / CATCHMENT

The Airport's primary catchment area includes St. John's and surrounding communities, and the Avalon Peninsula. The population of this area is approximately 260,000. A secondary catchment area is the remainder of the island, with a population of approximately 285,000.

Over the 20-year horizon of the Airport Master Plan, the population of the St. John's Census Metropolitan Area (CMA) is forecast to grow from the current 210,600 to approximately 233,760. This represents an increase of approximately 11% over the 20-year period. However, for the same period, the overall population of the province is forecast to remain relatively steady, with no significant growth. **Figure 2-1** illustrates the forecasted population growth for St. John's.

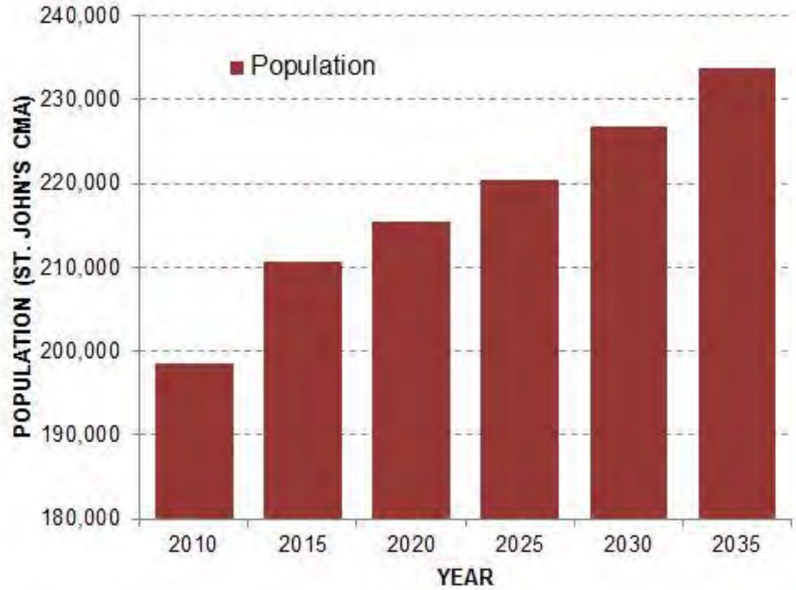

Figure 2-1 – Forecasted Population Growth for St. John's[5]

2.3 ECONOMIC PROFILE

After a decade of significant growth, economic activity in Newfoundland and Labrador has slowed due to weaker commodity market conditions, particularly in oil and gas and iron ore. Many of the province's economic indicators, including Gross Domestic Product (GDP), employment, housing starts, and provincial exports are all expected to decline in 2015 over the previous year. Oil production from Hibernia fell by 5.7 percent in 2014 and iron ore shipments decreased by approximately 20 percent.

The provincial GDP for 2015 is forecasted to be $32.9 billion, a decline of approximately 0.3 percent over the previous year.

Despite this downturn, capital investment remains at very high levels and consumer spending increased by 3.4 percent in 2014 over the previous year.

[5] 2009 Economic Impact Analysis of the St. John's International Airport, April 2011

Below is a summary table of the direct, indirect and induced economic impacts of YYT tenants, including the airport authority impact from an updated draft 2016 updated Economic Impact Study for St. John's International Airport:

Current Ongoing Annual Impacts of YYT Tenants[6]

Type of Impact	Employment (Person Years)	Income ($ Millions)	GDP ($ Millions)	Output ($ Millions)
Direct	1,720	104	166	369
Indirect	540	36	55	132
Induced	380	20	45	72
Total in NL	***2,640***	***160***	***266***	***573***

These results indicate that onsite operations at St. John's International Airport support an estimated **1,720 direct full-time equivalents (FTEs)**, with those employees earning approximately **$104 million in direct wages**. The estimated average annual wage per annum, per FTE is roughly $60,500. Since the previous impact study conducted, we observe a growth in jobs of approximately 20%, which has tracked the growth of E/D passenger traffic over the same time frame at the airport.

According to the Government of Newfoundland and Labrador[7] the provincial economy has entered a period of contraction stemming from the decline in commodity markets and the winding down of several major infrastructure projects including Hebron and Muskrat Falls projects. Over the next few years annual capital investment is forecast to decline by approximately $4 Billion.

However, beyond 2018, the economy is forecast to grow again on the strength of production from Hebron, Muskrat Falls, and Voisey's Bay, as well as the development of new offshore resources.

[6] Preliminary ***DRAFT*** Onsite Economic Impacts - December 16th, 2016

[7] Provincial Economic Overview Government of Newfoundland and Labrador

3. AIRPORT PROFILE

3.1 AIRPORT SETTING

St. John's International Airport is located within the City of St. John's at its north end, approximately 7 km from the city centre. To the north of the Airport is the community of Torbay. The Airport covers approximately 639 hectares of land, which includes three (3) runways, associated taxiways, aprons, a passenger terminal building, and three (3) commercial development areas. Access to the west side of the Airport and terminal area is from World Parkway, which in turn leads to Portugal Cove Road and from there to the Trans-Canada Highway. The facilities on the east side of the Airport are accessed from Torbay Road.

3.2 AIRPORT HISTORY

The origins of the St. John's International Airport date back to 1939 when the Canadian Government determined that an airfield was required near St. John's as a defense against potential enemy threats. Construction began in 1941 on an airport at Torbay. Infrastructure comprised of two 4,000 ft. runways and associated taxiways, hangars and other military support facilities.

During the Second World War the Airport was used by the Royal Canadian Air Force, the Royal Air Force and the United States Army Air Corps. The Airport was also served by Trans Canada Airlines. A small, wood frame terminal building was constructed in 1943 and served the Airport until 1958.

Figure 3-1 – Airfield at Torbay
(Source: National Archives of Canada)

With the close of World War II, the Airport was transferred to the Canadian Department of Transport. However, after a short period of time the Airport reverted back to the Department of National Defense. From 1953 to 1958 the airport was used extensively by the US Air Force as a logistical supply base. Many of the hangar structures in use today at the Airport date back to the war and early post-war period.

In 1964 the Airport was again turned over to the Department of Transport and renamed St. John's Airport. The original terminal building was replaced with a new brick building in 1958 and continued to serve the Airport for many years.

In 1998 the operation and management of the Airport was turned over to the St. John's International Airport Authority. This transfer to a local airport authority initiated a major capital program that included the construction of a new 16,220 m^2 terminal facility and associated civil works.

3.3 AIRPORT ROLE

St. John's International Airport serves as the primary gateway to Newfoundland and Labrador with direct scheduled passenger service serving major centres in Canada, as well as the United States and Europe, and regional service to communities in Atlantic Canada. The airport is also the primary airport within the province for air cargo service.

The airport serves as a hub for general aviation in the province. These activities include fixed base operations, aircraft maintenance services, air charter, air ambulance, search and rescue, and helicopter operations. The airport is a centre of logistics for helicopter operations serving the off-shore oil and gas industry. Given its eastern location, the airport also serves as a technical stop for flights crossing the Atlantic.

3.4 ECONOMIC IMPACT

In 2011 an economic impact study was prepared for St. John's International Airport.[8] The study evaluated the direct, indirect and induced economic impacts of the Airport and provided a quantitative measure of its contribution to regional, provincial and national economies.

The results of the study concluded that airport activities generated over $400 million in GDP and 7,700 person-years of employment. Of this, approximately $270 million of GDP and 6,000 person-years of employment occurred within Newfoundland and Labrador. The economic impact to the Avalon Peninsula was estimated to be $250 million in GDP and 5,550 person-years of employment.

Tax revenues generated by the Airport Authority, Airport tenants and airline operators amounted to $48.4 million to the Federal Government, $30.1 million to the Provincial Government, and $5.1 to municipal government.

The Airport Authority's capital investments between 1999 and 2010 generated over $75 million in income to Newfoundland and Labrador and created 1,680 person-years of local employment. The combined government revenues from this activity have totaled over $30 million.

[8] 2009 Economic impact Analysis of the St. John's International Airport, Strategic Concepts Inc. and Wade Locke, April 2011

3.5 REGIONAL AIRPORT SYSTEM

St. John's International Airport is the largest airport serving Newfoundland and Labrador; however, there are a number of other airports on the island of Newfoundland that are served by scheduled air service. They include Gander, Stephenville, Deer Lake and St. Anthony. In the 2010 aviation activity forecast prepared for SJIA, the authors found that 22 percent of passengers travelling to/from Newfoundland and Labrador used an airport other than St. John's. In addition to having regional services feeding into St. John's, many of these airports have direct service to other domestic centres including Halifax and Toronto. **Figure 3-2** identifies airports in Newfoundland with commercial air service.

Figure 3-2 – Newfoundland Regional Airport System

3.6 ENVIRONMENTAL SETTING

3.6.1 Topography

SJIA encompasses approximately 639 hectares of land and is located approximately 7 km north west of the central business district of the City of St. John's. The site includes varying topography with elevations ranging from 100 metres (330 feet) above sea level (ASL) at the eastern most edge of the property up to approximately 150m (490 feet) ASL located approximately at the intersection of runway 11-29 and abandoned Taxiway Alpha. The site can be described as gentle rolling hills with slope bogs and exposed bedrock throughout. In general the site drains towards the east and is located at the headwater for most of the primary subwatershed systems present in the area.

Site topography has been identified as an economic barrier to future commercial and airside development. Excavation and/or fill operations are required to develop most areas of the airport attributing to high development costs. Due to regulatory changes the excavation of terrain adjacent to Runway 11-29 was recently required to allow for improvements to the level of service offered to air carriers. It is anticipated that terrain improvements would also be required for Runway's 16-34 and 02-20 if a level of service change were desired in the future.

3.6.2 Natural Environment

The Airport lies within the Maritime Barrens, Southeastern Barrens sub-ecoregion. This region is most recognized for its extensive barrens and exposed bedrock throughout. Slope and basin bogs are scattered throughout the region as well as small forest stands. In general soils consist of glacial till underlain by sandstone and shale. The Airport site closely mirrors the typical southeastern barrens sub-ecoregion environment described above.

There are no significant natural features within the Airport's property boundary. Vegetation consists of managed grass and sparse coniferous trees and shrubs. There are wetlands throughout the site consisting of bogs and fens none of which are designated as provincially significant. There are no known moose over wintering areas or significant water fowl nesting areas on Airport property. A wildlife and security fence surrounds the perimeter of the Airport to prevent land intrusions.

3.6.3 Meteorology

SJIA is located in the northeast corner of the Avalon Peninsula and is in close proximity to water in almost every direction. The elevation of the Airport is roughly 137 metres (450 feet) and the terrain slopes steadily downward towards the town of Torbay before reaching sea level. To the east, cliffs rise to over 152 metres (500 feet) at the ocean edge. Marshland, at elevations of between 60 metres (200 feet) and 90 metres (300 feet) ASL, lies beyond these cliffs.

The winds at St. John's are, for the most part, determined by large-scale weather systems. The prevailing wind direction is from the western quadrant but does vary slightly from season to season. Winds during the winter are predominantly from the west, whereas summer winds exhibit a shift to a more southwesterly direction due to the strengthening of the Bermuda High over the

Atlantic Ocean. The stronger winds generally occur in the winter and are always associated with storms moving northeastward near Newfoundland. Gusts of up to 35 knots occur frequently at St. John's and often persist for prolonged periods of time. Winds with gusts to 35 knots or more occur most frequently from the southwest. Very strong winds with gusts to 60 knots or more occur most often with very deep, low pressure systems that pass to the west of the Avalon Peninsula. Calm winds, on the other hand, only occur about 2 percent of the time. **Figures 3-3 and 3-4**, identify the average wind frequency by direction during the summer and winter respectively.

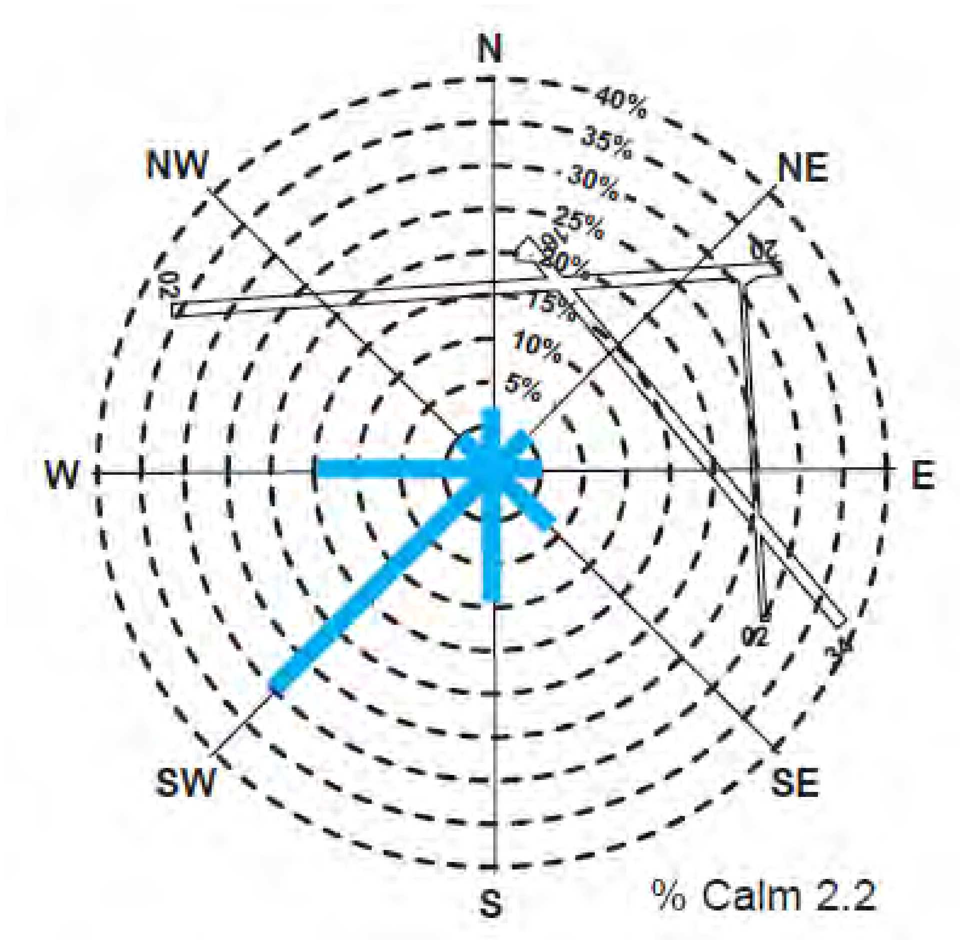

Figure 3-3 – Wind Frequency by Direction during Summer
(Source: NAV CANADA, 2002)

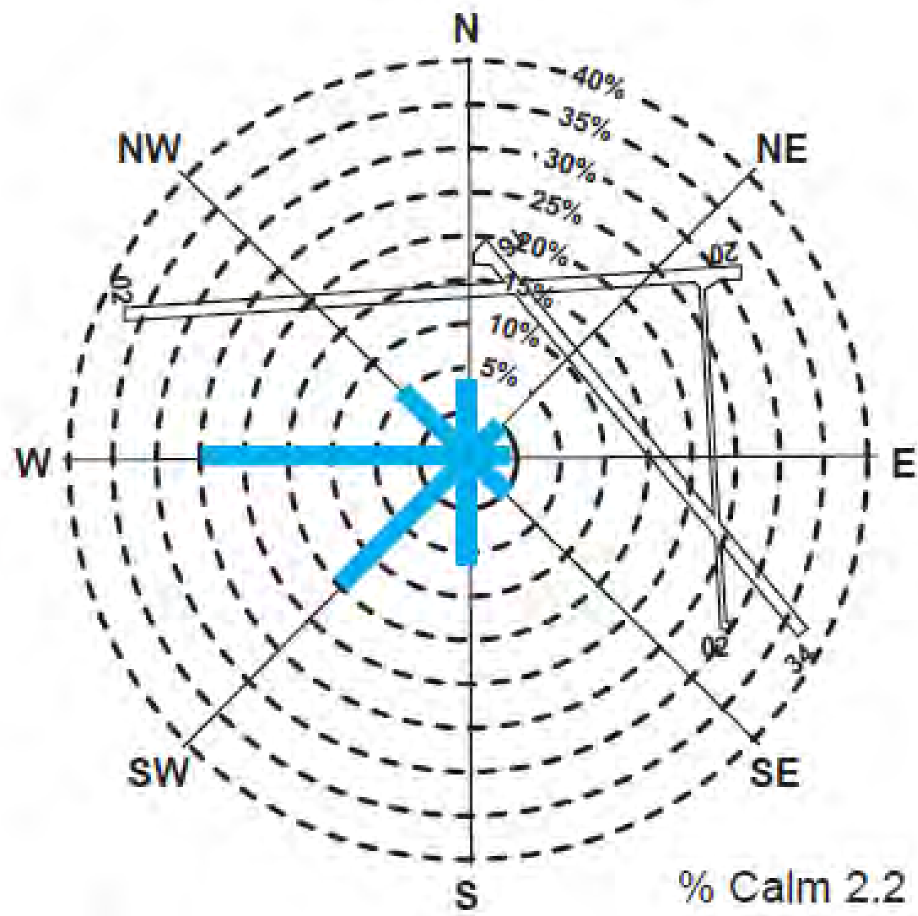

Figure 3-4 – Wind Frequency by Direction during Winter
(Source: NAV CANADA, 2002)

Although sea breeze activity does occur at St. John's, its overall effect on the prevailing wind direction is small. Even if the water temperatures are favourable for the development of sea breezes, the prevailing wind speed and direction are often such that any sea breeze formation will be suppressed. When they do develop, sea breezes at St. John's tend to be between 120 and 150 degrees or between 40 and 60 degrees True.

SJIA has a reputation for being the foggiest airport in Canada. The worst cases by far occur during the spring. Low ceilings and visibility are extremely common when winds are from the northeast to southeast. This is due to the upslope nature of the terrain and the air's prolonged exposure to the ocean when winds are from these directions. During the winter season, as depicted in **Figure 3-5**, when IFR conditions are present, there is very little diurnal variation. However, in the summer time, as depicted in **Figure 3-6**, sea fog that may move inland at night often burns off during the day accounting for the more pronounced improvement after about 7 am local time.

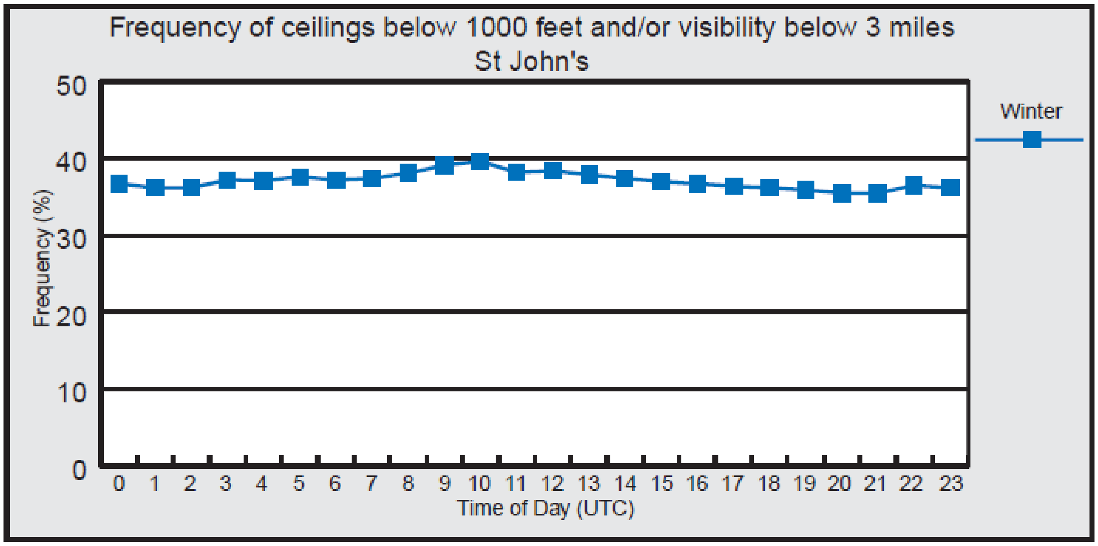

Figure 3-5 – Frequency of ceilings below 1000 feet and/or visibility below 3 miles in Winter
(Source: NAV CANADA, 2002)

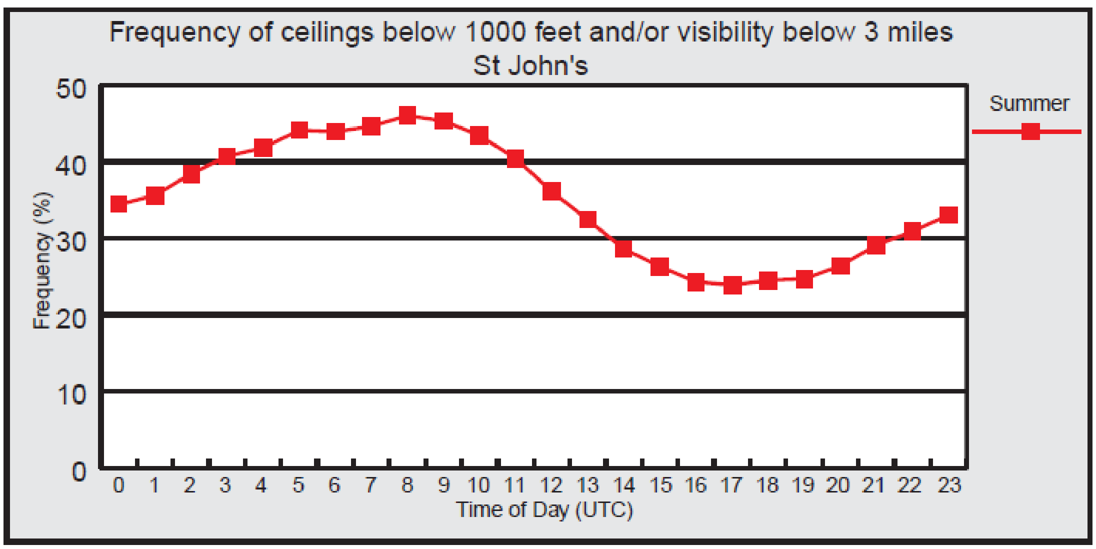

Figure 3-6 – Frequency of ceilings below 1000 feet and/or visibility below 3 miles in Summer
(Source: NAV CANADA, 2002)

The fall is more stable at St. John's in that IFR conditions are generally less frequent during this time than during all other seasons. Although very low conditions sometimes exist in mild flow, particularly if fog blankets the water south of the Avalon Peninsula, operational ceilings usually exist in the winter especially when winds are from the western quadrant. IFR conditions in this season are often due to snow and blowing now and can be quite variable. A particular hazard to aviation that develops frequently at St. John's is freezing precipitation, which occurs an average of 175 hours each year.

4. EXISTING CONDITIONS

The St. John's International Airport is located within the limits of the City of St. John's sharing the border with the Municipality of Torbay. The Airport operates with three runways; Runway 02-20, which measures 1,532.5 metres (5,028 feet) by 30.5 metres (100 feet), Runway 16-34, which measures 2,135.1 metres (7,005 feet) by 60 metres (197 feet), and Runway 11-29, which measures 2,591.4 metres (8,502 feet) by 60 metres (197 feet). The Airport, as of December 2015, is capable of supporting aircraft operations during instrument meteorological conditions down to Category IIIA instrument precision minima. Prior to December 2015 and the completion of the Airport's Accessibility Project the lowest instrument approach minima provided was Category II for Runway 29.

The following provides a summary of the existing facilities at St. John's International Airport.

4.1 AIRSIDE FACILITIES

The existing airfield configuration at St. John's International Airport consists of three runways in typical intersecting configuration, as shown in **Figure 4-1** below and further documented in **Exhibit A1** of **Appendix A**. This configuration is common to many legacy aerodromes throughout North America.

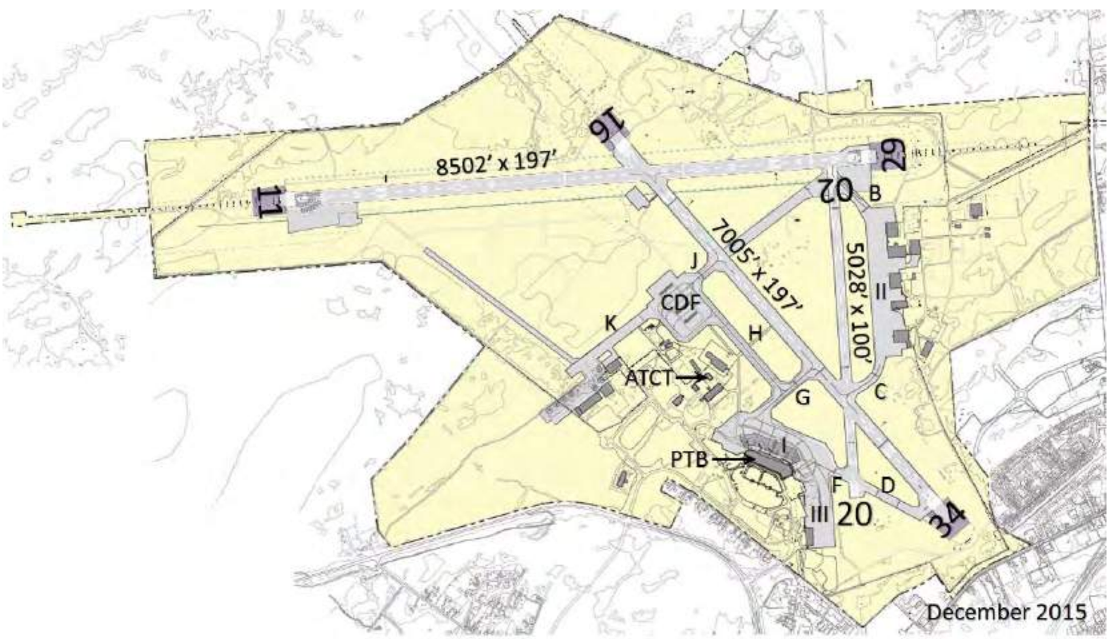

Figure 4-1 – Existing Airfield Configuration

4.1.1 Runways

4.1.1.1 Runway 02-20

Runway 02-20 is the shortest of the three runways at St. John's. The runway has a length of 1,532.5 metres (5,028 feet) and a width of 30.5 metres (100 feet) with an asphalt surface and is categorized as Code 3 Non-Instrument under TP312 4th Edition. The runway is used mainly as a taxi route between the terminal area and the other runways. It also serves as a secondary crosswind runway for rotary wing and light fixed wing aircraft including Dash 8 aircraft. Runway 02-20 has been identified as a barrier to further development of the general aviation area and commercial development along Aprons II and III.

In 2015 the first 260m of Runway 20 was rehabilitated. The balance of the runway was last overlaid in 1987. Based on the 28 year overlay age it is anticipated that the balance of Runway 02-20 will require rehabilitation within the short-term planning horizon of 0-5 years.

Runway 02-20 characteristics are described in the below table, **Table 4-1**.

Table 4-1 – Existing Runway 02-20 Characteristics

Runway Designator	02	20
Runway Dimensions	1,532.5m x 30.5m (5,028 ft. x 100 ft.)	
Reference Code	3C (Non-Instrument)	
Surface	Asphalt	
Pavement Load Rating[3] (PLR)	11	11
Edge Lighting	Yes	Yes
Centreline Lights	No	No
Touchdown Zone Lights	No	No
Approach Lights	No	No
REILS	No	No
Approach Slope Indicator	PAPI - P2	PAPI - P2
Clearway Dimension	984 ft.	Not Declared
Declared Distances [1,2] (feet)		
TORA	5,028 ft.	5,028 ft.
TODA	6,012 ft.	5,028 ft.
ASDA	5,028 ft.	5,028 ft.
LDA	5,028 ft.	5,028 ft.
Approach Minima (Lowest)	515 ft. / 1 ½ SM	500 ft. / 1 ½ SM
Departure Minima	½ SM	½ SM

Notes:

1. Source: Airport Operations Manual April 2014 & CAP 7 August 2015
2. Definitions:
   TORA: Take-off Run Available
   TODA: Take-off Distance Available
   ASDA: Accelerate-Stop Distance Available
   LDA: Landing Distance Available.
3. Pavement Load Rating is a Transport Canada designator indicating pavement strength on a scale of 1 to 12, the higher number denoting greater strength.

4.1.1.2 Runway 11-29:

Runway 11-29 is the Airport's longest runway at 2,591.4 metres (8,502 feet) long by 60 metres (197 feet) wide with an asphalt surface. The runway was the focus of a major rehabilitation and infrastructure upgrade project, branded the Strategic Airport Accessibility Project Accessibility Project that culminated in 2015 with improvements that provide Category IIIA landing minima to approved carriers in addition to low visibility departures for both Runway 11 and 29. Runway 11-29 is considered the primary runway and serves the majority of air traffic. As part of the Accessibility Project that started 2012 this runway was recertified in 2015 to TP 312 5th Edition standards with the exception of the edge lighting and Runway 29's ALSF-2 approach lighting systems.

Pavements, drainage, touchdown zone and centreline lights were rehabilitated in 2015. Runway 11-29 will not require rehabilitation within the short or medium term planning horizons.

Runway 11-29 characteristics are described in the below table, **Table 4-2**.

Table 4-2 – Existing Runway 11-29 Characteristics

Runway Designator	11	29
Runway Dimensions	2,591.4 m x 61 m (8,502 ft. x 197 ft.)	
Reference Code	4E / AGN V (Instrument – Precision CAT IIIA)	
Surface	Asphalt	
Pavement Load Rating[3] (PLR)	12	12
Edge Lighting	Yes	Yes
Centreline Lights	Yes	Yes
Touchdown Zone Lights	Yes	Yes
Approach Lights	ALSF-2	ALSF-2
REILS	No	No
Approach Slope Indicator	PAPI – P3	PAPI – P3
Clearway Dimension	984 ft.	984 ft.
Declared Distances [1,2] (feet)		
TORA	8,502 ft.	8,502 ft.
TODA	9,486 ft.	9,486 ft.
ASDA	8,502 ft.	8,502 ft.
LDA	8,502 ft.	8,502 ft.
Approach Minima (Lowest)	0 ft. / RVR 600[4]	0 ft. / RVR 600[5]
Departure Minima	RVR 600	RVR 600

Notes:

1. Source: Airport Operations Manual, April 2014 & CAP 7 August 2015
2. Definitions:
   TORA: Take-off Run Available
   TODA: Take-off Distance Available
   ASDA: Accelerate-Stop Distance Available
   LDA: Landing Distance Available.
   RVR: Runway Visual Range
3. Pavement Load Rating is a Transport Canada designator indicating pavement strength on a scale of 1 to 12, the higher number denoting greater strength.
4. Prior to December 2015 certification was for CAT I with minima to 200 ft. / RVR 2600.
5. Prior to December 2015 certification was for CAT II with minima to 100 ft. / RVR 1200.

4.1.1.3 Runway 16-34

Runway 16-34 is the secondary runway at 2,135.1 metres (7,005 feet) long by 60 metres (197 feet) wide with an asphalt surface. Runway 16 is categorized as a Code 4 Precision while Runway 34 is categorized as a Code 4 Non-Precision under TP 312 4th Edition. Runway 16-34 is usable by the majority of air traffic and forms part of the Airport's low visibility taxi route. Runway 16-34 is currently certified for RVR 1200 departures. Consideration has been given to the installation of two additional RVR's on this runway to facilitate RVR 600 departures. Moving to RVR 600 would be considered a Level of Service (LOS) change triggering an obligation to meet TP 312 5th Edition requirements and associated terrain improvements. Consideration could be given to applying for an exemption to remain under TP 312 4th edition under AC 302-022 until such time that infrastructure improvements would force compliance under TP 312 5th Edition.

Runway 16-34 was rehabilitated in 2008 up to the intersection of Runways 16-34 and 11-29. The intersection of Runway 11-29 and 16-34 and the portion of 16-34 north of the intersection was rehabilitated in 2015 as part of the Accessibility Project that started in 2012. Runway 16-34 will not require rehabilitation in the short- or medium-term.

Runway 16-34 characteristics are described in the below table, **Table 4-3**.

Table 4-3 – Existing Runway 16-34 Characteristics

Runway Designator	16	34
Runway Dimensions	2,135.1 m x 61 m (7,005 ft. x 200 ft.)	
Reference Code	4E – Precision / CAT I	4E – Non-Precision / CAT I
Surface	Asphalt	
Pavement Load Rating[3] (PLR)	12	12
Edge Lighting	Yes	Yes
Centreline Lights	Yes	Yes
Touchdown Zone Lights	No	No
Approach Lights	SSALR	No
REILS	No	Yes
Approach Slope Indicator	PAPI – P3	PAPI – P3
Clearway Dimension	984 ft.	984 ft.
Declared Distances [1,2] (feet)		
TORA	7,005 ft.	7,005 ft.
TODA	7,989 ft.	7,989 ft.
ASDA	7,005 ft.	7,005 ft.
LDA	7,005 ft.	7,005 ft.
Approach Minima (Lowest)	200 ft. / RVR 2600 (OPS Spec RVR 1200)	255 ft. / RVR 5000
Departure Minima	RVR 1200	RVR 1200

Notes:

1. Source: Airport Operations Manual, April 2014 & CAP 7 August 2015.
2. Definitions:
   TORA: Take-off Run Available
   TODA: Take-off Distance Available
   ASDA: Accelerate-Stop Distance Available
   LDA: Landing Distance Available.
   RVR: Runway Visual Range.
3. Pavement Load Rating is a Transport Canada designator indicating pavement strength on a scale of 1 to 12, the higher number denoting greater strength.

4.1.2 Taxiways

The Airport currently has eight usable taxiways, five of which are certified as part of the Airport's low visibility taxi route connecting Aprons I and II to Runway 11-29 in visibility down to a Runway Visual Range of 600 feet.

4.1.2.1 Taxiway Alpha (Abandoned):

Taxiway Alpha, although not included as one of the eight usable taxiways, is an abandoned taxiway that was originally envisioned as future connector from the Terminal Area to Threshold 11. For the past two decades the abandoned taxiway has served as a construction staging area, ground equipment storage location and fire access route.

From Taxi Kilo to approximately 900m north, Taxiway Alpha is relatively flat; however beyond 900m the taxiway slopes down at approximately 2%. It is understood from staff interviews this taxiway was abandoned due to issues surrounding aircraft operating on this 2% longitudinal slope shortly after its construction. TP 312 4th edition notes that maximum longitudinal slope of a taxiway is to be 1.5% only. The aforementioned maximum longitudinal grade issue coupled with lack of servicing and low commercial demand have discouraged any redevelopment of the area adjacent to abandoned taxiway alpha. However, it is envisioned there is future potential for redevelopment of the 900m taxi Alpha section to service future airside developments in this area, connecting to the airfield via taxi Kilo or other future taxiways.

4.1.2.2 Taxi Bravo

Taxiway Bravo connects the north end of Apron II to the thresholds of Runway 29 and Runway 20. Taxiway Bravo forms part of the low visibility taxi route and was reconstructed in 2015. Taxiway Bravo characteristics are described in below table, **Table 4-4**.

Table 4-4 – Existing Taxiway Bravo

Characteristic	Taxi Bravo
Width	75 ft. (23m)
Reference Code	E
Surface	Asphalt
Pavement Load Rating (PLR)	12
Edge Lighting	Yes
Centreline Lights	Yes
Guard Lights	Yes
Inset Stop Bar Lights	Yes

4.1.2.3 Taxi Charlie

Taxiway Charlie connects from the south end of Apron II to the intersection of Runway 02-20 and 16-34. Due to the configuration of this intersection and the number of nodes, the area is considered a 'hot spot' by NAV CANADA and Transport Canada posing a higher risk of runway incursion. Taxiway Charlie forms part of the low visibility taxi route and was last rehabilitated in 2008. Taxiway Charlie characteristics are described in below table, **Table 4-5**.

Table 4-5 – Existing Taxiway Charlie Data

Characteristic	Taxi Charlie
Width	75 ft. (23m)
Reference Code	E
Surface	Asphalt
Pavement Load Rating (PLR)	12
Edge Lighting	Yes
Centreline Lights	Yes
Guard Lights	Yes
Inset Stop Bar Lights	Yes

4.1.2.4 Taxiway Delta:

Taxiway Delta connects Threshold 34 to Threshold 02 and serves as part of the primary taxi route for departures from Runway 34. Taxiway Delta last rehabilitated in 1989. Based on its 26 year age it is anticipated Taxiway Delta will be rehabilitated in the short to medium term. Taxiway Delta characteristics are described in below table, **Table 4-6**.

Table 4-6 – Existing Taxiway Delta Data

Characteristic	Taxi Delta
Width	75 ft. (23m)
Reference Code	E
Surface	Asphalt
Pavement Load Rating (PLR)	12
Edge Lighting	Yes
Centreline Lights	No
Guard Lights	Yes
Inset Stop Bar Lights	No

4.1.2.5 Taxiway Foxtrot

Taxiway Foxtrot is one of two taxiways connecting the Terminal Area to the runway system. Taxiway Foxtrot connects the Terminal Area (Aprons I and III) to Threshold 02 and Threshold 34 via Taxiway Delta. Taxiway Foxtrot last rehabilitated in 2011. Taxiway Foxtrot characteristics are described in below table, **Table 4-7**.

Table 4-7 – Existing Taxiway Foxtrot Data

Characteristic	Taxi Foxtrot
Width	75 ft. (23m)
Reference Code	E
Surface	Asphalt
Pavement Load Rating (PLR)	12
Edge Lighting	Yes
Centreline Lights	No
Guard Lights	Yes
Inset Stop Bar Lights	Yes

4.1.2.6 Taxiway Golf:

Taxiway Golf is the second taxiway connection to the Terminal Area. The taxiway connects to the north end of Apron I and to Runway 16-34 at approximately 1,308 metres (4,291 feet) from the Threshold of 16. Its location makes it a suitable exit for landing traffic on Runway 16. Taxiway Golf forms part of the low visibility taxi route and was last rehabilitated in 2008. Taxiway Golf characteristics are described in below table, **Table 4-8**.

Table 4-8 – Existing Taxiway Golf Data

Characteristic	Taxi Golf
Width	75 ft. (23m)
Reference Code	E
Surface	Asphalt
Pavement Load Rating (PLR)	12
Edge Lighting	Yes
Centreline Lights	Yes
Guard Lights	Yes
Inset Stop Bar Lights	Yes

4.1.2.7 Taxiway Hotel

Taxiway Hotel connects Taxiway Golf with the Airport's Central De-icing Facility (CDF) and serves as a partial parallel taxiway to Runway 16-34. The taxiway was constructed in 2006-2007 as part of the construction of the CDF. Taxiway Hotel forms part of the Airport's low visibility taxi route. Taxiway Hotel characteristics are described in below table, **Table 4-9**.

Table 4-9 – Existing Taxiway Hotel Data

Characteristic	Taxi Hotel
Width	75 ft. (23m)
Reference Code	E
Surface	Asphalt
Pavement Load Rating (PLR)	12
Edge Lighting	Yes
Centreline Lights	Yes
Guard Lights	No
Inset Stop Bar Lights	No

4.1.2.8 Taxiway Juliet

From the CDF, Taxiway Juliet connects to Runway 16-34 approximately 1,459 metres (4,787 feet) from Threshold 34. Its location makes it suitable as an exit for aircraft landing on Runway 34. Taxiway Juliet was constructed in 2006-2007 on a portion of abandoned Runway 08-26 as part of the construction of the CDF. Taxiway Juliet forms part of the Airport's low visibility taxi route. Taxiway Juliet characteristics are described in below table, **Table 4-10**.

Table 4-10 – Existing Taxiway Juliet Data

Characteristic	Taxi Juliet
Width	75 ft. (23m)
Reference Code	E
Surface	Asphalt
Pavement Load Rating (PLR)	12
Edge Lighting	Yes
Centreline Lights	Yes
Guard Lights	Yes
Inset Stop Bar Lights	Yes

4.1.2.9 Taxiway Kilo

Taxiway Kilo extends west of the CDF into the West Commercial Area. The taxiway provides tenants operating from the West Commercial Area access to the rest of the airfield. The first phase of Taxiway Kilo was constructed in 2009 on a portion of the abandoned Runway 08-26 to connect with the CDF. The taxiway was extended in 2011 over abandoned Runway 08. In 2015 the Taxiway was again extended 156 metres over abandoned Runway 08 and further extended 34 metres (112 feet) beyond the end of 08 to service Cougar Helicopters' new facility. Taxiway Kilo is currently uncontrolled. The need to control aircraft movement on Taxiway Kilo is currently being investigated. It is anticipated that taxi Kilo expansion to the south represents the next potential airfield expansion for airside commercial land development.

Taxiway Kilo characteristics are described in below table, **Table 4-11**.

Table 4-11 – Existing Taxiway Kilo Data

Characteristic	Taxi Juliet
Width	75 ft. (23m)
Reference Code	E
Surface	Asphalt
Pavement Load Rating (PLR)	12
Edge Lighting	Yes
Centreline Lights	No
Guard Lights	No
Inset Stop Bar Lights	No

4.1.3 Aprons

There are four apron areas at the Airport serving a mix of private, commercial and military operations. They include:

- Apron I – located adjacent the main passenger terminal building (PTB), services scheduled commercial traffic only.
- Apron II – located east and running parallel to Runway 02-20, services general aviation traffic.
- Apron III – located south of Apron I, services Cougar Helicopters and Irving Oil, a Fixed Base Operator (FBO).
- Apron IV – the Airport's Central De-icing facility, located west of Runway 16-34 and north of the CSB, is the only approved dicing area on the Airport and is equipped with a glycol management system.

4.1.3.1 Apron I

The main apron, designated Apron I, serves the majority of commercial air carriers. Apron I is located at the passenger terminal building and has an area of approximately 100,500 square metres including apron taxilanes and recent expansions. The apron area at the passenger terminal building was expanded in 2012 to facilitate expansion of the passenger terminal building towards the southeast. In 2015, Apron I was further expanded, this time towards the northwest and east, to facilitate continued expansion of the terminal building. The continued expansion of Apron I is expected throughout the planning horizon.

Apron I has been constructed to pavement load rating 12. Original areas of Apron I were last rehabilitated in 1989.

Apron I is now designated as a Critical Restricted Area, requiring all vehicles, goods and people to be screened before enter the apron.

4.1.3.2 Apron II

The general aviation apron, designated Apron II, is located on the east side of the Airport. Apron II serves a number of commercial, government and military undertakings and has a combined area of approximately 78,522 square metres including taxilanes and private ramp space. There are currently six hangars accessing Apron II.

The general aviation apron, located east of Runway 02-20, is shared by multiple tenants. OLS constraints associated with Runway 02-20 have limited the ability to accommodate an increase in overnight parking on Apron II. As a result, Apron II has significant restrictions and operational constraints.

Apron II was constructed to pavement load rating 12. Apron II was rehabilitated last in 1987 and 1988. It is anticipated Apron II will require rehabilitation within the short to medium term.

4.1.3.3 Apron III

Apron III, located south of Apron I, has an area of approximately 15,383 square metres including taxilanes and private ramp areas. Apron III was developed as a private apron and currently serves the Irving FBO. It should be noted that Apron III is maintained by the tenant leasee Cougar Helicopters who relocated to a new facility off Taxiway Kilo in 2016.

The pavement load rating of Apron III has not been determined.

4.1.3.4 Central De-icing Facility (Apron IV)

Apron IV, the Airport's CDF is located at the end of Taxiway Hotel. All aircraft de-icing activities are conducted within the CDF. Apron IV occupies a paved area of approximately 60,000 square metres including de-icing bays, vehicle safety areas, taxilanes and pink snow dump areas. When the CDF is not in use for de-icing aircraft the apron area is used for remote aircraft parking.

The Central De-icing Facility (Apron IV), constructed in 2006, has an asphalt surface with a PLR of 12 and provides three Code C bays in flow-through configuration. The CDF configuration, as shown in **Figure 4-2**, depicts four bays which allows for Code E aircraft to be de-iced on Bay 3 while simultaneous de-icing of a Code C aircraft occurs in Bay 1. Current demand for the CDF is estimated to be between 11-13 aircraft per hour during peak periods.

The normal throughput of the facility could not be determined due to a lack of historical records. Typical throughput of a three-bay Code C de-icing facility is between 12 and 15 aircraft per hour assuming two trucks per aircraft as well as defined vehicle safety areas to each side of the bay. Throughput as St. John's would be limited due to the lack of a defined vehicle safety area between the Bays 3 and 4. It may also be limited due to a higher need to apply both Glycol Type I and IV chemicals as a result of the climate.

CDF capacity would also be somewhat limited due to an inability to queue multiple aircraft and the lack of a bypass taxilane for aircraft entering from Taxiway Kilo. Therefore, it can be estimated that the throughput of the CDF may be less than 12 aircraft per hour.

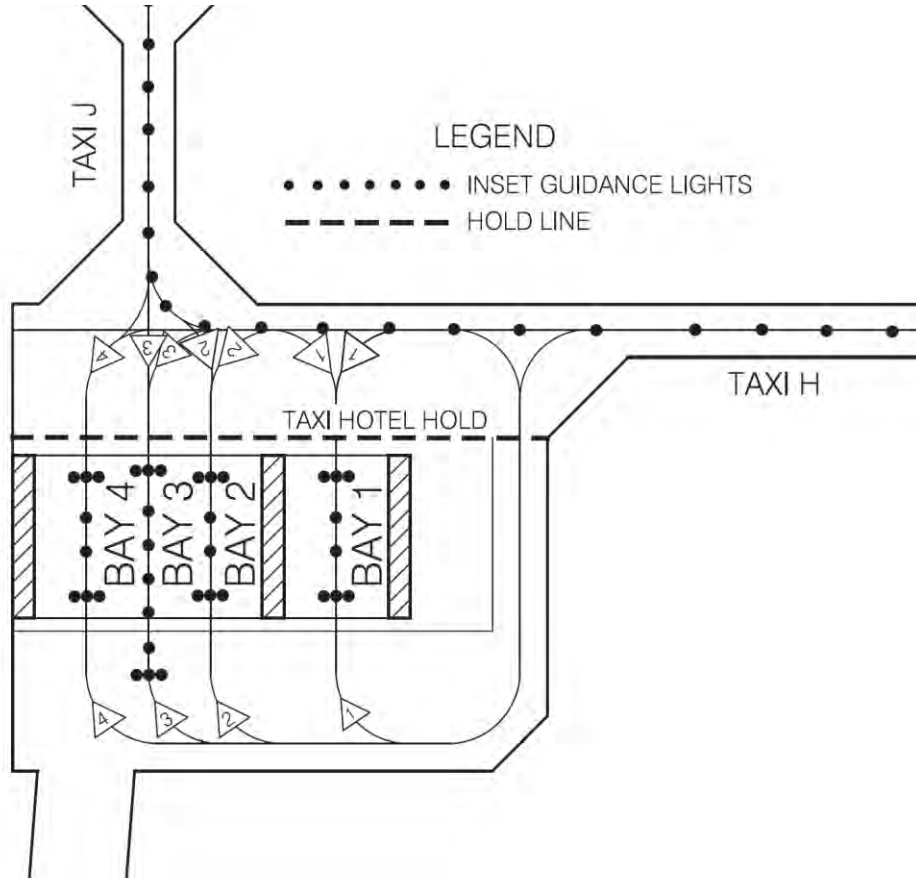

Figure 4-2 – Existing CDF Layout

The CDF was upgraded in 2008 with the necessary underground piping for direct discharge of compliant water to storm sewer, or pumping water to a holding tank for processing. The CDF is currently operated by Inland Technologies Canada Inc. ("Inland") with a typical deicing season from October 1st to May 15th. The CDF is a controlled environment on which Inland is responsible for the coordination, application and recovery of glycol operations.

Depending on weather conditions, glycol recovery operations are facilitated through both surface recovery using vacuum truck operations, as well as a network of surface inlets installed at low points that convey glycol contaminated run-off through a network of non-corrodible pipe to an underground storage tank. The run-off is then pumped from the underground storage tank to an above ground storage tank. The glycol contaminated runoff is then processed to a higher concentration and transported off-site for recycling. The above ground storage tank is by the airlines and operated by Inland Technologies.

SJIAA is currently studying the feasibility of a subsurface flow engineered wetland to handle the disposable of glycol contaminated effluent from the CDF instead of the above labour intensive, expensive and high carbon footprint method.

4.1.4 Navigational Aids

Due to frequent inclement weather conditions, the Airport has a number of ground-based electronic navigation and visual approach aids including Instrument Landing Systems (ILS) for Runways 11, 29, and 16. Recent upgrades to the ILS and visual aids for Runways 11 and 29 were completed in 2015 to allow Category IIIA approaches. Approved use of these approaches was achieved in December 2015, however frequent use by regularly scheduled air carriers is not expected to occur until early 2016. **Table 4-12** lists the ground-based navigational aids established for the Airport.

Table 4-12 – Existing Ground-based Electronic Navigational Aids

NAV / Visual Aid	Identification	Location
NDB	ZNF - WABANA	5km West of Airport
DME	NL - SIGNAL HILL	5km South East of Airport
DME	YYT - TORBAY	10km South of Airport
ILS / CAT IIIA	Runway 11	On Airport
ILS / CAT IIIA	Runway 29	On Airport
ILS / CAT I	Runway 16	On Airport
RVR A/B/C	Runway 11 – 29	On Airport
RVR A	Runway 16	On Airport
VOR	YYT	Off Airport

Notes:
1. Source: Canada Flight Supplement.

4.1.5 Airside Roads

The Airport maintains an extensive network of airside roads for ARFF access routes, wildlife patrols and visual aid inspection purposes. In general the roads are either gravel or asphalt surface. Road width varies between 3 and 7.5 metres. As part of the 2014-2015 Accessibility Project asphalt millings were placed and compacted on select priority roads. Low visibility road hold signs were also installed at key locations on the airfield roads.

The East-West airside road (known as the "Perimeter Road", which runs south of Threshold 34 and 20 is frequently used by the airport, support services and tenants. The road is maintained primarily for security, wildlife patrols and ARFF response services, but has been heavily used for airport operations linkage between Apron I and Apron II. The road is not maintained during winter months. It is not a properly designed road to modern day standards, but more so an upgraded travel "path" heavily relied upon by its users.

In 2016 the introduction of Non Passenger Screening-Vehicles (NPSV) prevents vehicles from travelling from Apron II onto Apron I via the Perimeter Road, as the SJIAA is currently completing a single NPSV check point on the west side of Apron I. The SJIAA will investigate constructing a second NPSV at the east end of Apron I and a properly constructed vehicle corridor under this Master Plan horizon.

4.1.6 Airfield Capacity

Airfield capacity is defined as the maximum number of aircraft operations that can safely occur at an airport for a given period of time. The analysis of airfield capacity provides a numerical measure of the airfield's (i.e., runways, taxiways, and taxiway connectors) inherent capability to accommodate the safe and efficient movement of aircraft activities. The calculation of airfield capacity and delay is essential in evaluating the ability of the existing runway system and taxiway systems to effectively serve current and future airport activity levels. In so doing, decisions regarding infrastructure improvements may also be identified based not only on qualitative measures of need but also quantitatively to allow for the development a more robust business case.

The identification of airfield capacity is not considered as part of this master plan. However, the factors that affect airfield capacity and conversely aircraft delay are discussed at length in Section 6.3 of this Master Plan in order to inform the reader of what should ultimately be considered prior to the formation of a capital expenditure program. For planning purposes airfield capacity has been estimated to be 150,000 movements.

4.2 PASSENGER TERMINAL BUILDING

4.2.1 Terminal Facilities

The Passenger Terminal Building (PTB) originally constructed in 2002 is a contemporary three-story facility approximately 16,220 m² in area. The facility is located in the southwest corner of the Airport's property, immediately west of Runway 02-20. **Figure 4-3** illustrates a number of site constraints that currently impact the development of the terminal area. These include transitional zoning associated with Runways 02-20 and 16-34, low lying flood plain and waterway located to the northwest, and the previous Cougar Helicopter facility located to the south (currently solely occupied by Irving FBO since the relocation of Cougar to Taxiway Kilo in 2016).

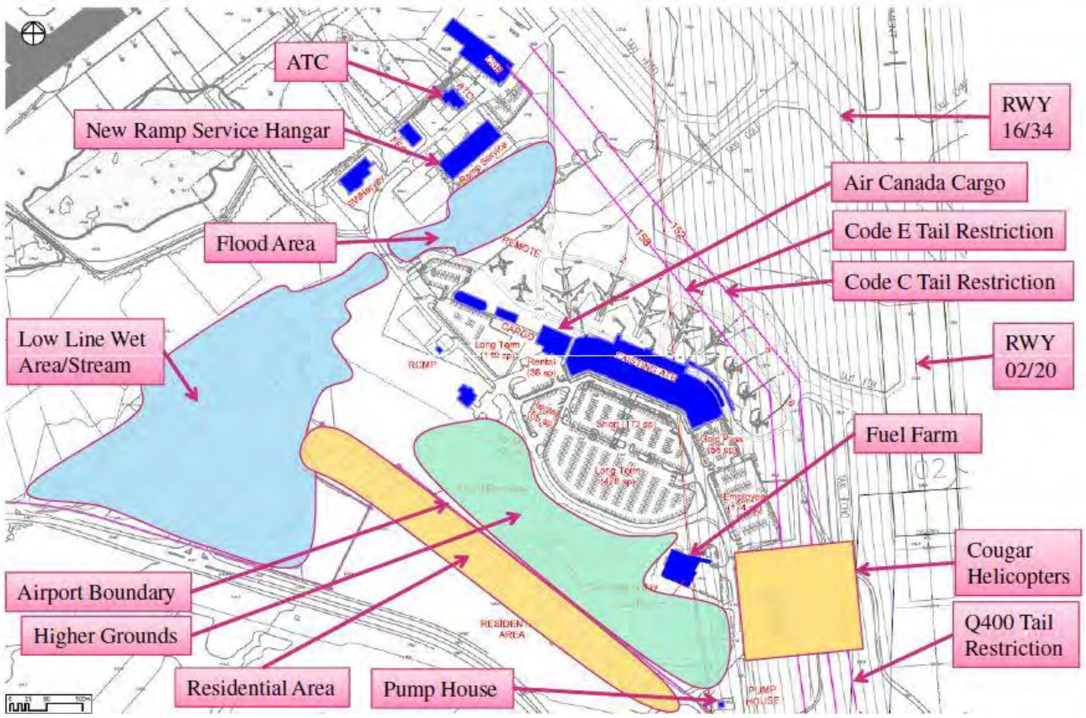

Figure 4-3 Terminal Area Constraints
(Source: St. John's International Airport Strategic Terminal Area Development Plan, ARUP, 2011)

The original terminal was designed to accommodate both domestic and international flight operations. Airside infrastructure includes six contact gates and two ground loaded gates. Groundside infrastructure includes a 150 metre long multi-lane drop-off curb.

Ground Level

The ground level of the PTB is approximately 11,390 m² in area and includes the majority of passenger and baggage processing functions, as well as passenger amenities. These include airline check-in facilities; out-bound baggage make-up, domestic and international baggage claim, Canada Border Services Agency (CBSA) inspection facilities and a number of public amenities including restaurants, retail concessions and washrooms. The baggage claim area is comprised of three flat plate claim devices, one of which can be cordoned off and used as a sterile claim area for international arrivals. The ground level also includes administrative and support space for CBSA and airlines.

The Ground Level floor plan is illustrated in **Figure 4-4**.

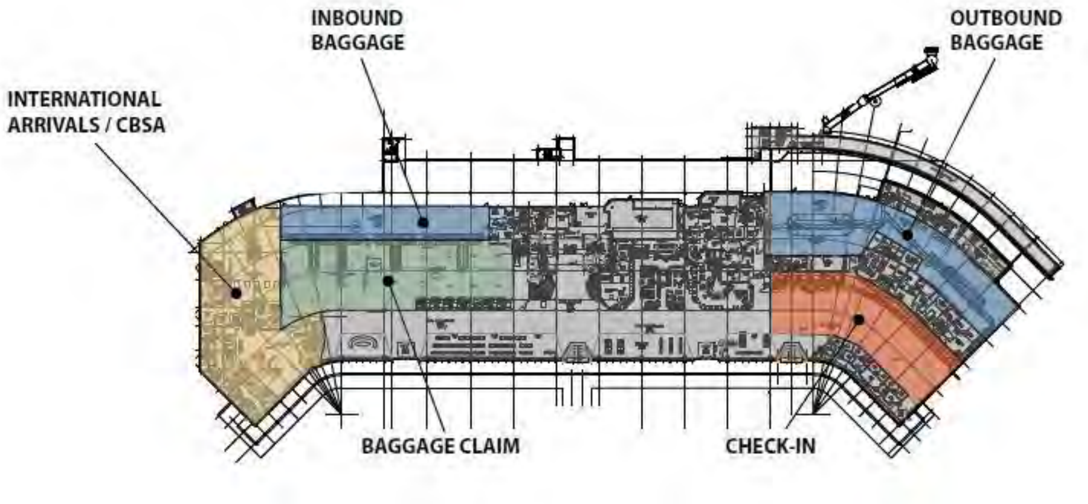

Figure 4-4 Ground Floor Plan

Level Two

Level Two is approximately 3,230 m² in area and includes the pre-board passenger screening function as well as a common departure holdroom. Other functions include washrooms, limited retail concession areas and mechanical space. From the common holdroom, corridors lead to the five (5) bridged gates as well as vertical circulation that drops passengers to the apron level and the three (3) ground loaded gate positions. Controlled access at the corridor leading to Gate 1, provides a sterile environment for international passengers arriving at Gate 1 and directs these passengers to dedicated vertical circulation leading to the CBSA area located on the Ground Level.

The Level Two floor plan is illustrated in **Figure 4-5**.

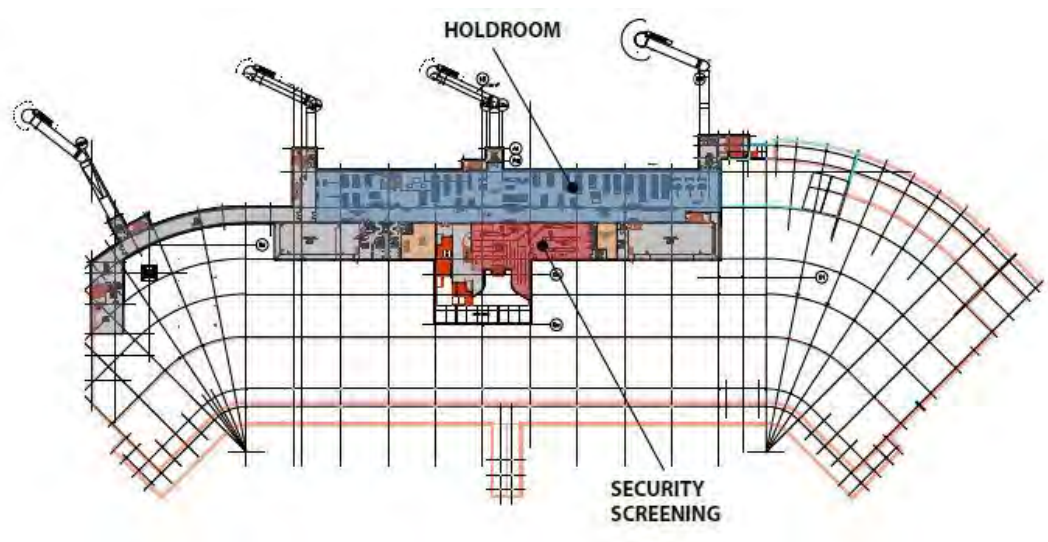

Figure 4-5 Level 2 Floor Plan

Level Three

Level Three is approximately 1,600 m² in area and is comprised of administrative offices and the Air Canada lounge, which is accessed directly from the holdroom by a dedicated stair and elevator.

The Level Three floor plan is illustrated in **Figure 4-6**.

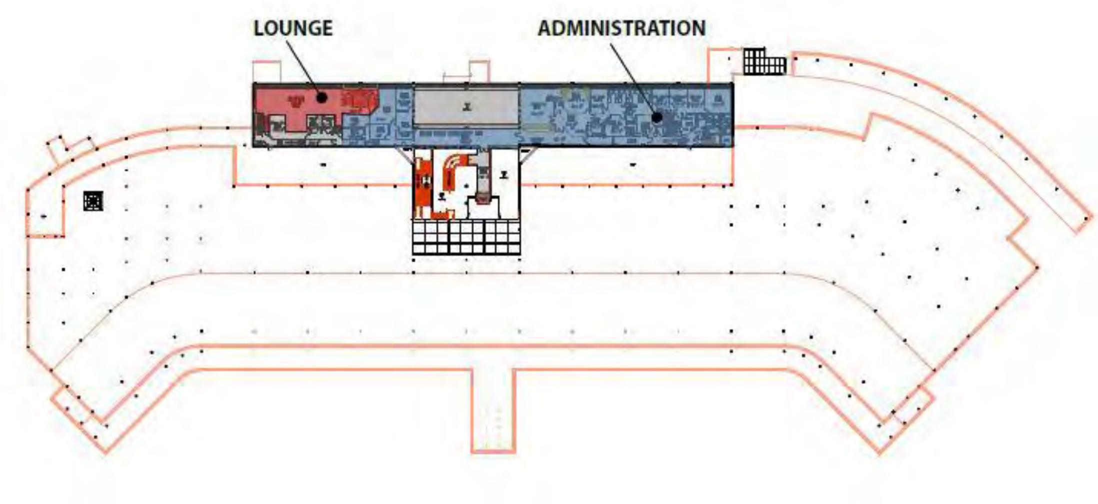

Figure 4-6 Level 3 Floor Plan

A Strategic Terminal Development Plan[9], originally prepared in 2007 and updated periodically, has established the framework for future building expansion based on forecasted peak hour passenger projections. A key recommendation of the Strategic Terminal Development Plan called for a phased approach to development in order that terminal expansions keep in step with forecasted incremental increases in passenger demand and financial capability, while having due regard for economic volatility that can result in short-term impacts to projected passenger demand. The current Phase 1 (East) and Phase 2 (West) expansions, scheduled to be complete in 2018 and 2021 respectively, are designed to meeting the peak and annual forecast demand of 1.9 million passengers by 2020.

This expansion program is further described in **Section 6.5**.

4.2.2 Terminal Capacity

The terminal was designed to accommodate peak hour passenger demands of approximately 1,130 enplaning/deplaning passengers forecast by 2010. Arrivals peaks typically occur in the early afternoon and late evening, whereas departure peaks occur in the early morning and early to mid-afternoon. A peak hour passenger demand analysis prepared by ARUP in 2011 identified a peak hour deplaning passenger demand of 652 and a peak hour enplaning passenger demand of 645.

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[9] Strategic Terminal Plan, ARUP Canada Inc., 2007 with updates.

Constraints currently impacting the capacity of the terminal building include:

- The pre-board passenger screening area, which can experience congestion and reduced levels of service during peak periods.
- A lack of holdroom capacity, which in turn results in reduced levels of service during peak periods.

Both of these constraints will be addressed as part of the Phase I development program.

4.3 GROUNDSIDE FACILITIES

4.3.1 Access Roads

Vehicular traffic access the Airport from one of three main arterial roadways. Commercial passengers and tenants access the Terminal Area and West Commercial Area utilizing Portugal Cove Road to enter the Airport using World Parkway. Terminal deliveries and other terminal service vehicles will access the terminal building via Craig Dobbin's Way beginning in 2018. Tenants and customers access the East Commercial Area and General Aviation side of the Airport utilize Torbay Road to enter the Airport using RCAF Road.

4.3.2 Parking

SJIA has three designated passenger parking areas; short-term, long-term, and gold pass. Gold pass is a monthly fixed rate parking area that is available on a minimum six month contract. In addition to these lots, there are employee parking areas, and a new rental car parking lot.

The Airport is nearing completion of a major parking lot expansion program that was initiated in 2012 and is scheduled for completion in 2016. Once complete, the Airport will have a total of 1,721 parking stalls, which includes 230 short-term, 852 long-term, 87 gold pass, 264 rental car, and 284 staff parking stalls with the ability to shift capacity through use of moveable barriers. Additionally there will be a cell phone lot providing 34 stalls near the entrance to the Airport.

The parking lot configuration, shown in **Exhibit D1** of **Appendix B**, allows for the Airport to continue expansion of the PTB without continuous reconfiguration of the parking lots. Parking lot capacity is designed to accommodate anticipated demand until 2020 and potentially to 2030 for some parking elements.

4.4 AIR CARGO DEVELOPMENT

4.4.1 Cargo Facilities

Air cargo is critical to the economy of Newfoundland and Labrador. Given its location, and the requirement for lengthy ferry crossings, the only way to expedite the delivery of goods is by air. This is especially important for the oil and gas industry which relies on air cargo for the urgent delivery of replacement parts.

St. John's is the 11th largest cargo airport in Canada handling an estimated 10,850 tonnes of cargo a year.[10] Approximately 98.6 percent of air cargo is domestic, while 1.1 percent is international and 0.3 percent transborder. Much of this cargo (84 percent) is carried by all-cargo or integrated cargo operators (Purolator, FedEx, UPS), which provide daily, and sometimes twice daily service, while only 14 percent is carried as belly cargo in passenger aircraft. One of the reasons for this is that the regional aircraft types currently serving St. John's have limited capacity to accommodate air cargo.

At present, there are no purpose-built air cargo facilities located on the airport. The majority of cargo and integrated cargo operators currently use the Provincial Airlines hangar facilities located in the East Commercial Area. These facilities are not ideally suited to cargo operations and the associated apron areas cannot adequately accommodate the large aircraft types used by the cargo operators. The on-airport cargo facilities are used primarily as cross-docks, whereby cargo is transferred directly from the aircraft to trucks and vice versa. Sortation of cargo is largely done off Airport.

Air Canada and WestJet have small air cargo facilities as part of their support facilities located in the West Commercial Area at the Ramp Services Building.

4.4.2 Cargo Capacity

The 2010 Air Cargo Study identified a number of weaknesses associated with air cargo operations at SJIA. They included a lack of a modern dedicated air cargo terminal with the capacity to screen goods. The current practice of airlines serving St. John's with regional aircraft types, such as the Q400, also limits the Airport's capacity to support air cargo development. A further weakness is the lack of a proper apron to accommodate large cargo aircraft such as the B767-300.

In the past, a couple of integrated cargo operators have expressed interest in establishing sortation facilities at the airport. However, the lack of available serviced airside commercial land impedes the realization of such opportunities.

4.5 GENERAL AVIATION & AIRLINE SUPPORT

4.5.1 General Aviation

General aviation includes a multitude of activities not associated with air carrier passenger or cargo services. These activities include corporate aviation, air taxi services, aircraft overhaul and maintenance, air ambulance services, government air operations and fixed base operations, which provide fuelling and other services. General aviation activities are concentrated in the East Commercial Area where there are a number of tenants and operators including Provincial Airlines, Irving Aviation, Woodward Aviation, and the Government of Newfoundland and Labrador.

[10] Air Cargo Study, St. John's International Airport, Jacobs Consultancy Canada Inc., 2010

Given the topography to the east and the proximity of Runway 02-20 to the west, there is, at present, little opportunity to expand general aviation activity in the East Commercial Area.

4.5.2 Airline Support

Airline support facilities are located northwest of the PTB in an area adjacent to the air traffic control tower and combined services building. Functions include a GSE maintenance/line maintenance garage and flight kitchen. The airline support area is somewhat constrained because of topographical features as well as the close proximity of the air traffic control tower and maintenance garage.

4.5.3 Helicopter Operations

With over 30,000 annual movements, helicopter operations encompass a significant component of general aviation activity. Both Cougar Helicopters and Canadian Helicopters provide daily logistics support to the offshore oil and gas industry. Canadian Helicopters operates from the East Commercial Area, while Cougar Helicopters currently operates from two facilities. One facility of approximately 3,000 m^2 is located directly south of the PTB on Apron III. Cougar ceased operations in this facility in the Fall of 2016 with operations relocating to a newly constructed facility located in the West Commercial Area off of Taxiway Kilo. Irving Oil's FBO remains operational in Cougars former location on Apron III.

4.6 NON-AVIATION COMMERCIAL DEVELOPMENT

At present, non-aviation commercial development is limited to a small number of businesses on the east side of the airport, off of RCAF Road. Such businesses include the Society for the Prevention of Cruelty to Animals (SPCA), and a public recreational centre. Although this area has a strong potential for non-aviation related land uses, there are a number of environmental contamination concerns resulting from its previous military uses. The costs associated with the environmental cleanup and soils remediation will be an obstruction to the future development of these lands for commercial uses, particularly for lands directly adjacent groundside of the hangars. Despite this, approximately 90 acres remain available for viable commercial development on the east side of the airport. The west side of the Airport is the current focus of non-aviation development. Anew 120 room Holiday Inn Express and Suites hotel development located at the intersection of World Parkway and Navigator Avenue opened in the fall of 2015. A second 175 room hotel, located at the corner of Jetstream and Navigator Avenue, Best Western Inn and Suites, is under construction and scheduled to open in the summer of 2017. A car rental service facility and associated staging lot was constructed in 2017. A gas station/convenience store/fast serve window facility will be constructed in 2017. A restaurant is also proposed for the same area.

4.7 AIRPORT OPERATIONS AND SUPPORT FACILITIES

Airport support facilities are located northwest of the passenger terminal building and include the NAV CANADA air traffic control tower and a Combined Services Building (CSB) that includes a maintenance garage and the airport fire services. Fuel farms are located within the Terminal Area southeast of the PTB and within the East Commercial Area accessible from RCAF Road.

4.7.1 Combine Services Building

The Combined Services Building (CSB) is located central to the airfield at the end of Airport Service Road. The CSB includes airfield maintenance, operations, building and electrical maintenance, and emergency services. It was upgraded and expanded in 2009. In addition to the CSB a storage facility was constructed in 2012-2015 to accommodate SJIAA's growing needs. The need for additional expansion in the future has been identified.

4.7.2 ARFF

The Airport's Aircraft Rescue and Fire Fighting (ARFF) service operates from the CSB. The Airport is equipped and staffed 24 hours a day 7 days a week to provide Category 7 Emergency Response Service (ERS) with the ability to upgrade to Category 8 with 30 minutes prior notice.

ERS equipment includes:

- 2x Waltek CP-7000 Foam Truck
- 1x Waltek CP-5500 Foam Truck
- 1x Ford F-450 Rescue Truck; and
- 1x Casualty Care Unit Trailer

According to the Airport the location of the existing ARFF station within the CSB allows for a suitable response time to all aircraft maneuvering areas.

4.7.3 Air Traffic Control Tower

The Air Traffic Control Tower (ATCT), located next to the CSB along the Airport Service Road, was constructed in 1976. The ATCT was located based on the existing configuration of the airfield to provided traffic control services to air and ground based traffic while minimizing development costs. Terrain continues to pose a significant constraint to visibility due to the low height of the cab. The line-of-sight from the relatively low tower cab height presents a significant restriction for further development along the north side of Taxiway Kilo and east and west along Taxiway Alpha.

4.7.4 Field Electrical Centre

The Field Electrical Centre (FEC) is located next to the ATCT and provides primary power (from the local Power Utility) and emergency power distribution to the west side of the Airport, buildings and the airfield. The FEC is considered to be in good condition and sized appropriately for the airfield and terminal building; it is currently undergoing a lifecycle/capacity upgrade with a new 3 generator arrangement, providing capacity until at least 2030 and likely beyond.

4.7.5 Fuel Storage Facilities

Currently, there are three storage facilities at St. John's International Airport. Two are located groundside within the East Commercial Area and one is located within the Terminal Area east of the existing long-term parking lot. Consolidation of these facilities is currently underway, with a new larger fuel storage facility currently planned for the west side of the Airport to replace the commercial airlines facility located immediately east of the terminal's long-term parking lot, which is slated for removal by 2018. It will provide fuel for all operations on the west side of the airport. A new aviation fuel farm will be constructed in 2017 as well, to replace the aging farm next to the ATB.

4.8 AIRPORT UTILITIES

4.8.1 Water

Water is supplied to the west side of the Airport by the City of St. John's from the Windsor Lake water supply reservoir via low zone gravity feed under low pressure. Prior to distribution on the Airport, the water enters a pump-house consisting of an underground 900 cu.metre. reservoir, two (2) variable frequency drive domestic supply submersible pumps rated at 250 US Gallons Per Minute (usgpm) at 48 psi and a diesel fire flow pump rated at 2,500 usgpm at 131 psi to boost the pressure from the city supply and provide adequate fire flow volumes. The distribution system consists of 200mm and 300mm diameter ductile iron water mains, and 400mm PVC watermains. It is understood the existing water distribution was modelled by BAE-Newplan in 2009 and 2011 and found to be adequately sized for the existing and most future infrastructure domestic and fire flow requirements[11]. It was remodeled again in 2016 by CBCL with the same conclusions. However, given the age and liability associated with the pumps and reservoir, it is recommended that the City of St John's connect the airport to its High Zone system and reservoir at Penetanguishine via a new existing connection across Portugal Cove at World Parkway (constructed in 2015) to provide a satisfactorily performing water supply to the west side of the airport and alleviate the airport's need to properly provide the service themselves.

The east side of the Airport is fed from the City's High Zone system which satisfies that area of the airport's requirements.

4.8.2 Sanitary Sewer

The sewage collection system consists of both gravity and forcemain sewers. In general sizes vary from 200mm to 450mm diameter. Most of the Airport's sewage is directed into a City of St. John's gravity on Torbay Road. A sewer trunk main carries the sewer from Apron 1 east across the airfield and eastward on to the airport boundary at Torbay Road. The trunk main was constructed in 1982 and has a capacity of 145 litres/second at half pipe capacity and was designed to service the land within the Airport's boundaries.

[11] Source: St. John's Airport Utilities Assessment, HMM, December 2014.

Sewage from Aviation Court, Airport Road and east flows by gravity to a lift station on Airport Road and eventually converges at a manhole located on Apron I east of the airport terminal building and into the above trunk main. The lift station was installed in 2010 and has a capacity of 48 litres / second. The lift station is equipped with a 10 hp duty pump and a 10 hp standby pump. A forcemain connects the lift station to a gravity sewer approximately 100m north west of the intersection of Aviation Service Road and World Parkway and near Outer Cove Brook. Sewerage then flows by gravity to the aforementioned manhole located on Apron I east of the airport terminal building. Sewerage from the general aviation area flows by gravity via the same trunk main to the outfall on Torbay Road.

Areas west of the above noted areas are serviced by gravity to a new lift station constructed in 2015 and then pumped across Portugal Cove Road to enter the city's gravity system at Viscount Street. This new line and lift station are sized for future commercial developments on the west side of the airport, up to 100 L/s as approved by the city.

4.8.3 Aircraft Sewage Disposal

Aircraft sewage, also called 'Blue Water', is disposed using mobile lavatory carts in a dumping station located west of the PTB and south of the Airport Service Road. The dumping stations is a 20 foot by 30 foot single story building equipped with a gravity grate hoper system connected to the City of St. John's sanitary system. The location has been identified as a possible constraint to continued expansion of airside and groundside facilities. Relocation of the facility is anticipated in 2017 to a location airside adjacent to the west end of apron I.

4.8.4 Storm Drainage

In general the site drains towards the east and is located at the headwater for most of the primary sub watersheds systems present. Storm drainage is collected and directed through a series of open grate catchbasins and underground pipe coupled with open ditches. Storm water eventually flows to Outer Cove Brook, Island Pond Brook or Soldier's Brook with the exception of the northwest quadrant of the property which flows towards Western Island Pond.

The SJIAA recently adopted a 'net zero' runoff policy for new development. The implementation of this policy aligns the Airport with the City of St. John's own initiatives to control the increase in storm water runoff.

There are currently no storm water detention facilities within the storm drainage system or other attenuation devices, however several new tenant facilities are currently being constructed with detention systems in accordance with the new policy. There are no reported storm water or drainage issues on the site. An airport drainage study is not within the scope of this master plan and was not undertaken. Several hydrology and Hydraulic studies have been undertaken to assess various developments on the west side of the airport. It is recommended to undertake a master drainage study prior to any further significant future commercial developments.

4.8.5 Electrical Power Supply and Distribution

Newfoundland Power supplies electricity to the Airport. The main feed for the west side of the airport's majority of infrastructure comes to the Field Electrical Centre (FEC) via. a 3000/4000 kVA step-down transformer. The FEC houses Interruptible Power Units (IPUs), switchgear and constant current regulators for the airport electrical system. There are two (2) IPU's each with an output rating of 1100 KVA. One IPU serves all airfield lighting and the CAT III ILS systems serving both Runways 11 and 29. The other standby generator supplies emergency power to the ATB, the flight kitchen, the Operations/Control Tower, the pump house and the CAT I ILS system of Runway 16. Most airport facilities are fed from the FEC via underground distribution networks.

The tenant facilities on the west side of the airport (as well as some SJIAA facilities) and all facilities on the east side of the airport are fed via overhead distribution lines from Newfoundland Power.

4.8.6 Communications

Bell Aliant, Rogers and Eastlink currently provides communication service to all areas of the airport. Telephone lines for the ATB and Airport Service Area enter the site underground from Craig Dobbin's Way. Communication for the general aviation area is provided via overhead pole lines.

4.9 AERONAUTICAL ZONING

4.9.1 Registered Aeronautical Zoning

The St. John's International Airport is protected federally by enacted Airport Zoning Regulations. This means that developments on specified lands and within specified airspace surrounding the St. John's International Airport are subject to the constraints identified within the regulation.

The St. John's International Airport Zoning Regulations (AZRs), referred officially as the Torbay Airport Zoning Regulations C.R.C., c.113, find their providence in the Federal Aeronautics Act. The Aeronautics Act was passed by the Parliament of Canada creating exclusive jurisdiction to make laws with respect to aeronautics. Section 5.4 (2) (b) of the Aeronautics Act states that the Governor in Council may make regulations for the purpose of:

> *"…. (b) preventing lands adjacent to or in the vicinity of an airport or airport site from being used or developed in a manner that is, in the opinion of the Minister, incompatible with the safe operation of an airport or aircraft;" (Reference: Transport Canada)*

Airport Zoning Regulations are intended to protect airports from conflicting off-airport developments, typically of a vertical nature. All AZRs include height restrictions based on Obstacle Limitation Surfaces (OLS) similar to those prescribed by Transport Canada for airports to maintain certification. However, AZR surfaces are not to be confused with an airport's Operational Zoning and associated Obstacle Limitation Surfaces (OLS). Although similar in composition an AZR OLS is not linked to airport certification, rather it is intended to protect the long-term operation of the Airport and its facilities.

AZRs may also include other provisions to further preserve a hazard free airspace environment surrounding the airport. One such additional provision, is to restrict the natural growth of vegetation. Another provision, is to restrict electronic interference with airport communications and aeronautical facilities. Lastly, AZRs may also include a bird hazard provision to restrict land uses and activities that attract birds which may cause a hazard and increased risk to aviation safety.

It should be noted that the primary purposes of AZRs are not to prescribe suitable land uses surrounding an airport as this falls under the jurisdiction of local and provincial planning authorities. AZRs are to be used as a restrictive test for any proposed development or land use to ensure compatibility with the aeronautical environment.

The St. John's AZRs are subject to the Subsections 31(1) and (3) of the Legislation Revision and Consolidation Act, in force on June 1, 2009, and available for public viewing on the Transport Canada website. The latest version shows the regulation is up to date as of November 24, 2015 and any amendments that were not in force as of November 24, 2015 are set out at the end of this document under the heading "Amendments Not in Force" should they exist.

The AZRs for St. John's date back to the 1970's at which time the supporting documentation including mapping was developed to describe the protection and affected lands. This mapping is referred to as Department of Transport Plan No. MT-0451 (A, B, C, D, E, F, G) dated January 6, 1970. Further amendments to the regulation were made since 1970 and are referenced in the regulation as SOR/81-662, s. 1 and SOR/84-969, s. 1.

The St. John's AZRs provide protection for two of the three (3) runways, including; Runway 11-29 and Runway 16-34. While the Department of Transport Plan No. MT-0451 (A,B,C,D,E,F,G) dated January 6, 1970 shows protection surfaces for Runway 02-20, these surfaces are not described in the official regulation and as such the restrictions are not enforceable by way of the regulation. For Runways 11-29 and 16-34 the following zoning provisions are contained in the existing AZR:

Building, Objects and Structures

"…5. No person shall erect or construct, on any land to which these Regulations apply, any building, structure or object or any addition to any existing building, structure or object, the highest point of which will exceed in elevation at that point any of the surfaces hereinafter set out that project immediately over and above the surface of the land at that location, namely,

(a) the approach surfaces;

(b) the outer surface; or

(c) the transitional surfaces…."

Natural Growth

"…6. Where an object of natural growth on any land to which these Regulations apply exceeds in elevation any of the surfaces referred to in paragraphs 5(a) to (c), the Minister may make a direction that the owner or occupier of the land on which the object is growing, remove the excessive growth. SOR/84-969, s. 1…."

Disposal of Waste

"…7. No owner or occupier of any land to which these Regulations apply shall permit that land or any part of it to be used for the disposal of any waste that is edible by or attractive to birds. SOR/84-969, s. 1…."

The AZRs for St. John's do not contain provisions for the protection of aeronautical communications nor electronic navigational aids from electronic interference. Where provided, this clause is typically worded as follows:

Aeronautical Facilities

"….No owner or lessee of land to which these Regulations apply shall permit any part of that land to be used or developed in a manner that causes interference with signals or communications to and from

(a) an aircraft; or

(b) facilities used to provide services relating to aeronautics….."

The St. John's International Airport has operated for several decades without a significant impact to aeronautical facilities by off-airport developments. However, with recent investments made to upgrade the Airport's instrument landing systems for Runways 11 and 29 in order to improve airport accessibility, there is a need to examine closely the gaps in protection for the Airport. One such gap is the exclusion of electronic protection from the AZR which could be critical to continued operation of the instrument landing systems.

For illustrative purposes, **Figure 4-7** has been included to help describe the standard characteristics of an OLS.

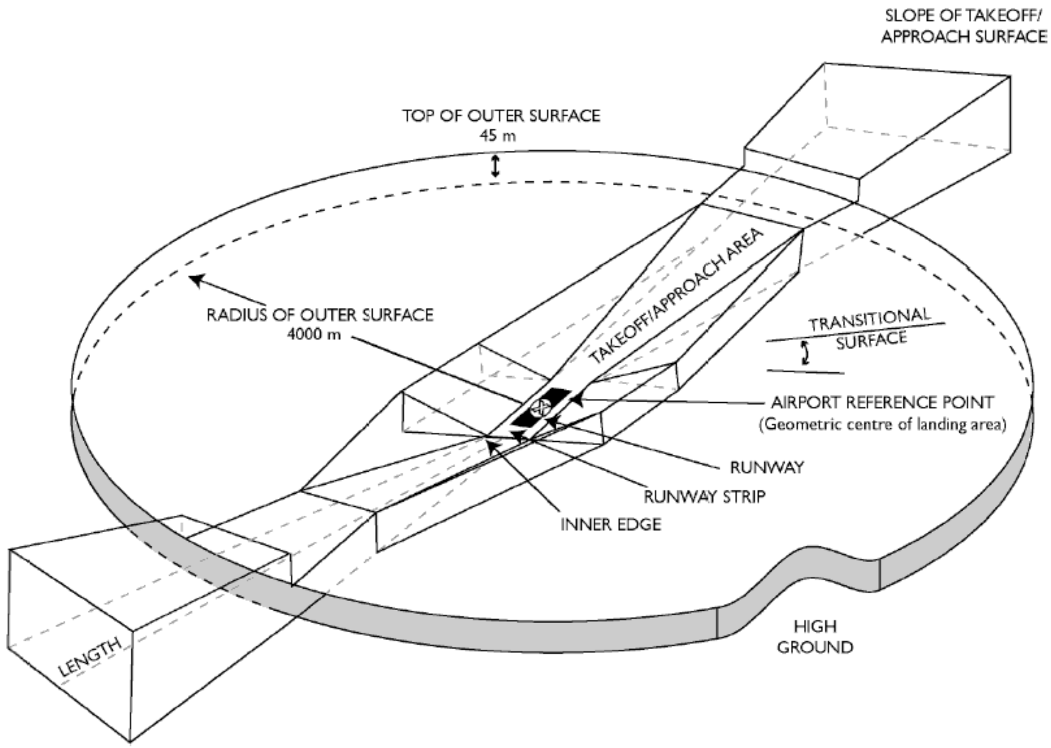

Figure 4-7 – Typical OLS

As shown in **Figure 4-7** above, the standard OLS for each runway is comprised of a Runway Strip, Approach and Transitional Surfaces, and an Outer Surface. These are 3D imaginary surfaces established to limit structure heights in the vicinity of an airport to protect the airspace from encroachments that would otherwise introduce a risk of collision to aircraft and/or limit the long-term development opportunities of the airport.

SJIA's existing AZR OLS, as summarized in **Table 4-13** below and illustrated in **Exhibit B1** of **Appendix B**, includes Runway Strips, Approach and Transitional Surfaces, and an Outer Surface.

Table 4-13 – Existing Airport Zoning Regulation Surfaces and Dimensions

Runway	11	29	16	34	02	20
Runway Takeoff/Approach Surfaces						
Approach Slope	2%	2%	2%	2%	Not Protected	
Approach Length	50,000ft (15,240m)	50,000ft (15,240m)	50,000ft (15,240m)	50,000ft (15,240m)	Not Protected	
Divergence	16%	16%	16%	16%	Not Protected	
Runway Strip						
Width	1,000 ft	1,000 ft	1,000 ft	1,000 ft	Not Protected	
Transitional Surface						
Transitional Surface Slope	1:7	1:7	1:7	1:7	Not Protected	
Outer Surface						
Airport Reference Point Elevation	431ft ASL					
Elevation	581ft ASL (177.1m)					

However, unlike the standard OLS illustrated in **Figure 4-7**, an AZR Outer Surface is not always a circular plane established in a reference to a specific point or points on the Airport. As is the found with the majority of AZRs, the Outer Surface for St. John's has been established in reference to lot, line and concession boundaries.

It is important to note that obstructions pre-existing the establishment of the AZRs are "grandfathered" in as exemptions to the limits imposed by the regulations.

4.9.2 Airport Operational Zoning

The non-registered airport operational zoning for St. John's International Airport is similar in composition to the registered AZRs with Obstacle Limitation Surfaces (OLS) established to protect aircraft flight maneuvering in the vicinity of an airport for the purpose of takeoff or landing. The operational zoning may at times match the zoning established by the AZRs but as is usually the case the operational zoning is less restrictive than the AZRs. Maintaining an obstacle free OLS based on the Operational Zoning is required for the Airport to maintain certification and allow day-to-day flight operations to continue.

The Operational Zoning for St. John's International Airport is less restrictive than the AZRs when comparing the protection requirements for Runway 16-34. However, for Runway 11-29, the move to TP 312 5th Edition standards have modified the OLS requirements for continued certification and open up some differences between the Operational and Registered Zoning OLS.

The Airport currently operates with three runways and a hybrid of TP312 4th and 5th Edition standards. **Table 4-14** summarizes the height protection obstacle limitation surface based the

Airports' current operating conditions. **Exhibits B2** and **B3** in **Appendix B** depict these surfaces and their respective maximum allowable elevations.

Table 4-14 – Current Airport Operational Zoning Characteristics

Runway	**11**	**29**	**16**	**34**	**02**	**20**
Certification	TP312 5th Ed. AGN V Precision	TP312 5th Ed. AGN V Precision	TP312 4th Ed. Code 4E Precision	TP312 4th Ed. Code 4E Non-Precision	TP312 4th Ed. Code 3C Non-Instrument	TP312 4th Ed. Code 3C Non-Instrument
Approach Surface						
Approach Slope	2% / 2.9%	2% / 2.9%	2%	2.5%	2.5%	2.5%
Approach Length	5,000m	5,000m	15,000m	15,000m	2,500m	2,500m
Divergence	15%	15%	15%	15%	10%	10%
Runway Strip						
Width	122m	122m	150m	150m	90m	90m
Transitional Surface						
Transitional Surface Slope	1:4 / 1:7	1:4 / 1:7	1:7	1:7	1:7	1:7
Outer Surface						
Airport Reference Point Elevation	140.5m ASL					
Elevation	185.5m ASL					

Note:
1. Where two numbers are shown, the first number relates to the first segment and the second number to the second segment.

A number of obstructions can be found noted on the exhibits. These obstructions were identified in assessment of the OLS surface using LiDAR data collected as part of the 2013-2015 Airport Accessibility Project. These obstructions are known to the Airport and are being further investigated. In certain cases, some obstructions may be exempt from OLS height restrictions through past aeronautical assessments and resulting exemptions. However, not all obstructions are expected to be covered by existing operating exemptions and as such should be further investigated for compliance with TP 312.

4.9.3 Restrictions to Off-Airport Land Uses

From **Exhibit B1** it can be seen that the limits of the AZRs for St. John's cover a large area surrounding the Airport. In general the majority of the municipal zoning around the Airport and underneath the approach surfaces is a mix of residential, rural and agricultural with some commercial and light industrial developments particularly east of the Airport. The majority of residential zoning is height restricted to 8m above ground level while heights within rural and agricultural areas vary and are usually determined on a case-by-case basis.

The AZR for St. John's International Airport impacts the following municipalities in varying degrees in terms of height control and land use restrictions:

- City of St. John's
- St. John's Metropolitan Area
- Town of Bauline
- Town of Logy Bay-Middle Cove-Outer Cove
- Town of Portugal Cove – St. Philip's
- Town of Torbay
- Town of Wabana

Each of the above municipalities have adopted local zoning by-laws to control land development within their jurisdictions. These by-laws do not directly integrate with the Airport's registered zoning and as such the onus remains on the individual landowners to comply with the AZRs. Land developers should not assume that they would automatically be in compliance with the AZRs even if they meet all municipal zoning requirements and are approved for development.

Currently, there is no formality to the AZR review process within these municipalities or with private developers. The Airport is currently in the process of reviewing its ARZs with surrounding municipalities to identify gaps in protection of existing, new and future facilities. One of the outcomes from these consultations will be the identification of a formal AZR review process. The Airport Authority continues to encourage a consultative approach and will offer to review development proposals for compliance if given sufficient time for comment.

5. AVIATION ACTIVITY AND FORECASTS

5.1 HISTORICAL ACTIVITY

5.1.1 Passenger Activity

From 1995 to present, passenger activity has more than doubled, from 622,000 annual passengers to 1,576,000 in 2014. A short downturn occurred in 2002; the result of the September 11th 2001 attacks, and again in 2007-2009, the result of an economic slowdown. Since 2009, the average annual growth rate has been approximately 5.6 percent. **Figure 5-1** illustrates the historic growth of passenger Activity.

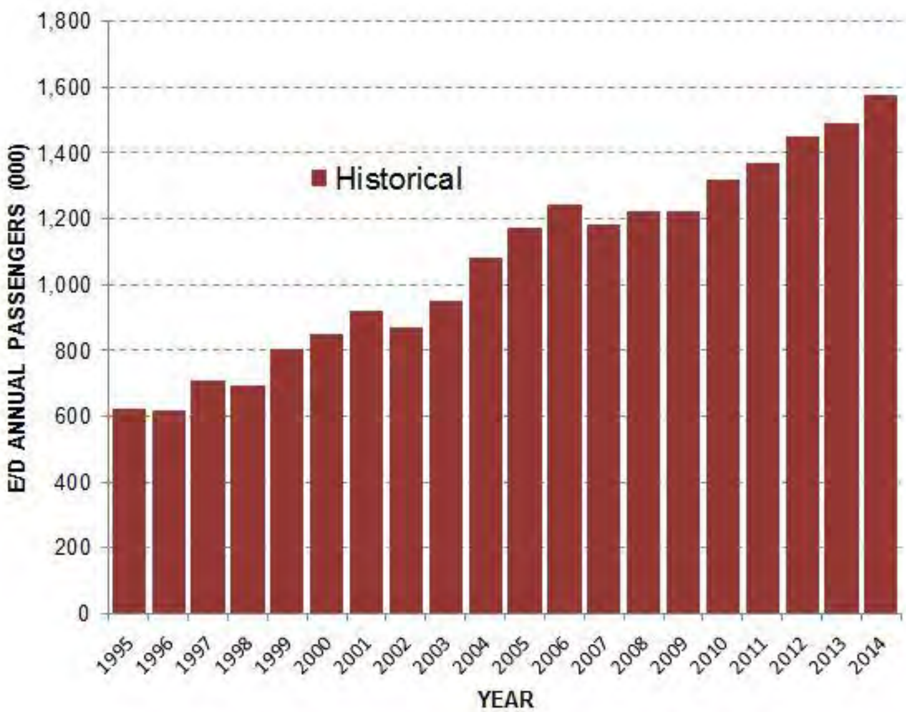

Figure 5-1 – Historical Growth of Passenger Activity at St. John's[12]

5.1.2 Air Cargo Activity

Air cargo activity is not tracked on an annual basis; however a study completed in 2010[13] estimated that in 2009 the total volume of cargo handled at SJIA was approximately 10,850 tonnes. The majority (84 percent) of this was handled by all-cargo and integrated carriers, while only 14 percent

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[12] Stats Can, 2015

[13] Air Cargo Study, St. John's International Airport, Jacobs Consultancy Canada, October, 2010

was carried in the bellies of passenger aircraft. Almost all of the cargo (98.6 percent) is domestic, and approximately 82 percent is inbound.

5.1.3 General Aviation Activity

General aviation is comprised of various components including corporate charter/air taxi services, non-passenger/cargo commercial activities, flight training, private aircraft as well as government and military movements. Over the past 10 years, general aviation activity has been on the decline, the result of reduced private flights, government and military activity and air taxi type services. **Figure 5-2** describes historic general aviation activity at SJIA.

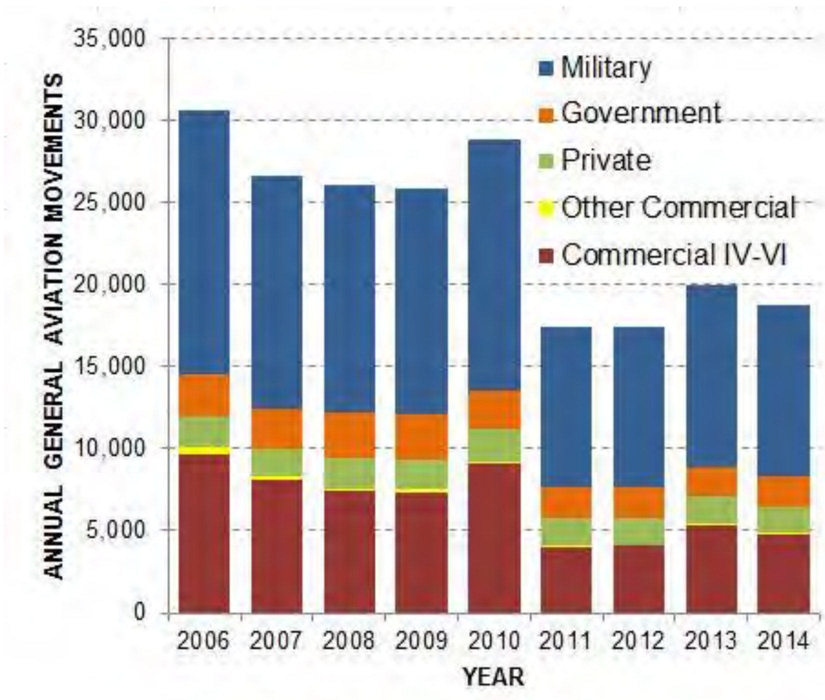

Figure 5-2 – Historical General Aviation Activity at St. John's[14]

5.1.4 Helicopter Activity

Compared to most other Canadian NAS airports, St. John's has a significant percentage of helicopter traffic. In 2014 helicopter activity accounted for approximately 12 percent of total aircraft movements. This activity is a result of the offshore oil and gas industry, which depends on helicopter operations for material and personnel supply logistics, as well as search and rescue response. Cougar Helicopters has a significant base of operations located at the airport. **Figure 5-3** describes historical helicopter activity at St. John's International Airport. A reduction in

[14] Stats Can, 2015

activity between 2007-2009 was a result of a downturn in the oil and gas industry. A reduction in activity for 2014 suggests a similar downturn, the result of current decline in global energy demand.

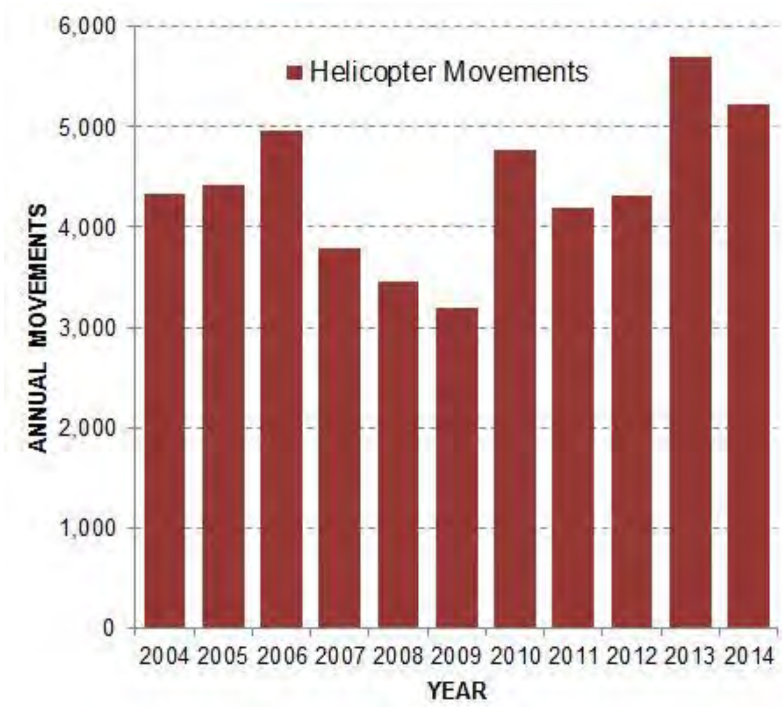

Figure 5-3 – Historical Helicopter Activity at St. John's[15]

5.1.5 Historical Aircraft Movements

Figure 5-4 illustrates historical aircraft movements broken down by local movements (flights which do not leave the airport's control zone) and itinerant movements (flights which come from another airport or which have left the airport's control zone). Over the past ten years there has been a decrease in local movements, from a high of 9,608 annual movements in 2004 to a low of 1,452 in 2014. This decrease is typical at many airports where in recent years there has been a general decrease in flight training activity.

[15] Stats Can, 2015

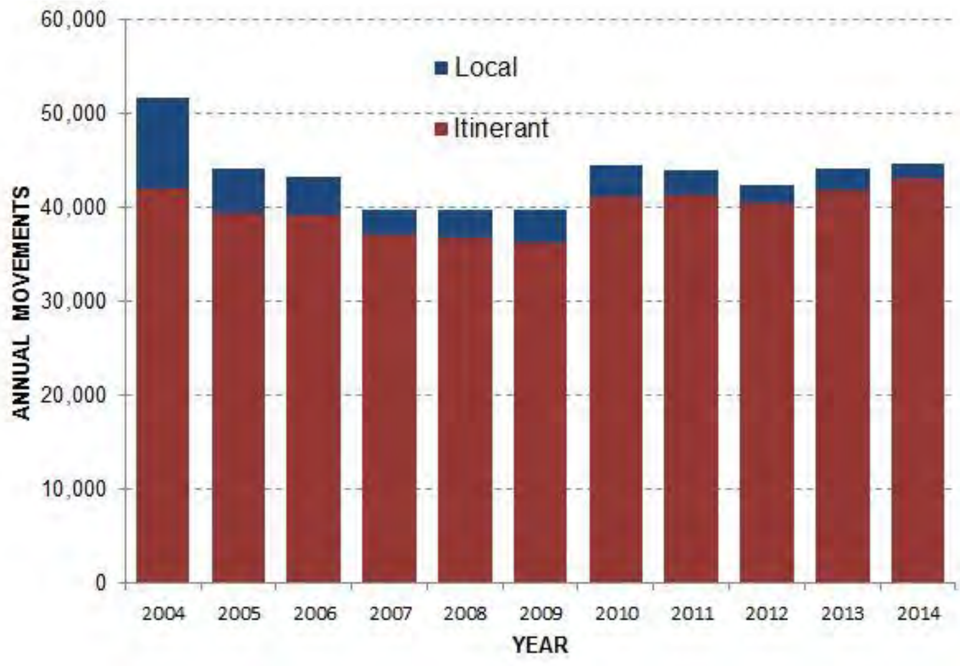

Figure 5-4 Historical Movements by Local and Itinerant at St. John's[16]

There has not been a significant increase in itinerant movements over the past 10 years. In 2004 there were 42,125 annual itinerant movements. In 2014 there were 43,190 movements. This represents an increase of only 2.5 percent. In the intervening years there were fluctuations in the number of annual movements, which generally reflected the health of the economy.

5.2 ECONOMIC OUTLOOK

5.2.1 Global Economy

According to the World Bank[17], the global economy was expected to grow 2.8 percent in 2015, strengthening to 3.2 in 2016-2017. High income countries are expected to grow at slower rates; 2 percent in 2015 and 2.3 percent in 2016-2017. Major influences that are impacting growth are the repercussions of falling commodity prices, tightening financial conditions and the rising strength of the US dollar. The benefits from low oil prices have been slow to materialize.

5.2.2 Regional Economy

In recent years economic activity in Newfoundland and Labrador has slowed, the result of weaker commodity markets and reduced demand for oil and iron ore. As a result, the value of exports has decreased and the provincial Gross Domestic Product negatively affected. The weaker

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[16] Stats Can, 2015

[17] Global Economic Prospects, The Global Economy in Transition, World Bank Group, June 2015

commodity market has also impacted capital investment in the province. A number of resource-related projects have been delayed or put on hold, and Wabush Mines closed permanently. The lower Canadian dollar relative to the US dollar has had a positive impact on certain exports such as newsprint and fish product.

The provincial government, in its report '2015 Provincial Economic Overview' suggests the economy of Newfoundland and Labrador is entering a period of contraction stemming from several factors. These include the winding down of a number of major projects including Hebron and Muskrat Falls, and the decline in commodity exports. Together, these factors will negatively impact capital investment expenditures. Investment is expected to decline from $12.5 billion in 2015 to $8.5 billion in 2018. The provincial GDP and employment are expected to decline as well.

Beyond 2018, the economy is expected to grow. In the longer term there is optimism that the development of offshore resources and production from Hebron, Muskrat Falls and Voisey's Bay will boost the province's economy.

5.3 AVIATION ACTIVITY TRENDS

Significant trends in recent years that have impacted activity include the 2010 introduction of Porter Airlines and the increase in Air Canada Express operations, which resulted in the increase in passenger aircraft movements. The trend has been to downsize the gauge of aircraft and increase the frequency of movements. As passenger activity increases in the future, it is likely that the size of aircraft will also increase.

Other events that have impacted activity include the introduction of WestJet's international flights to Dublin and Gatwick. This has introduced the potential for other European destinations to be served from St. John's utilizing narrow-body aircraft.

Although passenger activity appears to remain healthy, those activities directly related to the offshore oil and gas industry will likely be impacted by the current economic downturn affecting oil production

5.4 AVIATION FORECASTS

5.4.1 Passenger Activity

In 2010 InterVISTAS Consulting Inc. prepared long term air traffic forecasts for St. John's International Airport, which included annual passenger volumes and aircraft movements at 5-year intervals from 2010 to 2020. In 2014 InterVISTAS undertook a review of these forecasts to assess their validity against recent economic developments.

With respect to passenger activity InterVISTAS found that the actual growth in activity was closely in line with forecasts produced in 2010. Given the recent introduction of the WestJet flights to Dublin and Gatwick the forecast for international passenger traffic was increased as was domestic activity to reflect actual growth. **Figure 5-5** illustrates the forecasted passenger activity provided in the 2014 InterVISTAS report. From 2010 to 2030 passenger activity is expected to increase by

81 percent. The most significant areas of growth would be in the transborder and international sectors.

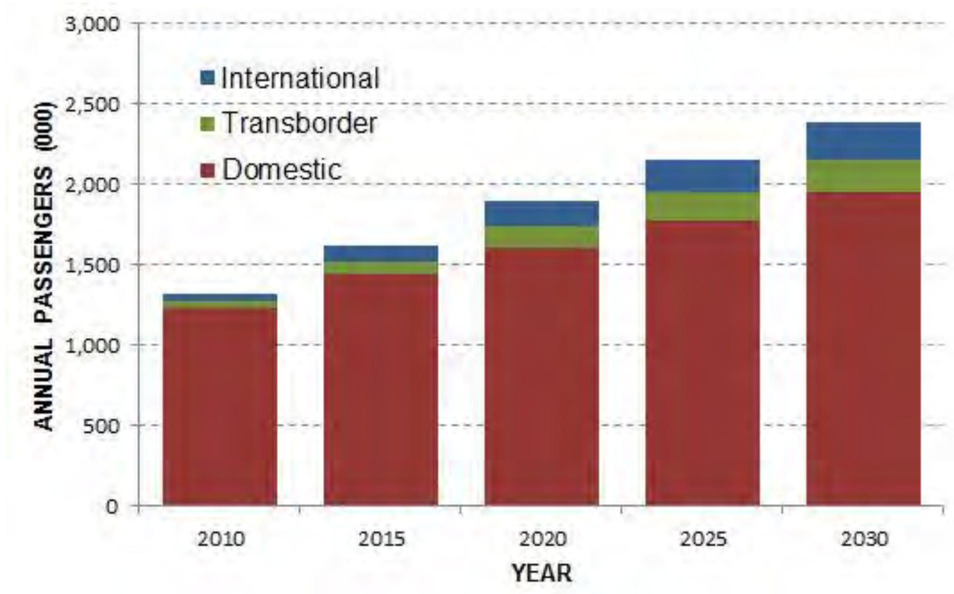

Figure 5-5 – Passenger Forecast for St. John's

5.4.2 Air Cargo Activity

Typically it is difficult to forecast air cargo activity due to a lack of information sources. The Air Cargo Study[18] undertaken in 2010 determined that that approximately 11,000 tonnes of air cargo was handled through St John's International Airport in 2009.

InterVISTAS, in their 2010 activity forecast used this figure as the basis for air cargo forecasts. Without reliable historic data, the forecasts for SJIA were largely based on industry-wide cargo traffic projections and regional GDP forecasts. InterVISTAS identified three growth scenarios. Under the 'most likely' scenario cargo activity would average 3.2 percent per annum. Under a 'low' forecast, cargo activity would grow by 1.7 percent, and under a 'high' forecast, cargo activity would grow by 4.3 percent. **Figure 5-6** illustrates the 'most likely' growth forecast.

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[18] Air Cargo Study by Jacobs Consultancy, 2010

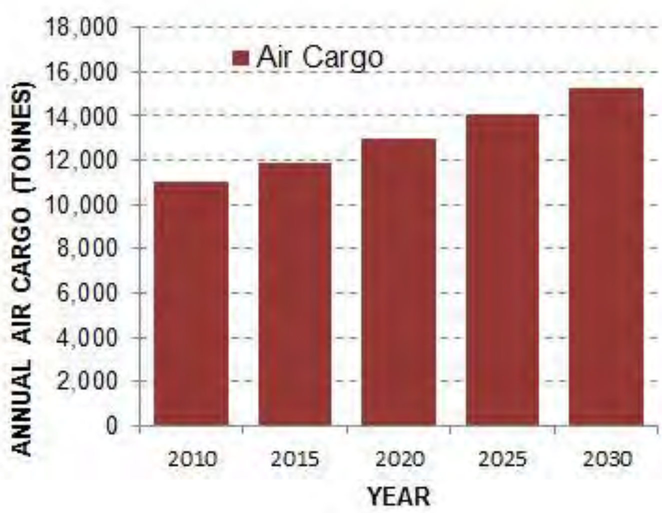

Figure 5-6 – Air Cargo Forecast

5.4.3 General Aviation Activity

General aviation activity is comprised of various components including corporate charters/air taxi services, flight training, private aircraft, as well as government and military movements. General Aviation at St. John's International Airport has generally declined in the past 10 years, dropping from about 16,000 annual movements down to approximately 10,500, although from year to year there have been significant swings in activity. Historically general aviation movements, as a percentage of total movements, has declined from approximately 48 percent in 2006 to approximately 20 percent in 2014. This, in part, is due to a decline in general aviation activity, while aircraft movements associated with scheduled air carrier activity have increased.

General aviation activity was not specifically addressed in the forecasts prepared by InterVISTAS in 2010. It is anticipated that there will be minimal growth of general aviation in the future. Although no national forecasts have been prepared for Canada, the Federal Aviation Authority (FAA) in the United States predicts that general aviation will grow by 1.4 percent annually over the long term, but that in the short term growth will be less than 0.3 percent per annum. At St. John's International Airport, given the regional economic outlook, it is reasonable to assume there will be little or no growth of general aviation activity until beyond 2018.

5.4.4 Helicopter Activity

The activity forecasts prepared in 2010 and again reviewed in 2014 did not specifically address helicopter activity. Given that this activity is so closely tied to the offshore oil and gas industry, it is anticipated that in the short term helicopter activity will likely decline, and then increase beyond 2018, when it is forecast there will be renewed activity and development in offshore exploration and production. In the short term a decrease of 10 – 15 percent in the number of movements could be expected.

5.4.5 Aircraft Movements

In its 2014 Activity Forecast Update, InterVISTAS provided an activity forecast for commercial passenger aircraft movements. This forecast is illustrated in **Figure 5-7**. The premise for the increase in movements is the forecasted increase in passenger activity as well as a shifting of Air Canada traffic from its mainline operation to its regional Air Canada Express operators, which will result in greater frequency and more movements. As passenger activity increases in the future there will likely be a gradual return to larger mainline aircraft.

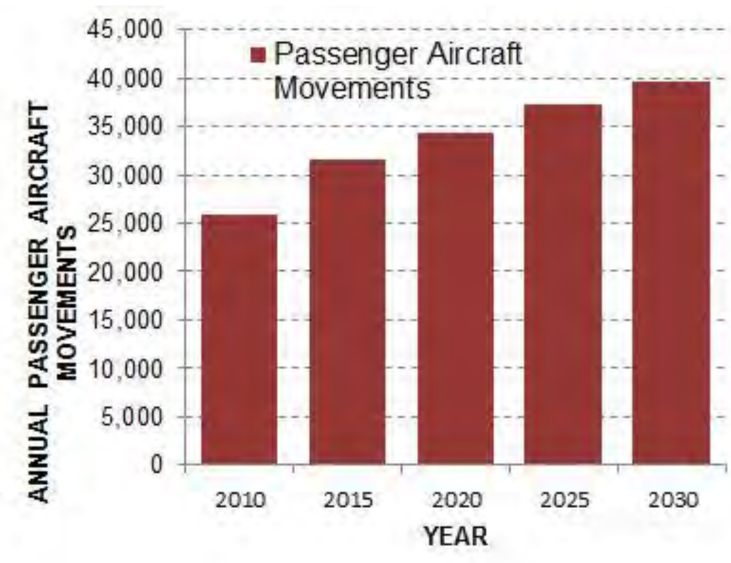

Figure 5-7 – Forecast of Passenger Aircraft Movements

6. Infrastructure Requirements

6.1 INTRODUCTION

This section identifies and describes the infrastructure required to accommodate the aviation demand forecast for St. John's International Airport over the course of the planning period 2015 to 2035. Included are recommendations for improvements to existing facilities and where appropriate the addition of new components aimed at addressing a perceived or anticipated capacity constraint. Facility requirements were developed with consideration to the aviation demand projections presented in **Section 5**, applying the appropriate industry planning and design standards, discussions with stakeholders, and by performing a preliminary demand/capacity analysis on the various functional Airport areas, including:

- Airside infrastructure including movement areas, navigational aids and vehicle corridors;
- Terminal facilities;
- Groundside infrastructure including road networks and vehicle parking areas;
- Air cargo facilities;
- General aviation facilities;
- Non-aviation commercial areas;
- Airport operations and support facilities; and
- Utilities.

To ensure a logical sequence of future developments, facility requirements are presented in three phases corresponding to the short-, medium-, and long-term planning horizons. The ultimate development of the Airport as theorised based on separate studies which investigated airport usability, development opportunities and runway length requirements, was considered in identification of implications within the planning horizon.

Infrastructure components, i.e. taxiways, runway extensions, and apron expansions, have been prioritised within each phase based on evaluation of need and benefit using a matrix that was developed with consideration to evaluation methods previously used the SJIAA. The evaluation matrix, as illustrated in **Table 6-1**, identifies five criteria or "triggers" used to determine priority of infrastructure improvements based on perceived need and/or benefit. These triggers include:

1. Operational Safety and/or Regulatory Compliance
2. Airfield Capacity and/or Operational Efficiency
3. Environmental Impact
4. Commercial Opportunity; and
5. Life-Cycle Replacement.

These five triggers for infrastructure improvement have been developed with consideration to the criteria used previously by the SJIAA in evaluation of capital spending programs. Prioritization of infrastructure improvements have been determined using the above described triggers and an assigned weighting developed from a relative comparison of each trigger. A priority factor was then assigned to each infrastructure component based on perceived need and level of benefit under each trigger.

Table 6-1 – Infrastructure Improvement Evaluation Matrix

Trigger	Weighting Factor	Primary Factor and Corresponding Maximum Score		
		x1 = Low	x3 = Medium	x5 = High
Operational Safety and/or Regulatory Compliance	1.5	1.5	4.5	7.5
Airfield Capacity and/or Operational Efficiency	1.4	1.4	4.2	7
Environmental Impact	1.3	1.3	3.9	6.5
Commercial Opportunity	1.2	1.2	3.6	6
Life-Cycle Replacement	1.1	1.1	3.3	5.5

Where life-cycle replacement is considered a trigger, it is assumed to contribute to a significant reduction to the overall cost of the infrastructure improvement being contemplated. Life-cycle replacement, by itself and within this context, is not considered an infrastructure improvement. Life-cycle replacement is being considered as a trigger for upgrade or expansion to existing infrastructure in order to minimize the total investment required to achieve the identified improvement. Therefore, life-cycle replacement of existing infrastructure has not been evaluated separately.

For further information on recommended capital phasing and evaluation of infrastructure improvements refer to **Section 10**.

The facility requirements were developed at a level of detail appropriate for an airport master plan, not the level of detail suitable for an architectural or engineering design study.

6.2 PLANNING AND DESIGN CRITERIA

6.2.1 Airport Planning and Design Criteria

The planning and design criteria applied in the development of this airport master plan is found throughout Transport Canada publication TP 312 5th Edition as well as a number of key reference documents that include:

- Canadian Aviation Regulations;
- ICAO Airport Planning Manuals; and
- FAA Advisory Circulars.

Where appropriate these documents have been referenced in identification of facility specific requirements and/or recommendations that are reflected in the infrastructure improvements identified in the proposed Airport Layout Plan (ALP) **Exhibit A4** of **Appendix A**.

6.2.2 Aircraft Group Number (AGN)

Airport design criteria, as described in TP 312 5th Edition, are determined based on the specification of Aircraft Group Number (AGN). AGNs are intended to help simplify the identification of facility requirements that are associated with aircraft types by grouping aircraft into categories based on their performance and size characteristics. In actual practice, the use of AGNs is somewhat complicated by the fact that an aircraft may belong to more than one AGN depending on the design standard being referenced and the facility being evaluated. This occurs as a consequence of each AGN being specified based on one or more of the following components:

1. Approach speed category;
2. Wing span;
3. Outer main gear span; and
4. Tail height.

Further complicating the application of standards based on AGN is the association of standards to one or more of the components listed above and to either the runway or taxiway environment.

Tables 6-2 through **6-4** identifies the components referenced in the identification of AGN.

Table 6-2 – Aircraft Approach Speed Categories

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

Notes:
1. Source: TP 312 Aerodrome Standards and Recommended Practices. 5th Edition, September 15, 2015.

Table 6-3 – Aircraft Group Number for Runway Environment

Column I	Column II	Column III
Aircraft Group Number	**Wing Span**	**Outer Main Gear Span (a)**
I (for approach speed category C or D use AGN IIIB)	Less than 14.94 m	Less than 4.5 m
II (for approach speed category C or D use AGN IIIB)	14.94 m up to but not including 24.10 m	4.5 m up to but not including 6 m
IIIA (for approach speed category C or D use AGN IIIB)	24.10 m up to but not including 36.00 m	6 m up to but not including 9 m
IIIB (includes Groups I - IIIA with C & D approach speeds)	24.10 m up to but not including 36.00 m	6 m up to but not including 9 m
IV	36.00 m up to but not including 52.12 m	9 m up to but not including 14 m
V	52.12 m up to but not including 65.23 m	9 m up to but not including 14 m
VI	65.23 m up to but not including 79.86 m	14 m up to but not including 16 m

Notes:
1. Source: TP 312 Aerodrome Standards and Recommended Practices. 5th Edition, September 15, 2015.
2. Distance between the outside edges of the main gear wheels.

Table 6-4 – Aircraft Group Number for Taxiway Environment

Column I	Column II	Column III	Column IV
Aircraft Group Number	**Wing Span**	**Outer Main Gear Span (a)**	**Tail Height**
I	Less than 14.94 m	Less than 4.5 m	Less than 6.10 m
II	14.94 m up to but not including 24.10 m	4.5 m up to but not including 6 m	6.10 m up to but not including 9.15 m
IIIA	24.10 m up to but not including 36.00 m	6 m up to but not including 9 m	6.10 m up to but not including 9.15 m
IIIB	24.10 m up to but not including 36.00 m	6 m up to but not including 9 m	9.15 m up to but not including 13.72 m
IV	36.00 m up to but not including 52.12 m	9 m up to but not including 14 m	13.72 m up to but not including 18.30 m
V	52.12 m up to but not including 65.23 m	9 m up to but not including 14 m	18.30 m up to but not including 20.12 m
VI	65.23 m up to but not including 79.86 m	14 m up to but not including 16 m	20.12 m up to but not including 24.40 m

Notes:
1. Source: TP 312 Aerodrome Standards and Recommended Practices. 5th Edition, September 15, 2015
2. Distance between the outside edges of the main gear wheels.

6.2.3 Identification of Critical Aircraft and Applicable Design Standards

To properly plan for future facilities at SJIA, design criteria must be applied based on the selection of the most appropriate AGN. This is accomplished through evaluation of a design aircraft mix to identify the AGN that would be applicable considering the most demanding aircraft that would use the facility on a regular basis.

In the past, planners and engineers have typically based their plans for an airport on the selection of one critical aircraft type. This aircraft would typically be identified as having the most demanding of operational and/or physical requirements. In practice, rarely is there one single aircraft that can be specified as the design aircraft for the Airport. Best practice therefore dictates that to ensure flexibility to accommodate multiple types of aircraft is built into the layout of an Airport, a critical aircraft mix, rather than a single aircraft, be evaluated to determine facility requirements.

The critical aircraft mix for St. John's includes several AGN IIIB, IV, and V fixed wing aircraft along with a number of helicopters that frequently use the Airport. For the purpose of runway system and taxiway planning the standards applicable to AGN V aircraft have been applied. This will ensure that the Airport and its facilities remain usable by the aircraft most flown by air carriers. In addition, where applicable, AGN VI standards have been considered, as the Airport may on occasion be used by very large aircraft such as the Antonov 124 or Boeing 747-8 carrying cargo for oil field exploration, or the A380 on emergency diversion. Such aircraft would be able to access the Airport but would need to observe certain taxi and parking restrictions while on the ground, similar to the procedures currently in place.

To assist with the identification of aircraft and associated AGN, a quick reference guide has been prepared and included in **Appendix G**.

6.3 AIRFIELD CAPACITY REQUIREMENTS

An airport's capacity is affected by numerous factors, including the physical layout of the airfield, local prevailing meteorological conditions, aircraft fleet mix, runway utilization rates, percentage of aircraft arrivals to each runway, relative level of aircraft touch-and-go activity on one or more of an airport's runways, and the location of exit taxiways relative to the approach end of the runway. These factors can be summarized in four sections:

1. airfield layout;
2. runway usability;
3. fleet mix; and
4. ATC flight rules and operating procedures.

6.3.1 Airfield Layout

The geometric layout of an airfield (i.e. the number, location, and orientation of runways) is the most significant factor affecting capacity. An airport's taxiway system also directly affects its capability to handle traffic volumes. To efficiently move aircraft on and off runways, each runway should have a full-length parallel taxiway with multiple well-placed exits. The use of dual taxiways may also be appropriate for areas of high traffic volume or dual directional split. Such may be the case between a Central De-icing Facility and an Apron or between adjacent Terminal Areas.

The existing layout of runways, taxiways and aprons at SJIA developed as need and constraints dictated. Generally, the airfield layout has been determined by the forces of nature and the reaction of practical persons in meeting aviation needs. In a number of instances, airfield design may have been determined by factors other than operational realities. At St. John's, the position of the air terminal complex was originally determined not in reference to the needs of aviation but by a desire to keep civil aviation activity remote to military installation while providing a ready access to the municipal road network. These conditions have resulted in the air terminal apron being located far from the most active air carrier runway, Runway 11-29, and near the southern end of Runway 16-34.

Air carrier traffic distribution by runway and percentage of arrivals and departures were calculated in the 2002 Airport Master Plan based on movement data collected from 2000. The distributions, reproduced in **Tables 6-5** and **6-6** below, identified Runway 29 as the most active runway for arrivals and departures. These statistics were more recently reaffirmed in assessment of aircraft noise. Current distributions based on 2012 movement statistics are shown in **Tables 6-8** and **6-9**. The year 2012 has been selected as the baseline year for ongoing noise studies and the evaluation of runway distribution as the movements during that period were least affected by construction activities.

Table 6-5 – Summary of Average Annual Runway End Utilization in Year 2000

Runway	Arrivals (% of Total)		Departures (% of Total)	
	Day	Night	Day	Night
02	1.9	0.2	5.0	1.0
20	3.1	0.6	6.0	2.8
11	17.6	25.3	5.9	10.1
29	39.1	38.8	43.6	62.6
16	27.4	28.0	8.9	6.6
34	10.9	7.2	30.6	17.0
Total	**100**	**100**	**100**	**100**

Notes:
1. Source: SJIA 2002-2015 Airport Master Plan

Table 6-6 – Day/Night Traffic Distribution by Runway in Year 2000

Runway	Day and Night (% of Total)	Day (% of Total)	Night (% of Total)
Runway 02-20	7.3	8.2	1.8
Runway 11-29	54.8	52.9	66.8
Runway 16-34	37.9	38.9	31.4
Total	**100**	**100**	**100**

Notes:
1. Source: SJIA 2002-2015 Airport Master Plan

Table 6-7 – Summary of Average Annual Runway End Utilization in Year 2012

Runway	Arrivals (% of Total)		Departures (% of Total)	
	Day	Night	Day	Night
02	1.1	0.0	2.2	0.2
20	3.2	0.1	4.3	1.0
11	16.6	21.9	8.4	10.2
29	42.2	49.8	43.0	52.6
16	23.3	20.0	14.6	11.7
34	13.6	8.0	27.6	24.2
Total	**100**	**100**	**100**	**100**

Notes:
1. Runway distributions based on analysis of Stats Canada records for year 2012.

Table 6-8 – Day/Night Traffic Distribution by Runway in Year 2012

Runway	Day and Night (% of Total)	Day (% of Total)	Night (% of Total)
Runway 02-20	4.38	5.4	0.6
Runway 11-29	57.70	54.9	68.1
Runway 16-34	37.92	39.7	31.3
Total	**100**	**100**	**100**

Notes:
1. Runway distributions based on analysis of Stats Canada records for year 2012.

Comparing the current distributions to that observed in 2000, shows a very similar pattern. Runway 11-29 remains the dominate air carrier runway, receiving only slightly more traffic than that observed in 2000. This may be attributed to a reduction in traffic from Runway 02-20 and the several improvements to instrument approach procedures for Runways 11-29 and 16-34.

Runway 29 remains the most active for arrivals and departures at St. John's. The taxi distances to and from the terminal apron and primary runway, Runway 11-29, result in excessive ground operating costs for air carriers due to the location of the terminal area and lack of a more direct taxi route. In an ideal world the location of the terminal building and associated aprons would be located more central to the primary runway in order to reduce taxi times. However, due to the high cost of terminal relocation and the original desire to locate close to the main arterial road network, the Airport is forced to adapt and make the best use of the existing terminal location.

The configuration of St. John's airfield was examined as part of previous studies and Airport Master Plans. Past studies concluded that the existing runway configuration meets current Airport needs, however a number of reservations were made concerning the lack of parallel taxiways and long taxi times to the primary runway. Air carriers, SJIA operations staff and SJIA ATC, when consulted during the stakeholder consultation process for this master plan update, expressed similar concerns regarding de-icing and long taxi times that result in a higher likelihood that holdover times could be exceeded forcing a return to the CDF.

The taxiway system at St. John's was also re-examined as part of the airport master planning process. The existing taxiway system is minimal with no full length parallel taxiways. Improvements to the taxiway system have been recommended as part of past airport master plans and should continue to be a priority to minimize aircraft operational delay and increase runway capacity.

Reducing aircraft taxi time between the terminal area and the primary runway should be a priority to minimize the cost to air carriers and reduce the likelihood that holdover times following de-icing could be exceeded.

Based the demand expected to occur within the planning period the existing runway configuration is expected to continue to meet the needs of the Airport provided improvements to the taxiway system are put in place as demand dictates to maximize capacity and reduce aircraft operational delays. For further information on airfield layout and recommendations for improvements refer to **Section 6.4**.

6.3.2 Runway Usability

Transport Canada and ICAO recommend that a minimum combined wind coverage of 95 percent for the runway system be provided. This value has been used as a guide to ensuring the suitability of runway orientations for an intended fleet mix. The combined wind coverage of existing runways at St. John's has historically been 99.0, 98.2 and 96.7 percent at crosswind components of 20, 15, and 10 knots respectively. This exceeds the minimum recommended wind coverage of 95 percent as specified by Transport Canada.

Runway wind coverage alone is however not a complete picture of runway usability. In order to more accurately estimate a runway's theoretical usability, other factors including: availability of instrument approach procedures; the percentage of time weather is below IFR minima; and the suitability of the runway surface may be considered.

Runway usability is the percentage of time that the combination of wind, visibility and cloud ceiling conditions allow a runway to be used. Overall airport usability is a function of the orientation of runways, the radio navigation, GPS and visual aids provided, and in particular the local weather conditions.

The usability of an airport is determine by an analysis of the frequency of specified weather conditions over a minimum ten-year period and the development of a probability matrix illustrating the average conditions than can be expected to occur in the future. This type of weather analysis can be used to determine the improvements to usability and the relative benefits of alternate approach systems, runway orientations and instrument landing systems.

The usability of runways at St. John's have always been a major concern. Indeed, a study done for Transport Canada in 1983 reported that usability was considered a problem of far greater proportion at St. John's than at any other major airport in Canada. The relative proportions of the problem increased overtime as flight frequency also increased.

Prevailing local weather conditions, have historically limited SJIA's usability to 93.87 percent, far below that of other major airports in Canada that typically achieve between 98 and 99 percent usability

This has been an impediment to SJIA in reaching its full potential as an economic enabler. Low visibility due to dense fog results in frequent flight cancellations, diversions and delay. In 2009, it was estimated that on average approximately 500 scheduled flights (arrivals and departures) were cancelled due to adverse weather conditions. Few airports in Canada achieve 100 percent usability, however enhanced navigational aids, improved ground infrastructure (runway lighting etc.) and changes to aircraft avionics can significantly increase usability.

A number of technical studies have demonstrated that the usability problem, due mainly to the frequent occurrence of coastal fog and strong wind conditions, is a crucial and somewhat unique issue at the SJIA. Studies on public concerns have clearly indicated that the reliability of air services is considered to be one of the most serious airport related problems by the community and its leaders.

The issue of airport usability became so great, that in 2009 the Airport estimated that it was losing on average 500 flight arrivals per year due to adverse weather conditions. In 2009, the Airport working with NAV CANADA, the capital corporation that operates Canada's civil air navigation services, commissioned a study to determine if the installation of Category IIIA Instrument Landing Systems and related infrastructure would improve overall airport usability and be significant enough to SJIAA, local businesses and the community to justify the high cost of installation.

6.3.2.1 Weather Analysis

In support of the 2009 initiative, detailed weather related studies were completed. According to NAV CANADA, SJIA experiences a significant amount of low visibility and low ceiling, due to its proximity to the Atlantic Ocean. The frequency is more than that found at any other airport in Canada. Most of the poor weather is caused by the on-shore flow of warm moist air over cold water, resulting in the formation of dense fog.

Figure 6-1 compares the percentage of annual time that visibility and runway visual ranges are below ¼ statute mile. The values range from less than 0.05 percent from Yellowknife to almost 7 percent for St. John's.

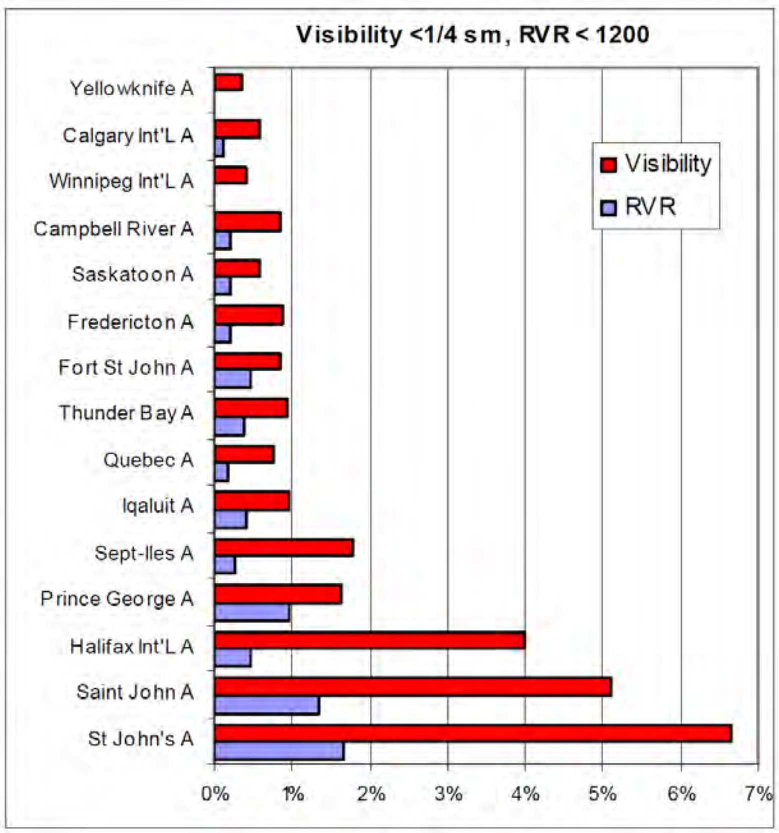

Figure 6-1 – Comparison of the Percentage of Annual Time that Visibility and Runway Visual Range are Below ¼ Statute Mile or RVR 1200.[19]

Low visibility conditions disrupt airline schedules resulting in frequent delays and cancellations thus impacting airport usability. **Figure 6-2** illustrates usability at major airports in Canada and

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[19] Visibility from Environment Canada, RVR from NAV CANADA)

ranges from 98 percent at Halifax to 99.8 percent at Montreal. The usability of SJIA in 2009 was estimated to be 93.9 percent, far below that of other major airports.

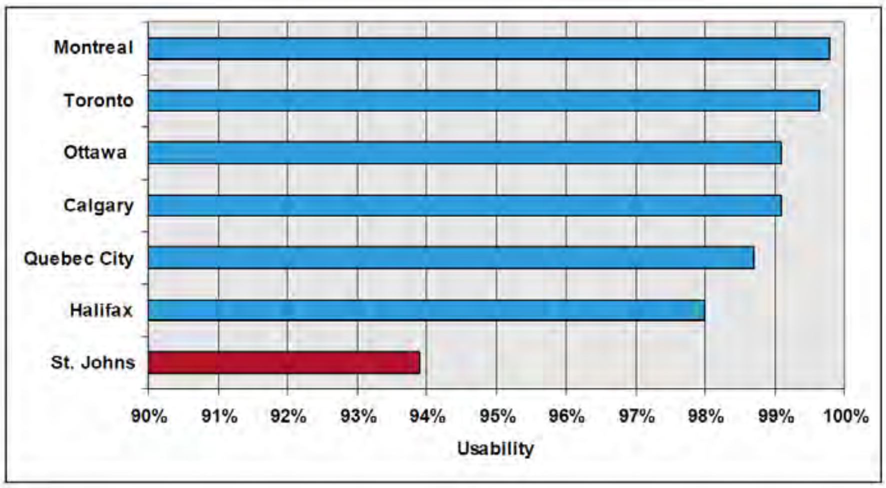


Figure 6-2 – Usability (% of Year) for Selected Canadian Airports.
(Source: St. John's Airport Usability Study, Sypher Consultants Inc. 1985)

It is important to note that in the calculation of usability for St. John's, Runway 02-20 was not included as its use by air carriers is very limited due to runway length and the lack of instrument approach procedures providing minimums not much below that of a circling approach.

The visibility at St. John's varies considerably by season and in April and May each year, usability at SJIA typically drops below 90 percent. Although 93.9 percent usability on an annual basis may sound high, the unusable hours can lead to up to 500 scheduled service flights per year being cancelled, diverted or significantly delayed.

The usability problem at SJIA is made more serious by the insularity of the region and its remoteness from other major centres. These features increase the need to travel by air. A person traveling to or from St. John's will, on average, utilise air transportation approximately 60 percent more than a person travelling to or from other airports in Atlantic Canada. Such a passenger will be 4.5 times as likely to be inconvenienced by a delayed or cancelled flight when compared with a person traveling to or from other Atlantic Canada Airports.

When low visibility conditions preclude landings or departures, the result are delays, flight cancellation or the diversions of inbound flights to alternative airports. Previous studies have indicated that a typical distribution of disrupted flights is:

- Delays 58 percent
- Cancellations 26 percent; and
- Diversions 16 percent.

Delays typically occur when inbound aircraft are either held at their point of origin (Halifax for example) or circle the airport waiting for visibility conditions to improve enough to enable landing. These are typically in the range of 30-45 minutes.

Cancellations occur when a carrier decides that weather conditions may not permit the flight to be completed. Passengers from the cancelled flight are redistributed to later flights. In the past, airlines accepted some responsibility for passengers, paying overnight accommodation, etc. However, in recent years, these costs tend to be borne by passengers, so the cost of cancellations to airlines has decreased.

Diversions occur when an aircraft is enroute to St. John's, but cannot land and is diverted to Gander or occasionally to Stephenville or to Deer Lake. The passengers are either, held in Gander and later flown back to St. John's, or in some cases moved to St. John's by bus. In either case, a delay of approximately four hours can be anticipated.

The low usability level of the runways impacts the Airport and the whole area served by it, both directly and indirectly:

- Air carriers experience the direct costs of delayed, diverted and cancelled flights, and the downstream costs as these aircraft are not positioned for later flights in the day.
- Passengers experience the frustrations of missed meetings, missed connections, missed vacation days as a result of delays, diversions and cancellations.
- Business aircraft disruptions are similarly disrupted.
- Oil rig crew changes are delayed as inbound workers do not arrive in time to be moved on schedule to rights. Each rig costs approximately $350,000 per day to operate and has a daily output of approximately $8 million. Each hour of delay is costly.
- Business decisions on office and plat operations in St. John's are impeded by the widespread knowledge that access can be difficult from time to time.
- Conference planners hesitate to book in St. John's, despite its reputation for hospitality.
- Entertainment events similarly hesitate to book St. John's.

Clearly, reducing disrupted flights through increased runway usability in St. John's would have a direct financial benefit to users and an indirect economic benefit.

6.3.2.2 Instrument Landing System (ILS)

The usability of a runway is improved through the use of Instrument Landing Systems (ILS) in conjunction with supporting airport infrastructure such as in-runway lighting and approach lighting systems. An ILS provides guidance to an aircraft on approach, supplying information to the pilot and to the aircraft's onboard autopilot system. There are three categories of ILS approved for use in Canada – CAT I, CAT II, and CAT IIIA. The Airport is currently certified to CAT I for Runway 16, and CAT IIIA for Runways 11 and 29. St. John's wind, ceiling and visibility conditions are below the limits provided by the existing ILS systems 6.1 percent of the time.

NAV CANADA's technical analysis for St. John's indicated that adding CAT IIIA ILS for approaches to both Runway 11 and 29 would improve usability by 5.04 percent. This increase would bring the overall usability of the Airport to 98.91 percent and would place SJIA in the same usability range as other major Canadian airports.

For the months of April, May and June, the improvement is estimated to be 9.4, 9.1 and 5.3 percent respectively. Improved usability would mean that approximately 358 arriving flights per year would potentially not incur weather related delays, diversions or cancellations that would have occurred without the CAT IIIA ILS system in place. This number would then grow over time as flight frequency during peak periods would also increase.

In 2009, with the above information, the SJIAA pursued and successfully secured funding for upgrade of Runway 11 and 29 with CAT IIIA ILS and associated infrastructure. Branded the 2013-2015 Strategic Airport Accessibility Project, the project started in 2013 and is completed with the availability of CAT IIIA approaches in December 2015. With CAT IIIA capability, the Airport will see an immediate increase in usability in-line with what has been anticipated, which will translate into a reduction in weather related flight delays, cancellations and diversions. Air carriers should begin preparations for the availability of CAT IIIA approaches, ensuring their crews a properly training and aircraft properly equipped to take full advantage of the improved facilities.

6.3.3 ATC Flight Rules and Procedures

6.3.3.1 ATC Flight Rules

The flight rules under which aircraft must operate affect airfield and airspace capacity. NAV CANADA, which controls the airspace around SJIA, has two basic types of flight rules: visual flight rules (VFR) and instrument flight rules (IFR). Specific in-trail separation standards (i.e. the minimum distance between one aircraft following another) and airspace route assignments are implemented depending on whether aircraft are operating in VFR or IFR conditions. These differences have a direct effect on airfield capacity.

Pilots operating under VFR are primarily responsible for seeing other aircraft and maintaining safe separation. Operations conducted under VFR are typically by reference to geographic and other visual references. Aircraft separation is reduced and airspace and airfield capacity increases as compared to IFR.

IFR procedures apply when either the ceiling falls below 1,000 feet (300 metres) or visibility decreases to less than three statute miles. These weather conditions are referred to as Instrument Meteorological Conditions (IMC). In addition, most air traffic operations at commercial airports are conducted using IFR procedures due to the complexity of en-route airspace structure and the high volume of traffic within terminal areas. St. John's is no exception.

Subject to ATC rules, aircraft operating under IFR are required to fly assigned navigational routes and altitudes while maintaining certain longitudinal and vertical separation minimums from other aircraft throughout all phases of the flight. In IFR, the responsibility for maintaining adequate separation is provided by aircraft traffic controllers. Aircraft and crew that do not meet the equipment and pilot training requirements for IFR flights are only permitted to operate under VFR.

IFR procedures are also required for operations above 18,000 feet mean seal level (MSL) which is typically the altitude above which turbojet aircraft operate.

Generally, the closer the spacing between aircraft, the greater the capacity of the airport to handle air traffic. Many factors influence the separation between aircraft, including the flight rules under which aircraft operate, safety considerations, runway occupancy times, the size and type of aircraft, and weather conditions. The increased separation standards between individual aircraft under IFR procedures decrease the capacity of both the airspace and airfield.

The high percentage of IMC in St. John's precludes the use of VFR in most cases and requires pilots to follow Instrument Flight Procedures (IFPs) under IFR. This reduces the annual capacity of the airspace.

6.3.3.2 Instrument Flight Procedures

Instrument Flight Procedures (IFP) are uniquely defined flight manoeuvers intended to be followed by pilots arriving or departing an airport where it is necessary to manoeuver aircraft with reference to flight instruments located inside of the cockpit rather than with visual reference to the ground. When properly flown IFPs are designed to provide a safe clearance between aircraft and terrain obstructions. These safety clearances are achieved through assessment of Obstacle Clearance Surfaces (OCS). OCS are similar in concept to OLS however their purpose is not to limit obstacles but rather to identify obstructions that need to be avoided when designing or reassessing an instrument flight procedure.

Where an obstruction is identified to penetrate an OCS the associated flight procedure must be revised to avoid conflict with the obstruction. When this occurs to an Instrument Approach Procedure (IAP), such as an RNAV (GNSS) LNAV Approach, the result is usually an increase in the Minimum Decent Altitude (MDA). The lower the MDA the better the usability of the runway and conversely the more flights an airport can accommodate when inclement weather becomes a limiting factor.

It is essential to the commercial viability of an airport that the level of usability associated with its runways be maintained as high as possible in order to minimize disruptions to operations that can result from inclement weather conditions.

IFPs are currently provided to all runways at SJIA. The following table, **Table 6-9**, provides a summary of the existing and planned Instrument Approach Procedures for SJIA.

Table 6-9 – Existing and Proposed Instrument Approach Procedures

Procedure Types	Runway and Associated Minima					
	02	20	11	29	16	34
ILS/DME CAT II			100 RVR 1200	100 RVR 1200		
ILS CAT IIIA (December 2015)			0 RVR 600	0 RVR 600		
ILS/DME			200 RVR 2600	200 RVR 2600	200 RVR 2600	
ILS/RADAR					200 RVR 2600	
LOC/DME			579 1 ¼ SM	351 RVR 5000	527 1 ¼ SM	
LOC/RADAR					527 1 ¼ SM	
NDB			659 1 ½ SM			635 2 SM
RNAV (GNSS) LNAV	515 1 ½ SM	500 1 ½ SM				
RNAV (GNSS) Z LNAV			619 1 ½ SM	411 RVR 5000	487 RVR 5000	455 1 ½ SM
RNAV (GNSS) Z LPV			319 RVR 5000	251 RVR 5000	287 RVR 5000	255 RVR 5000
Circling	679 2 SM	679 2 SM	679 2 SM	679 2 SM	659 2 SM	679 2 SM
RNP Y 0.10			284 1 SM	250 1 SM	299 1 SM	250 1 SM
RNP Y 0.15			327 1 SM	250 1 SM	303 1 SM	250 1 SM
RNP Y 0.20			381 1 ¼ SM	250 1 SM	317 1 SM	257 1 SM
RNP Y 0.30			444 1 ½ SM	250 1 SM	318 1 SM	299 1 SM

Notes:
1. Source: CAP 7 December 2015
2. Minimum decent altitude expressed in feet as Height Above Touchdown (HAT) or Height Above Aerodrome (HAA).
3. Minimum visibility expressed as Runway Visual Range in feet or reported visibility in Statute Miles (SM).
4. Approach minima applicable for Approach Category C only. Higher minima may apply for Approach Category D.
5. Circling minima listed is lowest available for Approach Category C.
6. ILS CAT IIIA minima reflects planned level of service.
7. RNP approaches are for approved carriers only.

The availability of CAT IIIA approaches for Runways 11 and 29 in 2016 will help increase the usability of the Airport. However, with this increase in usability, the Airport will eventually see a larger volume of aircraft flying in low visibility conditions. Procedures will limit the amount of aircraft arriving and departing from the primary runway, adversely affecting the capacity of the airfield. Throughput under CAT II and III conditions could be further reduced as a result of more narrow speed tolerances being applied once the aircraft has captured the ILS.

6.3.4 Fleet Mix

An airport's aircraft mix affects capacity in several ways. First, different groups of aircraft have different approach speeds. The greater the variation in these speeds among arriving aircraft the less ability controllers have in segregating various aircraft, the greater the amount of separation is required and the lower the airport's capacity.

In addition, wake turbulence considerations also affect capacity. Dangerous wake turbulence is produced by heavy aircraft, and is cause by strong cyclonic streams of air currents off the ends of their wings. Wake turbulence can create a safety concern for smaller aircraft following too closely behind heavier aircraft. In general, there are three weight classes: light, medium, and heavy. While aircraft within the same weight category may be separated by as little as 2.5 to 3 nautical miles separation standards increase up to 6 nautical miles between a light aircraft following a heavy aircraft (i.e. aircraft weighing 255,000 pounds or more) to reduce the effect of wake turbulence. Based on the forecast of operation discussion in Section 5, wake turbulence is likely to become more of a concern as air carrier traffic and general aviation movements increase.

The current fleet mix for SJIA includes a large range of aircraft within Aircraft Group Numbers (AGN) II, IIIA, IIIB, IV, V and occasionally VI. Aircraft within AGN Category I have over time become a rare occurrence at St. John's with very few of these aircraft utilizing the airfield on a regular basis. Predominately the range of air traffic at St. John's has and continues to be within AGN Category IIIB.

Within this category the majority of the aircraft are operated by scheduled air carriers serving St. John's. Such aircraft include:

- Bombardier Q400s;
- Embraer 190s;
- Boeing 737-700s;
- Boeing 737-800s;
- Airbus A320s; and
- Airbus A321s.

In addition to these aircraft many business aircraft fall with the AGN IIIB category. It is expected that aircraft within the AGN IIIB category will continue to dominate the peak hour at SJIA. The aircraft that will have the greatest impact on runway capacity will be rotary wing aircraft including those operated by Cougar Helicopters and Canadian Helicopters servicing oil platforms as well as the Canadian Coast Guard on search and rescue flights. Accommodating flights from these operators within the peak hour may have significant effect on runway capacity due the slower approach speeds than that of fixed wing aircraft. Furthermore, the ability to hold or reroute these operations is minimal as they are often operated at maximum range and endurance capabilities, making return flights very close to fuel critical.

It is also expected that with the planned availability of CAT IIIA approaches for Runways 11 and 29, the Airport will see an increase in the mixing of rotary wing and fixed wing aircraft. Historically, helicopters operating into and out of St. John's have been able to operate at visibilities lower than that of fixed wing aircraft due to differences in the applicability of IFR minima. However, with CAT IIIA approaches now available to both ends of Runway 11-29, fixed wing aircraft will be seen using the runway in conditions that would have previously been restricted to rotary wing aircraft. This mixing will reduce runway capacity and may increase the likelihood of delay during peak periods.

This fleet mix for St. John's is not expected to significantly change over the planning horizon. However, there is expected to be some change in the relative volume of traffic as major carriers shift traffic from aircraft in use by their regional airlines to aircraft used by their mainline service in order to accommodate increased demand during peak periods. This trend has already been spotted at St. John's and is expected to continue over the medium-term.

In some cases fleet renewals will lead to mix changes. However, this is not expected to occur in significant numbers over the medium-term. Where this may be expected to occur with greater frequency will be in the long-term, approaching the end of the planning horizon.

One example of this change in Canada has been the phase in of the Boeing 787-8 and -9 into Air Canada's fleet. Both aircraft are AGN Vs however, the B787-8 replaces the aging B767-300, an AGN IV aircraft, on a number of routes. This change in AGN category has forced a number of airports within Canada to re-examine the suitability of their airport for the step-up in design standards. The efficiency and operational range of modern aircraft such as the B787-8 is opening up new market opportunities and route prospects for a number of air carriers. Planning for technology change is perhaps one of the hardest aspects of long-term planning. To overcome some of these challenges, a conservative and flexible approach to long-term planning should be taken.

6.3.5 Existing Airfield Capacity

Airfield capacity can be defined in several ways. The two most common measures of capacity are hourly capacity and annual capacity. Hourly capacity is the maximum number of aircraft that can operate on the airfield in a 60-minute period. Annual capacity is the number of aircraft operations that can be accommodated on an annual basis at a given level of delay.

As part of the 2002 Airport Master Plan, existing runway system capacity was determined based on a cursory review of runway use and fleet mix. The study and its findings are still considered relevant and useful in justifying the need for taxiway system improvements. The following includes multiple excerpts from the original 2002 Master Plan which have been adopted to this master plan update for consideration.

In 2002, calculation of runway throughput was conducted as a basis for determining capacity of the runway system. The throughput was calculated using a 'Space-Time' approach to throughput calculation as a means of providing approximate throughput values without conducting detailed computer simulation. This approach examined the speed at which aircraft approach the runway threshold, the time aircraft are on the runway, the time required for aircraft to takeoff and all necessary separation requirements. The primary factor considered in the analysis was the mix of aircraft operating within the hour. Demand level was not considered as it was assumed for planning purposes that demand would always match supply. In other words, the supply of aircraft for both arrivals and departures was considered endless with the runway system processing aircraft as fast as is possible to achieve the maximum throughput.

It is important to note that this method of calculation did not examine delay incurred in the departure queue and airspace which would be of particular interest to air carriers and is required to gain a more in-depth understanding of delay impact and quantitative benefit of infrastructure improvements. In order to examine delay to air carriers both presently and in the future, the demand level must first be known and a detailed forecast of the period must be conducted.

The analysis undertaken in 2002 was conducted using a single IFR runway (Runway 29). This runway does not have a parallel taxiway or the ability for aircraft to quickly exit the runway. Therefore, it was assumed that all aircraft are required to backtrack on the runway. A proposed improvement to the runway system is to provide a parallel taxiway to reduce runway occupancy times and improve the capacity of the system. In order to take advantage of the development of a parallel taxiway, analysis of runway exits was required and a minimum configuration was proposed of a single 90 degree exit at the end of the runway and an FAA 30 degree exit provided at a point optimised for the traffic mix. This was determine to be at approximately 1,800 metres from the landing threshold. The addition of a parallel taxiway and optimised exits represented the second airport layout for testing.

6.3.5.1 Runway Traffic Scenarios

In addition to the airport layout scenarios, three different traffic scenarios were analysed as part of the 2002 study. The basic traffic scenario was based on the peak period found to exist in early June 2000. As traffic demand increases during the peak period, light GA traffic, particularly training flights, will find it less easy to operate. Therefore, the number of GA flights in the mix would likely drop as demand approaches the capacity limit. This situation is reflected in the second traffic scenario where the proportion of GA traffic is reduced to 1/3rd of the Year 2000 level during the peak period. The third traffic scenario reduces Light GA traffic entirely assuming that slot restrictions or pricing result in no light single engine aircraft operating during the peak period.

The scenarios examined are summarized in **Table 6-10** below.

Table 6-10 – Summary of Runway Demand/Configuration Scenarios

Scenario Number	Traffic Scenario	Layout Scenario
1	Basic Traffic	Existing Runway Layout
2	GA reduced by 1/3rd	Existing Runway Layout
3	No GA	Existing Runway Layout
4	Basic Traffic	Parallel Taxiway with Exits
5	GA reduced by 1/3rd	Parallel Taxiway with Exits
6	No GA	Parallel Taxiway with Exits

Most of the assumptions for this analysis were obtained from the Canadian Aeronautical Information Publication (AIP) and confirmed by NAV CANADA prior to their use in 2002.

However, some operational parameters that are specific to the Airport were not provided and additional assumptions had to be made. The most notable was the requirement to model aircraft landing operations to determine runway occupancy times. As found by the results of this analysis, discussed later, runway occupancy times are critical to the level of throughput achievable. The high runway occupancy times required for aircraft to backtrack on the runway results in higher airspace separations between aircraft wishing to use the runway. These higher separations reduce the number of aircraft that are able to use the runway system, and therefore reduce the runway capacity.

The traffic demand required for the Space-Time analysis of runway throughput is the mix of different aircraft types that would operate at different speeds or require different separation criteria. For the traffic data provided, there appeared to be five relatively distinct groups of aircraft based on performance and separation criteria. From these groups, one or two aircraft were chosen as representative of each group for the purposes of determining approach speed, runway occupancy time etc. Reference aircraft types have been identified in **Table 6-11**. Notably absent from the 2002 study are helicopters. These aircraft operate at reduced approach speeds comparable to that of a light aircraft, but produce significantly greater wake turbulence forcing in-trail separations to be increased.

Table 6-11 – Reference Aircraft for Traffic Scenarios

Basic Scenario		
Analysis Category	**Typical Aircraft**	**% of Peak Hour**
Light Aircraft	C-180/PA-28	55
Turbo Prop Aircraft	Dash-8	19
Small Jet	Avro RJ85	8
Medium Jet	B737-300/A320	12
Heavy Jet	DC-10-30	6

Reduced GA Scenario		
Analysis Category	**Typical Aircraft**	**% of Peak Hour**
Light Aircraft	C-180/PA-28	29
Turbo Prop Aircraft	Dash-8	29
Small Jet	Avro RJ85	13
Medium Jet	B737-300/A320	19
Heavy Jet	DC-10-30	10

No GA Scenario		
Analysis Category	**Typical Aircraft**	**% of Peak Hour**
Light Aircraft	C-180/PA-28	0
Turbo Prop Aircraft	Dash-8	41
Small Jet	Avro RJ85	18
Medium Jet	B737-300/A320	27
Heavy Jet	DC-10-30	14

6.3.5.2 Airspace Separations

Using the aircraft groups determined from the traffic data and identified above, airspace separations were applied as per Transport Canada requirements found in the Canadian AIP and summarized in **Table 6-12**.

Table 6-12 – Traffic Separations for Various Combinations of Aircraft

		Leading Aircraft (nautical miles)				
		Light	T'Prop	Small	Medium	Heavy
Following Aircraft	Light	3	3	4	4	6
	T'Prop	3	3	4	4	6
	Small	3	3	3	3	5
	Medium	3	3	3	3	5
	Heavy	3	3	3	3	4

Arriving IFR traffic is managed through the use of Standard Terminal Arrival Routes (STARs). These procedures aid in transitioning aircraft from airways to the terminal airspace and can be used to help ensure separations are maintained between arriving aircraft. SJIA currently has four STARs, each with multiple waypoints serving Runways 11-29 and 16-34.

6.3.5.3 Departure Separations

Without arriving aircraft affecting the departures, departures are able to takeoff from the runway with only separations between departures to account for speed, direction and wake turbulence criteria being applied. The information provided from NAV CANADA as part of the 2002 study required that departing aircraft maintain a three nautical mile separation. However, once the leading aircraft is clear of the runway and has obtained a considerable speed the following aircraft can be released, therefore when both aircraft are airborne, there will be more than the required 3nmi separation between them. Therefore, the separation between aircraft needs to be specified in terms of a time gap between departures. This approach is commonly used by ATC and can be found in the Canadian AIP and has been listed below in **Table 6-13** against the corresponding aircraft groups for this analysis.

Table 6-13 – Separation Times Between Aircraft

		Leading Aircraft (seconds)				
		Light	T'Prop	Small	Medium	Heavy
Following Aircraft	Light	120	120	180	180	180
	T'Prop	120	120	180	180	180
	Small	120	120	120	120	180
	Medium	120	120	120	120	180
	Heavy	120	120	120	120	120

Multiple Standard Instrument Departures (SIDs) may also be used to ensure separations and better manage traffic. SJIA currently has four published SIDs, each with one or more departure waypoints. Additional SIDs could be considered to help mitigate traffic congestion.

6.3.5.4 Runway Occupancy Times

In the 2002 Master Plan no information was provided for the length of time aircraft remain on the runway, and therefore modelling of the aircraft landing performance was required to determine runway occupancy times. This modelling was conducted to examine the time required for aircraft to come to a complete stop, turn and taxi back along the runway. These calculations were conducted using theoretical landing performance of the various aircraft types to determine the distance and time used to stop, including FAR/JAR criteria and shown in **Table 6-14.** This distance was then used to determine the backtracking distance needed and therefore the time required to backtrack along the runway.

Table 6-14 – Modeled Runway Occupancy Times by Aircraft Type

Aircraft Types	Landing to full stop (sec)	Turn and Backtrack (sec)	Total ROT (sec)
C182	41.7	92.9	134.6
PA28	41.7	97.0	138.7
Dash-8	51.5	124.7	176.2
RJ85	59.9	156.3	216.2
B737-300	62.7	171.1	233.8
A320	65.6	185.3	250.9
DC-10-30	76.0	252.3	328.3

For the second runway development scenario, runway occupancy times were derived from an analysis of the optimum location and number of runway exits for the analysed traffic mix. Using the June 2000 mix, and analysing the traffic, it became apparent that the provision of an ICAO 30 degree Rapid Exit Taxiway (RET) would only be useful to jet aircraft and should therefore be optimised for their use. Only one ICAO 30º exit located at 1,800 m, was analysed even though two exits were found to have reduced the runway occupancy times further. Provision of two ICAO 30º exits would increase the costs of construction with only a small benefit in throughput.

Table 6-15- Summary of Light Aircraft and ROT

Aircraft	Total ROT (sec)
C182	63.3
PA28	63.3
Dash-8	65.0
RJ85	59.1
B737-300	59.3
A320	57.8
DC-10-30	115.3

Provision for an exit optimised for light aircraft as shown in **Table 6-15** was examined and it was found that although benefit could be achieved by providing an exit optimised for light GA aircraft, this would be located close to Runway 16/34. Allowing light aircraft to use Runway 16/34 to taxi off the runway, rather than providing an additional exit would not have a significant impact on overall throughput therefore is was assumed that no exit would be provided for light aircraft and that part of Runway 16/34 would be usable as a runway exit.

Upon review of the 2002 analysis of runway occupancy times, it was identified that the study failed to compare the effectiveness of a RET versus traditional 90 degree exits. It may be advisable to first implement a 90 degree connector opposed to a 30 degree RET as it could be more readily used by aircraft in both directions for arrivals and departures.

Furthermore, the 2002 study did not consider the preferred exit locations for rotary wing aircraft or the impact they could have on runway capacity. The location of a new right-angle connector could be optimised in such a way as to be usable for fixed-wing aircraft landing in one direction and rotary-wing aircraft landing in the opposite direction.

6.3.5.5 Calculated Runway Capacity

Table 6-16 summarizes the capacities under the different traffic and configuration scenarios.

Table 6-16 Runway Capacity under Different Scenarios

Scenario Number	Traffic Scenario	Layout Scenario	Limiting Throughput (Maximum Throughput) mvts/hr
1	Basic Traffic	Existing Runway Layout	26 (27)
2	Reduced GA	Existing Runway Layout	24 (26)
3	No GA	Existing Runway Layout	23 (24)
4	Basic Traffic	Parallel Taxiway with Exits	41 (45)
5	Reduced GA	Parallel Taxiway with Exits	43 (46)
6	No GA	Parallel Taxiway with Exits	45 (49)

The 2002 Master Plan identified that under scenarios using the existing runway layout (i.e. without an additional parallel taxiway or runway exits), reductions in the amount of light aircraft during the peak period will reduce the possible throughput of the existing runway system. This is due to the shorter distance required for the light aircraft to come to a complete stop resulting in a shorter backtrack distance and a reduced runway occupancy time. As the percentage of light aircraft decreases, the average runway occupancy time increases and therefore the overall throughput decreases.

However, the 2002 study may have not considered fully the effects of wake turbulence and scenarios that would further increase in-trail separations.

The 2002 Master Plan suggested that a parallel taxiway with an optimised single ICAO 30º Exit would significantly increase the potential throughput on the runway from 26 to 41 movements per hour under Basic Traffic Scenario.

Provision of a full length parallel taxiway and runway exits would enable the airport to accommodate increased demand for larger aircraft. Build-out of the taxiway system would enable the airport to maximum it's capacity and based on expert opinion achieved a reasonable practical capacity of approximately 150,000 movements per annum without the need to develop a parallel runway.

Further analysis of historical movement data would aid in the identification of existing airfield capacity. Such an analysis would help to identify specific capacity information as well as quantify typical delays that may occur in the peak hour.

6.3.6 Required Airfield Capacity

ICAO suggests improvements to an airfield be planned based on projections of annual and peak hour movements to reduce the likelihood of aircraft delay. In 2014, St. John's had 42,975 movements, the highest observed since 2003 which saw a total of 54,923 movements. Based on forecasts prepared by InterVISTAS and linear extrapolation of historical movements not forecast, it is expected that annual movements at SJIA could exceed 56,000 by year 2035.

Guidance produced by ICAO suggests that a parallel taxiway be planned for implementation when annual movement are projected to exceed 30,000. That being the case, and with St. John's current annual movements far exceeding this value, a parallel taxiway is recommended.

Improvements are also suggested based on identification of peak hour demand. In certain cases peak hour will dictate first when to plan the implementation of a parallel taxiway. ICAO suggests improvements be based on what is referred to as 'normal' peak hour.

Normal peak hour is determined based on peak hour by week and averaged by year. For SJIA, the normal peak hour over recent years has varied between 17 and 19 movements per hour, not including military flights, and has dropped significantly from its peak of 35 movement per hour in 2003. This decrease can be attributed to a reduction in GA flight frequency and should not be construed as part of a downward trend.

Peak hour movements of Level I-III air carriers were forecast by InterVISTAS to grow from the current 15-16 in 2015 to 19-20 in 2020 and 23-24 in 2025. By 2030 peak hour movements of Level I-III air carriers are expected to exceed 28 per hour. Based on historical observations, it is expected that other traffic will continue to contribute on average 2-3 movements to the normal peak hour with military flights most often occurring outside of peak hour. Therefore, normal peak hour could reasonably be expected to increase from its current 17-19 movements in 2015 to 21-23 movements in 2020 and 24-27 movements in 2025. By 2030 peak hour movements could exceed 30.

ICAO recommends for a normal peak hour of 20 movements a parallel taxiway should be provided and for a normal peak hour in excess of 30 movements a taxiway bypass/holding bay should be provided in addition to the parallel taxiway. These recommendations support construction of a parallel taxiway for Runway 11-29 and the eventual construction of a taxiway bypass.

However, ICAO's recommendations are not intended to be equally applicable to all airports. The need for specific infrastructure improvements, such as a parallel taxiway or holding bay, should be investigated in context with the operations being conducted and expected to occur at the airport. As discussed previously, there are several factors that influence airfield capacity and conversely have an effect on delay. Based on ICAO's recommendations, SJIA should plan for construction of a parallel taxiway in the short- to medium-term, but also consider what effect not providing a taxiway could have on aircraft delay and the viability of air carrier operations. A cost/benefit analysis should be undertaken following a detailed airfield capacity and delay study to determine if the need for a parallel taxiway can be substantiated or if other infrastructure improvements, such as a partial parallel taxiway or holding, could sufficiently address capacity and delay concerns.

Two significant factors in determining the need for a parallel taxiway will be rotary-wing operations and the time sensitivity of air carrier departures. The ability to de-peak schedules around the peak hour may be very limited at St. John's due to its importance within the national route network. On-time departures are of particular importance at St. John's due to the ripple effect that even a small delay of a few minutes can have across an air carrier's route network.

6.4 AIRSIDE FACILITIES

In development of the Airport Master Plan and associated Airport Land Use Plan, consideration has been given to the ultimate development requirements of the Airport and the reservation of sufficient area to accommodate this expansion. In particular, this includes the ultimate extension of the primary runways, 11-29 and 16-34, construction of parallel taxiways, holding or by-pass bays, reserves for land based instrument landing systems infrastructure, the expansion of Apron areas the Central De-icing Facility, Airside Vehicle Corridors, and Terminal Area expansions such as ATB expansion and vehicle parking.

6.4.1 Runway Configuration and Layout

The configuration of SJIA's runways are suitable based on previous studies that examined wind coverage and usability. There is no foreseen need to reconfigure the runways, change orientations or construct a new runway. Capacity concerns may be addressed with the addition of connecting taxiways, RETs and taxiway bypasses/holding bays. Operational procedures may also help to augment the capacity of the runway system before expansion is required. These procedures include HIRO (High Intensity Runway Operations) and SIRO (Simultaneous Intersecting Runway Operations) also referred to as LAHSO (Land and Hold Short Operations).

High Intensity Runway Operations (HIRO) generally refer to an operation where an aircraft on departure does not stop on the runway but rather uses a rolling start after exiting the taxiway to minimize runway occupancy time. It generally requires a by-pass bay at the runway taxiway intersection such that aircraft that are not ready to proceed can be by passed. It has been estimated as part of previous studies that this type of procedure could increase runway capacity by as much as 10 to 15 percent depending on the mix of traffic. In general, however, this procedure requires radar to maintain separations for arriving aircraft in IMC conditions.

Simultaneous Intersecting Runway Operations (SIRO) are designed to increase airport capacity by allowing simultaneous operations on intersecting runways. The general approach is to use the shorter runway for landings with instructions to hold short of either: an intersecting runway; a taxiway; or an imaginary point on the runway being utilized. The procedures are generally available only to specific aircraft groups that exhibit like stopping distances. The procedures are usually only allowed under VMC conditions unless sophisticated approach radar is installed. This procedure could be of benefit in St. John's to the general aviation community including helicopter operators and to those airlines flying small turboprop aircraft. However, if implemented at St. John's its effectiveness at increasing runway system capacity will be constrained by the low volume of GA and turboprop aircraft operating within the peak hour and the routine occurrence of IMC conditions.

6.4.2 Helicopter Operations Areas

Helicopter operations at SJIA are a frequent occurrence with multiple operators based locally. There are three primary helicopters operations areas on the Airport. These include:

- Apron II;
- Apron III; and
- Taxiway Kilo.

Occasionally other areas, such as Apron IV, are used for transient rotary-wing aircraft but for the most part operations are limited to these three areas. Helicopters typically approach and depart using the runway system. Ground and hover taxi is permitted throughout the Airport but restricted through the Terminal Area.

Helicopter operations are expected to continue to grow over the medium- to long-term with the heaviest concentration of operations being along Taxiway Kilo. For planning purposes and based on stakeholder consultations, it expected that helicopter movements will double within the medium- to long-term planning period. In order to ensure that this increase in helicopter movements can be accommodated, procedures to permit helicopters to approach to parallel taxiways should be investigated and implemented with the cooperation of Transport Canada, NAV CANADA and helicopter operators. This has been considered in the planning of future parallel taxiways.

In addition to on-airport helicopter operations areas, Universal Helicopters operates a heliport located southeast of the airport, south of Portugal Cove Road and underlying the approach path to Runway 34. The heliport is approximately 1.5 kilometers from the end of the runway, as illustrated in **Figure 6-3.**

The heliport, designated CDC2, is a certified heliport with arrival/departure paths to the south between 216 and 150 degrees Magnetic. Due to the location of the heliport underlying the approach path to Runway 34 and the departure path of Runway 16, the airspace is controlled by NAV CANADA. Conflicts between helicopters using the Universal Heliport and flight operations at SJIA is mitigated through communication procedures, primary and secondary radar.

Due to the location of the heliport, it will have an impact on the maximum processing capacity of Runway 16-34 as arrivals and departures from the heliport must be staggered with arrivals and departures to the runway. However, it is expected that impacts may be mitigated through management of air traffic by NAV CANADA.

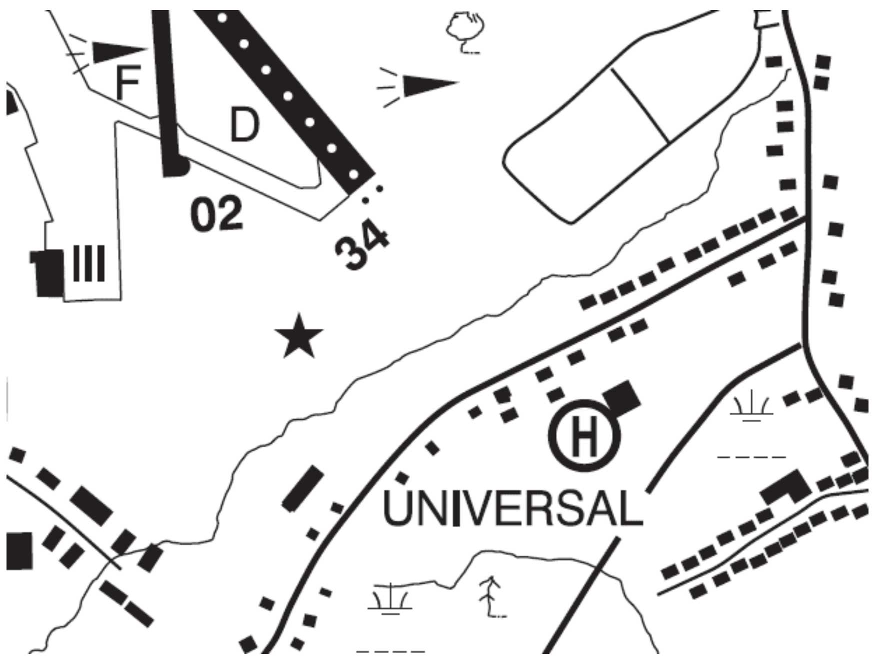


Figure 6-3 – Universal Helicopters St. John's Heliport[20]

6.4.3 Extension of Runways

Extensions to both Runway 11-29 and Runway 16-34 are illustrated in **Appendix A**. These extensions are proposed for consideration based on an assessment of design aircraft performance

[20] Canada Flight Supplement, October 2015

requirements and the analysis that was previously conducted in 2007 by Pryde Schropp McComb Inc.

6.4.3.1 Runway 11-29

The 2007 study concluded that the need for an extension of the primary runway, Runway 11-29, was minimal considering the performance requirements of the aircraft that regularly used the Airport and the markets they serve. The study identified that extending the Runway 11-29 by 1,500 feet to bring the total length to 10,000 feet would improve the serviceability of the Airport and cater to future long-haul passenger flights to such destinations as Athens and Sicily. However, it was also observed that at load factors of 80 percent or less, aircraft, such as the B767 and B747-400, could easily serve these destinations using the existing runway length of 8,500 feet. The study concluded that the most significant benefit of providing a 1,500 foot extension would be unrestricted load factors on routes to central Europe and reduced likelihood of limitations in inclement weather conditions.

Extensions of Runway 11-29, both the east and west, were further investigated as part of this master plan update. The recommendation in 2007 was to extend the runway towards the east and implement a 1,500 foot displacement to preserve the existing landing threshold location. The displacement was suggested as a way to minimize the impact of off-airport obstructions, noise and costs associated with the replacement of ILS components including associated approach lighting systems. Recent investigations concur with these findings but suggest that protection for an extension of 500 feet to the west would be in the SJAA's best interest to ensure that the minimum 10,000 feet of landing distance remains possible should the full extension eastward be deemed less feasible or costs dictate a partial extension eastward with a displacement would be more economical.

SJAA may also want to consider that providing a longer runway may be of benefit to neighboring communities, as the increased runway length may allow for reduced power departures or changes in departure profiles that could be implemented with a noise abatement procedure to help mitigate environmental impact.

6.4.3.2 Runway 16-34

In addition to the extension of Runway 11-29, extension of Runway 16-34 was investigated. Extension of the Runway 16-34 beyond its current length of 7,005 feet is more likely to occur within the planning horizon than an extension of Runway 11-29, in order to reduce occasional limitations associated with operations from this runway. Larger Code C/AGN IIIB aircraft, such as the A321-200 and B737-900, require longer takeoff distances than what is currently provided by 16-34 in order to maximize their operational range. When Runway 11-29 is not considered suitable for use by these aircraft, most likely due to high crosswinds, 16-34 remains the only option. However, based on stakeholder feedback the need to extend Runway 16-34 to a more suitable length of approximately 2,455 metres (8,000 feet) is not immediately required but would be a welcomed improvement.

Recent rehabilitation and infrastructure improvements to Runway 11-29 saw the need for a temporary extension of 16-34 to mitigate impacts to some scheduled flight operations. An extension of approximately 90m (295 foot) was implemented during the 2015 construction season to satisfy aircraft takeoff and landing distance performance requirements while the intersection of Runway 11-29 and 16-34 was closed for construction and the threshold of Runway 16 was relocated south of the intersection.

It is therefore recommended that an initial extension of 90 metres (295 feet) towards the south be planned to reduce the impact of displacements associated with any future work within the intersection of Runway 11-29 and 16-34. It is also suspected that this relatively small extension will help to improve the effectiveness of SIRO and the increase the usability of Taxiway Juliet as the primary exit for traffic landing Runway 34. Further extension of the runway towards the north should be protected through agreements with neighboring municipalities.

6.4.4 Conversion of Runway 02-20 to a Taxiway

The conversion of Runway 02-20 to a taxiway has been previously studied extensively and was revisited as part this latest master plan update. Previous studies concluded that the primary value of Runway 02-20 to the Airport and its users is as a taxi route connecting the terminal area to the threshold of Runway 29. Stakeholder discussions and a review of traffic distributions by runway helped to confirm this.

The runway is in fact used extensively for taxiing purposes but continues to see occasional use by light fixed-wing aircraft but more routinely by helicopters. It has been suggested that 02-20 should be permanently converted to a taxiway as the need for it to remain a runway is limited and it places undue restrictions on airport property that is considered ideal for airside commercial development.

Usability studies, conducted in 1985 and 2009 in support of the 2013-2015 Airport's Accessibility Project, confirmed that Runway 02-20 marginally contributes to the overall usability of the airfield. From a runway capacity perspective, Runway 02-20 provides an alternative to Runway 16-34 for light aircraft and helicopters which may in a limited number of cases alleviate congestion from Runway 16-34 or 11-29. The most significant being its use by helicopters.

That being said, the conversion of 02-20 to a taxiway does not necessarily preclude its use by helicopters. Similar to other airports in the United States and Canada, procedures could be developed to allow approved helicopter operators to approach and depart from maneuvering surfaces other than runways. Once such example can be found in Halifax, where Cougar Helicopters routinely operates from Halifax International Airport's taxiways to avoid conflict with fixed-wing aircraft using the runways. The procedures were developed in cooperation with Transport Canada, the Airport and the Operator to ensure safety and efficiency of operations.

With this in mind, the need to preserve Runway 02-20 remains only a question of fixed-wing usability. For light aircraft, if Runway 02-20 were to be converted to a taxiway the wind coverage afforded by the Airport's combined runway system would decrease to approximately 96.8 percent at crosswinds up to 15 knots and 87.5 percent at crosswinds up to 10 knots. Thus the conversion would have some impact on the usability of the Airport by certain light fixed-wing aircraft that are typically operated below 4,000 pounds. However, the impact is expected to be minimal as the usability would remain relatively high.

The question from operators of light aircraft would be whether there is a suitable alternative airport within range that could provide a similar runway alignment should the crosswind component at St. John's exceed their limitations. For light aircraft, such as Cessna Skyhawks or Piper Cherokees, Bell Island Airport, Harbour Grace Airport and Clarenville Airport may be suitable alternates depending on the local weather conditions. Runway alignments at these airports vary between 080/260 and 090/270 degree magnetic. These do not match the alignment of 02-20 (015/195) but may be close enough to reduce the crosswind component sufficiently to allow for landing.

For the purpose of this Master Plan it is recommended that 02-20 be converted to a taxiway in order to allow for expansion of airside commercial development on the east side of the Airport along Apron II and reduce current development restrictions on Apron III and in the south commercial development area as identified in the Land Use Plan update.

6.4.5 Taxiway Development

Based on existing conditions and the growth in air traffic volumes projected to occur within the planning horizon, there are a number of improvements to the taxiway system that could be implemented over the planning horizon. These include construction of a parallel taxiway to Runway 11-29, a taxiway bypass/holding bay near the thresholds for Runway 11 and 29, and dual parallel taxiways between the terminal area and the CDF.

In addition to these, additional expansion of the taxiway system will occur when the need to further address capacity and delay impacts arise. These would include a parallel taxiway to 16-34 and a holding bay on the east side of Runway 34. The Land Use Plan has been developed to consider the ultimate buildout of the taxiway system. For further information on taxiway improvements and recommendations for short, medium, and long-term development, refer to **Section 10**.

6.4.6 Apron Expansions

6.4.6.1 Apron I

Sufficient area has been identified within the terminal area and airside reserve to accommodate the expansion of the terminal apron (Apron I) within the planning horizon with consideration for the future ultimate expansion. Expansion is likely to be phased and will be closely tied to expansion of the PTB. The master plan has identified expansion of Apron I occurring north and south from the PTB. **Exhibit A5** of **Appendix A** depicts the proposed expansion boundaries being considered by the Airport.

The 2007 Strategic Terminal Plan identified constraints to an expansion of the apron towards the south as a result of the Obstacle Limitation Surfaces required for Runway 02-20. The eventual repurposing of 02-20 to a taxiway would remove these constraints and allow for greater expansion to occur. It is recommended that these implications be considered in reassessment of proposed terminal expansion plans. It is conceivable that there may be some costs savings to the long-term expansion of the apron if capacity can be provided towards the south.

6.4.6.2 Apron II

The eventual removal of constraints placed on development along Apron II as a result of the Obstacle Limitation Surfaces required for Runway 02-20 may allow for the development of new hangars and expansion of apron areas. **Exhibits A6** and **A7** of **Appendix A** illustrate two possible concepts for this expansion.

6.4.6.3 Apron III

Apron III will eventually be used as a terminal apron. Expansion of this apron is likely to occur towards the east but may also occur towards the south should demand or circumstances dictate a need for such an expansion. It is recommended that any future airside commercial development along the south side of Apron III be carefully evaluated against the requirements for terminal area expansion. Preference should be given to commercial development along Taxiway Kilo and Apron II prior to development along Apron III.

6.4.6.4 Central De-icing Facility Expansion (Apron IV)

A phased expansion of the Central De-icing Facility (CDF) is likely to occur over the planning horizon to accommodate demand and reduce foreseeable delays associated with aircraft de-icing during peak periods. Similar to other airside infrastructure requirements being considered, the Master Plan considers the ultimate development of the CDF to ensure sufficient area is reserved to accommodate its expansion.

Exhibits F1 through **F5** of **Appendix F** provide illustration of the possible phased expansion of the CDF.

In the short-term it may become necessary to reconfigure the CDF to provide increased wingtip clearances for large Code C/AGN III aircraft to existing Vehicle Safety Areas (VSAs) and clearly identify a bypass corridor for traffic entering and exiting Taxiway Kilo. The changes to wingtip clearances would be necessary to comply with the latest guidance material produced by the Federal Aviation Administration (FAA) for flow through CDFs.

Peak hour demand for the CDF is expected to increase from its current 11-13 aircraft per hour to 13-15 by 2020. Typical throughput for a three-bay Code C/AGN III de-icing facility is estimated to be between 12 and 15 aircraft per hour assuming two trucks per aircraft as well as defined vehicle safety areas to each side the bays. In the short-term increases to throughput could be accomplished by providing additional queuing capacity, increasing the number of trucks per de-icing-bay and adding a CDF bypass taxiway as shown in **Exhibit F2**.

In the medium-term, air traffic operating within the peak hour is expected to further increase which will adversely affect processing times in the CDF. Peak hour demand for the CDF is expected to reach 15-16 by 2025. It is also expected that number of Code D/AGN IV and Code E/AGN V aircraft operating within the peak hour will also increase.

To mitigate this impact, the CDF could be expanded and reconfigured to provide two Code C/AGN III bays and one Code E/AGN V bay in flow-through configuration in addition to proving a taxiway bypass corridor for traffic to/from Taxiway Kilo.

Reconfiguration and expansion could be phased over the short- to medium-term as shown in **Exhibits F1** through **F3.** Expansion would occur to the north side of the CDF towards Runway 11-29.

Beyond 2030, the peak hour demand for the CDF is expected to exceed 17 aircraft. The majority of the traffic beyond 2025 is expected to be Code C/AGN III aircraft with the number of Code D/AGN IV and Code E/AGN V aircraft operating within the peak hour to remain similar to that expected in the medium-term.

To accommodate this foreseen increase in demand and to minimize any increase in delay the CDF could be expanded to provide a total of four de-icing bays. **Exhibit F5** illustrates how this expansion could occur along with a reconfiguration of the existing CDF area. An area has also been reserved for an engineered wetland in close proximity to permit on-site treatment of the glycol runoff.

It is proposed that the existing CDF infrastructure could eventually be abandoned instead of replaced at the end of its life cycle. New capacity would be brought online as it nears the end of its expected life cycle. Portions of the existing CDF area could then be allocated to accommodating overnight parking demand and/or commercial development with pavement rehabilitation.

6.4.7 Navigational Aids

A number of improvements to SJIA's navigational aids have been identified through past master planning initiatives, and recent usability studies. The majority of those improvements have been implemented. The primary improvements, being the implementation of Category III ILS for both Runways 11 and 29. This included upgrades to localizers and approach lighting systems. Other improvements that could be perused, include; the implementation of a Local Area Augmentation System (LAAS) also referred to as a Ground Based Augmentation System (GBAS) used to increase the precision of GPS based approaches, and implementation of a Precision Approach Lighting System for Runway 34 to complement a future CAT I ground based instrument landing system on Runway 34 which currently does not exist.

The implementation of a GBAS has been suggested by ICAO as a possible future upgrade separate to or alongside existing ILS systems. Compared to other precision approach systems, GBAS typically present a number of benefits, including:

- Reduction of critical and sensitive areas;
- Curved approaches;

- Positioning service;
- Provision of service in several runways in the same airport;
- Provision of several approach glide path angles and displaced threshold;
- Guided missed approach; and
- Adjacent airports use.

The potential for a future long-term, land based precision instrument approach for Runway 34 should be protected in the master plan. While satellite based navigation has gained considerable support by NAV CANADA and the aviation industry as a whole, land based instrumentation offers a proven and reliable alternative that continues to be used by international carriers and remains the primary instrumentation at all major international airports worldwide. As the premier transportation gateway to Newfoundland and Labrador, it will continue to be expected that the airport offer the highest level of service and accessibility to domestic, transborder and international air carriers. Having both satellite based and ground based approach navigational capabilities should continue to be priority and the master plan should protect for this.

A potential Runway 34 glidepath located on the west or east side of Runway 16-34 should be suitability planned for under this master plan. There are inherent benefits to airfield operations by placing the future glidepath on the east side of Runway 16-34 versus the west side. For example, by placing the glidepath antenna on the east side or Runway 34, aircraft could hold closer to threshold of 34 since they would no longer be within the electronic protection area of the glidepath if it were on the west side of the runway. This would result in more efficient taxi operations and reduced delays on Runway 34 operations. Along with protecting for a future Runway 34 instrument landing system within the planning horizon of this master plan, SJIAA should continue to maintain an existing approach lighting easement off the Threshold 34 which would support an eventual CAT I high intensity approach lighting system enabling approach minima down to 200 ft. and ½ SM when operating in conjunction with either an ILS or GNSS based approaches. This easement has been in place for decades. It is it recommended that the feasibility of implementing these systems become part of a long-term objective for the SJIAA.

6.4.8 Airside Roads

Airside roads are used to maintain and access airside infrastructure while limited use of Taxiways and Runways by ground vehicles. Improvements to a number of airside roads were implemented as part of the Accessibility Project. These included, select approach roads and portions of perimeter service roads.

Changes to airside roads may be required as new taxiways are constructed, aprons expanded and runways extended. The planned implementation of Non-Passenger Screening for Vehicles (NPS-V) at St. John's in 2016 will require changes to airside access within the Terminal Area. In order to limit the need to screen all vehicles transitioning through the Terminal Area there may be a need to implement an unscreened vehicle bypass corridor. This corridor, identified in concept as part of **Exhibit 3** of **Appendix A**, would allow vehicles to avoid secure areas of Apron I when transitioning north and south.

Other improvements to airside roads could include:

- Improvements to the south access road; and
- Construction of a maintenance vehicle holding bay immediately east of Glide Path 11.

The current condition of the south access road which connects the west side of the airport to the east side forces Ground Support Equipment to utilise public use groundside roadways to reposition equipment from one side of the airport to the other. Recent changes implemented to restrict vehicle runway crossings have forced GSE requiring access to both sides of the airport to use the either the south access road or public roadways. While it has been suggested that additional GSE equipment be purchased to avoid the need to use the airside roadway, there is benefit to ensuring an efficient operation. Therefore it is recommended that the business case be developed to for a dedicated properly designed airside road corridor between Apron II and Apron I. The investigation should also consider the effects of NPS-V and any other security measures, including the addition of a possible second NPSV screening facility located at the future east extremity of Apron I should a bypass corridor to the West NPSV facility be unfeasible. Exhibits A3 and A4 depict the planning level land reserves for this proposed NPSV airside perimeter road.

6.5 PASSENGER TERMINAL BUILDING

6.5.1 Passenger Terminal Facilities

6.5.1.1 Current Development Program

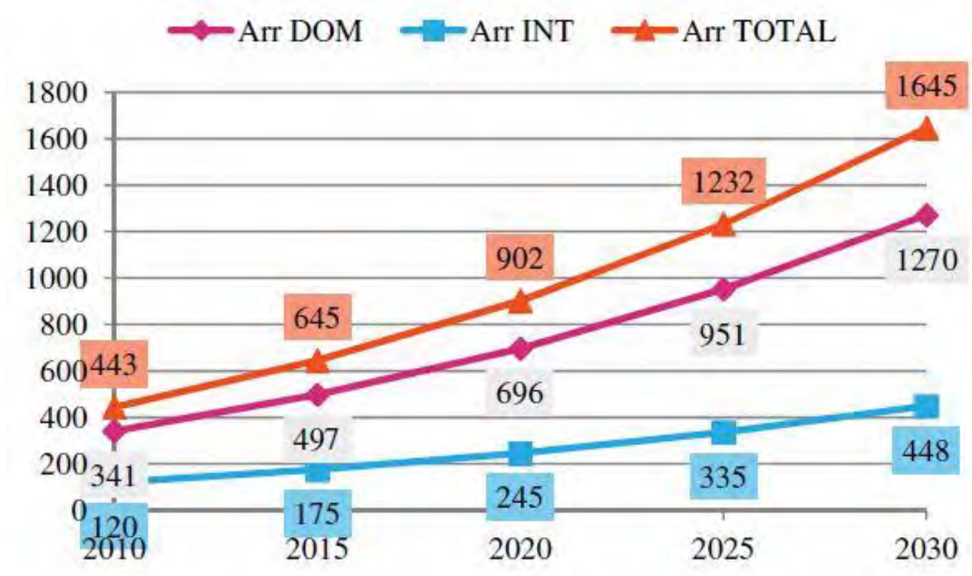
Proposed terminal expansion requirements are based on the Strategic Terminal Development Plan and reviewed on a periodic basis. The requirement for terminal expansion is derived from projected peak hour passenger demand, which in turn drives specific requirements for various passenger processing functions including check-in, security screening, holdroom capacity and baggage claim.

Table 6-17 describes the projected peak passenger demand identified in the Strategic Terminal Development Plan Update[21]. **Figures 6-4** and **6-5** describe forecasted peak hour demand broken down by sector.

Table 6-17 Projected Peak Passenger Demand 2015-2030

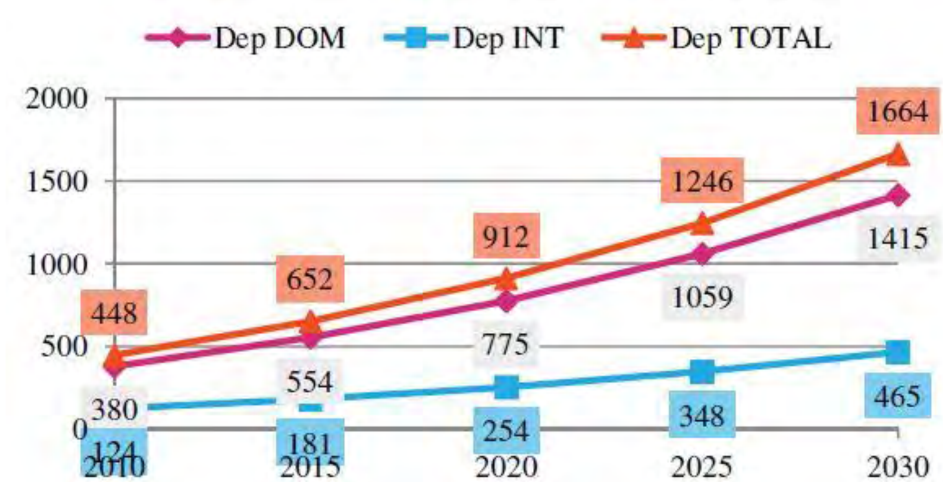
Peak Hour Passenger Demand	2015	2020	2025	2030
Enplaning	652	912	1246	1664
Deplaning	645	902	1232	1645

[21] Strategic Terminal Plan Update, ARUP Canada, 2011



Source: St. John's International Airport Strategic Terminal Area Development Plan, ARUP Canada, 2011

Figure 6-4 – Peak Hour Arrivals Passenger Forecast



Source: St. John's International Airport Strategic Terminal Area Development Plan, ARUP Canada, 2011

Figure 6-5 – Peak Hour Departures Passenger Forecast

From the forecasted peak hour demand, the Strategic Terminal Development Plan identified terminal area requirements and gate requirements. These are described in **Table 6-18**

Table 6-18 – Projected Terminal Requirments 2015 - 2030

Requirements	Current	2015	2020	2025	2030
Building Area	16,220	22,700	26,060	30,030	35,870
Gates	8	8	11	13	14

The first phase of the building expansion, based on the Strategic Terminal Development Plan, is located at the east end of the terminal. Currently in the process of construction, the addition is scheduled to open in the spring of 2018. The three-level expansion is approximately 16,000 m² in area. The Ground Level accommodates expanded check-in facilities, a new pre-board passenger screening facility and a larger baggage make-up area. **Figures 6-6 and 6-7** illustrate the proposed Ground Level and Second Level expansion. For further details and illustrations refer to **Appendix C**.

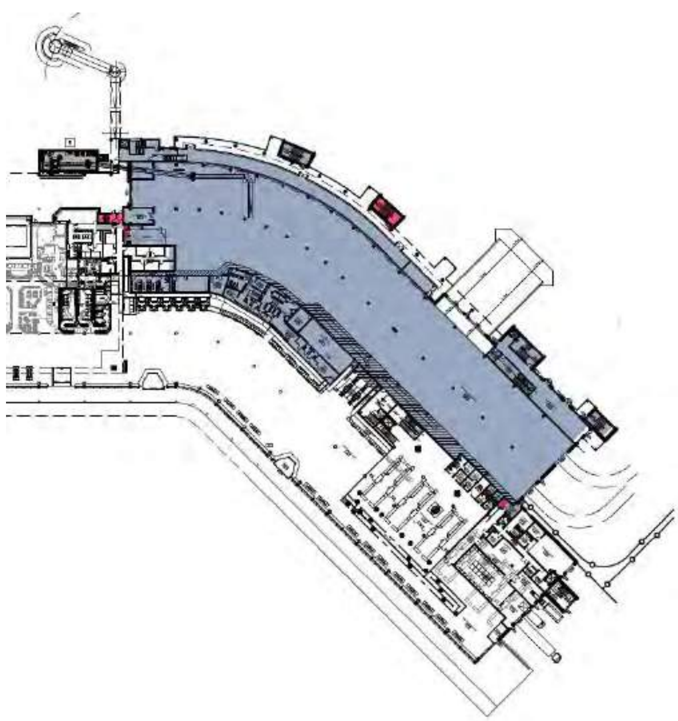


Figure 6-6 – PTB Proposed East Ground Level Expansion

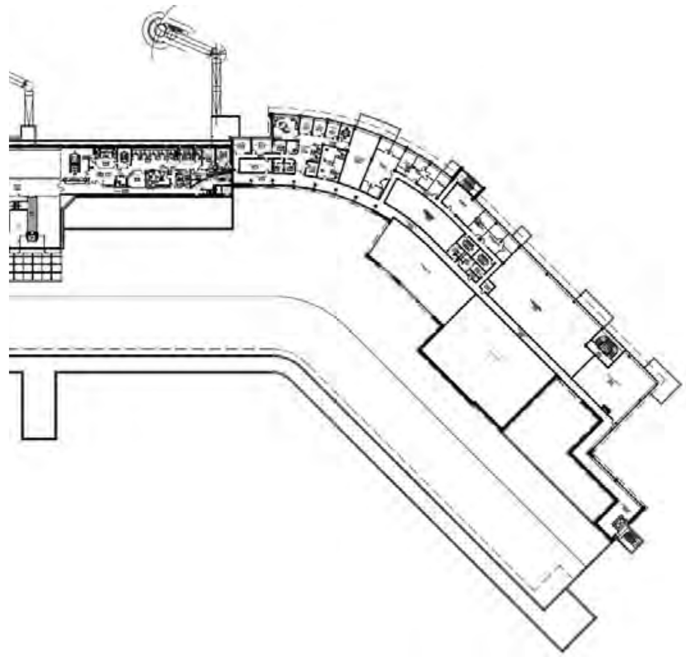


Figure 6-7 – PTB Proposed East Second Level Expansion

Level 2 of the addition includes expanded holdroom facilities with associated amenities, including washrooms and retail concessions. The expanded second level will accommodate the provision of four additional passenger boarding bridges at gates that previously were only ground loaded. Level 2 also accommodates new support space for CATSA. Phase 1 will accommodate these target facilities to the forecast 2020 traffic demand of 1.9 million passengers per year.

Preparation is now ongoing to accommodate a Phase 2 expansion on the west side of the terminal building to complete the expansion to accommodate forecast 2020 traffic levels. Commencing in mid-2018, the proposed 9,000 m² addition would include a new International Arrivals area on the ground floor, comprised of an expanded CBSA facility and two international baggage claim devices. Level 2 of the expansion would accommodate expanded holdroom facilities with provision for two additional contact gate positions, one of which would be designed to accommodate AGN V aircraft. It is anticipated that Phase 2 of the terminal expansion would be completed in 2021. **Figures 6-8** and **6-9 as well as Appendix C** illustrate the proposed west PTB expansion.

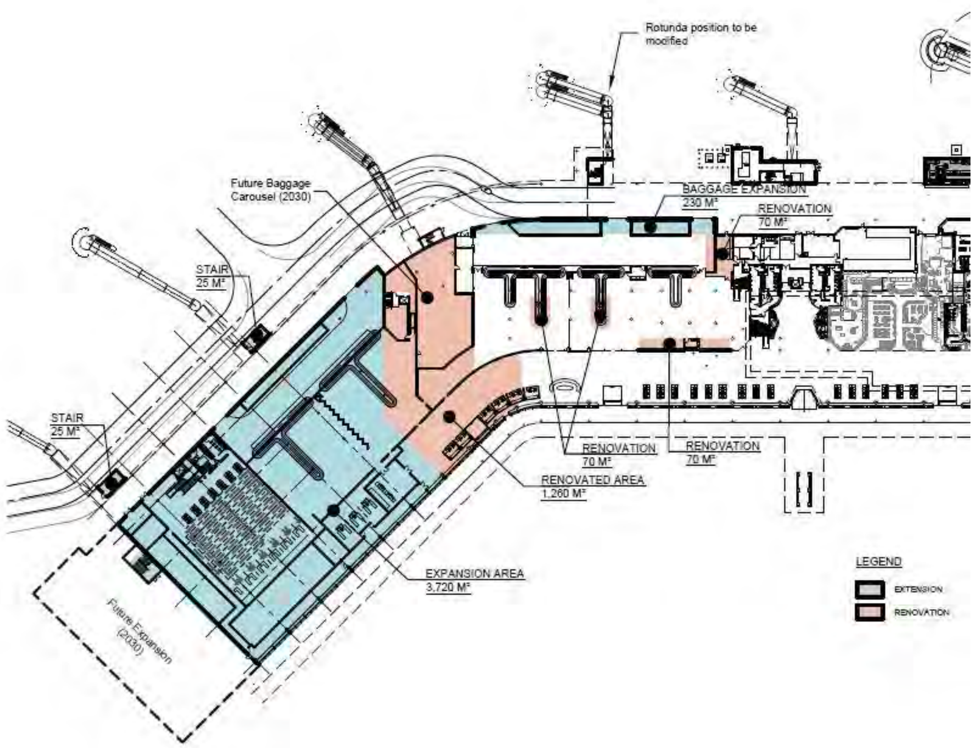


Figure 6-8 – PTB Proposed West Ground Level Expansion

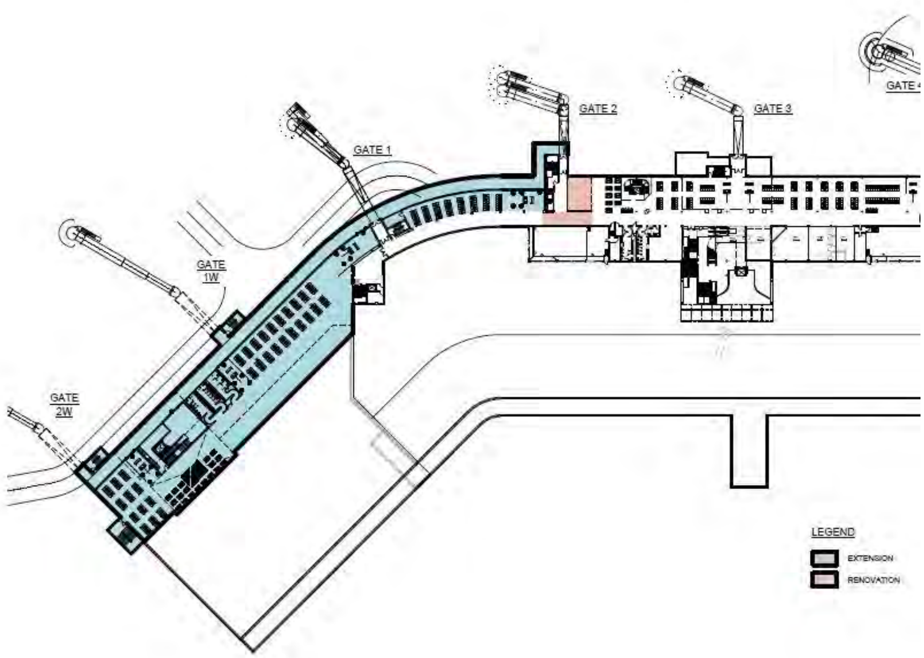


Figure 6-9 – PTB Proposed West Second Level Expansion

6.5.1.2 Long-Term Expansion

Basic design concepts have been prepared for further east and west terminal expansions to accommodate further growth to the forecast 2030 traffic levels of 2.4 million passengers annually.

Given the current volatility of the oil and gas industry other factors, it is foreseen that within the time frame of the Airport Master Plan, terminal expansion may be limited to the first phases of development to accommodate 2020 levels. However, should passenger traffic continue to grow as projected to 2.4 million passengers by 2030, these two further phases of terminal expansion, currently in concept phase only, would be planned for 2030 to accommodate an increase in passenger traffic beyond 2.4 million per year. Additional phases would likely expand the terminal to the west and south.

Figure 6-10 illustrates the proposed Phases 1 and 2 of the expansion for 2020 traffic levels.

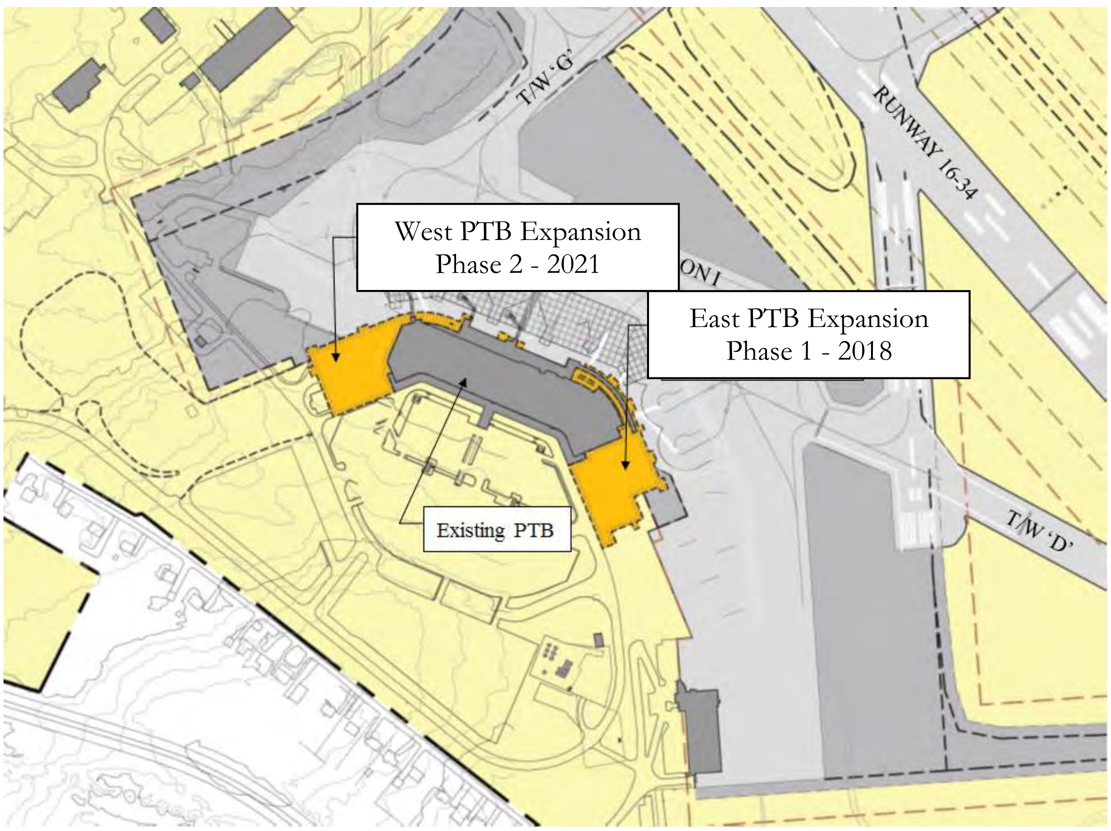


Figure 6-10 – ATB East and West Exapnsion Phasing Plan

6.6 GROUNDSIDE FACILITIES

6.6.1 Parking Lots

The current development program, completed in late 2016 is expected to accommodate parking demand to 2020 and potentially to 2030 for some elements. The opening of off-airport discount parking lots by such companies as Park n' Fly may for a short period of time, stifle some of the anticipated growth in demand for long-term parking. However, the Airport should expect that growth in air travel will continue and plan accordingly. Accommodating additional demand for long-term parking may be accomplished through an expansion of the long-term parking area east as shown in **Exhibit D4** of **Appendix D**. The fuel storage facilities within this area will require relocation to a consolidated fuel storage facility prior to further expansion of the parking area.

Beyond 2030 there is expected to be sufficient demand to justify further expansion of SJIA's parking facilities beyond surface parking capacity. To accommodate further demand beyond a planning horizon of 2030, the construction of a multi-story parking structure will likely be necessary as land for surface parking will be exhausted, as potentially identified in **Exhibit D5 and D6** of **Appendix D**. Should other parking products require expansion prior to 2030 a parkade construction will have to happen sooner as no further land based vehicle parking is available within the immediate terminal area.

The construction of such a facility should be started well in advance of the Airport reaching parking lot capacity. This is to ensure that there is sufficient capacity to allow for construction of the parking structure to take place within the existing parking lot area while still providing a sufficient number of parking stalls.

6.6.2 Ground Transportation Access

The need for improvements to the ground transportation system has been identified as part of previous studies including the Strategic Terminal Development Plan Update[22].

Improvements to the Airport's road network were identified and considered as part of the SJIA's current terminal area expansion program. The improvements being considered include: the reconfiguration of terminal area roadways, including World Parkway, to provide two-lane unidirectional flow of traffic outside of parking areas; the addition of turning lanes for entry to parking areas; and, a two lane roundabout at the intersection of World Parkway and Navigator Avenue. **Exhibits D2** through **D6** of **Appendix D** identify these improvements and show them in connection to the current and possible future parking lot expansion program.

Improvements to public transit and a defined bus stop are identified as part of SJIA's terminal expansion program. Initiatives that would see the extension of public transit services to SJIA are

[22] Strategic Terminal Plan Update, ARUP Canada Inc., 2011

beginning in 2017 to improve connectivity and provide a low cost travel alternative to accessing downtown St. John's.

6.7 CARGO FACILITIES

The development of a new cross-dock cargo facility is being constructed by Cargojet for construction in 2017. The facility will be located in the West Commercial Development area, and will include an apron of sufficient size to accommodate large cargo aircraft. The Air Cargo Study[23] prepared in 2010 suggests that a cargo building of approximately 5,000 m² would be required to support the forecast growth in air cargo activity. To accommodate air cargo growth in the long term, sufficient lands should be identified for air cargo uses. Potential sites should have both airside and airside access and be of sufficient depth to accommodate the operational requirements of cargo operators. For planning purposes and to help with the identification of a suitable site, a conceptual layout of a cargo facilities has been included on the ALP shown in **Exhibit A5** of **Appendix A**.

6.8 GENERAL AVIATION FACILITIES

6.8.1 Airline Support

Although it is not anticipated there could be significant demand for expanded airline support facilities. The current infrastructure is dated and will require replacement in the future. Lands located in close proximity to the terminal area should be reserved for future airline support functions. Should the gage of passenger aircraft increase in size, there could be a demand for larger cargo facilities operated by the scheduled passenger airlines. Space should be reserved inside the Critical Restricted Area of Apron I to construct a future ramp support facility.

6.8.2 Business Aviation / FBOs

The East Commercial Development Area is the location of airport's fixed base operators (FBOs). Located away from the passenger terminal, this area is an ideal location for general aviation activities. Although the forecasted growth of general aviation is relatively low there is an existing need to provide an expanded apron area. The Apron II area is severely constrained, with limited parking for large itinerant aircraft. This is especially true during periods when the military makes extensive use of the FBOs. With the potential closure of Runway 02-20, there is an opportunity to expand the apron and add additional hangar facilities. Two options to illustrate the expansion of apron and hangar facilities are shown in **Appendix A, Exhibits A6 and A7**.

6.8.3 Helicopter Operations

In the medium- to long-term it is anticipated that helicopter operations will continue to expand. In discussion with the helicopter operators, they predict their operations will eventually double and could occur within the next five to ten years. To support this increase in operations, Cougar

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[23] YYT Air Cargo Study, Jacobs Consultancy Canada Inc., 2010

Helicopters has constructed a new facility in the West Commercial Development Area. This expansion should likely accommodate their infrastructure needs for the 20-year planning horizon of this Airport Master Plan. Expansion of the East and West Commercial Development Areas would provide additional lands on which to accommodate helicopter operations. Providing an ability to more effectively separate rotary-wing from fixed-wing aircraft operations may become a higher priority over the medium-term if mixing of these aircraft occur during peak periods. As previously discussed, it may be possible to develop procedures that would allow helicopters to land and depart from maneuvering areas other than the runways. In the short-term following the conversion of Runway 02-20 to a taxiway, it could continue to serve helicopter arrivals and departures. The eventual construction of a parallel taxiway to Runway 11-29 could be configured to allow use by Helicopters at a distance from runway centreline that would minimize conflict with arriving and departing fixed wing aircraft using Runway 11-29 or 16-34.

6.9 NON-AVIATION COMMERCIAL AREAS

6.9.1 Hospitality

The provision of hospitality facilities, including hotels, convention facilities and restaurants, at airports is a developing trend that is seen as an opportunity to provide increased amenity to the traveling public, as well as generating non-aeronautical revenue for the airport. It is anticipated that the development of hospitality-related commercial activities will continue to expand at the airport. Such facilities should be located in close proximity to the passenger terminal building with good access to the community. A node of hospitality facilities is proposed at the intersection of World Parkway and Portugal Cove Road. The area is the site of an existing new hotel and a second hotel is scheduled to open in the summer of 2017.

6.9.2 Commercial / Office

The development of non-aviation commercial activity is somewhat dictated by the availability of serviced commercial lands beyond the airport and the need for businesses to be in close proximity to the airport. The types of businesses that might be attracted to an airport include rental car storage and vehicle maintenance facilities, groundside sortation facilities, warehousing, and low-rise office facilities.

6.10 AIRPORT OPERATIONS AND SUPPORT FACILITIES

Sufficient area is required to allow functions associated with airport operations and support activities to expand, as required, over the long term. The area currently utilized for the majority of these functions is well suited in that it is centrally located with respect to the airfield and air terminal building. Any future expansion of airport operations and support functions should be accommodated in the current location, however other reserves for various functions not directly terminal related are located elsewhere on the airport as indicated on the land use map.

6.10.1 ARFF

In is anticipated the current Category 7/8 airport rescue and firefighting (ARFF) services will meet the long-term needs of the Airport over the horizon of the Airport Master Plan. With respect to the accommodation of ARFF services, the existing fire hall has sufficient capacity to accommodate the current fleet of ARFF vehicles and support equipment. No expansion of ARFF facilities is anticipated during the term of the Master Plan.

6.10.2 Airport Maintenance

The existing airport maintenance facility, although meeting current requirements, may require expansion in the future in order to accommodate the additional storage of heavy airfield equipment. There is some opportunity on-site to accommodate a moderate expansion of the existing maintenance garage. An alternative strategy would be to expand the maintenance garage into the existing fire hall, and construct a new fire hall at an alternate location

6.10.3 Air Traffic Control Tower

Although the existing Air Traffic Control Tower (ATCT) is located at an appropriate site on the airport, line-of-sight from the controller's cab to aircraft maneuvering areas is obstructed because of terrain. Areas not provided with line of sight include portions of Runway 11-29 at the western end of the runway and at the intersection of Runway 11-29 and 16-34. Given these constraints, a new ATCT, with line-of-site to the entire airfield, should be considered for the future as indicated in Appendix A drawings.

6.10.4 Field Electrical Centre

The existing Field Electrical Centre (FEC) location and facility size is considered appropriate and should not require an increased footprint to accommodate the infrastructure requirements identified within the long-term planning horizon. There is however limited physical space to install additional regulators. This will need to be addressed during detailed design. Should a need to increase the size of the facility be identified, it is anticipated that the requirements could be accommodated on lands northwest of the existing facility.

6.10.5 Fuel Storage

The consolidation of aviation fuel storage facilities to service the west side of the Airport is currently under construction with a new tank farm being built near the CDF. Sufficient space has been identified within the Airport operations and support areas to accommodate this facility.

6.10.6 NPS-V

The International Civil Aviation Organization (ICAO) has implemented the Non-Passenger Screening (NPS) standard, requiring countries to ensure non-passenger and their belongings entering the restricted areas are subjected to screening and security controls. To further the NPS standards, Transport Canada has implemented a Non-Passenger Screening of Vehicles (NPS-V).

The NPS-V will be implemented as random screening selections of vehicles, including their occupant(s) and their belongings, entering restricted areas. Transport Canada has appointed the Canadian Air Transport Security Authority (CATSA) to work in conjunction with the Airport Authorities, Category A and B, for full NPS-V implementation by April 1, 2016. The total number of access points will be determined by the defined Critical Restricted Area for each airport.

Provision for at least one of these facilities is included as part of the master plan development. The first site is under construction near the west end of Apron I and will be completed during winter 2017. A second location been identified within the Terminal Area, near the future east apron expansion as a potential second NPSV facility.in the future if warranted. Both sites are considered suitable, however, both will require the construction of an NPS-V facility and changes to airside access procedures.

6.11 UTILITIES

6.11.1 Water

Based on the Airport Utilities Assessment report recently completed for SJIAA the existing water distribution is adequately sized for existing infrastructure on both the east and west sides of the airport. Based on comments contained within the Airport Utilities Assessment report it was recommended that a capacity analysis by carried out to determine any required upgrades in support of future infrastructure on the west side of the airport.

In 2016 CBCL undertook a water distribution masterplan for the west side of the airport. It was determined the existing airport owned system (reservoir, fire pump, domestic pumps and pipe distribution network) can supply the existing and future water needs of the west side of the airport. However, it is recommended to connect to the city high zone system at Viscount Street, for which the connection infrastructure is already in place, to alleviate the airports requirement to provide its own fire flow reservoir as well as fire and domestic booster pumps, in the near future.

6.11.2 Sanitary Sewer

Based on the Airport Utilities Assessment report the existing terminal area sanitary sewer system is sized appropriately. The system serving the general aviation area was not investigated as part of this study, however it is understood that the outfall for this area is a trunk sewer along Torbay Road and based on findings from the 2002 Airport Master Plan it is adequately sized for the airport lands. Detailed capacity analysis would be required for future developments.

A new sanitary sewer connection to the city's truck sewer along Portugal Cove Road at Viscount Street was established along World Parkway in 2015. It provides an additional capacity of 100 l/s for existing and proposed future requirements on the west side of the airport outside the terminal area (ie. The ATB and other service buildings along Airport Road feed into the Torbay Road sewer). It is not anticipated further capacity will be required within the planning horizon.

6.11.3 Drainage / Storm Sewers

While a detailed master drainage study has not been undertaken for the entire airport, several drainage studies have been conducted for various developments on the west side of the airport. There are no reported storm water or drainage issues on the site. An airport drainage study is not within the scope of this master plan and was not undertaken. It is recommended to undertake a master drainage study prior to any future commercial developments.

The airport has adopted a "Net Zero Runoff" policy for tenant developments to mirror the City of St. John's policy. Storm water management ponds and/or water attenuation installations will be required to support this policy.

7. LAND USE PLAN

7.1 PREAMBLE

As part of the master planning process, an updated Land Use Plan was prepared for the Airport. The Land Use Plan was prepared as a separate document for submission to Transport Canada in accordance with the Ground Lease requirements. This section of the Master Plan is included to summarize the recommended land use plan as illustrated in **Exhibit A3** of **Appendix A**.

The currently adopted Land Use Plan is shown in **Figure 7-1** below and has been in effect since 2001.

Figure 7-1 – Current Adopted SJIAA Airport Land Use Plan, 2001

The updated Land Use Plan shown in Exhibit A3 results in an increase in Airside System and Airside Commercial development areas improving upon the 2001 plan. These changes were primarily driven by SJIAA's long-term objectives for a continued high level of air access combined with flexible and optimized airside commercial and air terminal development opportunities. Furthermore, the introduction of new airport design and planning standards vis a vis TP312 5th Edition, has enabled more efficient use of the available lands. While other changes in land uses are reflected in the updated plan, these changes are relatively minor when compared to the 2001 plan.

7.2 RECOMMENDED LAND USE PLAN

7.2.1 Objectives and Approach

The primary goal of the Land Use Plan is to identify land areas by use and location. The plan is designed to ensure continued operation, efficient and cost effective development, while recognizing SJIAA's strategic operational and business objectives. The land use designations identified in the Airport Land use Plan include the following:

7.2.1.1 Airside System (AS)

Land areas at the Airport which need to be protected from encroaching development. This includes the runway system, taxiways, all fixed and rotary-wing manoeuvring areas, aprons, approach paths, and navigational aids. This area also includes electronic zoning and OLS clearance up to approximately 10 metres Above Ground Level (AGL).

7.2.1.2 Airport Reserve (AR)

Land parcels within the property boundaries that are not yet assigned to any land use designations but are held in reserve for contingency requirements, and provide an effective buffer zone for the continuance of safe airport operations. Airport Reserve land may be leased for agricultural or similar short-term interim uses.

7.2.1.3 Terminal Reserve (TR)

These areas include the Airport Passenger Terminal Building and associated infrastructure including car parks and access roads, and provides for future expansion.

7.2.1.4 Airside Commercial (AC)

Airside commercial land allows for uses involving air cargo, equipment servicing, goods or equipment storage, light manufacture and assembly, etc. which require access to the runway system. These would include aviation-related uses like hangars, aircraft maintenance facilities, fixed base operations, hangars, aprons, and tie-down areas.

7.2.1.5 Groundside Commercial (GC)

Groundside commercial land allows for uses that do not require direct access to the airside and do not impact the operation of the Airport or flight safety. Uses include warehousing and storage, freight forwarding, light industrial, ground transportation, car rental facilities/parking, and office facilities. Due to the close proximity of these areas to airside, preferential treatment should be given to aviation related commercial developments that may benefit from synergies that can form when in close proximity to aviation activities.

7.2.1.6 Restricted Groundside Commercial (RGC)

Restricted groundside commercial lands available for development but strictly limited to select land uses due to proximity to the existing or future runway system and/or electronic protection areas.

7.2.1.7 Non-Aviation Groundside Commercial (NAGC)

Commercial land separated from the Airport for the purpose of non-aviation development. These lands do not have access to the airside system or other Airport areas. Land use in these areas should still be limited to compatible land use in the vicinity of airports.

7.2.1.8 Operations and Support Services (OASS)

Operations and support service areas are protected for facilities relating to airport service operations. These may include maintenance garages, fire hall(s), security office(s), utility buildings, airport administration, service roads, etc. includes airport operations and support services.

7.2.1.9 Public Access and Parking (PAAP)

Public access comprising the ground transportation system including access roads not included as part of Terminal Reserve.

7.2.2 Opportunities and Constraints

The future development of Airport lands must take into consideration a number of constraints. They include:

Terrain – a number of areas on the Airport are not suitable for development because of terrain.

Line-of-Sight – the line-of-sight from the air traffic control tower is already compromised because of terrain. Future development on the airport must ensure that existing sight lines from the control tower to aircraft maneuvering areas are maintained.

Obstacle Limitation Surfaces – future development on the Airport must adhere to obstacle limitation surfaces and electronic zoning requirements. Areas where future commercial development may be restricted, because of zoning restrictions that limit the nature and scale of development, are identified on the Land Use Plan

Environment – There are areas on the Airport where environmental issues may limit development. The most significant of these are the lands located between RCAF Road and Torbay Road that have been contaminated because of previous military uses. The costs of remediating these lands for commercial use could be significant.

7.3 AERONAUTICAL ZONING

The Airport Master Plan proposes a number of changes to the runway configuration at St. John's over the planning period. Most notably is the closure of and re-purposing of Runway 02-20 to a taxiway which would enable additional terminal and commercial airside expansion on the south and east sides of the airport. These changes are reflected in **Exhibits B4** and **B5** of **Appendix B** and are considered part of the short- to medium-term recommendations of the master plan. Furthermore, an extension is also proposed to the south off Threshold 34 adding more operational flexibility to Runway 16-34. This change is reflected in **Exhibit B6** and **B7** of **Appendix B** and are a long-term consideration. Should any changes be considered to the AZR the long-term option should be the protected.

The Airport Master Plan also recommends that aeronautical facilities including communications and navigational aid protection be implemented in any updates to the AZR for St. John's. **Exhibit B8** of **Appendix B** shows the minimum electronic protection areas for the new ILS CAT IIIA equipment on Runway 11-29 and the ILS CAT I equipment on Runway 16-34 and those anticipated in the future including a long-term potential ILS on Runway 34. It is recommended that these protection areas be further assessed for inclusion into future AZR amendments.

New AZRs or amendments to AZRs can be a costly and extremely time consuming. Transport Canada recommends a minimum of 1-3 years be allocated to create new or amend existing regulations and costs can exceed hundreds of thousands to millions of dollars. Given that existing AZRs already exist and have adequately protected the runways at St. John's since the 1970s, the Airport Master Plan recommends that as a phased approach to updating the AZRs be considered.

The initial phase would involve the overlay of the long-term airport layout and associated runway and aeronautical facility protection areas (Exhibits B7 and B8) with the existing AZR mapping. These overlays would identify areas of over/under protection and gaps in existing AZR protection. These areas would then be further assessed in terms of existing land use controls that exist by way of local municipal or provincial zoning to better understand the risk in terms of heights and land use with respect to airport operations. The end result will provide the Airport Authority with a thorough understanding of risk of the "do nothing" option and potential mitigation strategies that may not involve the significant investment of time and money for a full scale AZR amendment or update.

The optional second phase would involve triggering a full update or amendment of the existing AZR using the Transport Canada Federal Process. This complex process and steps required to update AZRs and the approximate timelines involved are outlined in **Table 7-1** below:

Table 7-1 Steps to Make/Amend Airport Zoning Regulations by Federal Process
(Source: Transport Canada)

Steps to Make/Amend Airport Zoning Regulations Federal Process	Approximate Time Frame
Phase 1 – Pre-regulatory Phase	
1) Submission of Request for Regulation	1 month
2) Submission of AZR Requirements Form to Proponent	1 month
3) Completion of AZR Requirements Form by Proponent	1 week
4) Proponent sends AZR Requirements Form to Inspector	1 week
5) Review of AZR Requirements Form	1 week
6) Inspector Prepares Draft Commitment Agreement	1 week
7) Execution of Commitment Agreement by RDCA and Proponent	1-2 weeks
8) Briefing note to the RDCA	1 week
9) Inspector to complete STAT (Sustainable Transportation Assessment Tool)	1 week
10) Inspector to complete Triage Statement and submits to HQ	1-3 weeks
11) Proponent to obtain Estimate for Zoning Costs	1-3 weeks
12) Proponent to complete Preliminary Zoning Intrusions Report	1-3 weeks
13) Preparation of Zoning Plans and Drafting of Zoning Instructions and Legal Description of Land	1–3 months
14) Proponent to send Zoning Plans and Instructions to Inspector for review	1-3 weeks
15) Translation of AZR Drafting Instructions	1-2 months
16) AZR Drafting Instructions Sent to Legislative Services for Preparation of Discussion Draft	1-2 months
17) Consultation - Briefings with Land Use Authorities/Potentially Affected Landowners/Aboriginal Consultation	2–3 months
18) Update Briefing Note to RDCA	1 week
19) Inspector drafts RIAS (Regulatory Impact Analysis Statement)	1-2 weeks
20) Inspector submits final AZR Drafting Instructions, Zoning Plans and RIAS to Regulations Unit, Legislative Services	1 week
Phase 2 – Regulatory Phase	
1) Preparation of Discussion Draft by Regulations Unit	1-2 months
2) Update Briefing Note to RDCA	1 week
3) Proposed regulation "Blue-Stamped" and Request for Insertion to Canada Gazette I	1 week
4) Inspector to prepare Submission Package for RDG Signature	1-2 weeks
5) Submission for Minister's Approval – Transmission to TB/PCO – Publication in Canada Gazette Part I	1-2 weeks
6) Update Briefing Note to RDCA	1 week
7) Consultation on Timing of Newspaper Publication	1 week
8) Publication in Local Newspaper	1 week
9) Proposed AZR may be published on the Regional Website	1 week
10) 60-day Public Notice Period Begins	2 months
11) Reponses to Written Representations – Updating of RIAS	1-2 weeks
12) Update Briefing Note to RDCA	1 week
13) Proposed regulation "Blue-Stamped" and Request for Insertion to Canada Gazette Part II	1 week
14) Inspector to prepare submission package for RDG Signature	1-2 weeks
15) Submission for Minister's Approval – Transmission to TB/PCO – Publication in Canada Gazette Part II	1-2 weeks
16) AZR may be published on the Regional Website	1 week
17) Update Briefing Note to RDCA	1 week
Phase 3 – Post-regulatory Phase	
1) Submission of Existing Intrusions to Region from Proponent	1 month

Steps to Make/Amend Airport Zoning Regulations Federal Process		Approximate Time Frame
2)	Zoning Plans to be signed by the RDCA - Update and Deposit of Regulation in Land Titles/Land Registry Office	1-2 months
3)	(Regulation in Force) – Update Briefing Note to RDCA	1 week
4)	Initiation of Publication of Airport Zoning Regulation in Newspaper	1 week
5)	Publication of Full AZR in two issues of local newspaper	1 week
6)	Confirmation of Deposit of AZR in Local Land Titles Office	1 week
7)	AZR Posted on TC Website	1-2 weeks
Estimated Total Time		**1-3 years***
Source: Transport Canada		

8. Environment and Sustainability

8.1 PREAMBLE

The St. John's International Airport Authority recognizes the need to protect the environment while continuing to meet the demands of the aviation community it serves. The Airport strives to balance financial obligations and environmental stewardship through policy, procedures and capital investments.

8.2 POLICIES AND PRACTICES

The Airport is committed to protecting the environment and has a public environmental policy which states we will (the Airport):

1. Serve St. John's growing need for air travel, while protecting the environment and the health and safety of employees, airport users, neighbours and the traveling public at large.
2. Ensure that all practices and procedures are in compliance with federal, provincial and municipal laws.
3. Promote environmental awareness among Airport Authority employees and tenants.
4. Work closely with all levels of government to implement responsible environmental programs.
5. Subject all new airport developments and projects to internal environmental review.
6. Maintain plans and procedures to effectively deal with environmental emergencies.
7. Conduct regular reviews to assess the environmental condition of the airport.
8. Conduct environmental audits.
9. Provide appropriate environmental training to Airport Authority staff.

In addition to the above, the Airport maintains a number of plans and programs as follows:

1. Environmental Management System complete with a series of Standard Operating Procedures (SOP's).
2. Environmental Emergency Contingency Plan;
3. Water Quality Monitoring Program;
4. Glycol Operations Management Plan;
5. Noise Pollution Planning.

It should be noted that all major capital programs are subject to a Hazard Identification and Risk Assessment (HIRA) process prior to implementation.

Based on site interviews conducted during the master planning process, the following is understood:

1. The Airport has identified the desire to adopt LEED principles where practicable.
2. For any new tenant development, the Airport has adopted a storm water 'net zero runoff' policy to mirror the City of St. John's.
3. All GSE equipment entering the PTB are electric.
4. For heating purposes some portions of the PTB were converted from oil to electric.

8.3 MASTER PLAN IMPLICATIONS AND MITIGATION

8.3.1 Air Quality

As with most other industries, the air emissions from airports will have an impact on the surrounding air quality. Sources of emissions include aircraft, ground service equipment and building mechanical systems. The most prevalent emissions include nitrogen oxides (NOx), volatile organic compounds (VOCs), carbon monoxide (CO), and particulate matter.

Recent advancements in aircraft engine technology have significantly decreased the level of emissions. Today's turbofan engines emit 40 percent less NOx and 50 percent less carbon monoxide than engines manufactured in the 1980s. Emerging engine technology will reduce levels even further.

Other initiatives to reduce airport-related emissions include the use of fixed electrical ground power and preconditioned air at the gates and the conversion of ground service equipment to alternative fuels including propane, natural gas and electricity. Restrictions on vehicle idling at the terminal curb is another initiative being undertaken at airports.

At present, SJIA has not undertaken an air quality study. Given that the reduction of air emissions has become an important objective within the airport industry, it is recommended that a base-line air quality study be completed. This study would use emissions and dispersion modeling to compute an estimate of annual emissions. A baseline study would allow the Airport to start to quantify its reduction or relative increase over time. Tracking emissions may also be helpful in understanding where efficiencies in vehicle and equipment operation can be gained.

8.3.1 Site Hydrology

Site hydrology will be impacted by future development as outlined in the Airport Land Use Plan **Exhibit A3** of **Appendix A**. Due to increased impervious area coupled with the adoption of a net zero run-off policy storm water management runoff control facilities will be required. It is recommended that prior to any development, a drainage study be carried out and storm water management facilities be sized to accommodate immediate and future flows. If it is not possible to modify existing infrastructure to accommodate future flows, ensure sufficient land is set aside for future expansion of the facility.

8.3.2 Vegetation

Vegetation will be impacted by future development. It is recommended that vegetation be restored upon construction completion for both aesthetic and erosion control purposes.

8.3.3 Wildlife

The presence of the wildlife on the airfield is a significant concern due to safety of the travelling public and the possibility of potential incidents which can result in aircraft structural damage or engine damage. The aircraft at low altitude is in the critical phase of the flight and the contact with wildlife during this time would be catastrophic

As a result, Transport Canada has identified wildlife, such as birds and mammals, as a hazard to aircraft flight operations. The challenge is that airports are an attractive area for wildlife as the land is open with ample food and water source.

To address the concern, Transport Canada mandates that airports develop, implement and administer an Airport Wildlife Management Plan (AWMP). The AWMP acts as a wildlife control program to reduce the risk to aviation caused by wildlife on the airport property. In compliance with Transport Canada, St. John's International Airport Authority (SJIAA) has developed an AWMP. With four main components that include wildlife monitoring, habitat management, movement of birds, and removal of birds. The following describes each components of St. John's AWMP.

8.3.3.1 Wildlife Monitoring

The first component, wildlife monitoring, is achieved by employing wildlife control officers to monitor the wildlife activity on the airfield or within airport proximity on a daily basis. The Airport Authority keeps statistical records to monitor the wildlife activity, including wildlife type, quantity seen, strikes and culling activities necessary due to immediate safety concerns. In 2012, the SJIAA has reported twelve (12) bird strikes with an aircraft. In the case of a bird or any other wildlife strike, the Airport Authority reports the strike to Transport Canada through the online bird/wildlife strike reporting page. On a yearly basis, the Airport reviews the statistical data to identify the wildlife hazard present on the airfield.

By investigating the data, the airport can plan, coordinate, implement or mitigate the program to address the concerns. The program will then be reevaluated during the following year. For instance, the statistical data has aided the airport to identify the runway where most often the strikes occur are during the approach on Runway 34 and the departure on Runway 16.

8.3.3.2 Habitat Management

Habitat management is one of the most crucial components of the AWMP. The Airport's operations staff are required to control the wildlife habitat to reduce any hazards. As part of their duties, they are required to cut the grass on a regular basis and mitigate insect activities, to reduce bird feeding on airport premises. SJIAA has surrounded the airport with fencing to reduce the large and small mammal activity on the airport. Additionally, SJIAA has implemented a fence maintenance program and the Airport operations staff conducts regular inspection. No additional improvements have been identified as part of this Airport Master Plan.

8.3.3.3 Movement of Birds

Movement of birds is known as the third component of the Airport Wildlife Management Program. The scare tactics, pyrotechnics and propane cannons, are used at the St. John's International Airport. These techniques are inexpensive; however their immediate effectiveness is short lived and is required to be used repeatedly. Due to the short-term efficiency, the control officers utilize these techniques shortly before the aircraft arrival or departure.

8.3.3.4 Removal of Birds

Lastly, the control officers are sometimes required to cull wildlife and remove them from the premises. These conditions are only used when there is an extreme safety concern to aviation. These control officers are trained and have acquired the permits required by the local authorities. In compliance with their license, the Airport Authorities are required to report wildlife culling activities conducted by their trained personnel. In 2012, the SJIAA's wildlife control officers reported culling fifty-seven (57) birds.

The four components in the Airport Wildlife Management Plan; wildlife monitoring, habitat management, movement of birds and removal of birds, have proven the Airport successful at reducing hazards to the travelling public. As safety is one of the airport's priorities, the airport will continue to monitor, plan and re-evaluate the program to ensure the safety of air travelers is maintained as high priority.

9. COMMUNITY INTERFACE

9.1 PREAMBLE

The long term viability of an airport is to some degree dependent upon an appropriate interface between the community and the airport. This is especially true for airports that are immediately surrounded by urban development. Issues such as noise exposure, vehicle traffic, and the appropriateness of surrounding land use are elements that must be addressed to ensure some degree of compatibility.

9.2 NOISE

9.2.1 Noise Exposure Forecast

Noise Exposure Forecast (NEF) is a single cumulative noise rating representing the forecasted level of aircraft sourced noise disturbance. The NEF is represented in a contour line following the same noise disturbance rating around the airport. Several factors are taken in considerations during the contour development;

- Aircraft Mix/Type
  - The noise disturbance can be impacted based on the different aircrafts used, such as jet, turbine or piston.
- Runway distribution
  - The NEF will calculate the contours based on the frequency each runway is in use. The runway used more frequently will have larger contours.
- Departure configuration
  - Based on the aircraft type, discussed above, departing aircraft with a longer stage length will result in a greater noise disturbance
- Night time movement
  - Between the hours of 2200 and 0700, the NEF system penalizes the night movements 16.7 times (12dB) to account for the annoyance to the community.

The NEF contours are developed to represent the noise exposure for the next five to ten years. Planners will utilize the contours to strategize the use of offsite lands.

9.2.2 Noise Exposure Prediction

For future land use planning between ten to twenty years, the Noise Exposure Projection (NEP) was developed. The NEP takes into consideration the possible changes in fleet, noise production levels, and runway configuration.

9.2.3 Transport Canada

Since NEF contours are not standards, but rather recommendations, NEF contours are not approved by Transport Canada, but are rather validated for correct use of the software system. The intent is that airport operators will work collaboratively with their local municipal planning authorities to discourage land use development in the vicinity of airports that is known to be incompatible with airports and airport sourced noise.

Transport Canada does not recommend or support incompatible land use development, particularly residential development, within the 30 NEF or above.

Table 9-1 below provides a breakdown to the predicated resident's response to aircraft noise levels inside of specific NEF contours.

Table 9-1 NEF and Response Prediction

Response Area	Response Prediction
1 (over 40 NEF)	Repeated and vigorous individual complaints are likely. Concerted group and legal action might be expected.
2 (35-40 NEF)	Individual Complaints may be vigorous. Possible group action and appeals to authorities.
3 (30-35 NEF)	Sporadic to repeated individual complaints. Group action is possible.
4 (below 30 NEF)	Sporadic complaints may occur. Noise may interfere occasionally with certain activities of the resident.
*It should be noted that the above community response predictions are generalizations based upon experience resulting from the evolutionary development of various noise exposure units used by other countries. For specific locations, the above response areas may vary somewhat in accordance with existing ambient or background noise levels and prevailing social, economic and political conditions. Source: https://www.tc.gc.ca/eng/civilaviation/publications/tp1247-part4-1436.htm	

9.2.4 NEF Studies and Recommendations

9.2.4.1 1996 Studies

During the implementation of the 1991 Land Use Plan, the Transport Canada developed a 1996 Noise Exposure Forecast, using the existing traffic mix and time of day of operations data. The NEF contours, illustrated in **Figure 9-1** below, were developed and used as guide to compatible development surrounding the Airport.

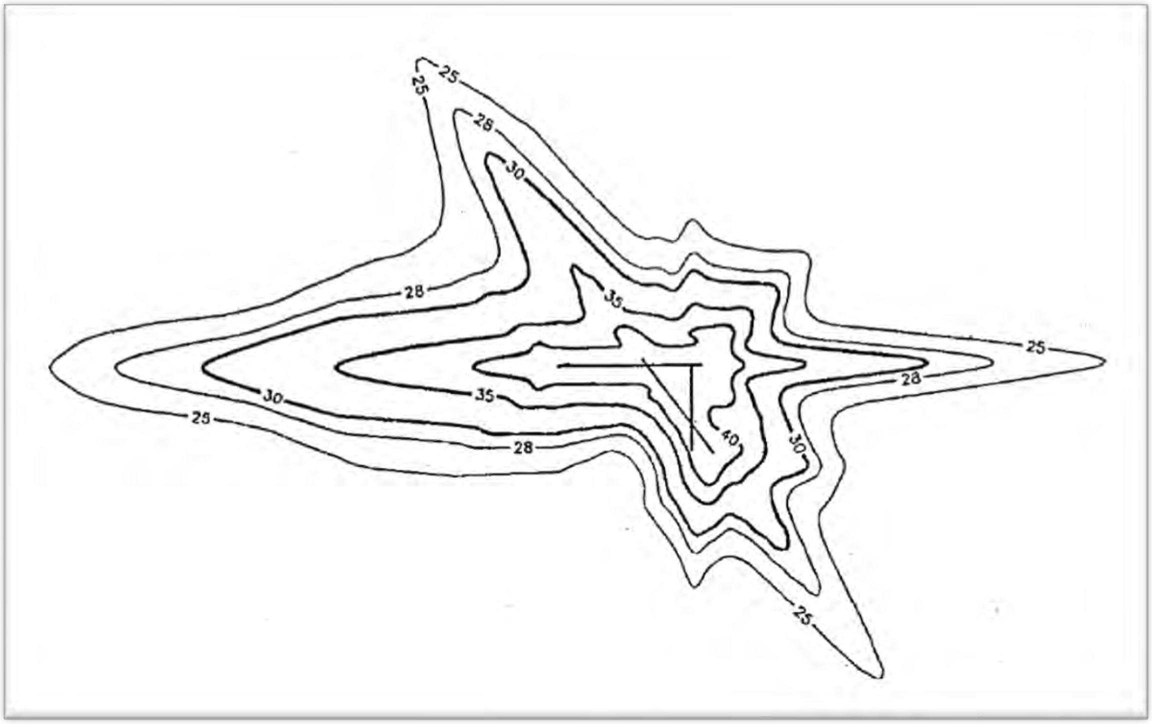

Figure 9-1 St. John's 1996 NEF Contours by Transport Canada

9.2.4.2 2002 Studies

The studies conducted in 2002 are represented in three Figures reproduced below. The first **Figure 9-2** identifies the 2991 NEF contours overlay by Transport Canada. The second **Figure 9-3** was prepared in 2002 based on existing 2000 traffic conditions and was used to compare to the 1996 Transport Canada NEF. The conclusion derived from this comparison was that there was an overall decrease in the noise footprint due to decreased traffic volume and changes in the air traffic mix. The final **Figure 9-4** entitled 2015 NEP Contour, was also developed in 2002 based on the Chapter II phase-out, fleet change and projected growth to the year 2015. These contours also suggested that the 1996 Transport Canada NEF contours continue to provide adequate land use compatibility protection at SJIA. At the time, although, several differences were noted, the contours developed by Transport Canada were recommended to remain effective as the official contours for land use planning consideration by the surrounding municipalities.

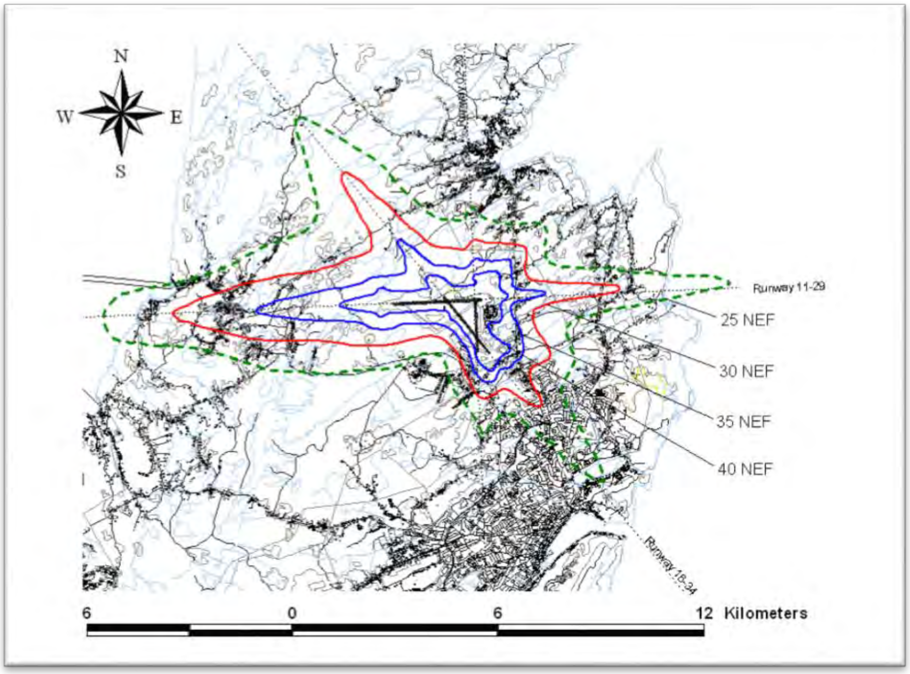

Figure 9-2 St. John's Airport 1996 NEF (Transport Canada)[24]

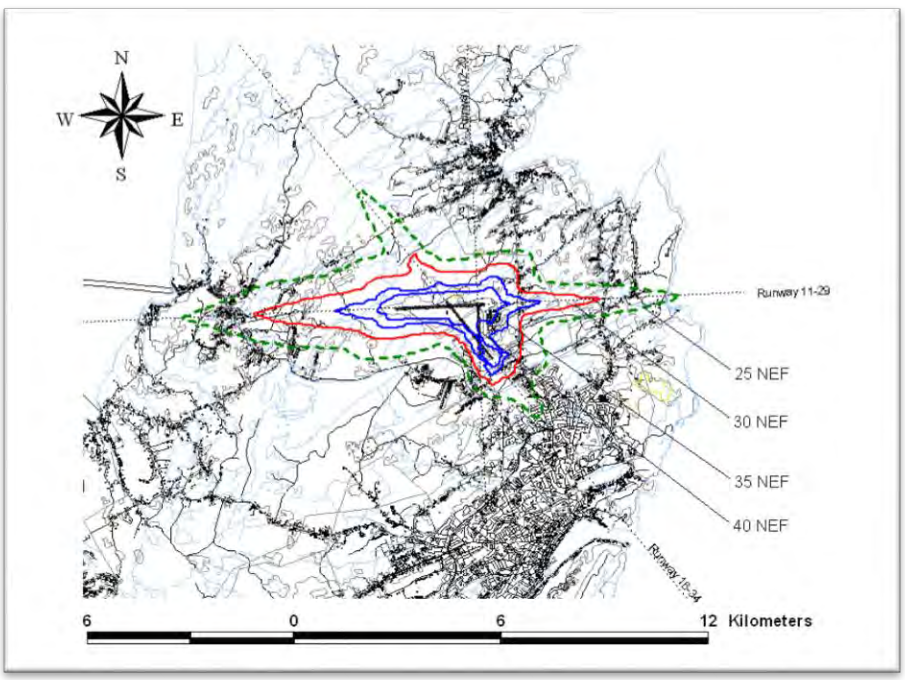

Figure 9-3 St. John's Airport 2000 NEF (Planning Contour)

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[24] Same as Figure 9-1 but georeferenced to the airport and surrounding topography.

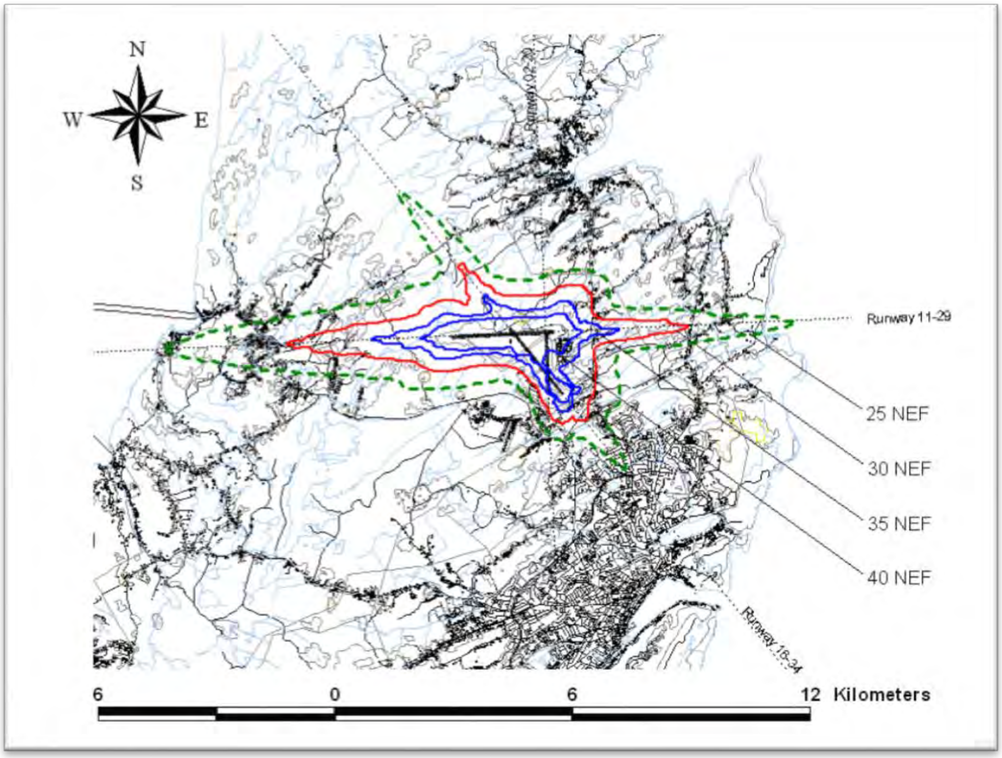

Figure 9-4 St. John's Airport 2015 NEP

9.2.4.3 2005 Studies

In 2005, St. John's International Airport commissioned an NEF and NEP study for a twenty year period. The studies included preparation of an NEP for 2015 based on 2005 statistics, 2025 NEP based on projected growth rate of 2.0 percent and an additional 2025 NEP based on the extension eastward of 1,500ft. on Runway 29. The conclusion reached remained the same as the 2002 studies, which recognized that the contour developed by Transport Canada should remain.

9.2.4.4 2016 Updated NEF-NEP and Recommendations

As part of the Master Planning process, a separate NEF study was commissioned. Noise Exposure Contours were updated for the St. John's International Airport. A total of four (4) sets of contours were developed. The first provided a baseline scenario for existing conditions. Two scenarios were then prepared for 10 and 20 years into the future: Noise Exposure Forecast (NEF) and Noise Exposure Projection (NEP) respectively. Finally, a Maximum Capacity scenario was developed based on the airport's infrastructure.

The growth forecast for the NEF and NEP contours did not create contours that were vastly larger nor significantly different than the existing baseline contours. The Maximum Capacity scenario however generated contours that were nearly twice the size of the baseline scenario. While this may seem significant, when compared to the Transport Canada developed 1996 NEF contours, the last scenario developed by this study is are not larger and are generally encompassed within the early 1996 NEF contours.

Based on the scenarios developed for this study and the nature of forecasting the future the aviation industry, it is recommended that no change to the official contours currently being used for land use planning need to be made. The 1996 Transport Canada NEF contours still represent an appropriate limit for residential development surrounding the airport.

9.2.5 Noise Abatement Procedures

Noise Abatement Procedures (NAP) are typically used to reduce the aircraft noise impact on nearby residents or other noise sensitive areas. Currently St. John's International Airport Authority has not identified the use of NAP as a requirement. The Airport may wish to further investigate the use of NAPs and consider implementation of these at a later date. However, it is not recommended that any restriction to operational hours ever be considered. To do so would have a significant and potentially detrimental impact on the ability for the Airport to continue to operate in a manner that is essential to providing a strong service to the local community and businesses within St. John's and greater Newfoundland and Labrador.

See below for a few examples of NAPs based on the Canadian Aviation Regulations, CARs 602.105:

- Preferential runways;
- Minimum Noise Routes; and
- Hours when aircraft operations are prohibited or restricted.

9.3 GROUND TRANSPORTATION

A number of initiatives have been undertaken to provide convenient and direct access to the Airport while minimizing airport-related traffic impacts on surrounding neighbourhoods. An important initiatives was development of World Parkway as the primary dedicated access to the western side of the Airport. The construction of World Parkway eliminated airport-related traffic on a number of surrounding streets. Similarly, access to the eastern side of the airport was enhanced with a new roadway intersection at RCAF Road and Torbay Road, which enhanced safety and capacity.

Studies have been undertaken to identify further enhancements to the groundside road network. These enhancements include; additional lanes on World Parkway, a better division and separation of passenger and airport operational support traffic, and the implementation of a roundabout at the intersection of World Parkway and Navigator Avenue.

9.4 MUNICIPAL ZONING AND BUILT DEVELOPEMNT

To ensure that development surrounding the SJIA is compatible with airport operations and the long-term viability, it is important that SJIAA works closely with the adjacent municipalities.

Compatible land uses include commercial and industrial uses as well as open space and agricultural land. Noise sensitive land uses such as residential, schools and hospitals should be located outside of an area defined by the 30 NEF/NEP Noise contour. Lands immediately to the north and west of the Airport are largely undeveloped. Lands directly south of the airport are industrial, whereas lands to the southwest are a mix of open space and residential. Lands to the east of the airport include commercial development and a golf course. Existing general municipal land uses surrounding the Airport are shown in **Figure 9-5**.

Figure 9-5 – Surrounding Municipal Land Use[25]

The surrounding urban development is in keeping with the registered NEF contours prepared by Transport Canada in 1996. Lands located within the 30 NEF contour have land use designations compatible with airport uses. Although there are some residential uses located within the 30 NEF contour, these areas are relatively small and developed prior to the establishment of the noise contours.

[25] Consolidated by WSP based on City and regional government planning departments land use plans.

10. IMPLEMENTATION AND PHASING

10.1 DEVELOPMENT / IMPLEMENTATION METRICS

Implementation and phasing recommendations have been formulated based on an evaluation of need and benefit using an evaluation matrix as discussed in **Section 6**. Each infrastructure component, as identified in **Exhibit E1** of **Appendix E** have been evaluated separately and assigned a score based on evaluation against the principal triggers for implementation. **Table 10-1** of **Appendix E** identifies the score obtained for each component and its respective rank amongst other components. For the purpose of infrastructure evaluation and the identification of improvements, a theoretical naming of infrastructure components has been used. Actual naming of taxiways will vary according to implementation and availability of designations. In order of priority each component is identified below and has been assigned to a short-, medium-, and long-term planning horizon corresponding to the phasing illustrated in **Exhibit E1**.

Short-term, 0-5 years (Green)

1. Taxiway A 02-20
2. Vehicle Holding Bay / VEC-BA
3. Taxiway M & N / TWY-M+N
4. Taxiway T / TWY-T1
5. Taxiway C / TWY-C1
6. Apron 1 / APR-1-EXPW
7. Taxiway L / TWY-L1
8. Taxiway H /TWY-H1
9. Taxiway P Holding Bay / TWY-P1

Medium-term, 5-10 years (Light Blue)

10. Taxiway Q / TWY-Q+R
11. Taxiway Q / TWY-Q1
12. Taxiway S / TWY-S1
13. CDF Expansion / APR-4-CDF1

Long-term, over 10 years (Dark Blue)

14. Apron 1 Expansion / APR-1-EXP3
15. Taxiway K Extension / TWY-K1
16. Taxiway Q & H / TWY-Q+H
17. Runway 34 Extension / RWY-34-EXT
18. CDF Expansion / APR-4-CDF2

19. Taxiway N / TWY-N2
20. Taxiway N / TWY-N1
21. Apron 1 Expansion / APR-1-EXP1 Long-Term
22. Apron 1 Expansion / APR-1-EXP2 Long-Term
23. Taxiway U / TWY-U1 Long-Term
24. Taxiway Q & N / TWY-Q&H Long-Term
25. Taxiway W / TWY-W1 Long-Term

10.2 SHORT-TERM IMPROVEMENTS

Suggested short-term airside infrastructure improvements consists of the:

- conversion of Runway 02-20 to a taxiway;
- construction of a maintenance vehicle holding bay;
- construction of taxiway connections from the CDF to Runway 11-29;
- expansion of Apron I;
- construction of dual-taxiways connecting the CDF to Apron I; and
- construction of an aircraft holding bay adjacent to Threshold 11.

These improvements are suggested based on the evaluation of capacity and forecast demand.

The conversion of Runway 02-20 to a taxiway would allow additional commercial development along Apron III and a reduction to development constraints on Apron II. This west extension development on Apron II is shown on E1 in yellow; this construction would be business case developed by tenants or other stakeholders.

The construction of vehicle holding bay immediately east of Glide Path 11 would provide snow removal equipment and other maintenance vehicles the ability to hold clear of the runway and ILS critical and sensitive areas without having to return to exit on Runway 16-34. This will help to minimize unnecessary runway occupancy by maintenance vehicles and reduce associated flight delays.

Construction of taxiway connections from the CDF to Runway 11-29, as illustrated in **Exhibit E1** of **Appendix E**, would serve as a partial parallel taxiway to Runway 11-29. The implementation of such would reduce taxi times and runway occupancy.

Expansion of Apron I is planned to accommodate the continued expansion of the PTB and the need for additional overnight parking. Changes to the Apron layout should be investigated to determine the benefits of Runway 02-20 repurposing as a taxiway.

In order to implement the suggested dual-taxiways between the CDF and Apron 1, Runway 16-34 will first need to adopt the OLS standards contained in TP 312 5th Edition. This will allow for reduced separations between taxiway and runway to be implemented and provide sufficient space to accommodate the two taxiways without impact to the CSB.

Planning guidance produced by the International Civil Aviation Organisation (ICAO) as well as standards implemented by the Federal Aviation Administration (FAA) support the construction of a full length parallel taxiway for Runway 11-29 based current air traffic movements and level of service. However, due to the high cost of taxiway construction an aircraft holding bay located adjacent to Threshold 11 is recommended as the first phase of parallel taxiway development.

These infrastructure improvements are aimed at significantly improving the efficiency of airside operations.

10.3 MEDIUM-TERM IMPROVEMENTS

Suggested medium-term improvements include:

- construction of a partial parallel taxiway for Runway 11-29;
- continued expansion of Apron I; and
- expansion of the CDF

The need to construct a parallel taxiway for Runway 11-29 has been identified based on planning guidance and studies of airfield capacity. It is recommended that a business case for its construction be undertaken. It is important to note that the FAA has also indirectly linked the implementation of a parallel taxiway to a reduction in risk and increase in operational safety, citing a requirement within Advisory Circular 150/5300-13A for its implantation based on visibility and approach minima.

Continued expansion of Apron I is anticipated to be required within the medium-term to accommodate demand with the priority being the southern expansion towards the existing Apron III. Along with the expansion of Apron I, the expansion of the CDF may be required if expected levels of peak-hour traffic are to be realised without increases to aircraft operational delays. Furthermore, the need for a potential alternative NSPV route between Apron I and Apron II should be considered a medium term requirement and has been shown on E1 for this timeframe.

10.4 LONG-TERM IMPROVEMENTS

Suggested long-term improvements within the planning horizon include:

- extension of Runway 16-34 towards the south;
- continued development of the parallel taxiway system for Runways 11-29 and 16-34 from Charlie to Threshold 34 along with an aircraft holding bay east of threshold;
- expansion of the CDF; and
- continued expansion of Apron I with reconfiguration of apron taxilanes.

The extension of Runway 16-34 towards the south of approximately 90 metres (295 feet) has been identified as a means to improve the usability of LAHSO operations and mitigate impacts associated with future runway rehabilitations.

Continued construction of taxiway improvements and the expansion of the CDF have been identified for the long-term based on anticipated demand.

Continued expansion of Apron I is anticipated along with the PTB. Reconfiguration of Apron I taxilanes may become necessary to optimize use of Apron areas.

It is important to note that not all anticipated improvements in the planning horizon are included in the above list. Rather, this list serves as a guide for airfield surface developments in accordance with the land use plan. Other groundside developments, including further ATB expansion, parking, road networks etc are dealt with under separate cover (see strategic terminal development plan and strategic terminal area development plan).

GLOSSARY	
Term	**Definition**
ACC	Area Control Centre
Aerodrome	Any area of land, water (including frozen surface thereof) or other supporting surface used or designed, prepared, equipped or set apart for use either in whole or in part for the arrival and departure, movement or servicing of aircraft and includes any building, installations and equipment in connection therewith.
Aerodrome Beacon	Aeronautical beacon used to indicate the location of an aerodrome from the air.
Aerodrome Elevation	The elevation of the highest point of the landing area.
Aerodrome Reference Code	A code-number and code-letter that provides a simple method to interrelate and identify standards for various sizes of Airports and match the aircraft that can operate on them. The code-number (1 to 4) reference the field length (than 800 m to 1,800 m and over). The code letters (A to E) reference the wingspan and the outer main gear wheel span (Up to 15 m wingspan and 4.5 gear wheel span to 52-65 m wing span and 9-14 m gear wheel span).
Aerodrome Reference Point	The designated point or points on an aerodrome normally located at or near the geometric centre of the runway complex that establishes the locus of the radius or radii of the outer surface (as defined in a Zoning Regulation).
Aerodrome Reference Temperature	The monthly mean of the maximum daily temperature for the hottest month of the year (the hottest month being that which has the highest monthly mean temperature).
Aeronautical Beacon	An aeronautical ground light visible at all azimuths, either continuously or intermittently, to designate a particular point on the surface of the earth.
Aeroplane Reference Field Length	The minimum field length required for take-off at maximum certificated take-off mass, sea level, standard atmospheric conditions, still air and zero runway slope, as shown in the appropriate aeroplane flight manual prescribed by the certificating authority or equivalent data from the aeroplane manufacturer. Field length means balanced field length for aeroplanes, if applicable, or take-off distance in other cases.
Air Carrier	Any company or person operating a commercial air service.
Air Terminal Building (ATB)	An installation provided with the facilities for loading and unloading aircraft and the intransit handling of traffic (passengers, cargo and mail) which is moved by aircraft.
Air Traffic	All aircraft in flight and aircraft on the manoeuvring area of an aerodrome.
Air Traffic Control (ATC)	A service as specified in Part VI of the Air Regulations provided for the purposes of preventing collisions between aircraft, and on the manoeuvring area between aircraft and obstructions, and expediting and maintaining an orderly flow of air traffic.

GLOSSARY	
Term	**Definition**
Air Traffic Control Tower	A facility established on an Airport to provide air traffic control services on and in the vicinity of that Airport; a structure containing facilities for the control of Airport traffic, including the movement of aircraft, vehicles and pedestrians in the manoeuvring areas, as well as aircraft in flight. This structure may be associated with an Air Terminal Building or an operational building or it may be a freestanding structure.
Aircraft	A machine capable of deriving support in the atmosphere from the reactions of the air
Aircraft Mix	The various types of aircraft operating at an Airport or in a region. Generally classified on the basis of weight and engine type. Category: Light – 0 to 12,499 lbs. (e.g. Cessna 402) Medium – 12,500 to 299,999 (e.g. Airbus A320) Heavy – over 300,000 (e.g. Boeing B767)
Aircraft Movement	Take-off, landing, or simulated approach by an aircraft. *Itinerant movement* Movements proceeding to or arriving from another location; or leaves the aerodrome traffic circuit but will be returning to land. Includes all fixed wing runway movements and helicopter operations. Excludes flights only passing through the control zone of the Airport in question. *Local movement* Local aircraft are considered as aircraft which remain in the circuit or in the vicinity of the Airport and will return to the Airport.
Aircraft Stand	A designated area on an apron intended to be used for parking an aircraft.
Aircraft Stand Taxilane	A portion of an apron designated as a taxiway and intended to provide access to aircraft stands only.
Airport	An aerodrome for which an Airport certificate is in force.
Airport Operator	The holder of an Airport certificate, or the person in charge of such Airport, whether, an employee, agent or representative.
Airport Zoning	The establishment of obstacle limitation surfaces to define the limits to which objects may project into the airspace around Airports.
Airport Zoning Regulations	A regulation respecting a given Airport pursuant to section S.4 of the Aeronautics Act made by the Governor in Council. A zoning or legal instrument which will prohibit the erection of structures which would violate any of the defined plane surfaces.
Airside	Movement area of an Airport, including adjacent terrain and buildings or portions thereof where access is controlled.

GLOSSARY	
Term	**Definition**
Apron	That part of an aerodrome, other than the manoeuvring area, intended to accommodate the loading and unloading of passengers and cargo, the refuelling, servicing, maintenance and parking of aircraft, and any movement of aircraft, vehicles and pedestrians necessary for such purposes.
Automated Weather Observation System (AWOS)	A set of meteorological sensors, and associated systems designed to electronically collect and disseminate meteorological data.
Bearing Strength	The structural ability of a surface to support loads imposed by aircraft.
Circling Procedure	Visual manoeuvring required after completing an instrument approach procedure.
Clearway	A defined rectangular area on the ground or water under the control of the appropriate authority, selected or prepared as a suitable area over which an aeroplane may make a portion of its initial climb to a specified height.
Commercial Aircraft	An aircraft operated or available for operation for hire or reward.
Control Tower	A structure containing facilities for the control of Airport traffic, including the movement of aircraft, vehicles and pedestrians on the manoeuvring areas, as well as aircraft in flight. This structure may be associated with an air terminal building or an operational building or it may be a free standing structure.
CRA	Critical Restricted Area
Critical Aircraft	The aircraft whose operational requirements are most demanding with respect to the determination of runway lengths, pavement load rating and other physical characteristics of the Airport design. The airplane (s) the aerodrome is intended to serve as having the most demanding operational requirements
Declared Distances	Take-off run available (TORA). The length of runway declared available and suitable for the ground run of an aeroplane taking off. Take-off distance available (TODA). The length of the take-off run available plus the length of the clearway, if provided. Accelerate-stop distance available (ASDA). The length of the take-off run available plus the length of the stopway, if provided. Landing distance available (LDA). The length of runway which is declared available and suitable for the ground run of an aeroplane landing.
Deplaned	Traffic (passengers, mail and cargo) which lands and disembarks form an aircraft at an Airport.

GLOSSARY	
Term	**Definition**
Derived Forecast	Is defined to include the following: • indirect forecasts (e.g. terminal or parking lot occupancy, ticket counter queues, etc.); • predicted schedules.
Direct Aviation Forecasts	Refers to annual and peak period forecasts of aircraft, passengers, cargo and mail.
Displaced Threshold	A threshold not located at the extremity of a runway. Displaced thresholds are used when an obstacle in the final approach area intrudes into the specific obstruction clearance surfaces. Displacing the threshold provides the required obstacle free slope. The declared landing distance (LDA) which assumes a specified obstacle clearance plane is therefore measured from the displaced threshold. However, there is no restriction to an aircraft actually landing on the usable runway prior to the displaced threshold. This portion of the runway is also available for take-off or rollout.
DME – Distance Measuring Equipment	Radio navigation equipment which provides a pilot with the slope distance from the aircraft to the transmitter/receiver station. Equipment (airborne and ground) used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.
Domestic Flight/Passenger	Movements at a Canadian Airport departing to or arriving from a point in Canada and which, therefore, do not involve inspection services.
Elevation	The vertical distance of a point or a level, on or affixed to the surface of the earth, measured from mean sea level.
Emergency Response Services (ERS)	Formerly "Crash, Fire fighting and Rescue Services" (CFR).
Enplaned	Traffic (passengers, mail and cargo) which boards an aircraft and takes off from an Airport.
Enplaned And Deplaned (E D)	E D passengers leave or board an aircraft at an Airport and include all O D passengers plus those who connect to or from other flights.
FAA	Federal Aviation Administration (U.S.)
Fixed Base Operator (FBO)	Private operator located on the Airport, providing space including hangars and other services, primarily aircraft related.
Fixed Light	A light having constant luminous intensity when observed from a fixed point.
Fleet Mix	The various types of aircraft operating at an Airport or in a region. Generally classified on the basis of weight and engine type.
Flight Service Station (FSS)	An aeronautical facility providing mobile and fixed communications, flight information, search and rescue alerting, and weather advising services to pilots and other users.

GLOSSARY	
Term	**Definition**
Frangible Object	An object of low mass designed to break, distort or yield on impact so as to present the minimum hazard to aircraft. *Note.- Guidance on design for frangibility is contained in the* ICAO *Aerodrome Design Manual Part 6*.
General Aviation	All civil aviation operations, other than scheduled air services and non scheduled air transport operations for remuneration or hire.
Glide Path	A descent profile determined for vertical guidance during a final approach.
GPS	Global Positioning System
GPS – Global Positioning Equipment	Navigation equipment which provides a pilot with the exact position of the runway based on satellite transmissions.
Graded Area	An area adjacent to a runway which is graded to a specified standard to minimize hazards to aircraft which may accidentally run off of the runway surface.
Groundside	That area of an aerodrome not intended to be used for activities related to aircraft operations and to which the public normally has unrestricted access.
Hangar	A building which houses aircraft.
Hazard Beacon	An aeronautical beacon used to designate danger to air navigation.
Head Of Stand (HOS) Road	Service road provided between the terminal building and the aircraft parking position (stand) for movement of ground vehicles.
Height Above Aerodrome (HAA)	The height in feet of the MDA (for circling approaches) above the aerodrome elevation.
Height Above Touchdown Zone Elevation (HAT)	The height in feet of the DH and the MDA (for straight-in approaches) above the Touchdown Zone Elevation.
Holding Bay	A defined area where aircraft can be held, or bypassed, to facilitate efficient surface movement of aircraft.
ICAO	International Civil Aviation Organization
IFR	Instrument Flight Rules
IFR Flight	A flight conducted in accordance with the instrument flight rules.
IFR Weather Conditions	Weather conditions below the minima prescribed pursuant to Section 541 (of the Air Regulations).
ILS	Instrument Landing System, made up of 3 degree glide-path and localizer
ILS – Instrument Landing System	An arrangement of radio transmitters which provide a pilot with horizontal and vertical guidance to a runway touchdown point.
Instrument Approach Procedure	A series of predetermined manoeuvres by reference to flight instruments for the orderly transfer of an aircraft from the beginning of the initial approach to a landing, or to a point from which a landing may be made.

GLOSSARY	
Term	**Definition**
Instrument Landing System (ILS)	A radio navigation system which provides aircraft with horizontal and vertical guidance during an approach landing.
Instrument Landing System (ILS)	ILS equipment includes: a localizer for an azimuth guidance and glidepath transmitter for vertical guidance.
Instrument Landing System (ILS)	ILS Category I: an approach procedure to a height above touchdown of not less than 200 feet and with runway visual range of not less than 1,800 feet.
Instrument Landing System (ILS)	ILS Category II: an approach procedure to a height above touchdown of not less than 100 feet and with runway visual range of not less than 1,200 feet.
Instrument Meteorological Conditions (IMC)	Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling less than the minima specified for visual meteorological conditions.
Instrument Runway	A runway suitably equipped for the operation of aircraft under IFR conditions. a) Instrument Approach Runway – an instrument runway served by visual and non-visual aids providing directional guidance adequate for a straight-in approach. b) Precision Approach Runway, Category I – an instrument runway served by ILS or GCA approach aids and visual aids intended for operations down to 200 feet decision height and down to an RVR of the order of 2,600 feet. c) Precision Approach Runway. Category II – an instrument runway served by ILS and visual aids intended for operations down to 100 feet decision height and down to an RVR of the order to 1,200 feet. d) Precision Approach Runway Category III – an instrument runway served by ILS (no decision height being applicable) and: i. by visual aids intended for operations down to an RVR of the order of 700 feet: ii. by visual aids intended for operations down to an RVR of the order of 150 feet: iii. intended for operations without reliance on external visual reference.
International Airport	An Airport designated by Transport Canada to support international commercial air transport and listed as such in the ICAO Air Navigation Plan - North Atlantic, North American, and Pacific Regions (ICAO Doc 8755/13).
International Civil Aviation Organization (ICAO)	A specialized agency of the United Nations, the objective of which is to develop the principles and techniques of international air navigation and to foster planning and development of international civil air transport. http://www.icao.org
JAA	European Joint Aviation Authorities

GLOSSARY	
Term	**Definition**
LIAL	Low Intensity Approach Lighting
Localizer	The component of an instrument landing system (ILS) which provides lateral guidance with respect to the runway centreline.
Manoeuvring Area	That part of an aerodrome to be used for the take-off, landing and taxiing of aircraft, excluding aprons.
Movement	A take-off or a landing
Movement Area	
NAP	Noise Abatement Procedures, which are federally regulated
National Airports Policy (NAP)	A Federal Government policy which establishes the first clear framework for the federal government's role in Airports and will shift that role from owner and operator, to landlord and regulator.
National Airports System (NAS)	The core network of Canadian Airports comprised of the 26 Airports that currently handle 94 per cent of air travellers in Canada. NAS Airports include those in the national and provincial capitals as well as Airports that handle at least 200,000 passengers each year.
Navaid	A navigational aid located on the ground.
NAV CANADA	The corporation providing air navigation services in Canadian airspace and ATS in international airspace for which Canada has assumed responsibility.
NDB – Non-Directional Beacon	Radio navigation aid which enables a pilot to fly an aircraft to a transmitter. Operates in the medium frequency (AM) band.
NEF	Noise Exposure Forecast (based on 5 to 10 year forecasts)
NEP	Noise Exposure Projection (based on forecasts beyond 10 years but not past 20 years)
Night	The period beginning one half-hour after sunset and ending one half-hour before sunrise and, in respect of any place where the sun does not rise or set daily, the period during which the centre of the sun's disc is more than six degrees below the horizon.
NLA	New Large Aircraft
Nm	Nautical Mile (1.152 Statute Miles, 1.853 kilometres)
NMT	Noise Monitoring Terminal
Noise Abatement Procedures	Noise operating restrictions may be applied at any aerodrome where there is an identified requirement. When applied at an aerodrome, the procedures and restrictions will be set out in the Canadian Flight Supplement (CFS) and/or the Canadian Air Pilot.
Noise Exposure Forecast (NEF)	The officially recognized metric measurement used for Airport noise assessment in Canada.

GLOSSARY	
Term	**Definition**
Noise Exposure Projections (NEP)	A system of estimating aircraft noise levels in vicinity of Airports. The noise estimates are provided in the form of contours overlaid on 1:50,000 map of the Airport and its surrounding communities. The noise level of each contour is indicated by the Noise Exposure Projections (NEP) index. The NEP index values are calculated using a computer program, developed and maintained by Transport Canada. Projections of aircraft traffic movements, aircraft types, night/day split, runway and flight path utilization, and Airport configurations are provided as data for the calculation.
Non-Directional Beacon (NDB)	A radio beacon transmitting non-directional signals whereby the pilot of an aircraft equipped with direction-finding equipment can determine bearing to or from the radio beacon.
Non-Instrument Runway	A runway intended for the operation of aircraft under visual flight conditions. This will include circling approaches.
Non-precision Approach Runway.	An instrument runway served by visual aids and a non-visual aid providing at least directional guidance for a straight in approach.
Obstacle Limitation Surface (OLS)	A surface that establishes the limit to which objects may project into the airspace associated with an aerodrome so that aircraft operations at the aerodrome may be conducted safely. Obstacle limitation surfaces consist of the following: • Outer surface. A surface located in a horizontal plane above an aerodrome and its environs. • Take-off/Approach surface. An inclined plane beyond the end of a runway and preceding the threshold of a runway. • Transitional surface. A complex surface along the side of the strip and part of the side of the approach surface, that slopes upwards and outwards to the outer surface, when provided.
ODALS	Omni Directional Approach Lighting System (FAA/US).
OLS – Obstacle Limitation Surface	A surface that establishes the limit to which objects may project into the airspace associated with an aerodrome so that aircraft operations may be conducted safely. Obstacle limitation surfaces consist of the following: • Outer surface. A surface located in a horizontal plane above an aerodrome. • Take-off/Approach surface. An inclined plane beyond the end of a runway and preceding the threshold of a runway. • Transitional surface. A complex surface along the side of the strip and part of the side of the approach surface, that slopes upwards and outwards to the outer surface.

GLOSSARY

Term	Definition
Operator	In respect of an aircraft, means the person in possession of the aircraft, whether as owner, lessee, hire or otherwise and, in respect of an Airport, means the holder of the Airport licence, or the person in charge of such Airport, whether as employee, agent or representative of the holder of such licence.
Origin And Destination (O D)	O D passengers are those who either start or terminate their trips at an Airport.
Other Commercial	All flight other than unit-toll services performed by aircraft classified as “2” or “3” under “purpose” in the Canadian Civil Aircraft Register; all non-unit toll movements by foreign commercial carriers including charter, training, specialty services, ferry flight, etc.
PANCAP	Practical Annual Capacity, used in reference to theoretical runway capacity.
PAPI	Precision Approach Path Indicator
PAPI – Precision Approach Path Indicator	A set of lights near the threshold of a runway to provide the pilot with an indication of the correct approach.
Passenger	A person, who pays a fare and receives air transportation, including a free baggage allowance, is counted as one revenue passenger. Person paying 25% or less of the adult fares are not included.
Passenger Origin And Destination	The first and last Airport in a passenger’s itinerary.
Pavement Classification Number (PCN)	A number expressing the bearing strength of a pavement for unrestricted operations.
Peak Hour Movements	Aircraft movements operated during the busiest hour (minutes 00 to 59 inclusive).
PHOCAP	Practical Hourly Capacity; used in reference to theoretical runway capacity.
Planning Peak Day (PPD)	An average day of the peak month.
Planning Peak Hour (Day) Passengers	The hourly (daily) traffic volume used for terminal facility planning purposes. This level (which falls between the average traffic volume and the absolute peak) is determined in accordance with planning standard. For example, the planning peak hour passenger volume or PPHP, for terminal planning at large Airports is defined as the 90th percentile of the annual distribution of hourly passengers. Note: The hourly passenger volume refers to clock hour.
Planning Peak Hour (PPH)	The busiest hour during the PPD.
Precision Approach	An instrument approach in which the final approach is conducted in accordance with directions issued by a controller referring to a precision approach radar display.
Primary Runway	The runway(s) intended to serve the critical aircraft.
Private Aircraft	A civil aircraft, other than a commercial aircraft or a state aircraft.

GLOSSARY	
Term	**Definition**
Ramp	Radar Modernization Project
Road-Holding Position	A designated position at which vehicles may be required to hold.
Runway	The defined area on a land aerodrome prepared for the landing and take-off of aircraft.
Runway End Safety Area (RESA)	An area symmetrical about the extended runway centre line and adjacent to the end of the strip primarily intended to reduce the risk of damage to an aeroplane undershooting or overrunning the runway.
Runway Identification Light (RILs)	Lights provided at aerodromes where terrain precludes the installation of approach lights, or where extraneous non- aeronautical lights or the lack of daytime contrast reduces the effects of approach lights.
Runway Strip	A defined area including the runway and stopway, if provided, intended: • To reduce the risk of damage to aircraft running off a runway; and • To protect aircraft flying over it during take-off or landing operations.
Runway Visual Range (RVR)	The range over which the pilot of an aircraft on the centre line of a runway can see the runway surface markings or the lights delineating the runway or identifying its centre line.
RWY Or Rwy	Runway
Secondary Runway	The runway (s) designed to serve less critical airplanes and not necessarily sufficient for all airplanes which the primary runway is intended to serve, and is provided to take account of the effect of particular winds of high velocity.
SEL	Single event noise exposure level in dBA accounting for maximum noise level and duration
Shoulder	An area adjacent to the edge of a pavement so prepared as to provide a transition between the pavement and the adjacent surface.
SID	Standard Instrument Departure
Stopway	A defined area on the ground at the end of a runway that is the same width as the runway and designated and approved for decelerating an aircraft in the event of an abandoned take-off.
Taxi	To operate an airplane under its own power on the ground, except that movement incident to actual take-off and landing.
Taxi-Holding Position	A designated position at which taxiing aircraft and vehicles may be required to hold in order to provide adequate clearance from a runway.

GLOSSARY

Term	Definition
Taxiway	A defined path on a land aerodrome established for the taxiing of aircraft and intended to provide a link between one part of the aerodrome and another, including: • Apron taxiway. A portion of a taxiway system located on an apron and intended to provide a through taxi route across the apron. • Rapid exit taxiway. A taxiway connected to a runway at an acute angle and designed to allow landing aeroplanes to turn off at higher speeds than are achieved on other exit taxiways thereby minimising runway occupancy times.
Taxiway Strip	An area including a taxiway intended to protect an aircraft operating on the taxiway and to reduce the risk of damage to an aircraft accidentally running off the taxiway.
TC	Transport Canada
TDZ – Touchdown Zone	The portion of the runway, beyond the threshold, where it is intended landing airplanes first contact the runway.
Threshold	The beginning of that portion of the runway usable for landing.
Threshold Lights	Lights placed across the ends of a runway or landing strip to indicate the usable limits thereof.
TODA	Take-Off Distance Available. The length of the take-off run available plus the length of the clearway, if provided.
TORA	Take-Off Run Available. The length of runway declared available and suitable for ground run of an aeroplane taking off.
Touchdown Zone (TDZ)	The portion of a runway, beyond the threshold, where it is intended landing aeroplanes first contact the runway.
Touchdown Zone Elevation (TDZE)	The highest elevation in the Touchdown Zone.
Traffic Density	Light: not greater than 15 movements per runway or less than 20 total aerodrome movements; Medium. 16 to 25 movements per runway or between 20 to 35 total aerodrome movements; and Heavy. 26 or more movements per runway or more than 35 total aerodrome movements.
Transport Canada	The federal authority responsible for the regulation of civil aviation in Canada, http://www.tc.gc.ca
Usability Factor	The percentage of time during which the use of a runway or system of runways is not restricted because of the cross-wind component. *Note. - Cross-wind component means the surface wind component at right angles to the runway centre line.*
Very High Frequency Omni-range Navigation Equipment (VOR)	A type of electronic navigation equipment. VOR is a phase comparison system in which an instrument in the cockpit shows the direction of the VOR station.
VFR	Visual Flight Rules

GLOSSARY	
Term	**Definition**
VFR	The visual flight rules.
VFR Flight	A flight conducted in accordance with the visual flight rules.
VFR Weather Conditions	Weather conditions equal to or above the minima prescribed pursuant to Section 541 (of the Air Regulations).
VHF – Very High Frequency	The band of radio frequencies used for air radio communications and navigation.
Visual Approach	An approach by an IFR aircraft operating clear of clouds and with at least one statute mile flight visibility, in which all or part of an instrument approach procedure is not completed and the approach is executed by visual reference to the surface of the earth.
Visual Approach Slope Indicator System (VASIS)	An Airport lighting facility providing vertical approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams.
Visual Flight Rules (VFR)	The rules that govern the procedures for conducting flight under visual conditions. The abbreviation "VFR" is also used to indicate weather conditions that are equal to or greater than minimum VFR requirements. In addition, it is used by pilots and controllers to indicate type of flight plan.
Visual Meteorological Conditions (VMC)	Meteorological conditions expressed in terms of visibility, distance from cloud, and ceiling, equal to or better than specified minima.
VOR – Very High Frequency Omnidirectional Range	A type of radio navigation system using VHF radio frequencies which provides an aircraft pilot with immediate information on the heading to the transmitter.

APPENDIX A

AIRPORT MASTER PLAN EXHIBITS

AIRPORT BUILDING INDEX

NO.	DESCRIPTION
1	PASSENGER TERMINAL BUILDING & SJIAA ADMINISTRATION
2	GUARD HOUSE
3	STORAGE FACILITY
4	RAMP SERVICES BUILDING
5	COMBINED SERVICES BUILDING (CSB)
6	NAV CANADA AIR TRAFFIC CONTROL TOWER (ATCT)
7	AIRFIELD MAINTENANCE STORAGE FACILITY
8	FIELD ELECTRICAL CENTRE (FEC)
9	E.W. HARVEY
10	CENTRAL DEICING FACILITY (CDF) OPERATIONS BUILDING
11	COUGAR SEARCH AND RESCUE OPERATIONS FACILITY
12	COUGAR HELICOPTERS
13	HOLIDAY INN EXPRESS
14	SERVICES BUILDING
15	FUEL STORAGE FACILITY (TO BE RELOCATED)
16	COUGAR HELICOPTERS (TO BE RETIRED)
17	PUMP HOUSE (LOCATION UNDER REVIEW)
18	RECREATION CENTRE
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21	HANGAR
22	HANGAR
23	STORAGE FACILITY
24	HANGAR
25	HANGAR
26	STORAGE FACILITY
27	FUEL STORAGE FACILITY
28	FUEL STORAGE FACILITY
29	STORAGE FACILITY
30	SPCA
31	STORAGE FACILITY

LEGEND

ITEM	EXISTING
AIRPORT PROPERTY LINE	
ELECTRONIC PROTECTION AREA	
AIRFIELD PAVEMENT	
ROADWAY AND PARKING	
BUILDINGS	
RUNWAY END SAFETY AREA (RESA)	
AIRPORT SECURITY FENCE	
PAPI SYSTEM	

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January 12, 2017

No.	DATE	DESCRIPTION	BY	QA/QC
4	JAN. 2017	FINAL REPORT	JRM	JH
3	12/31/2015	FINAL REPORT	JRM	JH
2	12/18/2015	FINAL DRAFT	JRM	JH
1	12/11/2015	DRAFT	JRM	JH
0	11/23/2015	PRELIMINARY DRAFT	JRM	JH

REVISION / ISSUE

Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY.

North Arrow

Consultant

WSP

Client

ST. JOHN'S
International Airport Authority

Scale

Scale 1:7000

100 0 50 100 250 500 METRES

250 0 250 500 1000 1500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015 - 2035
EXISTING CONDITIONS

Project No. 141-25347-00

EXHIBIT A1

AIRPORT BUILDING INDEX

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26	STORAGE FACILITY
27	FUEL STORAGE FACILITY
28	FUEL STORAGE FACILITY
29	STORAGE FACILITY
30	SPCA
31	STORAGE FACILITY
A	EAST ATB EXPANSION (PHASE 1)
B	WEST ATB EXPANSION (PHASE 2)

LEGEND

ITEM	EXISTING	LONG-TERM	ULTIMATE
AIRPORT PROPERTY LINE		N/A	N/A
AIRFIELD PAVEMENT			
ROADWAY AND PARKING			N/A
BUILDINGS			N/A
RUNWAY END SAFETY AREA (RESA)			
AIRPORT SECURITY FENCE		N/A	
PAPI SYSTEM		N/A	N/A
ELECTRONIC PROTECTION AREA			
RUNWAY SAFETY AREA (RSA)	N/A		
RUNWAY/TAXIWAY STRIP	N/A		

No.	DATE	DESCRIPTION	BY	QA/QC
5	JAN. 2017	FINAL REPORT	JRM	JH
4	12/23/2016	FINAL REPORT	JRM	JH
3	12/31/2015	FINAL REPORT	JRM	JH
2	12/18/2015	FINAL DRAFT	JRM	JH
1	12/11/2015	FIRST DRAFT FOR CLIENT REVIEW	JRM	JH

REVISION / ISSUE

Notes

1. DRAWING IS TO BE USED FOR PANNING PURPOSES ONLY.
2. ENVIRONMENTAL ISSUES IDENTIFIED PER PORTER DILLON LIMITED.

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:7000

100 0 50 100 250 500 METRES

250 0 250 500 1000 1500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035 DEVELOPMENT CONSTRAINTS AND OPPORTUNITIES

Project No. 141-25347-00

EXHIBIT A2

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\CYYT Constraints and Opportunities r3a.dwg
January 13, 2017

LAND USE LEGEND

ITEM
AIRSIDE SYSTEM (AS)
AIRPORT RESERVE (AR)
TERMINAL RESERVE (TR)
AIRSIDE COMMERCIAL (AC)
GROUNDSIDE COMMERCIAL (GC)
RESTRICTED GROUNDSIDE COMMERCIAL (RGC)
NON-AVIATION GROUNDSIDE COMMERCIAL (NAGC)
OPERATIONS AND SUPPORT SERVICES (OASS)
PUBLIC ACCESS AND PARKING (PAAP)

LEGEND

ITEM	EXISTING	LONG-TERM	ULTIMATE
AIRPORT PROPERTY LINE		N/A	N/A
AIRFIELD PAVEMENT			
ROADWAY AND PARKING			N/A
BUILDINGS			N/A
RUNWAY END SAFETY AREA (RESA)			
AIRPORT SECURITY FENCE		N/A	
PAPI SYSTEM		N/A	N/A
ELECTRONIC PROTECTION AREA			
RUNWAY SAFETY AREA (RSA)	N/A		
RUNWAY/TAXIWAY STRIP	N/A		

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January 13, 2017

No.	DATE	DESCRIPTION	BY	QA/QC
5	JAN. 2017	FINAL REPORT	JRM	JH
4	12/23/2016	FINAL REPORT	JRM	JH
3	12/31/2015	FINAL REPORT	JRM	JH
2	12/18/2015	FINAL	JRM	JH
1	12/11/2015	FIRST DRAFT FOR CLIENT REVIEW	JRM	JH

REVISION / ISSUE

Notes

1. DRAWING IS TO BE USED FOR PANNING PURPOSES ONLY.

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:7000

100 0 50 100 250 500 METRES

250 0 250 500 1000 1500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

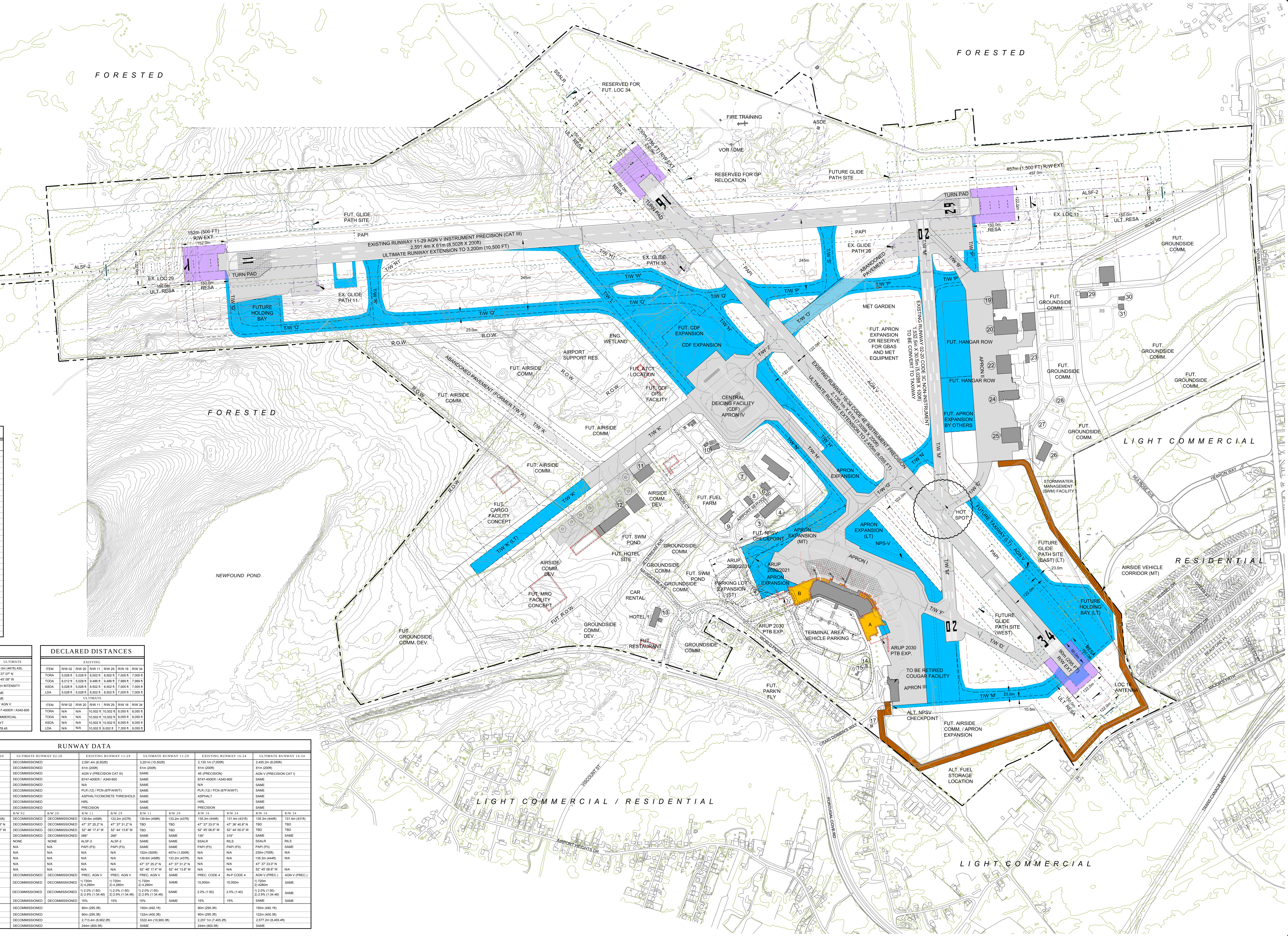
Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT LAND USE PLAN UPDATE 2015 - 2035
RECOMMENDED AIRPORT LAND USE PLAN

Project No. 141-25347-00

EXHIBIT A3



AIRPORT BUILDING INDEX

NO.	DESCRIPTION
1	PASSENGER TERMINAL BUILDING & SJIAA ADMINISTRATION
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28	FUEL STORAGE FACILITY
29	STORAGE FACILITY
30	SPCA
31	STORAGE FACILITY
A	EAST ATB EXPANSION (PHASE 1)
B	WEST ATB EXPANSION (PHASE 2)

AIRPORT DATA

ITEM		EXISTING	ULTIMATE
ESTABLISHED AIRPORT ELEVATION		140.5m (461ft) ASL	140.5m (461ft) ASL
AIRPORT REFERENCE POINT (ARP)	-- LATITUDE	47° 37' 07" N	47° 37' 07" N
COORDINATES (NAD '83)	-- LONGITUDE	52° 45' 09" W	52° 45' 09" W
AIRPORT VISUAL AIDS		HIGH INTENSITY	HIGH INTENSITY
AREA NAVIGATIONAL AIDS		VOR, DME, ILS, NDB	SAME
AERODROME REF. TEMPERATURE		20.1° C	SAME
AIRPORT REFERENCE CODE		4E / AGN V	4E / AGN V
CRITICAL DESIGN AIRCRAFT		B747-400ER / A340-600	B747-400ER / A340-600
AIRPORT ROLE		COMMERCIAL	COMMERCIAL
AIRPORT IDENTIFIER (ICAO)		CYYT	CYYT
AIRPORT ACREAGE		1,578.45	1,578.45

DECLARED DISTANCES

EXISTING						
ITEM	R/W 02	R/W 20	R/W 11	R/W 29	R/W 16	R/W 34
TORA	5,028 ft	5,028 ft	8,502 ft	8,502 ft	7,005 ft	7,005 ft
TODA	6,012 ft	5,028 ft	9,486 ft	9,486 ft	7,989 ft	7,989 ft
ASDA	5,028 ft	5,028 ft	8,502 ft	8,502 ft	7,005 ft	7,005 ft
LDA	5,028 ft	5,028 ft	8,502 ft	8,502 ft	7,005 ft	7,005 ft
ULTIMATE						
ITEM	R/W 02	R/W 20	R/W 11	R/W 29	R/W 16	R/W 34
TORA	N/A	N/A	10,502 ft	10,502 ft	8,055 ft	8,055 ft
TODA	N/A	N/A	10,502 ft	10,502 ft	8,055 ft	8,055 ft
ASDA	N/A	N/A	10,502 ft	10,502 ft	8,055 ft	8,055 ft
LDA	N/A	N/A	10,002 ft	9,002 ft	7,300 ft	8,055 ft

RUNWAY DATA

ITEM		EXISTING RUNWAY 02-20		ULTIMATE RUNWAY 02-20		EXISTING RUNWAY 11-29		ULTIMATE RUNWAY 11-29		EXISTING RUNWAY 16-34		ULTIMATE RUNWAY 16-34	
RUNWAY LENGTH		1,532.5m (5,028ft)		DECOMMISSIONED		2,591.4m (8,502ft)		3,201m (10,502ft)		2,135.1m (7,005ft)		2,455.2m (8,055ft)	
RUNWAY WIDTH		30.5m (100ft)		DECOMMISSIONED		61m (200ft)		61m (200ft)		61m (200ft)		61m (200ft)	
RUNWAY REFERENCE CODE		3C (NON-INSTRUMENT)		DECOMMISSIONED		AGN V (PRECISION CAT III)		SAME		4E (PRECISION)		AGN V (PRECISION CAT I)	
CRITICAL DESIGN AIRCRAFT		B727-200		DECOMMISSIONED		B747-400ER / A340-600		SAME		B747-400ER / A340-600		SAME	
% WIND COVERAGE (ALL WEATHER)		N/A		DECOMMISSIONED		N/A		SAME		N/A		SAME	
RUNWAY PAVEMENT	-- STRENGTH	PLR (11) / PCN (54F/A/W/T)		DECOMMISSIONED		PLR (12) / PCN (67F/A/W/T)		SAME		PLR (12) / PCN (67F/A/W/T)		SAME	
	-- SURFACE TYPE	ASPHALT		DECOMMISSIONED		ASPHALT/CONCRETE THRESHOLD		SAME		ASPHALT		SAME	
RUNWAY LIGHTING		HIRL		DECOMMISSIONED		HIRL		SAME		HIRL		SAME	
RUNWAY PAVEMENT MARKING		NON-PRECISION		DECOMMISSIONED		PRECISION		SAME		PRECISION		SAME	
RUNWAY ENDS		R/W 02	R/W 20	R/W 02	R/W 20	R/W 11	R/W 29	R/W 11	R/W 29	R/W 16	R/W 34	R/W 16	R/W 34
END ELEVATIONS (MSL)		135.6m (445ft)	134.1m (440ft)	DECOMMISSIONED	DECOMMISSIONED	139.6m (458ft)	133.2m (437ft)	139.6m (458ft)	133.2m (437ft)	135.3m (444ft)	131.4m (431ft)	135.3m (444ft)	131.4m (431ft)
END COORDINATES (NAD 83)	-- LATITUDE	47° 36' 42.0" N	47° 37' 31.8" N	DECOMMISSIONED	DECOMMISSIONED	47° 37' 25.2" N	47° 37' 31.2" N	TBD	TBD	47° 37' 33.0" N	47° 36' 40.8" N	TBD	TBD
	-- LONGITUDE	52° 44' 17.4" W	52° 44' 22.2" W	DECOMMISSIONED	DECOMMISSIONED	52° 46' 17.4" W	52° 44' 13.8" W	TBD	TBD	52° 45' 06.6" W	52° 44' 00.0" W	TBD	TBD
TRUE BEARING		356°	176°	DECOMMISSIONED	DECOMMISSIONED	086°	266°	SAME	SAME	139°	319°	SAME	SAME
APPROACH LIGHTING		NONE	NONE	NONE	NONE	ALSF-2	ALSF-2	SAME	SAME	SSALR	RILS	SSALR	RILS
VISUAL APPROACH AIDS		N/A	N/A	N/A	N/A	PAPI (P3)	PAPI (P3)	SAME	SAME	PAPI (P3)	PAPI (P3)	PAPI (P3)	SAME
RUNWAY THRESHOLD DISPLACEMENT LENGTH		N/A	N/A	N/A	N/A	N/A	N/A	152m (500ft)	457m (1,500ft)	N/A	N/A	230m (755ft)	N/A
THRESHOLD DISPLACEMENT ELEVATION (MSL)		N/A	N/A	N/A	N/A	N/A	N/A	139.6m (458ft)	133.2m (437ft)	N/A	N/A	135.3m (444ft)	N/A
THRESHOLD DISPLACEMENT	-- LATITUDE	N/A	N/A	N/A	N/A	N/A	N/A	47° 37' 25.2" N	47° 37' 31.2" N	N/A	N/A	47° 37' 33.0" N	
END COORDINATES	-- LONGITUDE	N/A	N/A	N/A	N/A	N/A	N/A	52° 46' 17.4" W	52° 44' 13.8" W	N/A	N/A	52° 45' 06.6" W	N/A
OLS RUNWAY APPROACH CLASSIFICATION		NI CODE 3	NI CODE 3	DECOMMISSIONED	DECOMMISSIONED	PREC. AGN V	PREC. AGN V	PREC. AGN V	SAME	PREC. CODE 4	IN-P CODE 4	AGN V (PREC.)	AGN V (PREC.)
TAKE-OFF/APPROACH SURFACE LENGTH		2,500m	2,500m	DECOMMISSIONED	DECOMMISSIONED	1) 720m 2) 4,280m	1) 720m 2) 4,280m	1) 720m 2) 4,280m	SAME	15,000m	15,000m	1) 720m 2) 4280m	SAME
TAKE-OFF/APPROACH SURFACE SLOPE		2.5% (1:40)	2.5% (1:40)	DECOMMISSIONED	DECOMMISSIONED	1) 2.0% (1:50) 2) 2.9% (1:34.48)	1) 2.0% (1:50) 2) 2.9% (1:34.48)	1) 2.0% (1:50) 2) 2.9% (1:34.48)	SAME	2.0% (1:50)	2.5% (1:40)	1) 2.0% (1:50) 2) 2.9% (1:34.48)	SAME
TAKE-OFF/APPROACH SURFACE DIVERGENCE		10%	10%	DECOMMISSIONED	DECOMMISSIONED	15%	15%	15%	SAME	15%	15%	SAME	SAME
RUNWAY END SAFETY AREA (RESA) LENGTH (BEYOND LENGTH OF STRIP)		N/A		DECOMMISSIONED		90m (295.3ft)		150m (492.1ft)		90m (295.3ft)		150m (492.1ft)	
RUNWAY END SAFETY AREA (RESA) WIDTH		N/A		DECOMMISSIONED		90m (295.3ft)		122m (400.3ft)		90m (295.3ft)		122m (400.3ft)	
RUNWAY STRIP TOTAL LENGTH		1,654.5m (5,428.1ft)		DECOMMISSIONED		2,713.4m (8,902.2ft)		3322.4m (10,900.3ft)		2,257.1m (7,405.2ft)		2,577.2m (8,455.4ft)	
RUNWAY STRIP TOTAL WIDTH		90m (295.3ft)		DECOMMISSIONED		244m (800.5ft)		SAME		244m (800.5ft)		SAME	

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\CYYT ALP r3a.dwg
January 13, 2017

No.	DATE	DESCRIPTION	BY	QA/QC
5	JAN. 2017	FINAL REPORT	JRM	JJH
4	12/23/2016	FINAL DRAFT	JRM	JJH
3	01/31/2015	FINAL DRAFT	JRM	JJH
2	12/18/2015	DRAFT FINAL FOR MASTER PLAN	JRM	JJH
1	12/11/2015	FIRST DRAFT FOR CLIENT REVIEW	JRM	JJH

REVISION / ISSUE

Notes

TORA - TAKEOFF RUN AVAILABLE
TODA - TAKEOFF DISTANCE AVAILABLE
ASDA - ACCELERATE STOP DISTANCE AVAILABLE
LDA - LANDING DISTANCE AVAILABLE

WIND COVERAGE REFERENCED FROM ST. JOHN'S USABILITY STUDY, COMPLETED BY SYPHER, 1982.

Legend

ITEM	EXISTING	ULTIMATE
AIRPORT PROPERTY LINE		N/A
AIRFIELD PAVEMENT		
ROADWAY AND PARKING		
BUILDINGS		
RUNWAY END SAFETY AREA (RESA)		
AIRPORT SECURITY FENCE		
PAPI SYSTEM		N/A

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:4000

50 0 25 50 100 200 300 METRES

200 0 100 200 400 1000 FEET

SCALE BASED ON SHEET SIZE 36" X 51"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035 RECOMMENDED AIRPORT LAYOUT PLAN

Project No. 141-25347-00

EXHIBIT A4

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\CYYT-East and West Commercial Development Areas v1a.dwg
January 13, 2017

No.	DATE	DESCRIPTION	BY	QA/QC
4	JAN. 2017	FINAL REPORT	JRM	JH
3	01/31/2016	FINAL DRAFT	JRM	JH
2	12/18/2015	DRAFT FINAL FOR MASTER PLAN	JRM	JH
1	12/11/2015	FIRST DRAFT FOR CLIENT REVIEW	JRM	JH
0	11/24/2015	PRELIMINARY DRAFT	JRM	JH

REVISION / ISSUE

Notes

1. THIS DRAWING TO BE USED FOR PLANNING PURPOSES ONLY.
2. REFER TO ALP FOR FACILITY INDEX.

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:3000

25 0 25 50 100 150 250 METRES

100 0 100 250 750 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035 WEST COMMERCIAL DEVELOPMENT AREA CONCEPTUAL DEVELOPMENT PLAN

Project No. 141-25347-00

EXHIBIT A5

LEGEND

ITEM	EXISTING	ULTIMATE
AIRPORT PROPERTY LINE		N/A
AIRFIELD PAVEMENT		
ROADWAY AND PARKING		
BUILDINGS		
RUNWAY END SAFETY AREA (RESA)		
AIRPORT SECURITY FENCE		
PAPI SYSTEM		N/A
APRON II HANGAR		

No.	DATE	DESCRIPTION	BY	QA/QC
4	JAN. 2017	FINAL REPORT	JRM	JH
3	01/31/2016	FINAL DRAFT	JRM	JH
2	12/18/2015	DRAFT FINAL FOR MASTER PLAN	JRM	JH
1	12/11/2015	FIRST DRAFT FOR CLIENT REVIEW	JRM	JH
0	11/24/2015	PRELIMINARY DRAFT	JRM	JH

REVISION / ISSUE

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\CYYT-East and West Commercial Development Areas v1a.dwg
January 13, 2017

Notes

1. THIS DRAWING TO BE USED FOR PLANNING PURPOSES ONLY.
2. REFER TO ALP FOR FACILITY INDEX.

North Arrow

Consultant

WSP

Client

ST. JOHN'S
International Airport Authority

Scale

Scale 1:3000

25 0 25 50 100 150 250 METRES

100 0 100 250 750 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035
EAST COMMERCIAL DEVELOPMENT AREA
CONCEPTUAL DEVELOPMENT PLAN - OPTION 1

Project No. 141-25347-00

EXHIBIT A6

LEGEND

ITEM	EXISTING	ULTIMATE
AIRPORT PROPERTY LINE		N/A
AIRFIELD PAVEMENT		
ROADWAY AND PARKING		
BUILDINGS		
RUNWAY END SAFETY AREA (RESA)		
AIRPORT SECURITY FENCE		
PAPI SYSTEM		N/A
APRON II HANGAR		

No.	DATE	DESCRIPTION	BY	QA/QC
4	JAN. 2017	FINAL REPORT	JRM	JH
3	01/31/2016	FINAL DRAFT	JRM	JH
2	12/18/2015	DRAFT FINAL FOR MASTER PLAN	JRM	JH
1	12/11/2015	FIRST DRAFT FOR CLIENT REVIEW	JRM	JH
0	11/24/2015	PRELIMINARY DRAFT	JRM	JH

REVISION / ISSUE

Notes

1. THIS DRAWING TO BE USED FOR PLANNING PURPOSES ONLY.
2. REFER TO ALP FOR FACILITY INDEX.

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:3000

25 0 25 50 100 150 250 METRES

100 0 100 250 750 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035 EAST COMMERCIAL DEVELOPMENT AREA CONCEPTUAL DEVELOPMENT PLAN - OPTION 2

Project No. 141-25347-00

EXHIBIT A7

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\CYYT-East and West Commercial Development Areas v1a.dwg
January 13, 2017

APPENDIX B

AERONAUTICAL ZONING EXHIBITS

OLS & AIRPORT ZONING REGULATIONS

ITEM	RUNWAY 11 OLS	RUNWAY 11 AZR	RUNWAY 29 OLS	RUNWAY 29 ARR	RUNWAY 16 OLS	RUNWAY 16 AZR	RUNWAY 34 OLS	RUNWAY 34 AZR
RUNWAY TYPE / CODE NUMBER	AGN V PREC. TP312 5th ED	CODE 4 PREC.	AGN V PREC. TP312 5th ED	CODE 4 PREC.	CODE 4 PREC. TP312 4th ED	CODE 4 PREC.	CODE 4 N-PREC. TP312 4th ED	CODE 4 PREC.
RUNWAY STRIP TOTAL LENGTH	2713.25m	2712.63m	2713.25m	2712.63m	2344.87m	2256.11m	2344.87m	2256.11m
RUNWAY STRIP TOTAL WIDTH	244m	304.8m	244m	304.8m	244m	304.8m	244m	304.8m
OUTER / OBSTACLE IDENTIFICATION SURFACE ELEVATION	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m
OUTER / OBSTACLE IDENTIFICATIONSURFACE RADIUS	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.
TAKEOFF / APPROACH DIVERGENCE	15%	16%	15%	16%	15%	16%	15%	16%
TAKEOFF / APPROACH SURFACE LENGTH (1ST SECTION)	720m	15240m	720m	15240m	720m	15240m	720m	15240m
TAKEOFF / APPROACH SURFACE SLOPE (1ST SECTION)	2%	2%	2%	2%	2%	2%	2.5%	2%
TAKEOFF / APPROACH SURFACE LENGTH (2ND SECTION)	4280m	N/A	4280m	N/A	4280m	N/A	4280m	N/A
TAKEOFF / APPROACH SURFACE SLOPE (2ND SECTION)	2.9%	N/A	2.9%	N/A	2.9%	N/A	2.9%	N/A
TRANSITION SURFACE SLOPE (1ST SECTION)	25%	14.3%	25%	14.3%	25%	14.3%	25%	14.3%
TRANSITION SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	14.3%	N/A	14.3%	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (1ST SECTION)	25%	N/A	25%	N/A	25%	N/A	25%	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	14.3%	N/A	14.3%	N/A

LEGEND

- AIRPORT PROPERTY LINE
- ELEVATION CONTOUR
- OLS OBSTRUCTION
- RUNWAY STRIP
- TRANSITIONAL SURFACE
- APPROACH SURFACE
- APPROACH TRANSITIONAL SURFCAE
- OUTER SURFACE

No.	DATE	DESCRIPTION	BY	QA/QC
4	JAN. 2017	FINAL REPORT	IW	JH
3	01/15/2016	DRAFT FINAL FOR MASTER PLAN	IW	JH
2	12/31/2015	DRAFT FINAL FOR MASTER PLAN	IW	JH
1	12/18/2015	DRAFT FINAL FOR MASTER PLAN	IW	BGS
0	11/26/2015	INITIAL DRAFT	IW	JH

REVISION / ISSUE

Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY.

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:25000

250 0 250 500 1000 2000 METRES

1000 0 500 1500 2500 5000 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: **AIRPORT MASTER PLAN UPDATE 2015-2035 OBSTACLE LIMITATION SURFACES PROPOSED OLS LONG-TERM**

Project No. 141-25347-00

EXHIBIT B7

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\Zoning and OLS\CAD\Master Plan Figures\CYYT Exhibit B7 Proposed Long Term Airfield OLS.dwg
January 12, 2017

OBSTACLE LIMITATION SURFACES & AIRPORT ZONING REGULATIONS

ITEM	RUNWAY 11 OLS	RUNWAY 11 AZR	RUNWAY 29 OLS	RUNWAY 29 ARR	RUNWAY 16 OLS	RUNWAY 16 AZR	RUNWAY 34 OLS	RUNWAY 34 AZR	RUNWAY 02 OLS	RUNWAY 02 AZR	RUNWAY 20 OLS	RUNWAY 20 AZR
RUNWAY TYPE / CODE NUMBER	AGN V PREC. TP312 5th ED	CODE 4 PREC.	AGN V PREC. TP312 5th ED	CODE 4 PREC.	CODE 4 PREC. TP312 4th ED	CODE 4 PREC.	CODE 4 N-PREC. TP312 4th ED	CODE 4 PREC.	CODE 3 N-PREC. TP312 4th ED	N/A	CODE 3 N-PREC. TP312 4th ED	N/A
RUNWAY STRIP TOTAL LENGTH	2713.25m	2712.63m	2713.25m	2712.63m	2254.87m	2256.11m	2254.87m	2256.11m	1654m	N/A	1654m	N/A
RUNWAY STRIP TOTAL WIDTH	244m	304.8m	244m	304.8m	300m	304.8m	300m	304.8m	90m	N/A	90m	N/A
OUTER SURFACE ELEVATION	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m
OUTER SURFACE RADIUS	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.
TAKEOFF / APPROACH DIVERGENCE	15%	16%	15%	16%	15%	16%	15%	16%	10%	N/A	10%	N/A
TAKEOFF / APPROACH SURFACE LENGTH (1ST SECTION)	720m	15240m	720m	15240m	15000m	15240m	15000m	15240m	2500m	N/A	2500m	N/A
TAKEOFF / APPROACH SURFACE SLOPE (1ST SECTION)	2%	2%	2%	2%	2%	2%	2.5%	2%	2.5%	N/A	2.5%	N/A
TAKEOFF / APPROACH SURFACE LENGTH (2ND SECTION)	4280m	N/A	4280m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TAKEOFF / APPROACH SURFACE SLOPE (2ND SECTION)	2.9%	N/A	2.9%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRANSITION SURFACE SLOPE (1ST SECTION)	25%	14.3%	25%	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%	N/A	14.3%	N/A
TRANSITION SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (1ST SECTION)	25%	N/A	25%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

LEGEND

- AIRPORT PROPERTY LINE
- ELEVATION CONTOUR
- OLS OBSTRUCTION
- RUNWAY STRIP
- TRANSITIONAL SURFACE
- APPROACH SURFACE
- APPROACH TRANSITIONAL SURFCAE
- OUTER SURFACE

No.	DATE	DESCRIPTION	BY	QA/QC
3	JAN. 2017	FINAL REPORT	IW	JH
2	01/15/2016	DRAFT FINAL FOR MASTER PLAN	IW	JH
1	12/31/2015	DRAFT FINAL FOR MASTER PLAN	JH	JH
0	12/18/2015	DRAFT FINAL FOR MASTER PLAN	IW	BGS

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Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY.

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:20000

250 0 100 250 500 1000 1500 METRES

1000 0 500 1000 2000 5000 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035 OBSTACLE LIMITATION SURFACES EXISTING AZR

Project No. 141-25347-00

EXHIBIT B1

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\Zoning and OLS\CAD\Master Plan Figures\CYYT Exhibit B1 Existing Airfield AZR.dwg
January 12, 2017

AIRPORT BUILDING INDEX

NO.	DESCRIPTION
1	PASSENGER TERMINAL BUILDING & SJIAA ADMINISTRATION
2	GUARD HOUSE
3	STORAGE FACILITY
4	RAMP SERVICES BUILDING
5	COMBINED SERVICES BUILDING (CSB)
6	NAV CANADA AIR TRAFFIC CONTROL TOWER (ATCT)
7	AIRFIELD MAINTENANCE STORAGE FACILITY
8	FIELD ELECTRICAL CENTRE (FEC)
9	E.W. HARVEY
10	CENTRAL DEICING FACILITY (CDF) OPERATIONS BUILDING
11	COUGAR SEARCH AND RESCUE OPERATIONS FACILITY
12	COUGAR HELICOPTERS
13	HOLIDAY INN EXPRESS
14	SERVICES BUILDING
15	FUEL STORAGE FACILITY (TO BE RELOCATED)
16	COUGAR HELICOPTERS (TO BE RETIRED)
17	PUMP HOUSE (LOCATION UNDER REVIEW)
18	RECREATION CENTRE
19	HANGAR
20	HANGAR
21	HANGAR
22	HANGAR
23	STORAGE FACILITY
24	HANGAR
25	HANGAR
26	STORAGE FACILITY
27	FUEL STORAGE FACILITY
28	FUEL STORAGE FACILITY
29	STORAGE FACILITY
30	SPCA
31	STORAGE FACILITY

LEGEND

ITEM	EXISTING
AIRPORT PROPERTY LINE	
LAND ACQUISITION	N/A
AIRFIELD PAVEMENT	
ROADWAY AND PARKING	
BUILDINGS	
RUNWAY END SAFETY AREA (RESA)	
AIRPORT SECURITY FENCE	
RUNWAY STRIP	
TRANSITIONAL SURFACE	
APPROACH SURFACE	
APPROACH TRANSITIONAL SURFACE	
OLS OBSTRUCTION	

OBSTACLE LIMITATION SURFACES & AIRPORT ZONING REGULATIONS

ITEM	RUNWAY 11		RUNWAY 29		RUNWAY 16		RUNWAY 34		RUNWAY 02		RUNWAY 20	
	OLS	AZR	OLS	ARR	OLS	AZR	OLS	AZR	OLS	AZR	OLS	AZR
RUNWAY TYPE / CODE NUMBER	AGN V PREC. TP312 5th ED	CODE 4 PREC.	AGN V PREC. TP312 5th ED	CODE 4 PREC.	CODE 4 PREC. TP312 4th ED	CODE 4 PREC.	CODE 4 N-PREC. TP312 4th ED	CODE 4 PREC.	CODE 3 N-PREC. TP312 4th ED	N/A	CODE 3 N-PREC. TP312 4th ED	N/A
RUNWAY STRIP TOTAL LENGTH	2713.25m	2712.63m	2713.25m	2712.63m	2254.87m	2256.11m	2254.87m	2256.11m	1654m	N/A	1654m	N/A
RUNWAY STRIP TOTAL WIDTH	244m	304.8m	244m	304.8m	300m	304.8m	300m	304.8m	90m	N/A	90m	N/A
OUTER SURFACE ELEVATION	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m
OUTER SURFACE RADIUS	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.
TAKEOFF / APPROACH DIVERGENCE	15%	16%	15%	16%	15%	16%	15%	16%	10%	N/A	10%	N/A
TAKEOFF / APPROACH SURFACE LENGTH (1ST SECTION)	720m	15240m	720m	15240m	15000m	15240m	15000m	15240m	2500m	N/A	2500m	N/A
TAKEOFF / APPROACH SURFACE SLOPE (1ST SECTION)	2%	2%	2%	2%	2%	2%	2.5%	2%	2.5%	N/A	2.5%	N/A
TAKEOFF / APPROACH SURFACE LENGTH (2ND SECTION)	4280m	N/A	4280m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TAKEOFF / APPROACH SURFACE SLOPE (2ND SECTION)	2.9%	N/A	2.9%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRANSITION SURFACE SLOPE (1ST SECTION)	25%	14.3%	25%	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%	N/A	14.3%	N/A
TRANSITION SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (1ST SECTION)	25%	N/A	25%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

No.	DATE	DESCRIPTION	BY	QA/QC
4	JAN. 2017	FINAL REPORT	IW	JH
3	01/15/2016	DRAFT FINAL FOR MASTER PLAN	IW	JH
2	12/31/2015	DRAFT FINAL FOR MASTER PLAN	JH	JH
1	12/18/2015	DRAFT FINAL FOR MASTER PLAN	IW	BGS
0	11/26/2015	INITIAL DRAFT	IW	JH

REVISION / ISSUE

Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY.

North Arrow

Consultant

WSP

Client

ST. JOHN'S
International Airport Authority

Scale

Scale 1:7000

100 0 50 100 250 500 METRES

250 0 250 500 1000 1500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035
OBSTACLE LIMITATION SURFACES
EXISTING CONDITIONS

Project No. 141-25347-00

EXHIBIT B2

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\Zoning and OLS\CAD\Master Plan Figures\CYYT Exhibit B2 Existing Airfield OLS.dwg
January 12, 2017

OBSTACLE LIMITATION SURFACES & AIRPORT ZONING REGULATIONS

ITEM	RUNWAY 11		RUNWAY 29		RUNWAY 16		RUNWAY 34		RUNWAY 02		RUNWAY 20	
	OLS	AZR	OLS	ARR	OLS	AZR	OLS	AZR	OLS	AZR	OLS	AZR
RUNWAY TYPE / CODE NUMBER	AGN V PREC. TP312 5th ED	CODE 4 PREC.	AGN V PREC. TP312 5th ED	CODE 4 PREC.	CODE 4 PREC. TP312 4th ED	CODE 4 PREC.	CODE 4 N-PREC. TP312 4th ED	CODE 4 PREC.	CODE 3 N-PREC. TP312 4th ED	N/A	CODE 3 N-PREC. TP312 4th ED	N/A
RUNWAY STRIP TOTAL LENGTH	2713.25m	2712.63m	2713.25m	2712.63m	2254.87m	2256.11m	2254.87m	2256.11m	1654m	N/A	1654m	N/A
RUNWAY STRIP TOTAL WIDTH	244m	304.8m	244m	304.8m	300m	304.8m	300m	304.8m	90m	N/A	90m	N/A
OUTER SURFACE ELEVATION	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m
OUTER SURFACE RADIUS	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.
TAKEOFF / APPROACH DIVERGENCE	15%	16%	15%	16%	15%	16%	15%	16%	10%	N/A	10%	N/A
TAKEOFF / APPROACH SURFACE LENGTH (1ST SECTION)	720m	15240m	720m	15240m	15000m	15240m	15000m	15240m	2500m	N/A	2500m	N/A
TAKEOFF / APPROACH SURFACE SLOPE (1ST SECTION)	2%	2%	2%	2%	2%	2%	2.5%	2%	2.5%	N/A	2.5%	N/A
TAKEOFF / APPROACH SURFACE LENGTH (2ND SECTION)	4280m	N/A	4280m	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TAKEOFF / APPROACH SURFACE SLOPE (2ND SECTION)	2.9%	N/A	2.9%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
TRANSITION SURFACE SLOPE (1ST SECTION)	25%	14.3%	25%	14.3%	14.3%	14.3%	14.3%	14.3%	14.3%	N/A	14.3%	N/A
TRANSITION SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (1ST SECTION)	25%	N/A	25%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

LEGEND

- AIRPORT PROPERTY LINE
- ELEVATION CONTOUR
- OLS OBSTRUCTION
- RUNWAY STRIP
- TRANSITIONAL SURFACE
- APPROACH SURFACE
- APPROACH TRANSITIONAL SURFACE
- OUTER SURFACE

No.	DATE	DESCRIPTION	BY	QA/QC
4	JAN. 2017	FINAL REPORT	IW	JH
3	01/15/2016	DRAFT FINAL FOR MASTER PLAN	IW	JH
2	12/31/2015	DRAFT FINAL FOR MASTER PLAN	JH	JH
1	12/18/2015	DRAFT FINAL FOR MASTER PLAN	IW	BGS
0	11/26/2015	INITIAL DRAFT	IW	JH

REVISION / ISSUE

Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY.

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:20000

250 0 100 250 500 1000 1500 METRES

1000 0 500 1000 2000 5000 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: **AIRPORT MASTER PLAN UPDATE 2015-2035 OBSTACLE LIMITATION SURFACES EXISTING CONDITIONS**

Project No. 141-25347-00

EXHIBIT B3

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\Zoning and OLS\CAD\Master Plan Figures\CYYT Exhibit B3 Existing Airfield OLS.dwg
January 12, 2017

AIRPORT BUILDING INDEX

NO.	DESCRIPTION
1	PASSENGER TERMINAL BUILDING & SJIAA ADMINISTRATION
2	GUARD HOUSE
3	STORAGE FACILITY
4	RAMP SERVICES BUILDING
5	COMBINED SERVICES BUILDING (CSB)
6	NAV CANADA AIR TRAFFIC CONTROL TOWER (ATCT)
7	AIRFIELD MAINTENANCE STORAGE FACILITY
8	FIELD ELECTRICAL CENTRE (FEC)
9	E.W. HARVEY
10	CENTRAL DEICING FACILITY (CDF) OPERATIONS BUILDING
11	COUGAR SEARCH AND RESCUE OPERATIONS FACILITY
12	COUGAR HELICOPTERS
13	HOLIDAY INN EXPRESS
14	SERVICES BUILDING
15	FUEL STORAGE FACILITY (TO BE RELOCATED)
16	COUGAR HELICOPTERS (TO BE RETIRED)
17	PUMP HOUSE (LOCATION UNDER REVIEW)
18	RECREATION CENTRE
19	HANGAR
20	HANGAR
21	HANGAR
22	HANGAR
23	STORAGE FACILITY
24	HANGAR
25	HANGAR
26	STORAGE FACILITY
27	FUEL STORAGE FACILITY
28	FUEL STORAGE FACILITY
29	STORAGE FACILITY
30	SPCA
31	STORAGE FACILITY

LEGEND

ITEM	EXISTING
AIRPORT PROPERTY LINE	
LAND ACQUISITION	N/A
AIRFIELD PAVEMENT	
ROADWAY AND PARKING	
BUILDINGS	
RUNWAY END SAFETY AREA (RESA)	
AIRPORT SECURITY FENCE	
RUNWAY STRIP	
TRANSITIONAL SURFACE	
APPROACH SURFACE	
APPROACH TRANSITIONAL SURFACE	
OLS OBSTRUCTION	

OLS & AIRPORT ZONING REGULATIONS

ITEM	RUNWAY 11		RUNWAY 29		RUNWAY 16		RUNWAY 34	
	OLS	AZR	OLS	ARR	OLS	AZR	OLS	AZR
RUNWAY TYPE / CODE NUMBER	AGN V PREC. TP312 5th ED	CODE 4 PREC.	AGN V PREC. TP312 5th ED	CODE 4 PREC.	CODE 4 PREC. TP312 5th ED	CODE 4 PREC.	CODE 4 N-PREC. TP312 5th ED	CODE 4 PREC.
RUNWAY STRIP TOTAL LENGTH	2713.25m	2712.63m	2713.25m	2712.63m	2255.87m	2256.11m	2254.87m	2256.11m
RUNWAY STRIP TOTAL WIDTH	244m	304.8m	244m	304.8m	244m	304.8m	244m	304.8m
OUTER / OBSTACLE IDENTIFICATION SURFACE ELEVATION	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m
OUTER / OBSTACLE IDENTIFICATIONSURFACE RADIUS	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.
TAKEOFF / APPROACH DIVERGENCE	15%	16%	15%	16%	15%	16%	15%	16%
TAKEOFF / APPROACH SURFACE LENGTH (1ST SECTION)	720m	15240m	720m	15240m	720m	15240m	720m	15240m
TAKEOFF / APPROACH SURFACE SLOPE (1ST SECTION)	2%	2%	2%	2%	2%	2%	2.5%	2%
TAKEOFF / APPROACH SURFACE LENGTH (2ND SECTION)	4280m	N/A	4280m	N/A	4280m	N/A	4280m	N/A
TAKEOFF / APPROACH SURFACE SLOPE (2ND SECTION)	2.9%	N/A	2.9%	N/A	2.9%	N/A	2.9%	N/A
TRANSITION SURFACE SLOPE (1ST SECTION)	25%	14.3%	25%	14.3%	25%	14.3%	25%	14.3%
TRANSITION SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	14.3%	N/A	14.3%	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (1ST SECTION)	25%	N/A	25%	N/A	25%	N/A	25%	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	14.3%	N/A	14.3%	N/A

REVISION / ISSUE

No.	DATE	DESCRIPTION	BY	QA/QC
4	JAN. 2017	FINAL REPORT	IW	JH
3	01/15/2016	DRAFT FINAL FOR MASTER PLAN	IW	JH
2	12/31/2015	DRAFT FINAL FOR MASTER PLAN	JH	JH
1	12/18/2015	DRAFT FINAL FOR MASTER PLAN	IW	BGS
0	11/26/2015	INITIAL DRAFT	IW	JH

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\Zoning and OLS\CAD\Master Plan Figures\CYYT Exhibit B4 Proposed Short Term OLS.dwg
January 12, 2017

Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY.

North Arrow

Consultant

WSP

Client

ST. JOHN'S
International Airport Authority

Scale

Scale 1:7000

100 0 50 100 250 500 METRES

250 0 250 500 1000 1500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: **AIRPORT MASTER PLAN UPDATE 2015-2035**
OBSTACLE LIMITATION SURFACES
PROPOSED OLS SHORT-TERM

Project No. 141-25347-00

EXHIBIT B4

OLS & AIRPORT ZONING REGULATIONS

ITEM	RUNWAY 11		RUNWAY 29		RUNWAY 16		RUNWAY 34	
	OLS	AZR	OLS	ARR	OLS	AZR	OLS	AZR
RUNWAY TYPE / CODE NUMBER	AGN V PREC. TP312 5th ED	CODE 4 PREC.	AGN V PREC. TP312 5th ED	CODE 4 PREC.	CODE 4 PREC. TP312 5th ED	CODE 4 PREC.	CODE 4 N-PREC. TP312 5th ED	CODE 4 PREC.
RUNWAY STRIP TOTAL LENGTH	2713.25m	2712.63m	2713.25m	2712.63m	2255.87m	2256.11m	2254.87m	2256.11m
RUNWAY STRIP TOTAL WIDTH	244m	304.8m	244m	304.8m	244m	304.8m	244m	304.8m
OUTER / OBSTACLE IDENTIFICATION SURFACE ELEVATION	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m
OUTER / OBSTACLE IDENTIFICATIONSURFACE RADIUS	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.
TAKEOFF / APPROACH DIVERGENCE	15%	16%	15%	16%	15%	16%	15%	16%
TAKEOFF / APPROACH SURFACE LENGTH (1ST SECTION)	720m	15240m	720m	15240m	720m	15240m	720m	15240m
TAKEOFF / APPROACH SURFACE SLOPE (1ST SECTION)	2%	2%	2%	2%	2%	2%	2.5%	2%
TAKEOFF / APPROACH SURFACE LENGTH (2ND SECTION)	4280m	N/A	4280m	N/A	4280m	N/A	4280m	N/A
TAKEOFF / APPROACH SURFACE SLOPE (2ND SECTION)	2.9%	N/A	2.9%	N/A	2.9%	N/A	2.9%	N/A
TRANSITION SURFACE SLOPE (1ST SECTION)	25%	14.3%	25%	14.3%	25%	14.3%	25%	14.3%
TRANSITION SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	14.3%	N/A	14.3%	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (1ST SECTION)	25%	N/A	25%	N/A	25%	N/A	25%	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	14.3%	N/A	14.3%	N/A

LEGEND

- AIRPORT PROPERTY LINE
- ELEVATION CONTOUR
- OLS OBSTRUCTION
- RUNWAY STRIP
- TRANSITIONAL SURFACE
- APPROACH SURFACE
- APPROACH TRANSITIONAL SURFCAE
- OUTER SURFACE

No.	DATE	DESCRIPTION	BY	QA/QC
4	JAN. 2017	FINAL REPORT	IW	JH
3	01/15/2016	DRAFT FINAL FOR MASTER PLAN	IW	JH
2	12/18/2015	DRAFT FINAL FOR MASTER PLAN	IW	JH
1	12/18/2015	DRAFT FINAL FOR MASTER PLAN	IW	BGS
0	11/26/2015	INITIAL DRAFT	IW	JH

REVISION / ISSUE

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January 12, 2017

Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY.

North Arrow

Consultant

WSP

Client

ST. JOHN'S
International Airport Authority

Scale

Scale 1:25000

250 0 250 500 1000 2000 METRES

1000 0 500 1500 2500 5000 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: **AIRPORT MASTER PLAN UPDATE 2015-2035**
OBSTACLE LIMITATION SURFACES
PROPOSED OLS SHORT-TERM

Project No. 141-25347-00

EXHIBIT B5

AIRPORT BUILDING INDEX

NO.	DESCRIPTION
1	PASSENGER TERMINAL BUILDING & SJIAA ADMINISTRATION
2	GUARD HOUSE
3	STORAGE FACILITY
4	RAMP SERVICES BUILDING
5	COMBINED SERVICES BUILDING (CSB)
6	NAV CANADA AIR TRAFFIC CONTROL TOWER (ATCT)
7	AIRFIELD MAINTENANCE STORAGE FACILITY
8	FIELD ELECTRICAL CENTRE (FEC)
9	E.W. HARVEY
10	CENTRAL DEICING FACILITY (CDF) OPERATIONS BUILDING
11	COUGAR SEARCH AND RESCUE OPERATIONS FACILITY
12	COUGAR HELICOPTERS
13	HOLIDAY INN EXPRESS
14	SERVICES BUILDING
15	FUEL STORAGE FACILITY (TO BE RELOCATED)
16	COUGAR HELICOPTERS (TO BE RETIRED)
17	PUMP HOUSE (LOCATION UNDER REVIEW)
18	RECREATION CENTRE
19	HANGAR
20	HANGAR
21	HANGAR
22	HANGAR
23	STORAGE FACILITY
24	HANGAR
25	HANGAR
26	STORAGE FACILITY
27	FUEL STORAGE FACILITY
28	FUEL STORAGE FACILITY
29	STORAGE FACILITY
30	SPCA
31	STORAGE FACILITY

LEGEND

ITEM	EXISTING
AIRPORT PROPERTY LINE	
LAND ACQUISITION	N/A
AIRFIELD PAVEMENT	
ROADWAY AND PARKING	
BUILDINGS	
RUNWAY END SAFETY AREA (RESA)	
AIRPORT SECURITY FENCE	
RUNWAY STRIP	
TRANSITIONAL SURFACE	
APPROACH SURFACE	
APPROACH TRANSITIONAL SURFACE	
OLS OBSTRUCTION	

OLS & AIRPORT ZONING REGULATIONS

ITEM	RUNWAY 11		RUNWAY 29		RUNWAY 16		RUNWAY 34	
	OLS	AZR	OLS	ARR	OLS	AZR	OLS	AZR
RUNWAY TYPE / CODE NUMBER	AGN V PREC. TP312 5th ED	CODE 4 PREC.	AGN V PREC. TP312 5th ED	CODE 4 PREC.	CODE 4 PREC. TP312 4th ED	CODE 4 PREC.	CODE 4 N-PREC. TP312 4th ED	CODE 4 PREC.
RUNWAY STRIP TOTAL LENGTH	2713.25m	2712.63m	2713.25m	2712.63m	2344.87m	2256.11m	2344.87m	2256.11m
RUNWAY STRIP TOTAL WIDTH	244m	304.8m	244m	304.8m	244m	304.8m	244m	304.8m
OUTER / OBSTACLE IDENTIFICATION SURFACE ELEVATION	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m	185.5m	177.1m
OUTER / OBSTACLE IDENTIFICATIONSURFACE RADIUS	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.	4000m	IRREG.
TAKEOFF / APPROACH DIVERGENCE	15%	16%	15%	16%	15%	16%	15%	16%
TAKEOFF / APPROACH SURFACE LENGTH (1ST SECTION)	720m	15240m	720m	15240m	720m	15240m	720m	15240m
TAKEOFF / APPROACH SURFACE SLOPE (1ST SECTION)	2%	2%	2%	2%	2%	2%	2.5%	2%
TAKEOFF / APPROACH SURFACE LENGTH (2ND SECTION)	4280m	N/A	4280m	N/A	4280m	N/A	4280m	N/A
TAKEOFF / APPROACH SURFACE SLOPE (2ND SECTION)	2.9%	N/A	2.9%	N/A	2.9%	N/A	2.9%	N/A
TRANSITION SURFACE SLOPE (1ST SECTION)	25%	14.3%	25%	14.3%	25%	14.3%	25%	14.3%
TRANSITION SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	14.3%	N/A	14.3%	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (1ST SECTION)	25%	N/A	25%	N/A	25%	N/A	25%	N/A
APPROACH TRANSITIONAL SURFACE SLOPE (2ND SECTION)	14.3%	N/A	14.3%	N/A	14.3%	N/A	14.3%	N/A

No.	DATE	DESCRIPTION	BY	QA/QC
4	JAN. 2017	FINAL REPORT	IW	JH
3	01/15/2016	DRAFT FINAL FOR MASTER PLAN	IW	JH
2	12/31/2015	DRAFT FINAL FOR MASTER PLAN	IW	JH
1	12/18/2015	DRAFT FINAL FOR MASTER PLAN	IW	BGS
0	11/26/2015	INITIAL DRAFT	IW	JH

REVISION / ISSUE

Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY.

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:7000

100 0 50 100 250 500 METRES

250 0 250 500 1000 1500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035
OBSTACLE LIMITATION SURFACES
PROPOSED OLS LONG-TERM

Project No. 141-25347-00

EXHIBIT B6

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\Zoning and OLS\CAD\Master Plan Figures\CYYT Exhibit B6 Proposed Long Term Airfield OLS.dwg
January 12, 2017

AIRPORT BUILDING INDEX

NO.	DESCRIPTION
1	PASSENGER TERMINAL BUILDING & SJIAA ADMINISTRATION
2	GUARD HOUSE
3	STORAGE FACILITY
4	RAMP SERVICES BUILDING
5	COMBINED SERVICES BUILDING (CSB)
6	NAV CANADA AIR TRAFFIC CONTROL TOWER (ATCT)
7	AIRFIELD MAINTENANCE STORAGE FACILITY
8	FIELD ELECTRICAL CENTRE (FEC)
9	E.W. HARVEY
10	CENTRAL DEICING FACILITY (CDF) OPERATIONS BUILDING
11	COUGAR SEARCH AND RESCUE OPERATIONS FACILITY
12	COUGAR HELICOPTERS
13	HOLIDAY INN EXPRESS
14	SERVICES BUILDING
15	FUEL STORAGE FACILITY (TO BE RELOCATED)
16	COUGAR HELICOPTERS (TO BE RETIRED)
17	PUMP HOUSE (LOCATION UNDER REVIEW)
18	RECREATION CENTRE
19	HANGAR
20	HANGAR
21	HANGAR
22	HANGAR
23	STORAGE FACILITY
24	HANGAR
25	HANGAR
26	STORAGE FACILITY
27	FUEL STORAGE FACILITY
28	FUEL STORAGE FACILITY
29	STORAGE FACILITY
30	SPCA
31	STORAGE FACILITY

LEGEND

ITEM	EXISTING
AIRPORT PROPERTY LINE	
LAND ACQUISITION	N/A
AIRFIELD PAVEMENT	
ROADWAY AND PARKING	
BUILDINGS	
RUNWAY END SAFETY AREA (RESA)	
AIRPORT SECURITY FENCE	
GLIDEPATH CRITICAL AREA	
GLIDEPATH SENSITIVE AREA	
LOCALIZER CRITICAL AREA	
LOCALIZER SENSITIVE AREA	
EXISTING ELECTRONIC ZONING	

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\Zoning and OLS\CAD\Master Plan Figures\CYYT Exhibit B8 Proposed Airfield Electronic Zoning r18.dwg
January 12, 2017

No.	DATE	DESCRIPTION	BY	QA/QC
4	JAN. 2017	FINAL REPORT	IW	JH
3	01/31/2016	FINAL DRAFT	IW	JH
2	01/15/2016	DRAFT FINAL FOR MASTER PLAN	IW	JH
1	12/31/2015	DRAFT FINAL FOR MASTER PLAN	JH	JH
0	12/18/2015	DRAFT FINAL FOR MASTER PLAN	IW	BGS

REVISION / ISSUE

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Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY.

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:7000

100 0 50 100 250 500 METRES

250 0 250 500 1000 1500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035 ELECTRONIC ZONING

Project No. 141-25347-00

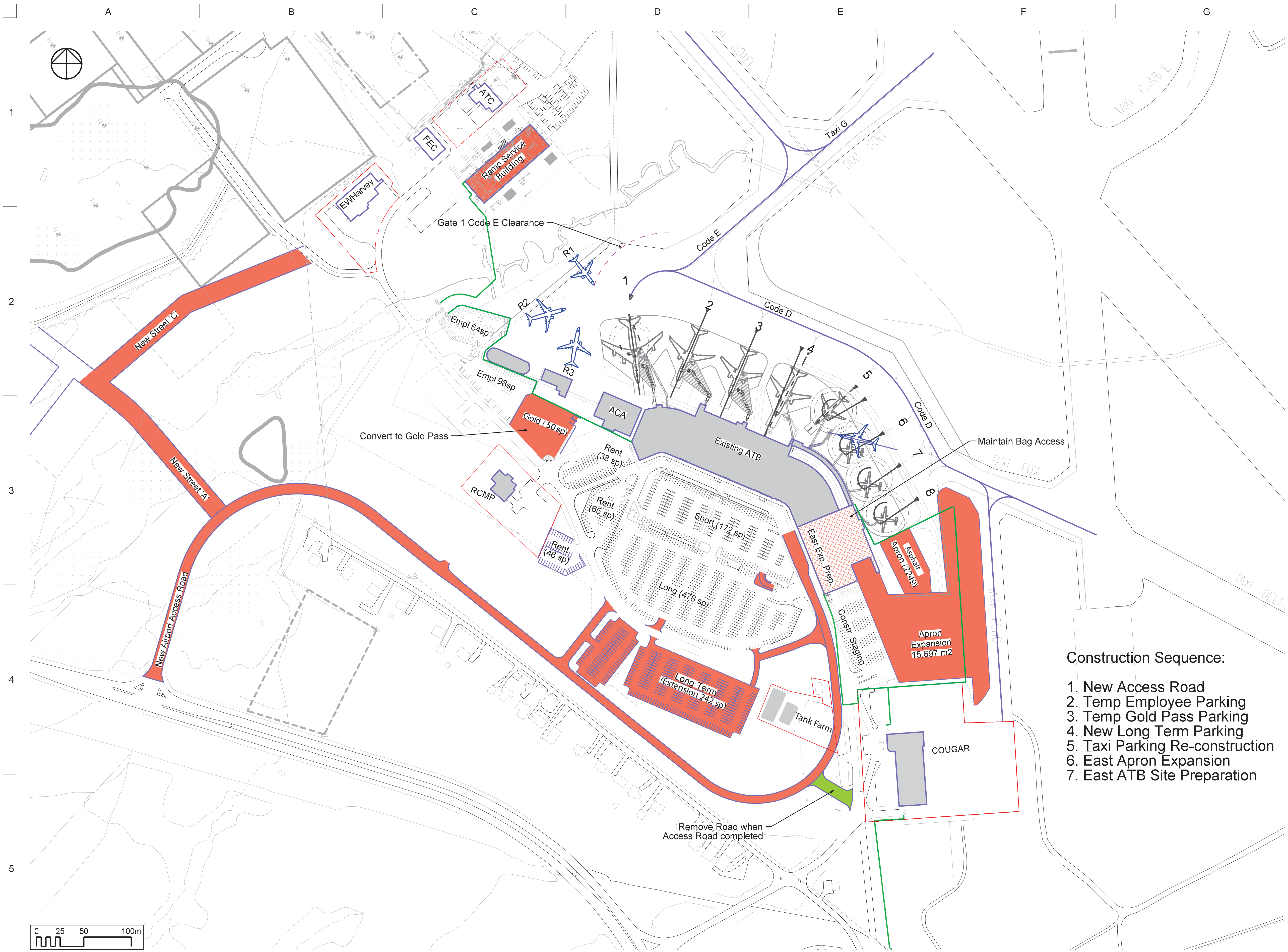
EXHIBIT B8

APPENDIX C

PTB EXPANSION STRATEGY 2014 AND CONCEPTUAL LAYOUT PLANS

ST. JOHN'S
International Airport Authority

ANSI B (11x17" / 279x432mm)



Construction Sequence:

1. New Access Road
2. Temp Employee Parking
3. Temp Gold Pass Parking
4. New Long Term Parking
5. Taxi Parking Re-construction
6. East Apron Expansion
7. East ATB Site Preparation

LEGEND:

- Construction
- Demolition
- Complete
- Fence

Issue	Date	By	Chkd	Appd
3	28/04/14	MB	ML	ML
2	27/04/12	YB	ML	ML
1	28/02/12	YB	ML	ML

ARUP

2 Bloor Street East Suite 2400
Toronto ON M4W 1A8 Canada
Tel +1 (416) 515 0915 Fax +1 (416) 515 1635
www.arup.com

Client
St. John's International Airport Authority

Job Title
St. John's International Airport Strategic Terminal Development Plan

Job Phase
Conceptual Planning

Location / Stage
St. John's International Airport Air Terminal Building Area

Drawing Title
ATB Site Plan Expansion Strategy
Stage 1 - 2012

Scale at B (11"x17") 1:4000

Plot ID

Drawing Status
FINAL

Job No	Drawing No	Issue
226601-00	**Sk 010 A**	**3**

File: J:\TOR\210000\216103-04\4 Internal Project Data\4-03 Drawings\4-03-21 Planning\Sk 010 - 2 - St John's Site Plan (Stages).dgn
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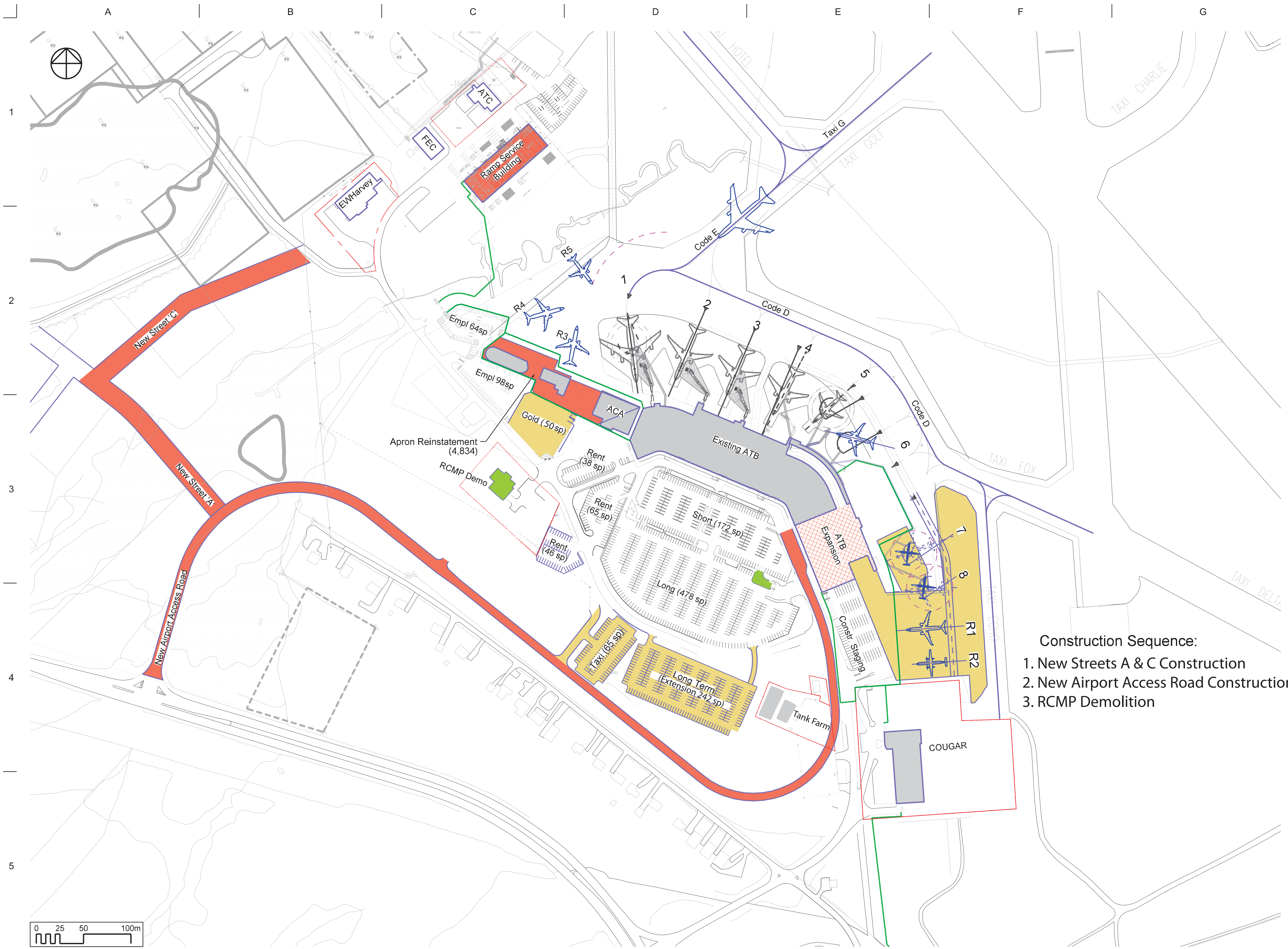

LEGEND:

- Construction
- Demolition
- Complete
- Fence

ANSI B (11x17" / 279x432mm)

Issue	Date	By	Chkd	Appd
3	28/04/14	MB	ML	ML
2	27/04/12	YB	ML	ML
1	28/02/12	YB	ML	ML

ARUP

2 Bloor Street East Suite 2400
Toronto ON M4W 1A8 Canada
Tel +1 (416) 515 0915 Fax +1 (416) 515 1635
www.arup.com

Client
St. John's International Airport Authority

Job Title
St. John's International Airport Strategic Terminal Development Plan

Job Phase
Conceptual Planning

Location / Stage
St. John's International Airport Air Terminal Building Area

Drawing Title
ATB Site Plan
Expansion Strategy
Stage 2 - 2013

Scale at B (11"x17") 1:4000

Plot ID

Drawing Status
FINAL

Job No	Drawing No	Issue
226601-00	**Sk 010 B**	**3**

File: J:\TOR\210000\216103-04\4 Internal Project Data\4-03 Drawings\4-03-21 Planning\Sk 010 - 2 - St John's Site Plan (Stages).dgn
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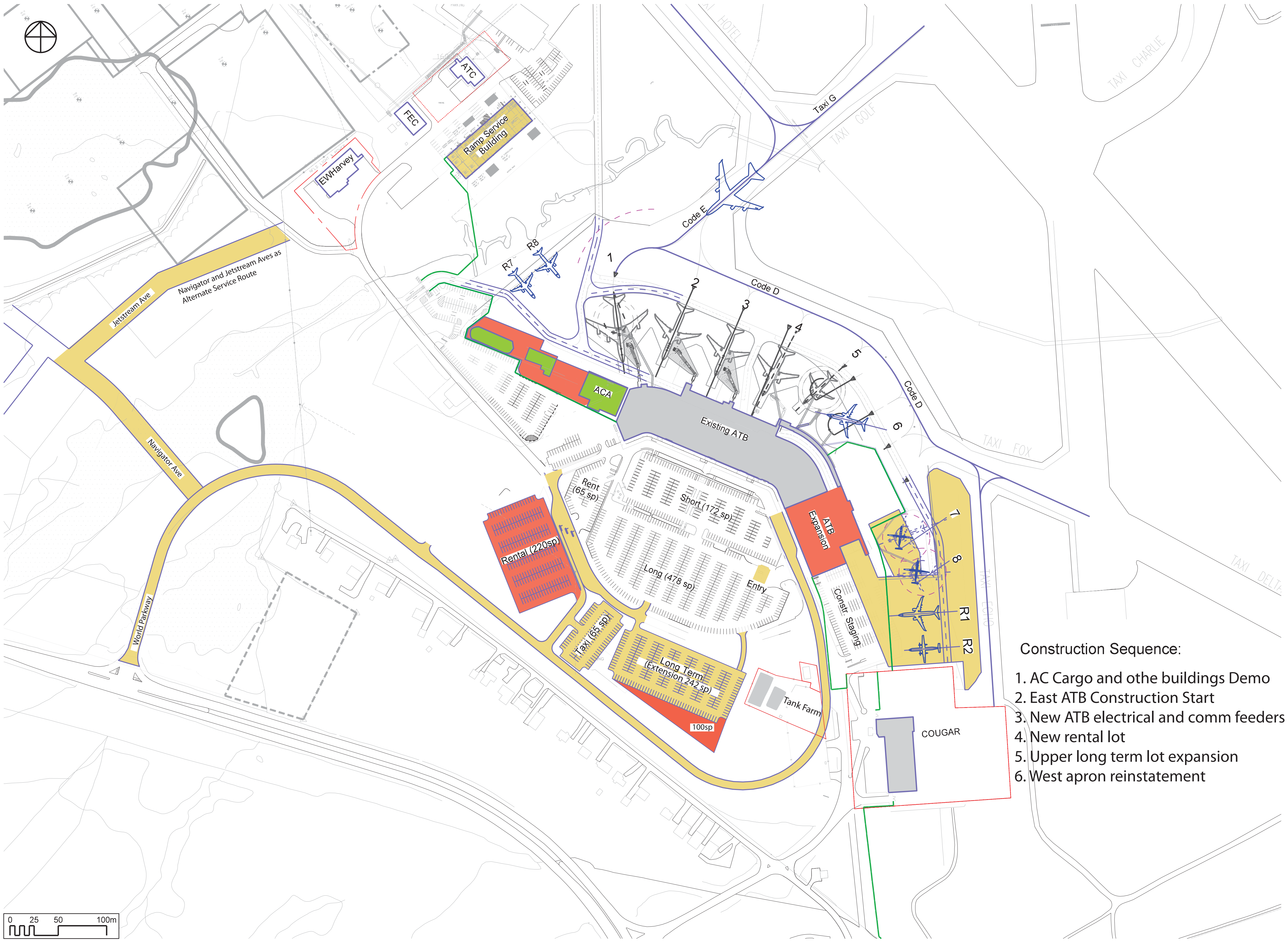

LEGEND:

- Construction
- Demolition
- Complete
- Fence

ANSI B (11x17" / 279x432mm)

Issue	Date	By	Chkd	Appd
3	28/04/14	MB	ML	ML
2	27/04/12	YB	ML	ML
1	28/02/12	YB	ML	ML

ARUP

2 Bloor Street East Suite 2400
Toronto ON M4W 1A8 Canada
Tel +1 (416) 515 0915 Fax +1 (416) 515 1635
www.arup.com

Client
St. John's International Airport Authority

Job Title
St. John's International Airport Strategic Terminal Development Plan

Job Phase
Conceptual Planning

Location / Stage
St. John's International Airport Air Terminal Building Area

Drawing Title
ATB Site Plan
Expansion Strategy
Stage 3 - 2014

Scale at B (11"x17") 1:4000

Plot ID

Drawing Status
FINAL

Job No	Drawing No	Issue
226601-00	Sk 010 C	3

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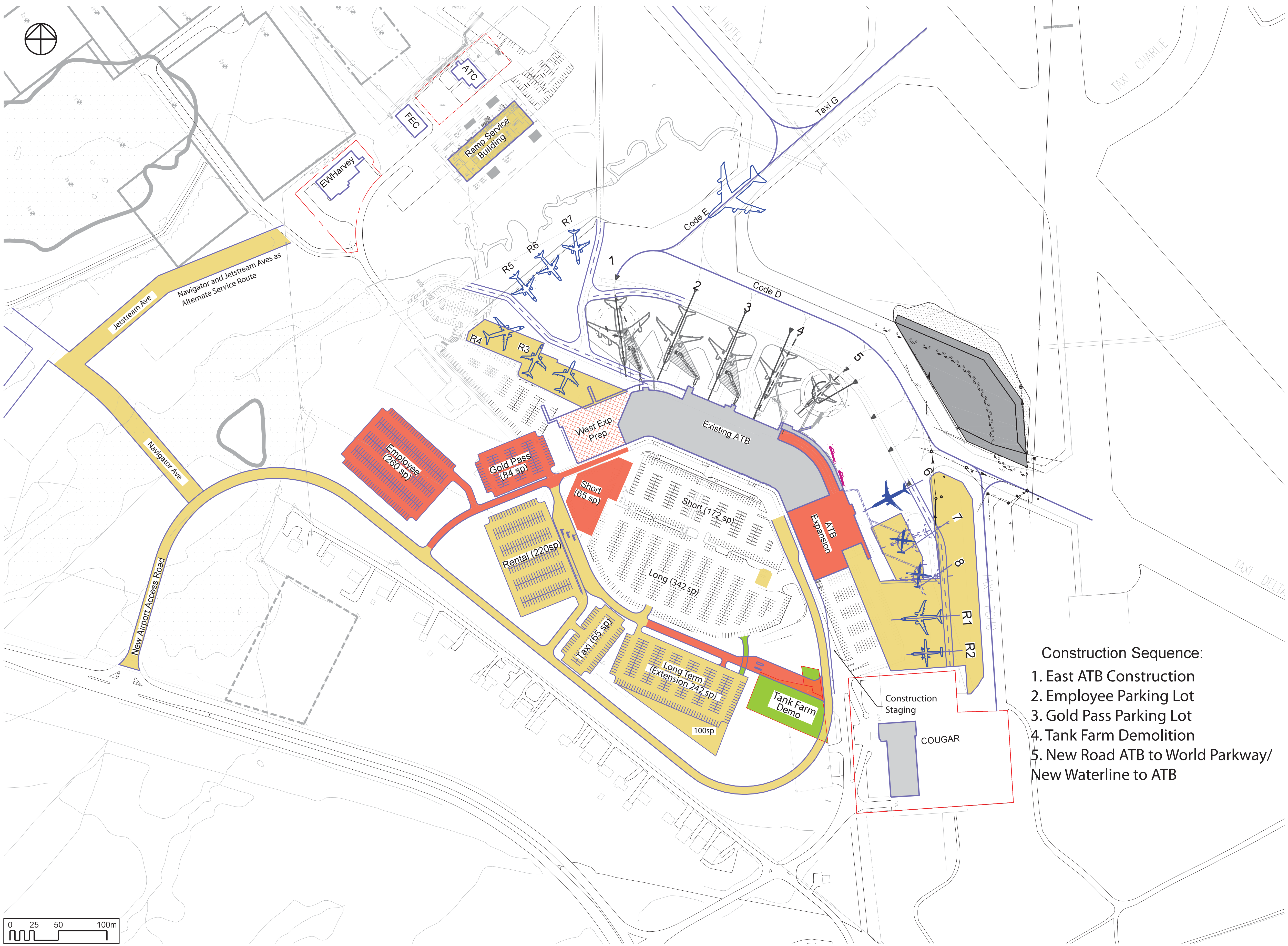

Construction Sequence:

1. East ATB Construction
2. Employee Parking Lot
3. Gold Pass Parking Lot
4. Tank Farm Demolition
5. New Road ATB to World Parkway/ New Waterline to ATB

LEGEND:

- Construction
- Demolition
- Complete
- Fence

ANSI B (11x17" / 279x432mm)

Issue	Date	By	Chkd	Appd
3	28/04/14	MB	ML	ML
2	27/04/12	YB	ML	ML
1	28/02/12	YB	ML	ML

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www.arup.com

Client
St. John's International Airport Authority

Job Title
St. John's International Airport Strategic Terminal Development Plan

Job Phase
Conceptual Planning

Location / Stage
St. John's International Airport Air Terminal Building Area

Drawing Title
ATB Site Plan
Expansion Strategy
Stage 4 - 2015

Scale at B (11"x17") 1:4000

Plot ID

Drawing Status
FINAL

Job No	Drawing No	Issue
226601-00	**Sk 010 D**	**3**

File: J:\TOR\210000\216103-04\4 Internal Project Data\4-03 Drawings\4-03-21 Planning\Sk 010 - 2 - St John's Site Plan (Stages).dgn
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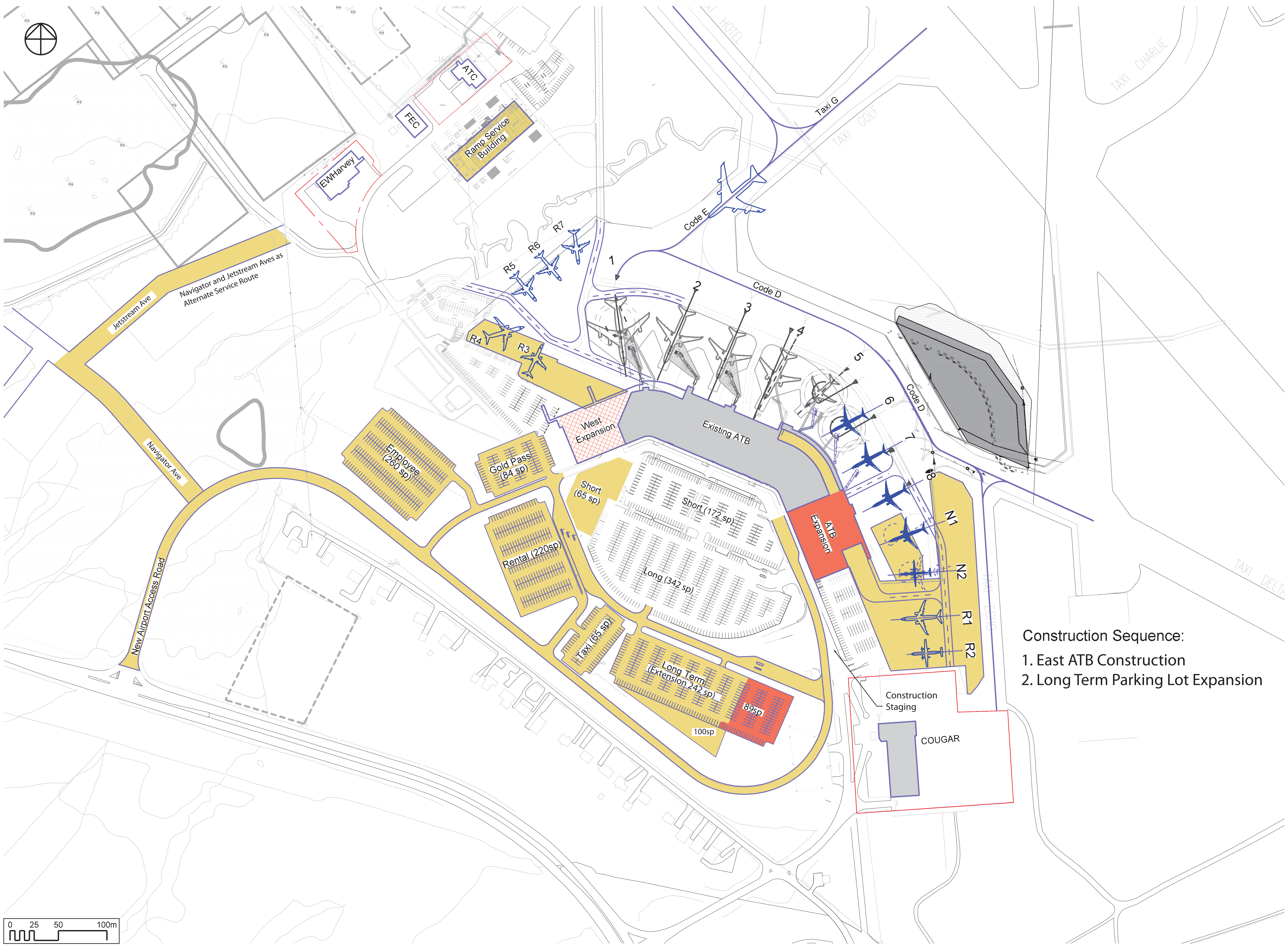
A B C D E F G



LEGEND:

- Construction
- Demolition
- Complete
- Fence

ANSI B (11x17" / 279x432mm)

Issue	Date	By	Chkd	Appd
3	28/04/14	MB	ML	ML
2	27/04/12	YB	ML	ML
1	28/02/12	YB	ML	ML

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Client
St. John's International Airport Authority

Job Title
St. John's International Airport Strategic Terminal Development Plan

Job Phase
Conceptual Planning

Location / Stage
St. John's International Airport Air Terminal Building Area

Drawing Title
ATB Site Plan
Expansion Strategy
Stage 5 - 2016

Scale at B (11"x17") 1:4000

Plot ID

Drawing Status
FINAL

Job No	Drawing No	Issue
226601-00	Sk 010 E	3

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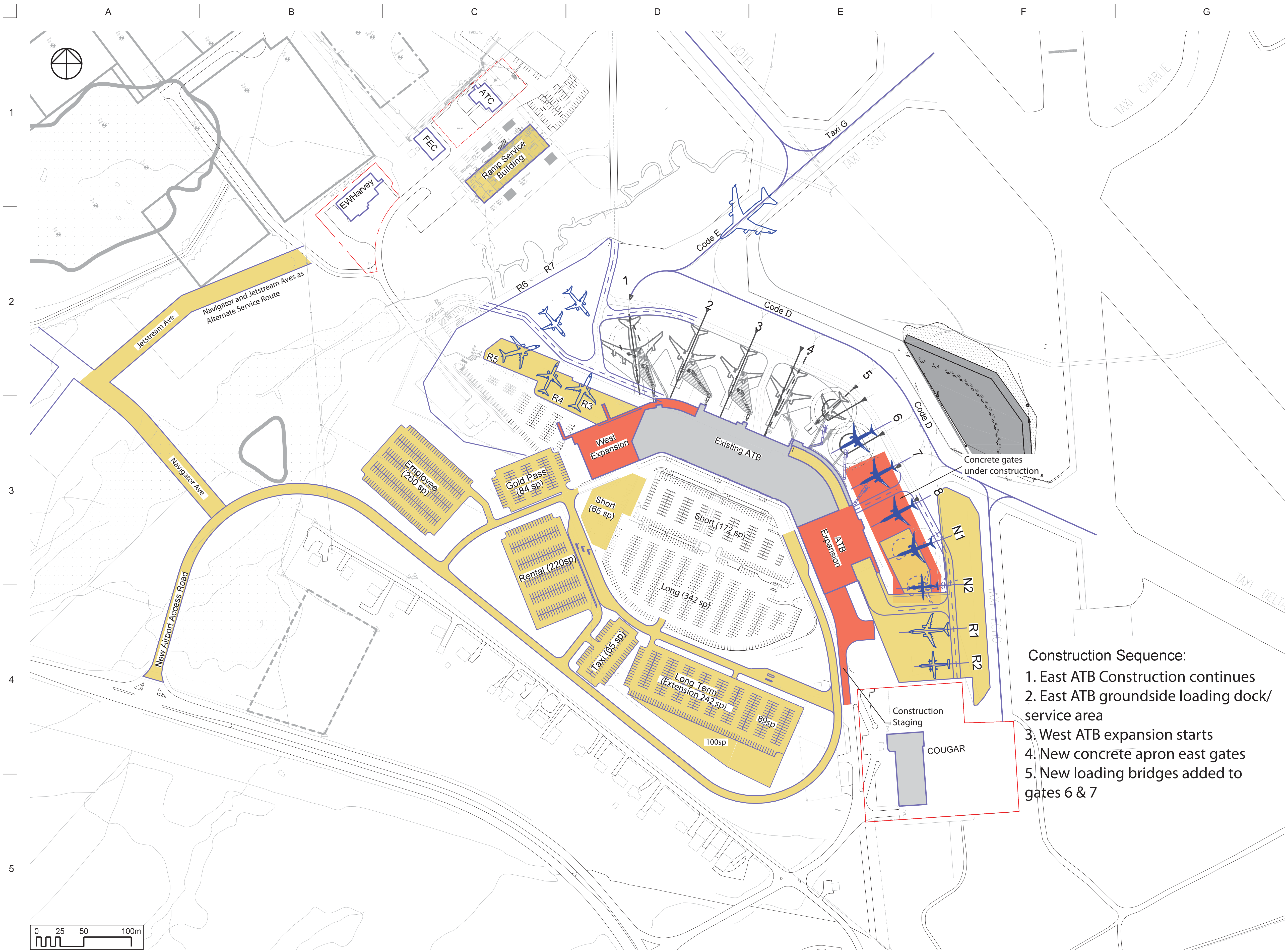

ANSI B (11x17" / 279x432mm)

LEGEND:

- Construction
- Demolition
- Complete
- Fence

3	28/04/14	MB	ML	ML
2	27/04/12	YB	ML	ML
1	28/02/12	YB	ML	ML
Issue	Date	By	Chkd	Appd

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Client
St. John's International Airport Authority

Job Title
St. John's International Airport Strategic Terminal Development Plan

Job Phase
Conceptual Planning

Location / Stage
St. John's International Airport Air Terminal Building Area

Drawing Title
ATB Site Plan
Expansion Strategy
Stage 6 - 2017

Scale at B (11"x17") 1:4000

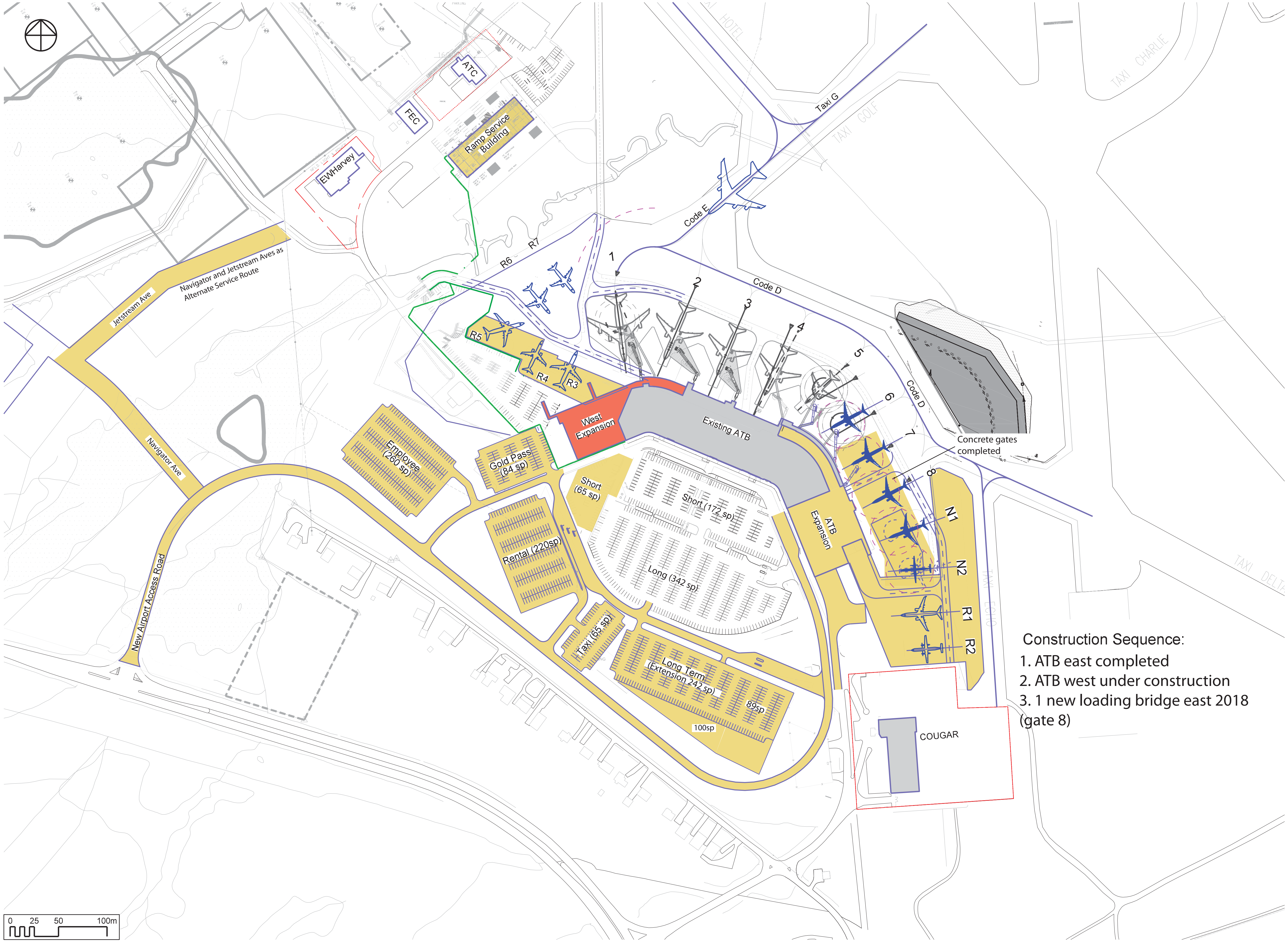
Plot ID

Drawing Status
FINAL

Job No	Drawing No	Issue
226601-00	Sk 010 F	3

File: J:\TOR\210000\216103-04\4 Internal Project Data\4-03 Drawings\4-03-21 Planning\Sk 010 - 2 - St John's Site Plan (Stages).dgn
Date: 4/27/2012 Time: 2:36:30 PM Plot Driver: pdf-1.pltcfg

A	B	C	D	E	F	G



1

2

3

4

5

ANSI B (11x17" / 279x432mm)

LEGEND:

- Construction
- Demolition
- Complete
- Fence

Issue	Date	By	Chkd	Appd
3	28/04/14	MB	ML	ML
2	27/04/12	YB	ML	ML
1	28/02/12	YB	ML	ML

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Client
St. John's International Airport Authority

Job Title
St. John's International Airport Strategic Terminal Development Plan

Job Phase
Conceptual Planning

Location / Stage
St. John's International Airport Air Terminal Building Area

Drawing Title
ATB Site Plan
Expansion Strategy
Stage 7 - 2018/2019

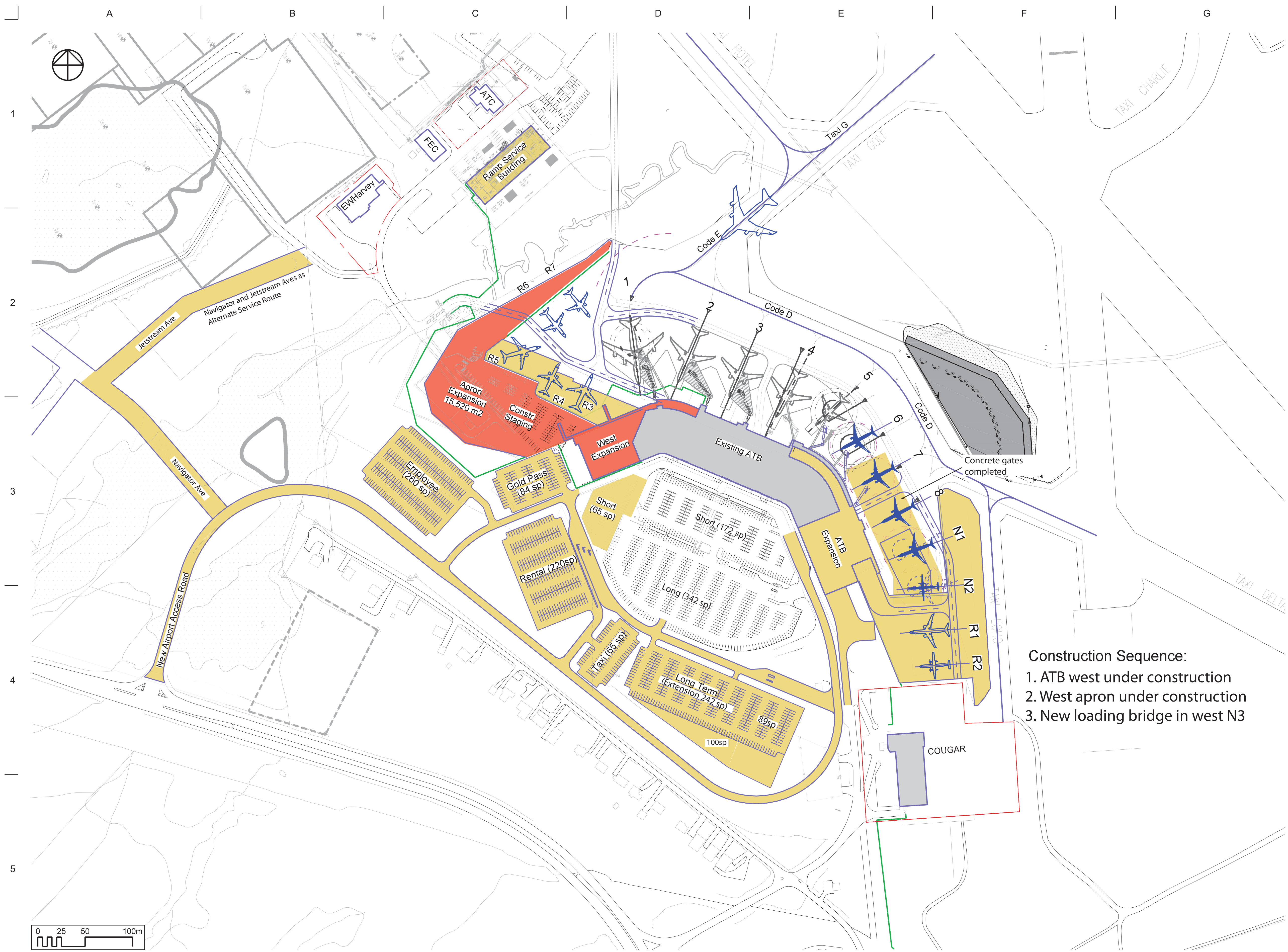
Scale at B (11"x17") 1:4000

Plot ID

Drawing Status
FINAL

Job No	Drawing No	Issue
226601-00	Sk 010 G	3

File: J:\TOR\210000\216103-04\4 Internal Project Data\4-03 Drawings\4-03-21 Planning\Sk 010 - 2 - St John's Site Plan (Stages).dgn
Date: 4/27/2012 Time: 2:36:30 PM Plot Driver: pdf-1.pltcfg



LEGEND:

- Construction
- Demolition
- Complete
- Fence

Construction Sequence:

1. ATB west under construction
2. West apron under construction
3. New loading bridge in west N3

ANSI B (11x17" / 279x432mm)

Issue	Date	By	Chkd	Appd
3	28/04/14	MB	ML	ML
2	27/04/12	YB	ML	ML
1	28/02/12	YB	ML	ML

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www.arup.com

Client
St. John's International Airport Authority

Job Title
St. John's International Airport Strategic Terminal Development Plan

Job Phase
Conceptual Planning

Location / Stage
St. John's International Airport Air Terminal Building Area

Drawing Title
ATB Site Plan
Expansion Strategy
Stage 8 - 2020

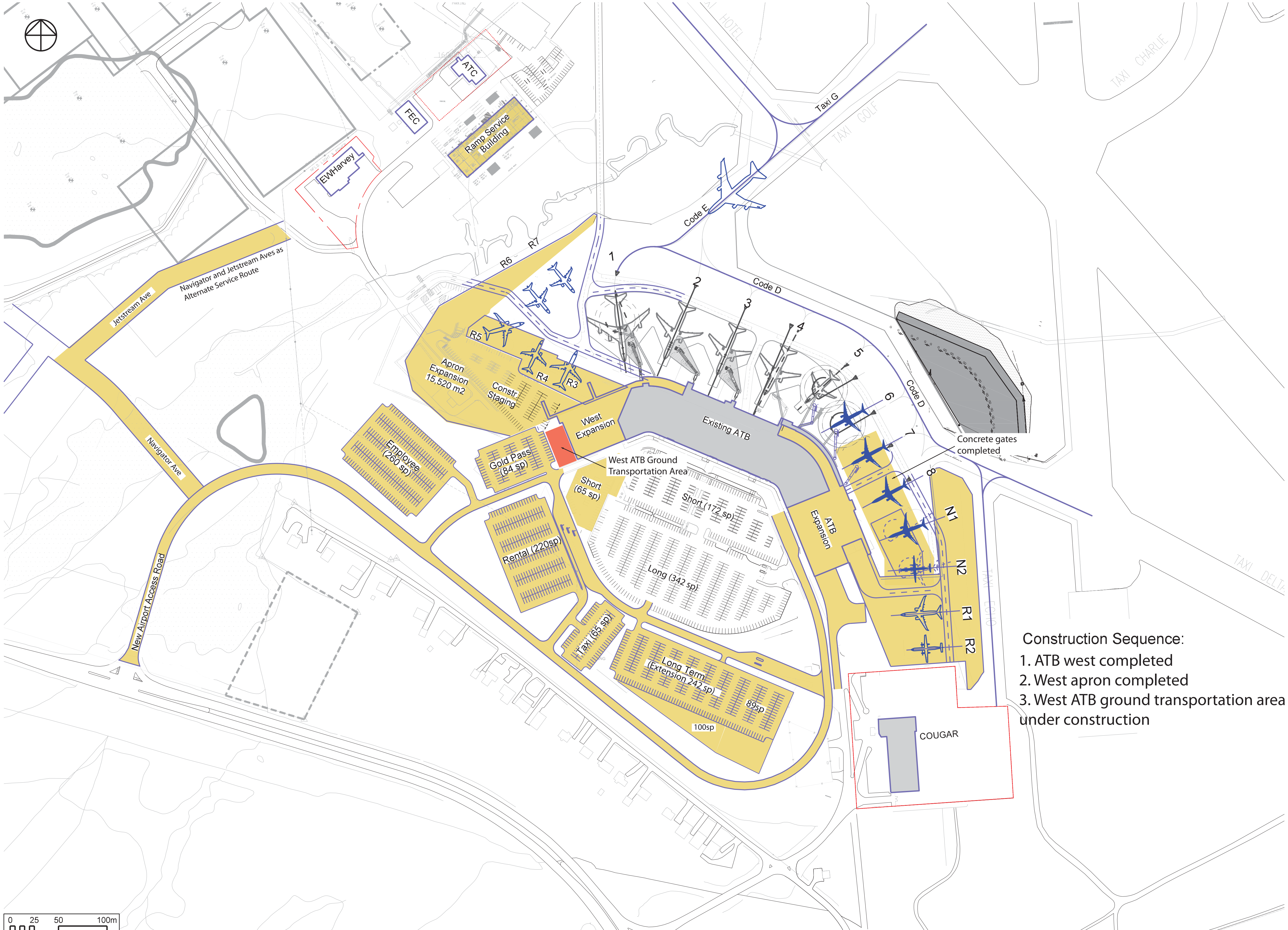
Scale at B (11"x17") 1:4000

Plot ID

Drawing Status
FINAL

Job No	Drawing No	Issue
226601-00	Sk 010 H	3

File: J:\TOR\210000\216103-04\4 Internal Project Data\4-03 Drawings\4-03-21 Planning\Sk 010 - 2 - St John's Site Plan (Stages).dgn
Date: 4/27/2012 Time: 2:36:30 PM Plot Driver: pdf-1.pltcfg



Construction Sequence:
1. ATB west completed
2. West apron completed
3. West ATB ground transportation area under construction

LEGEND:
- Construction
- Demolition
- Complete
- Fence

ANSI B (11x17" / 279x432mm)

Issue	Date	By	Chkd	Appd
3	28/04/14	MB	ML	ML
2	27/04/12	YB	ML	ML
1	28/02/12	YB	ML	ML

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www.arup.com

Client
St. John's International Airport Authority

Job Title
St. John's International Airport Strategic Terminal Development Plan

Job Phase
Conceptual Planning

Location / Stage
St. John's International Airport Air Terminal Building Area

Drawing Title
ATB Site Plan
Expansion Strategy
Stage 9 - 2021

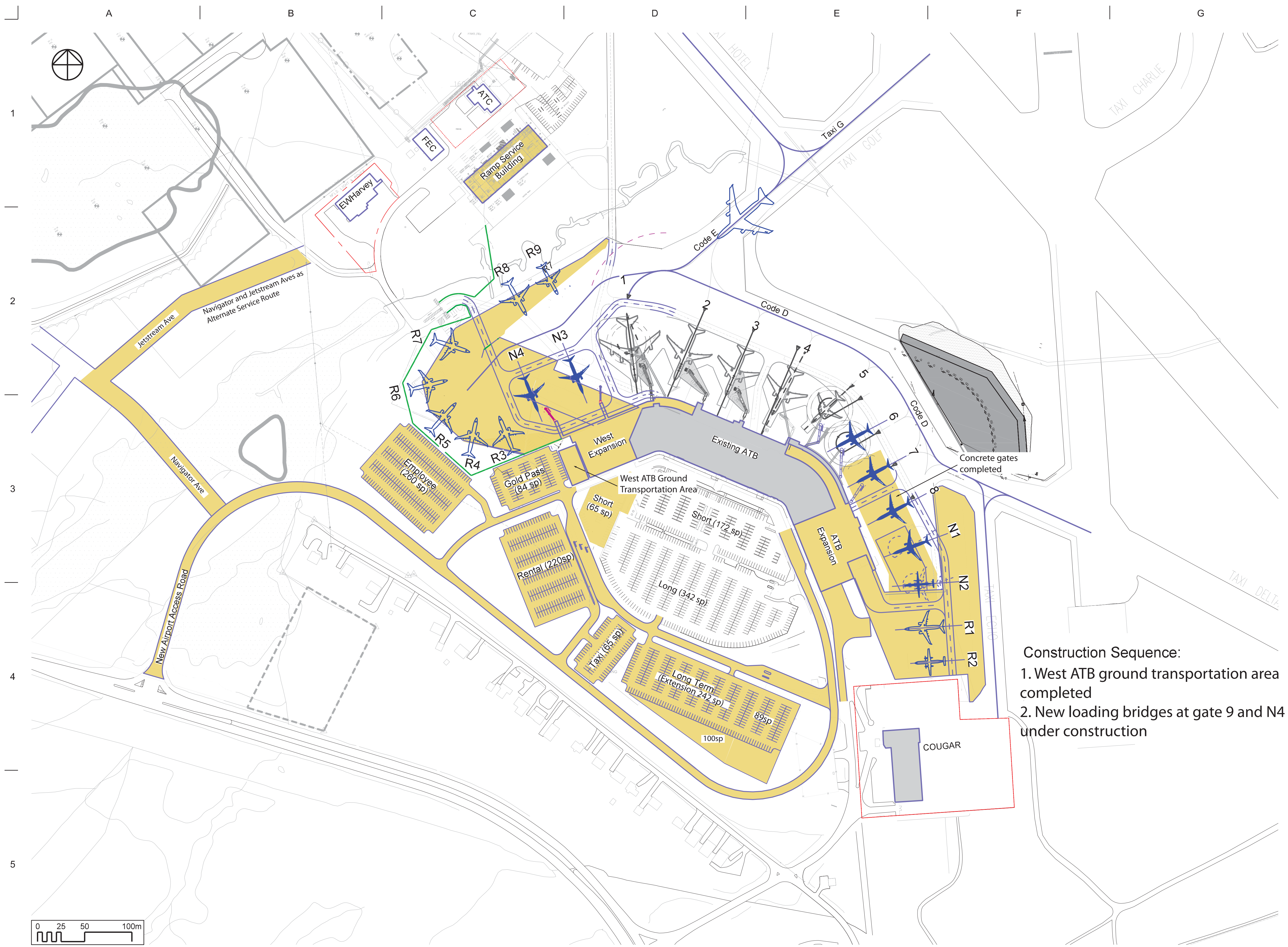
Scale at B (11"x17") 1:4000

Plot ID

Drawing Status
FINAL

Job No	Drawing No	Issue
226601-00	Sk 010 I	3

File: J:\TOR\210000\216103-04\4 Internal Project Data\4-03 Drawings\4-03-21 Planning\Sk 010 - 2 - St John's Site Plan (Stages).dgn
Date: 4/27/2012 Time: 2:36:30 PM Plot Driver: pdf-1.pltcfg



LEGEND:

- Construction
- Demolition
- Complete
- Fence

ANSI B (11x17" / 279x432mm)

3	28/04/14	MB	ML	ML
2	27/04/12	YB	ML	ML
1	28/02/12	YB	ML	ML
Issue	Date	By	Chkd	Appd

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Client
St. John's International Airport Authority

Job Title
St. John's International Airport Strategic Terminal Development Plan

Job Phase
Conceptual Planning

Location / Stage
St. John's International Airport Air Terminal Building Area

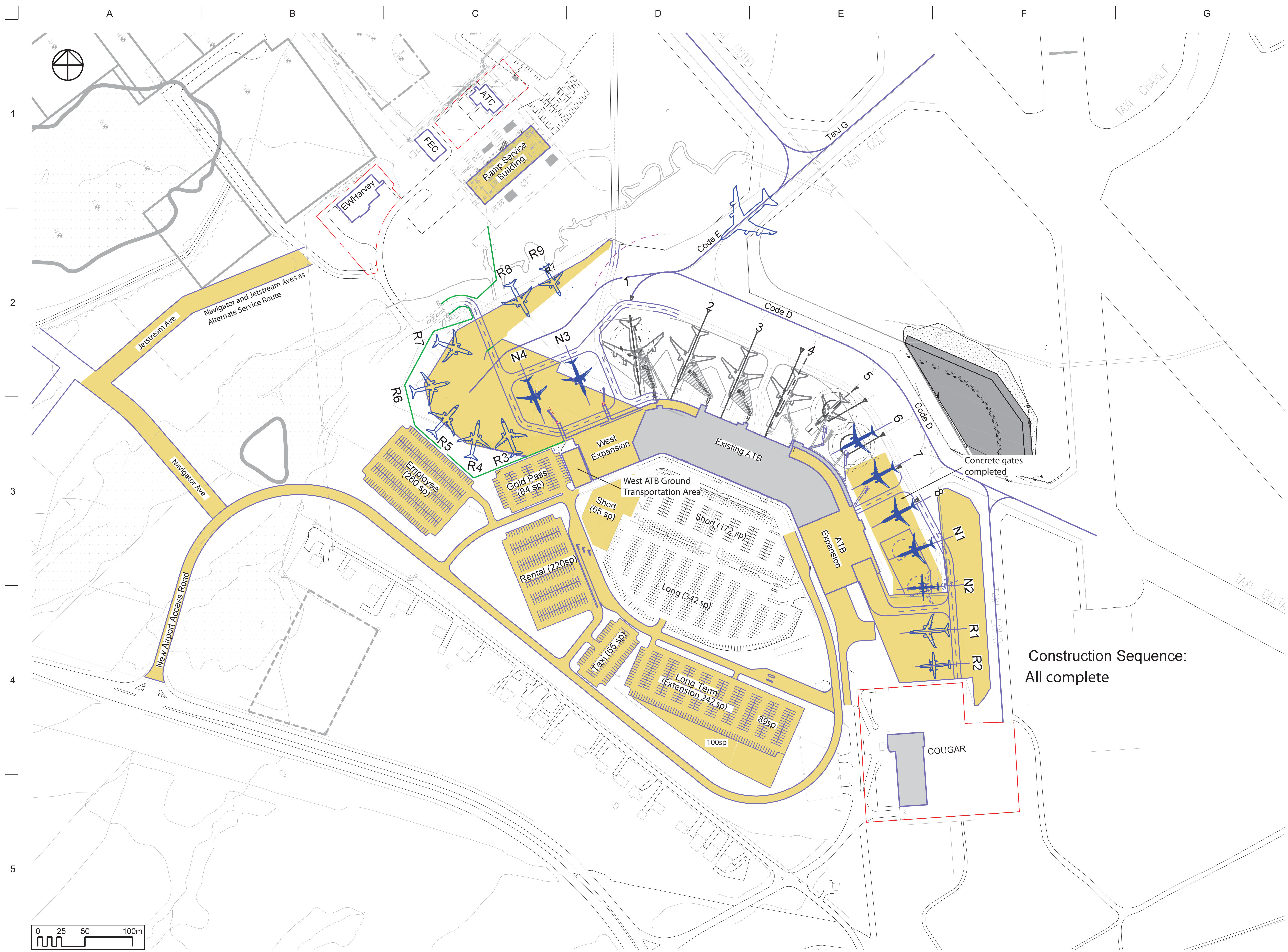
Drawing Title
ATB Site Plan
Expansion Strategy
Stage 10 - 2022

Scale at B (11"x17") 1:4000

Plot ID

Drawing Status
FINAL

Job No	Drawing No	Issue
226601-00	Sk 010 J	3



LEGEND:

- Construction
- Demolition
- Complete
- Fence

ANSI B (11x17" / 279x432mm)

3	28/04/14	MB	ML	ML
2	27/04/12	YB	ML	ML
1	28/02/12	YB	ML	ML
Issue	Date	By	Chkd	Appd

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Client
St. John's International Airport Authority

Job Title
St. John's International Airport Strategic Terminal Development Plan

Job Phase
Conceptual Planning

Location / Stage
St. John's International Airport Air Terminal Building Area

Drawing Title
ATB Site Plan
Expansion Strategy
Stage 11 - 2023

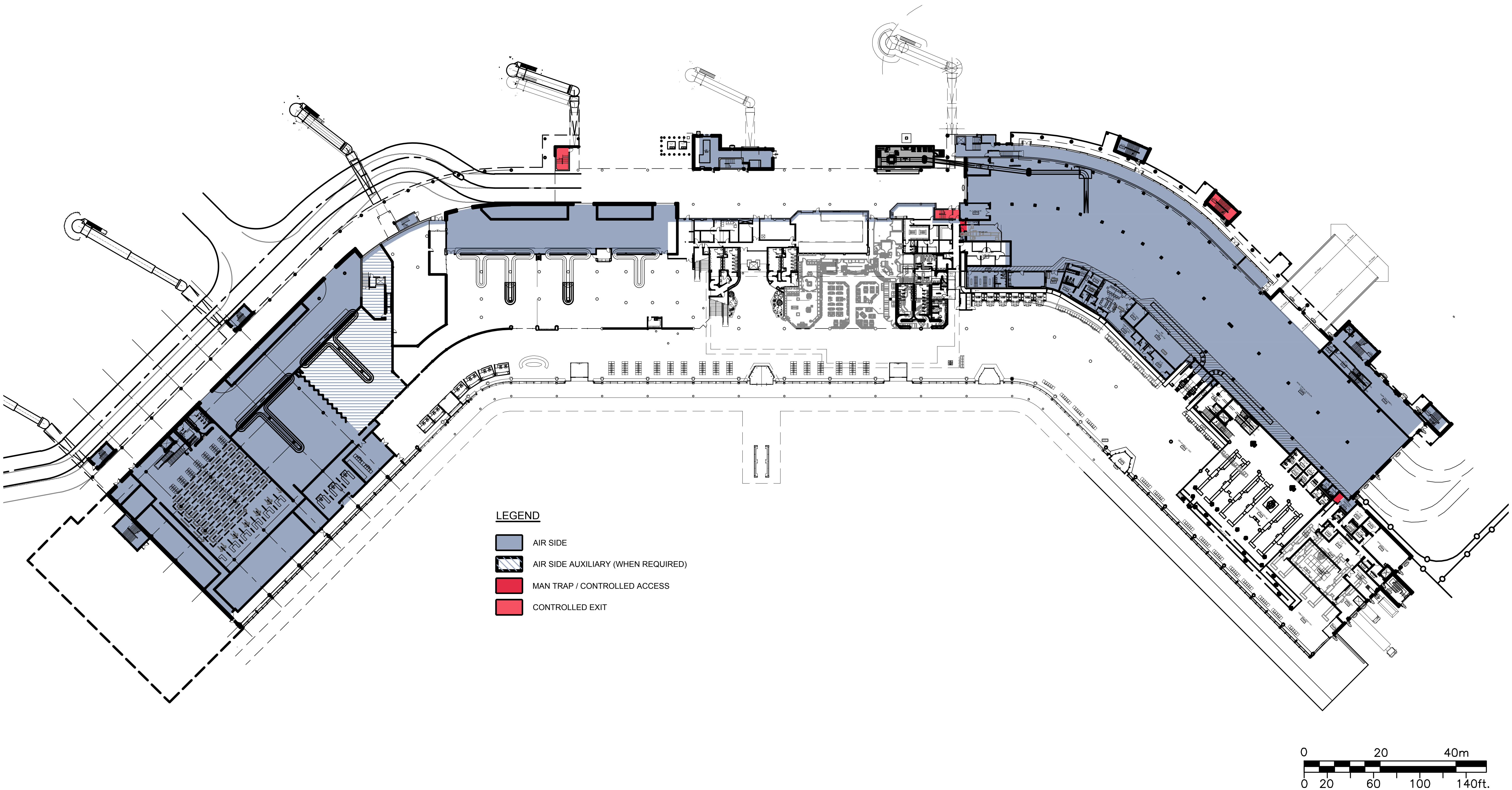
Scale at B (11"x17") 1:4000

Plot ID

Drawing Status
FINAL

Job No	Drawing No	Issue
226601-00	Sk 010 K	3

File: J:\TOR\210000\216103-04\4 Internal Project Data\4-03 Drawings\4-03-21 Planning\Sk 010 - 2 - St John's Site Plan (Stages).dgn
Date: 4/27/2012 Time: 2:36:30 PM Plot Driver: pdf-1.pltcfg



REV.	REVISIONS	DATE
B	ISSUED FOR CONCEPT DESIGN REPORT	14/07/31
A	ISSUED FOR REVIEW	13/12/20

JOHN HEARN architect incorporated

BAE • NEWPLAN GROUP

ST. JOHN'S International Airport Authority

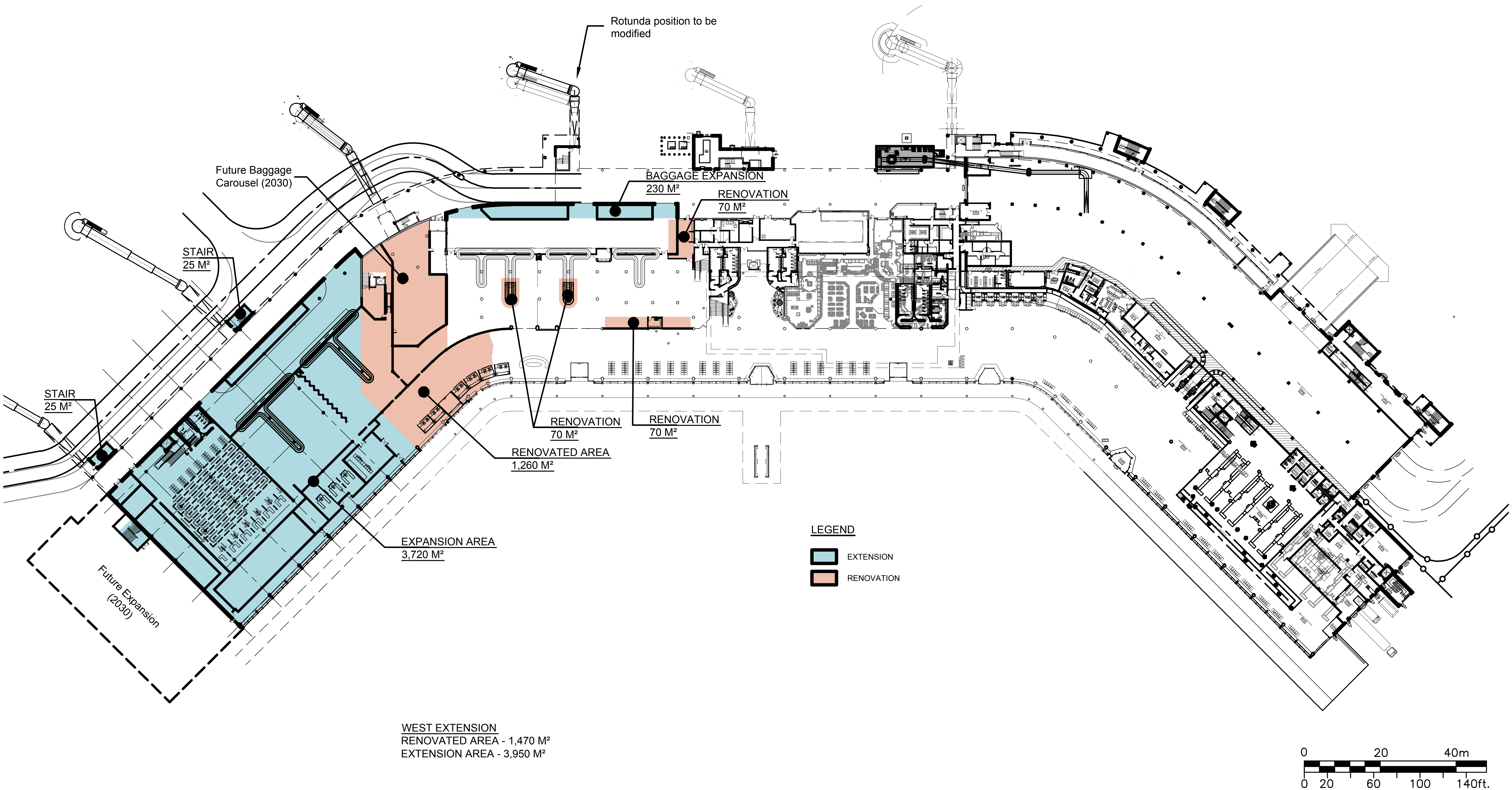
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

WEST EXPANSION
LEVEL 1 DEMARCATION

DATE 13/12/20

REV. B

W-1.0



WEST EXTENSION
RENOVATED AREA - 1,470 M²
EXTENSION AREA - 3,950 M²

REV.	REVISIONS	DATE
B	ISSUED FOR CONCEPT DESIGN REPORT	14/07/31
A	ISSUED FOR REVIEW	13/12/20

JOHN HEARN architect incorporated

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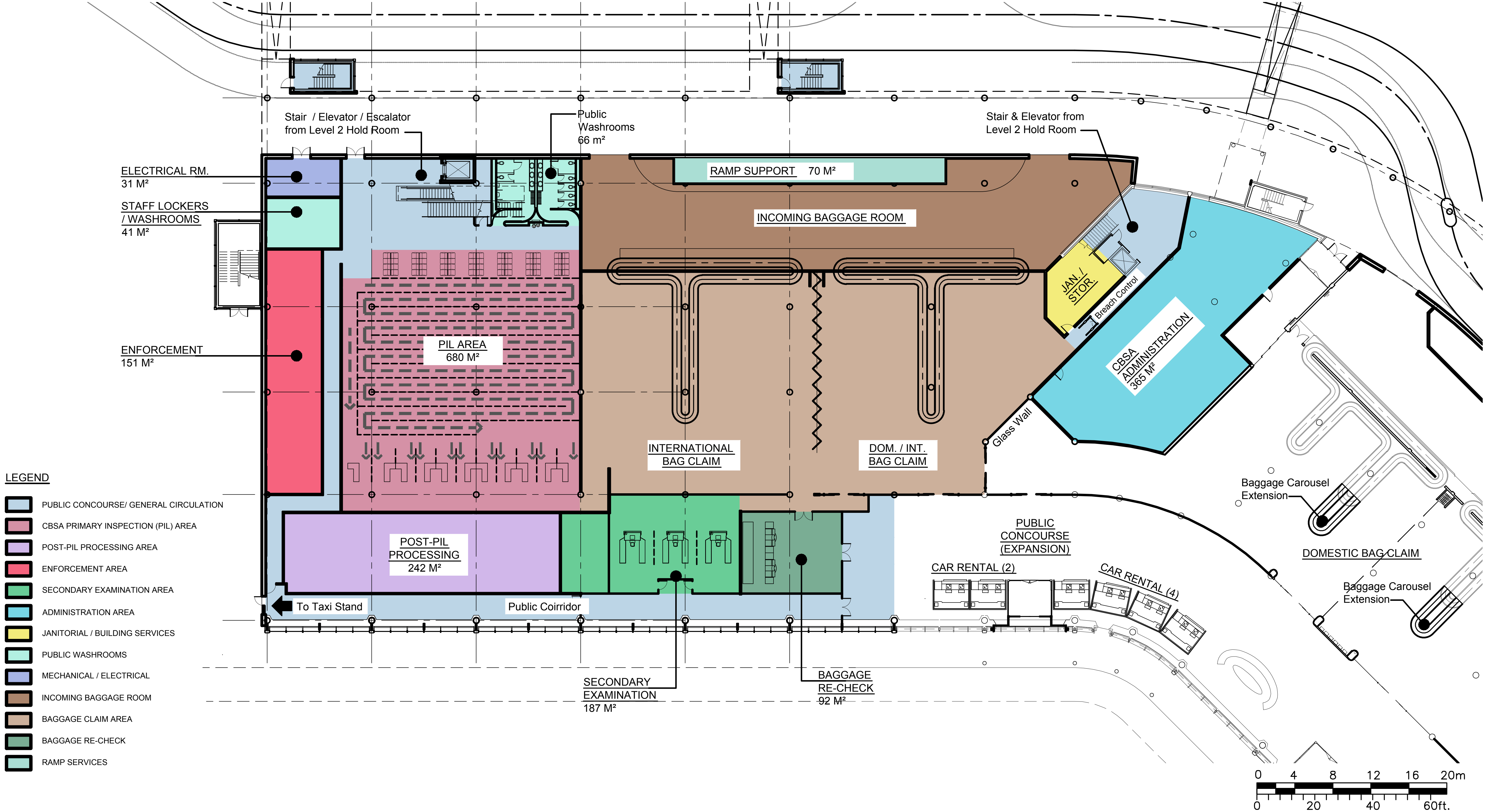
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

WEST EXPANSION
TERMINAL LEVEL 1PLAN

DATE 13/12/20
REV. B
W-1.1



B	ISSUED FOR CONCEPT DESIGN REPORT	14/07/31
A	ISSUED FOR REVIEW	13/12/20
REV.	REVISIONS	DATE

JOHN HEARN architect incorporated

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ST. JOHN'S International Airport Authority

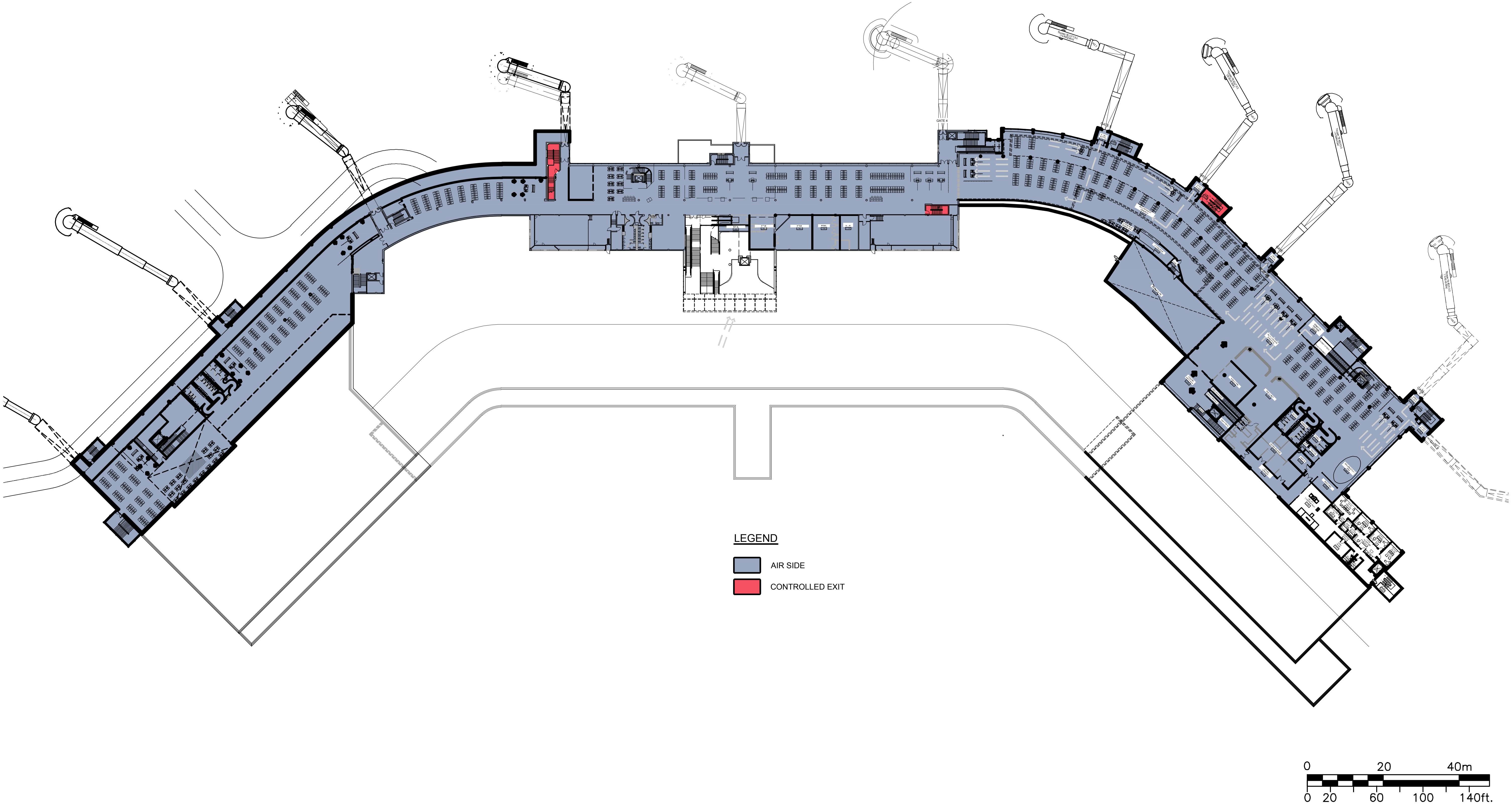
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

WEST EXPANSION
LEVEL 1 BLOW-UP PLAN

DATE 13/12/20

REV. B

W-1.2



REV.	REVISIONS	DATE
B	ISSUED FOR CONCEPT DESIGN REPORT	14/07/31
A	ISSUED FOR REVIEW	13/12/20

JOHN HEARN architect incorporated

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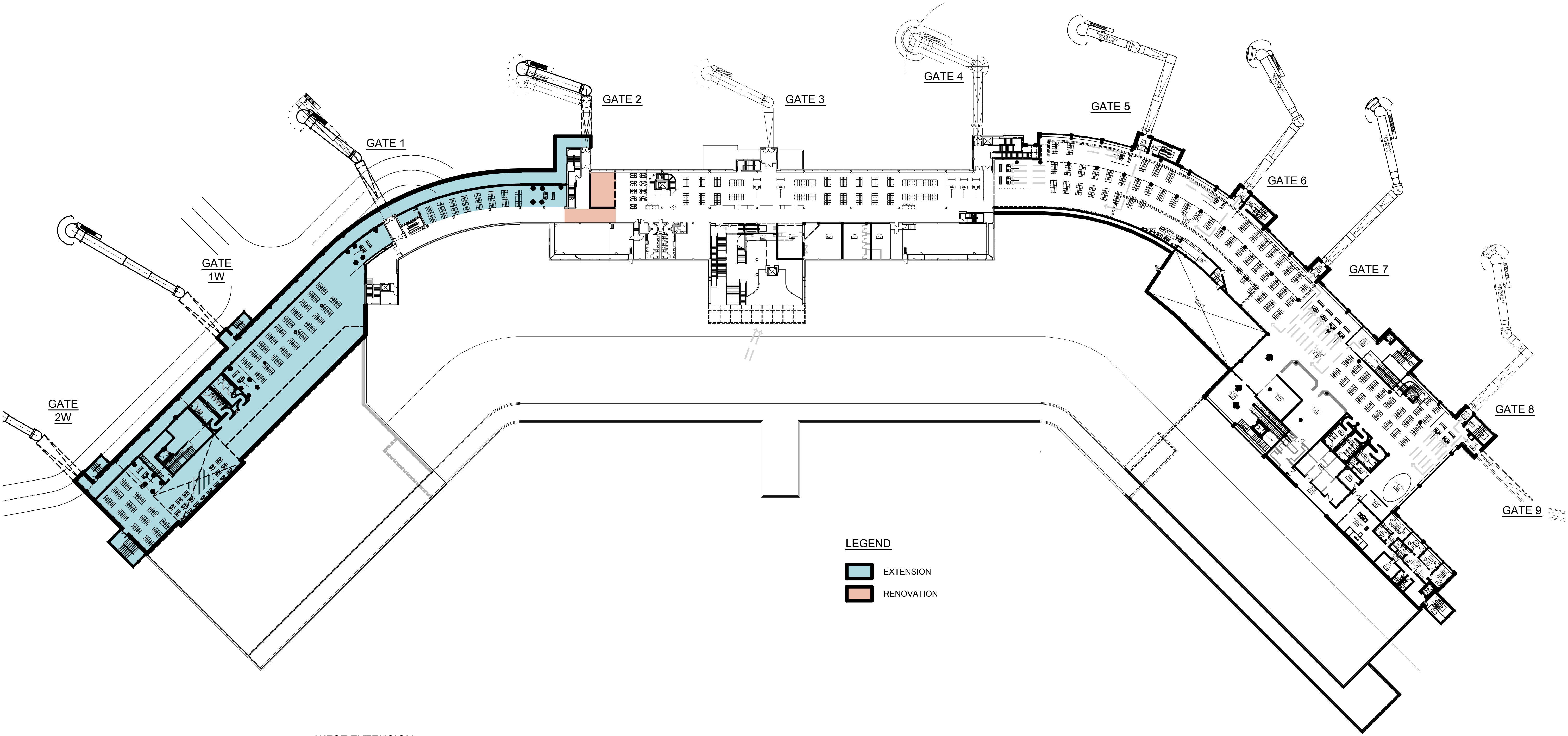
ST. JOHN'S International Airport Authority

AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

WEST EXPANSION
LEVEL 2 DEMARCATION

DATE 13/12/20
REV. B
W-2.0



WEST EXTENSION
RENOVATED AREA - 110 M²
EXTENSION AREA - 2,670 M²

0 20 40m
0 20 60 100 140ft.

REV.	REVISIONS	DATE
B	ISSUED FOR CONCEPT DESIGN REPORT	14/07/31
A	ISSUED FOR REVIEW	13/12/20

JOHN HEARN architect incorporated

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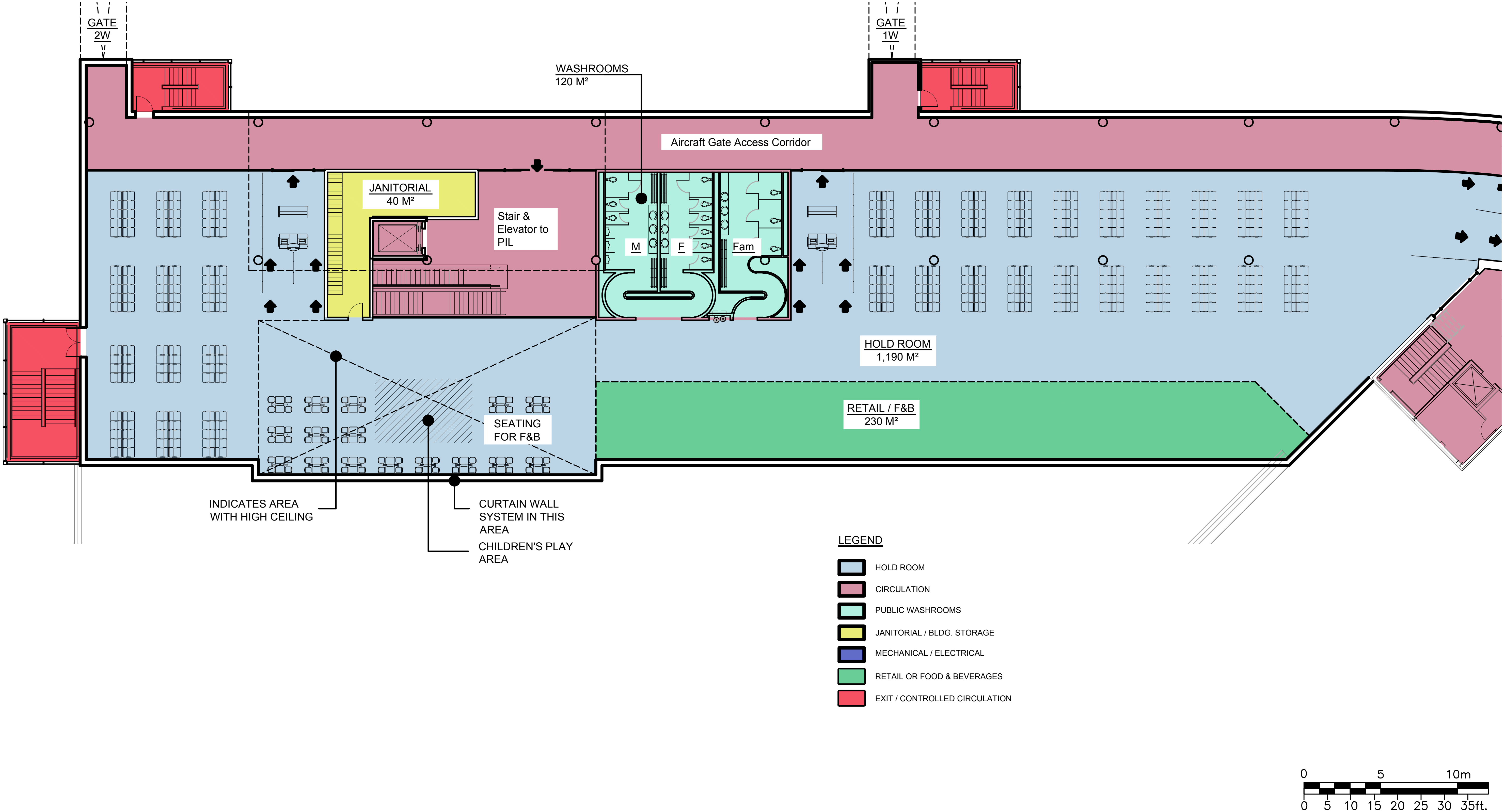
ST. JOHN'S International Airport Authority

AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

WEST EXPANSION
TERMINAL LEVEL 2

DATE 13/12/20
REV. B
W-2.1



REV.	REVISIONS	DATE
B	ISSUED FOR CONCEPT DESIGN REPORT	14/07/31
A	ISSUED FOR REVIEW	13/12/20

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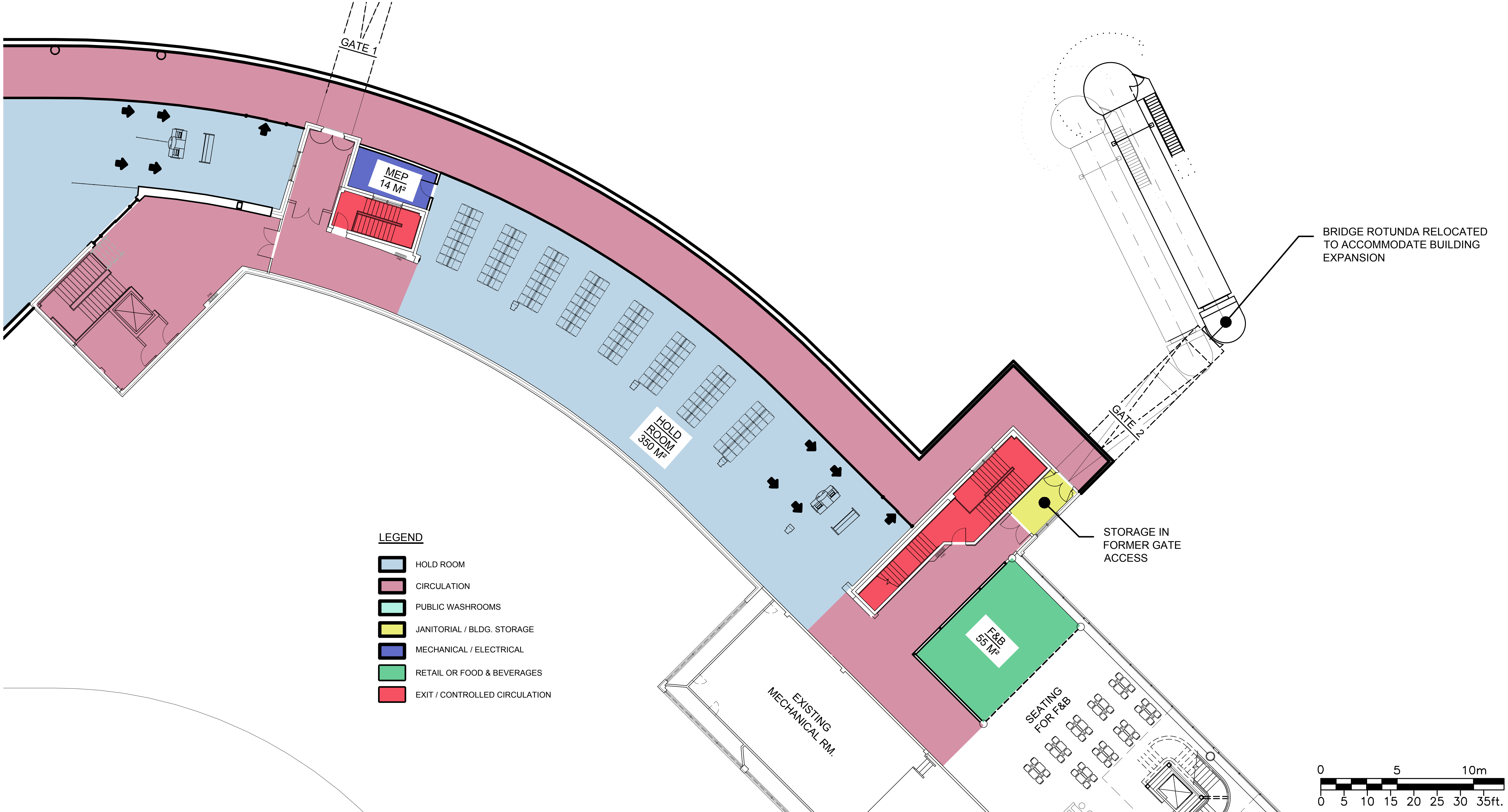
ST. JOHN'S International Airport Authority

AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

DATE 13/12/20
REV. B

WEST EXPANSION
LEVEL 2 BLOW-UP PLAN

W-2.2



REV.	REVISIONS	DATE
B	ISSUED FOR CONCEPT DESIGN REPORT	14/07/31
A	ISSUED FOR REVIEW	13/12/20

JOHN HEARN architect incorporated

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ST. JOHN'S International Airport Authority

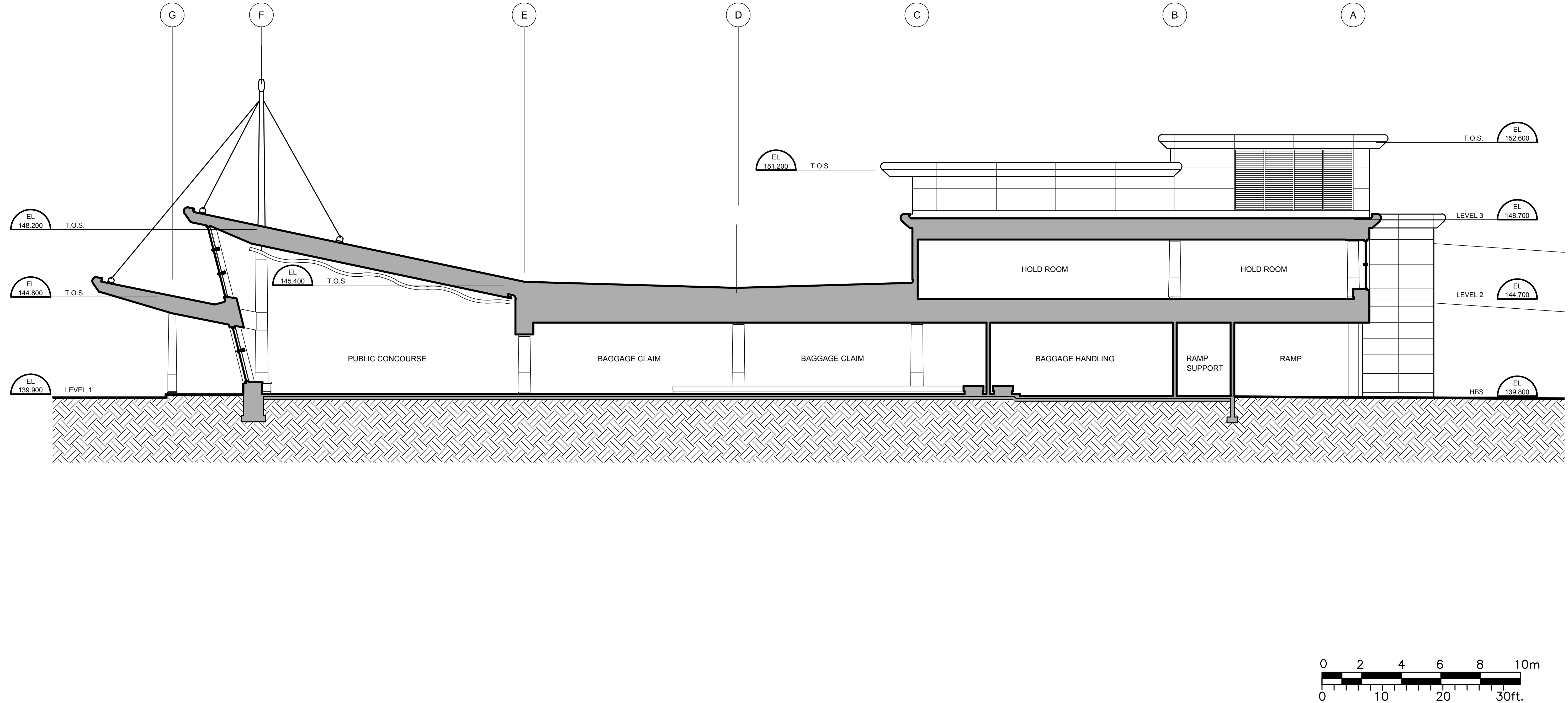
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

WEST EXPANSION
LEVEL 2 BLOW-UP PLAN

DATE 13/12/20

REV. B

W-2.3



REV.	REVISIONS	DATE
B	ISSUED FOR CONCEPT DESIGN REPORT	14/07/31
A	ISSUED FOR REVIEW	13/12/20

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ST. JOHN'S International Airport Authority

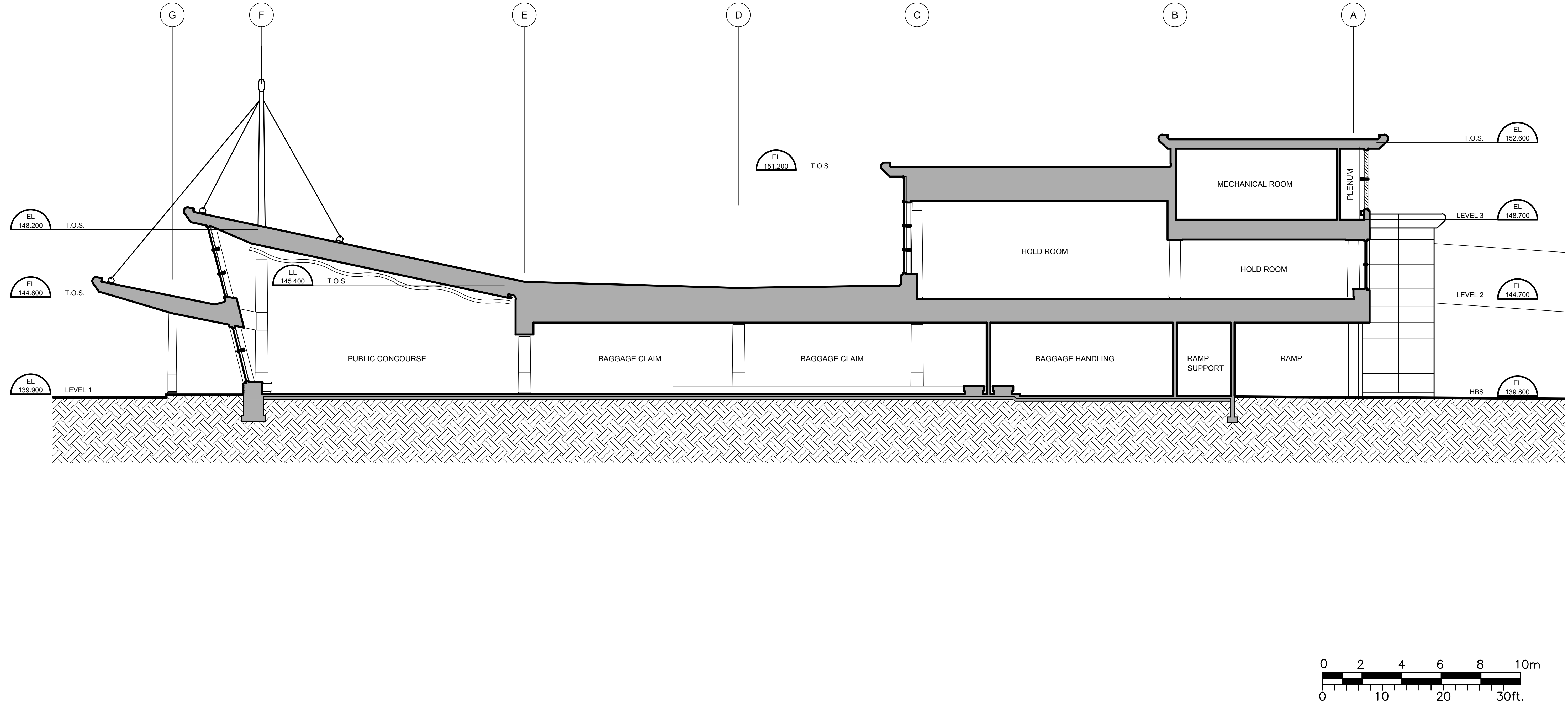
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

WEST EXPANSION
BLDG. SECTION - HOLD ROOM

DATE 13/12/20

REV. B

W-S.1



REV.	REVISIONS	DATE
B	ISSUED FOR CONCEPT DESIGN REPORT	14/07/31
A	ISSUED FOR REVIEW	13/12/20

JOHN HEARN architect incorporated

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ST. JOHN'S International Airport Authority

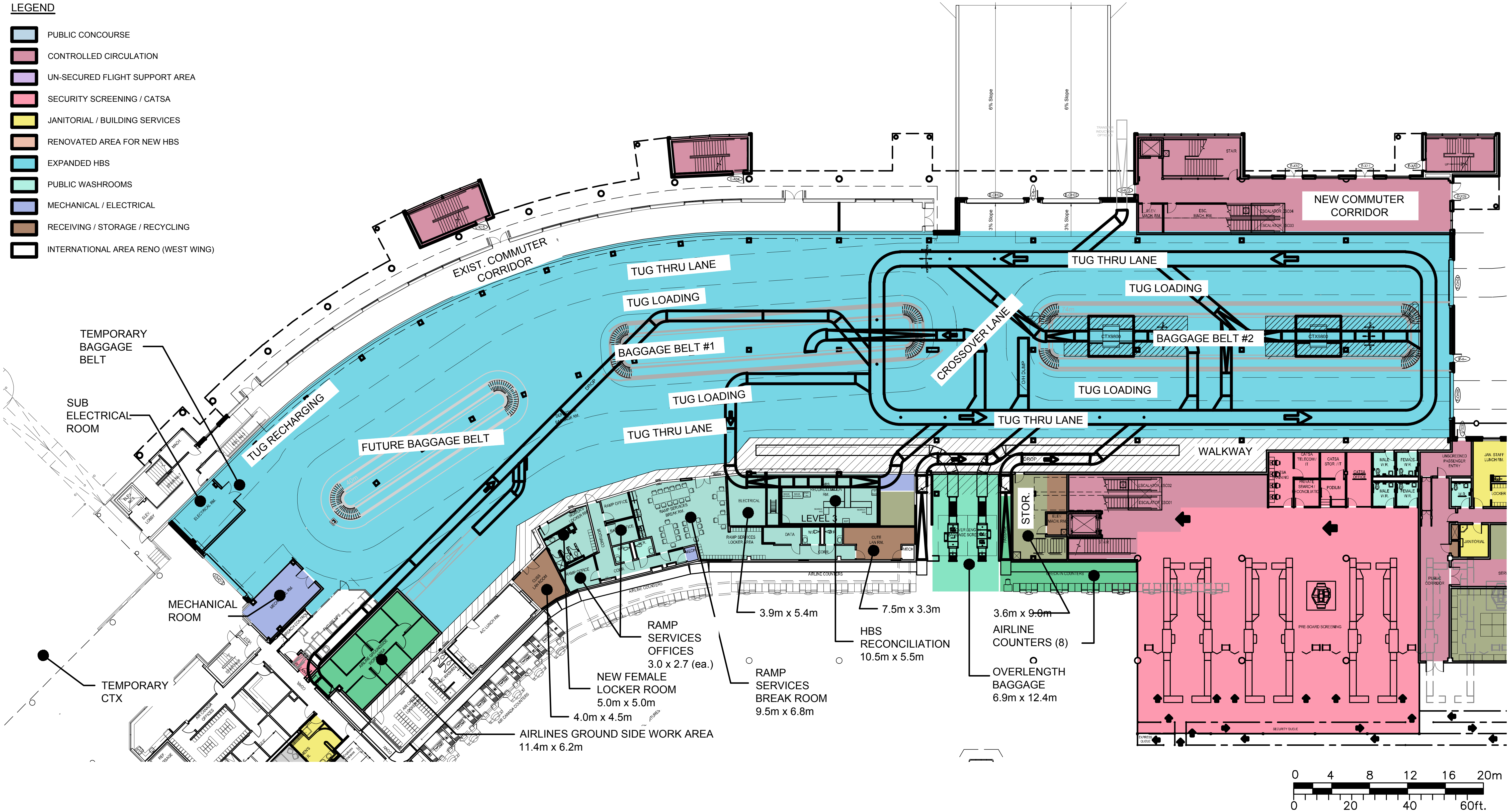
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

WEST EXPANSION
BLDG. SECTION - MECH. ROOM

DATE 13/12/20

REV. B

W-S.2



REV.	REVISIONS	DATE
3	GENERAL REVISIONS	
2	DESIGN DEVELOPMENT REPORT	14/07/23
1	GENERAL REVISIONS	14/04/28
0	CONCEPT DESIGN REPORT - FINAL	13/12/13
A	ISSUED FOR REVIEW	13/05/22

JOHN HEARN architect incorporated

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ST. JOHN'S International Airport Authority

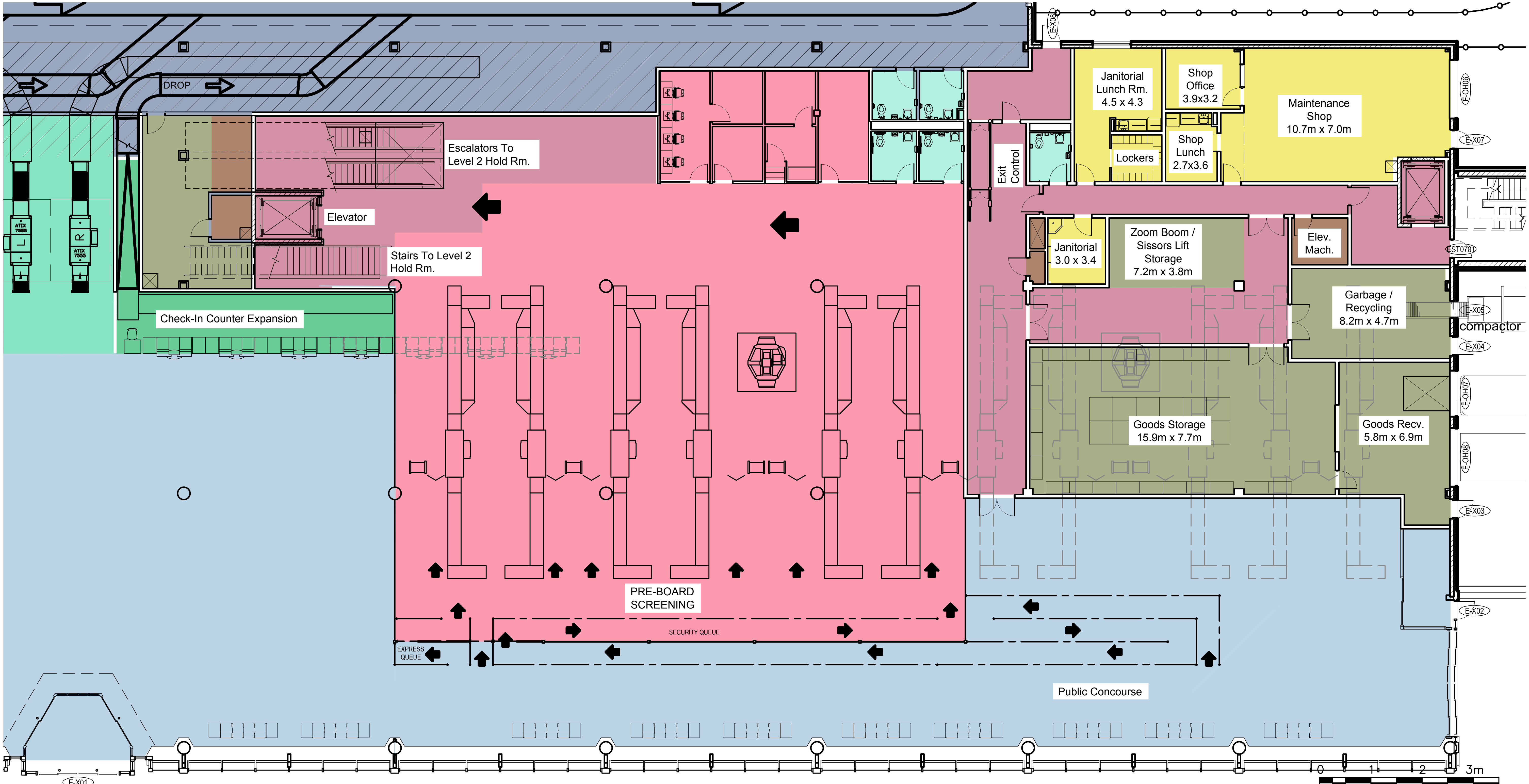
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

BLOW-UP FLOOR PLAN
LEVEL 1 HBS

DATE 13/05/22

REV. 3

PL-1.2



REV.	REVISIONS	DATE
3	GENERAL REVISIONS	
2	DESIGN DEVELOPMENT REPORT	14/07/23
1	GENERAL REVISIONS	14/04/28
0	CONCEPT DESIGN REPORT - FINAL	13/12/13
A	ISSUED FOR REVIEW	13/09/10

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ST. JOHN'S International Airport Authority

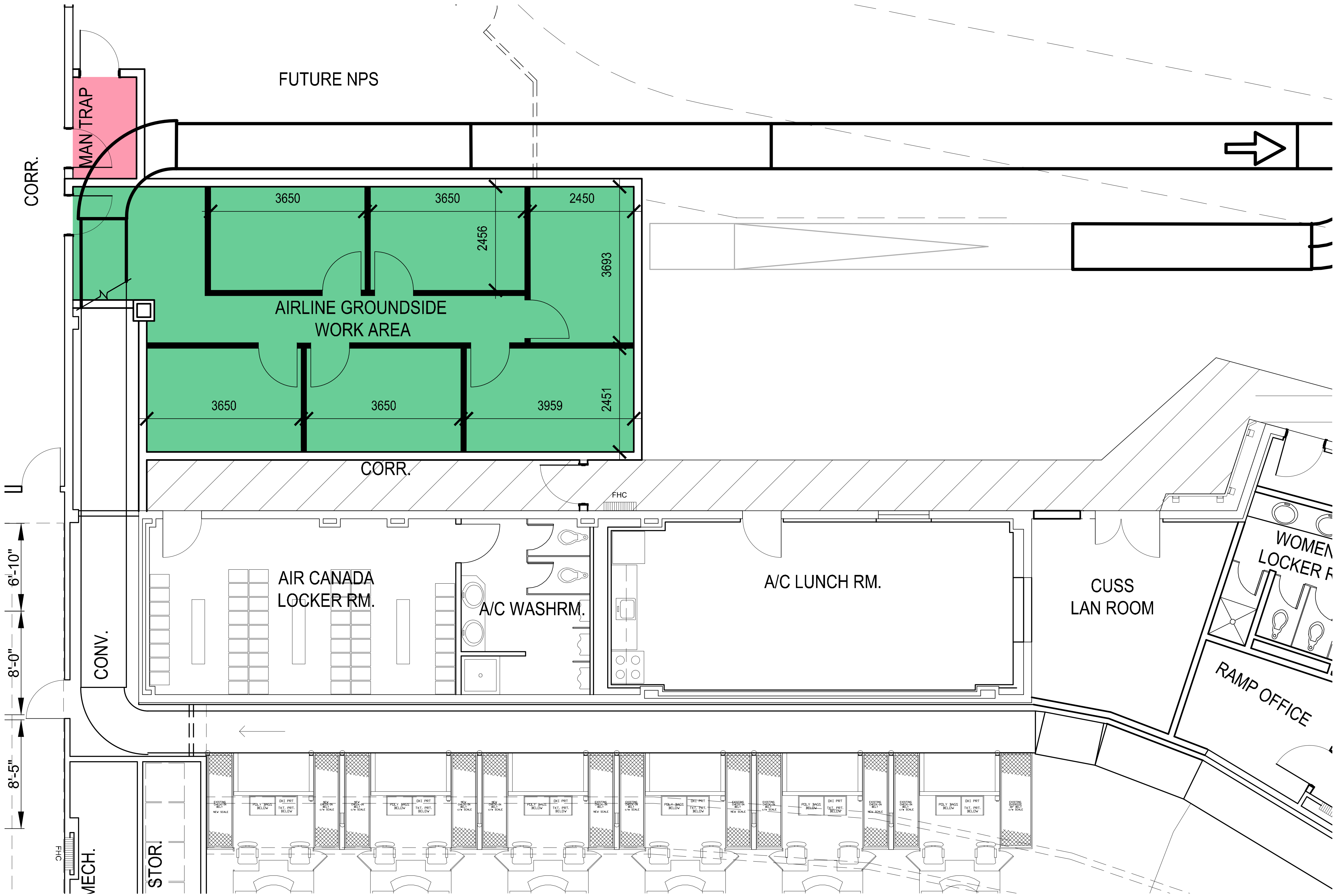
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

BLOW-UP FLOOR PLAN
EAST EXPANSION

DATE 13/05/22

REV. 3

PL-1.3



REV.	REVISIONS	DATE
2	DESIGN DEVELOPMENT REPORT	14/07/23
1	GENERAL REVISIONS	14/04/28
0	CONCEPT DESIGN REPORT - FINAL	13/12/13
A	ISSUED FOR REVIEW	13/05/22

JOHN HEARN architect incorporated

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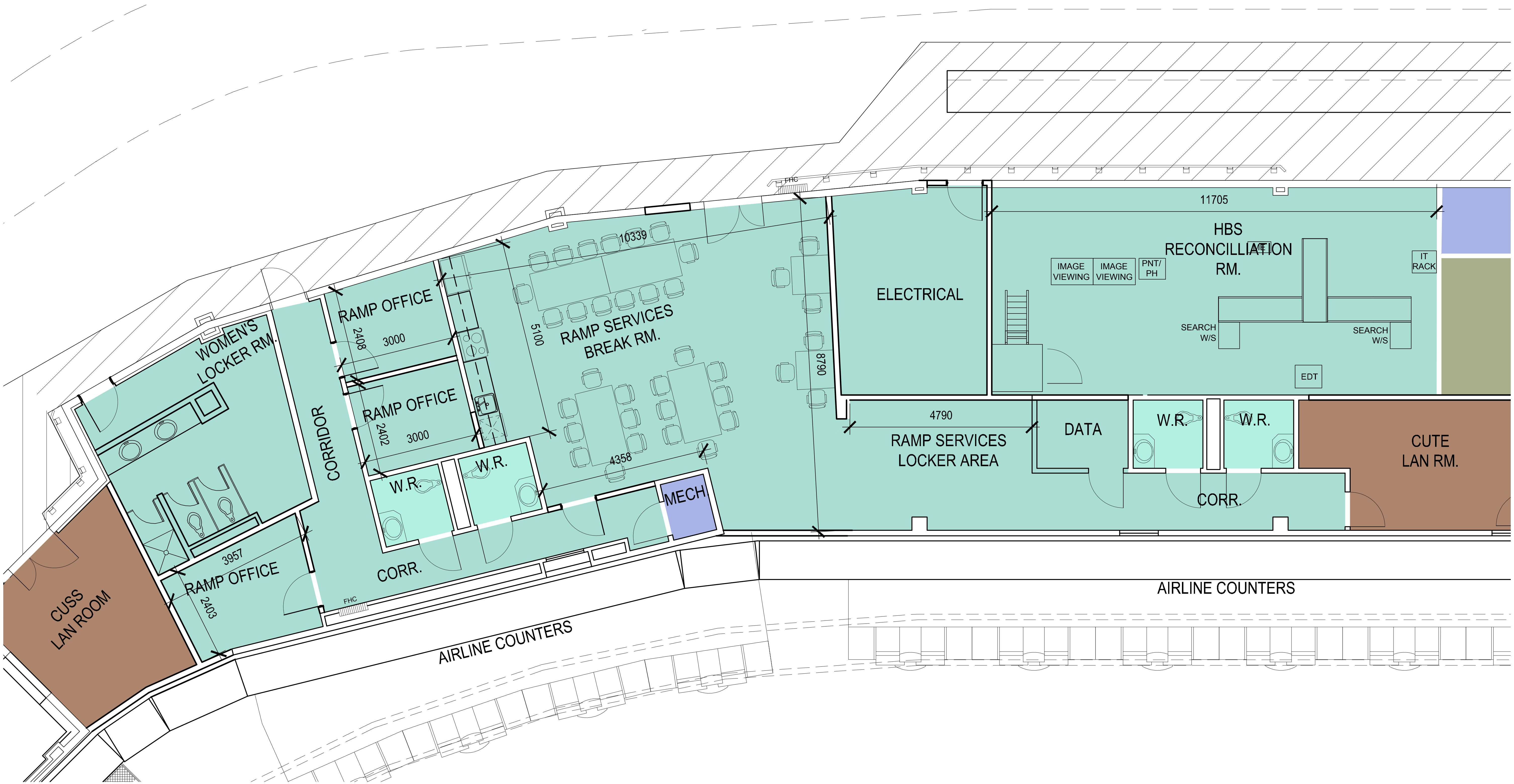
ST. JOHN'S International Airport Authority

AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

BLOW-UP FLOOR PLAN
GROUND SIDE WORK AREA

DATE 13/05/22
REV. 2
PL-1.7



REV.	REVISIONS	DATE
2	DESIGN DEVELOPMENT REPORT	14/07/23
1	GENERAL REVISIONS	14/04/28
0	CONCEPT DESIGN REPORT - FINAL	13/12/13
A	ISSUED FOR REVIEW	13/09/10

JOHN HEARN architect incorporated

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ST. JOHN'S International Airport Authority

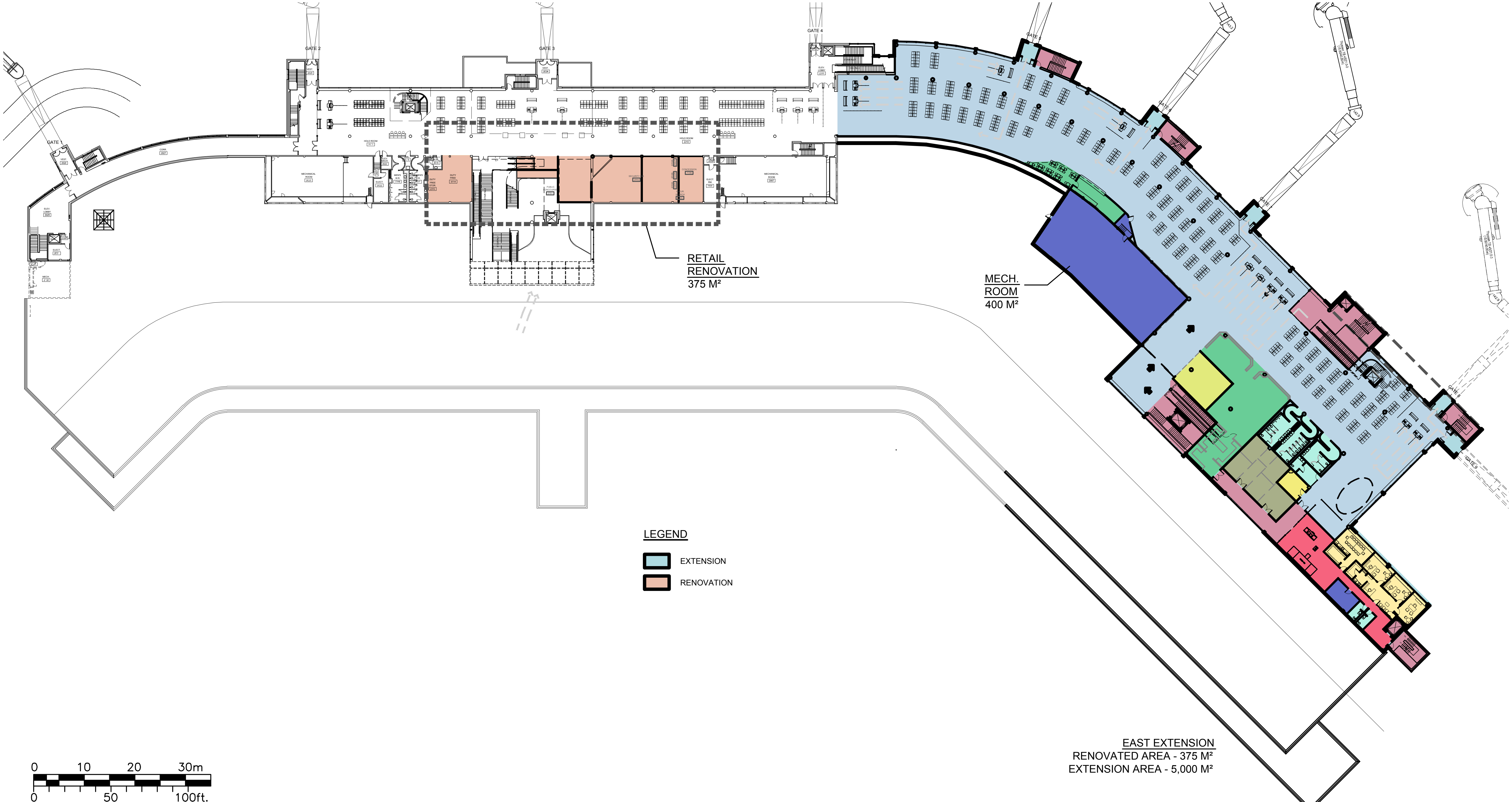
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

BLOW-UP FLOOR PLAN
RAMP SERVICES

DATE 13/05/22

REV. 2

PL-1.8



REV.	REVISIONS	DATE
2	DESIGN DEVELOPMENT REPORT	14/07/23
1	GENERAL REVISIONS	14/04/28
0	CONCEPT DESIGN REPORT - FINAL	13/12/13
A	ISSUED FOR REVIEW	13/05/22

JOHN HEARN architect incorporated

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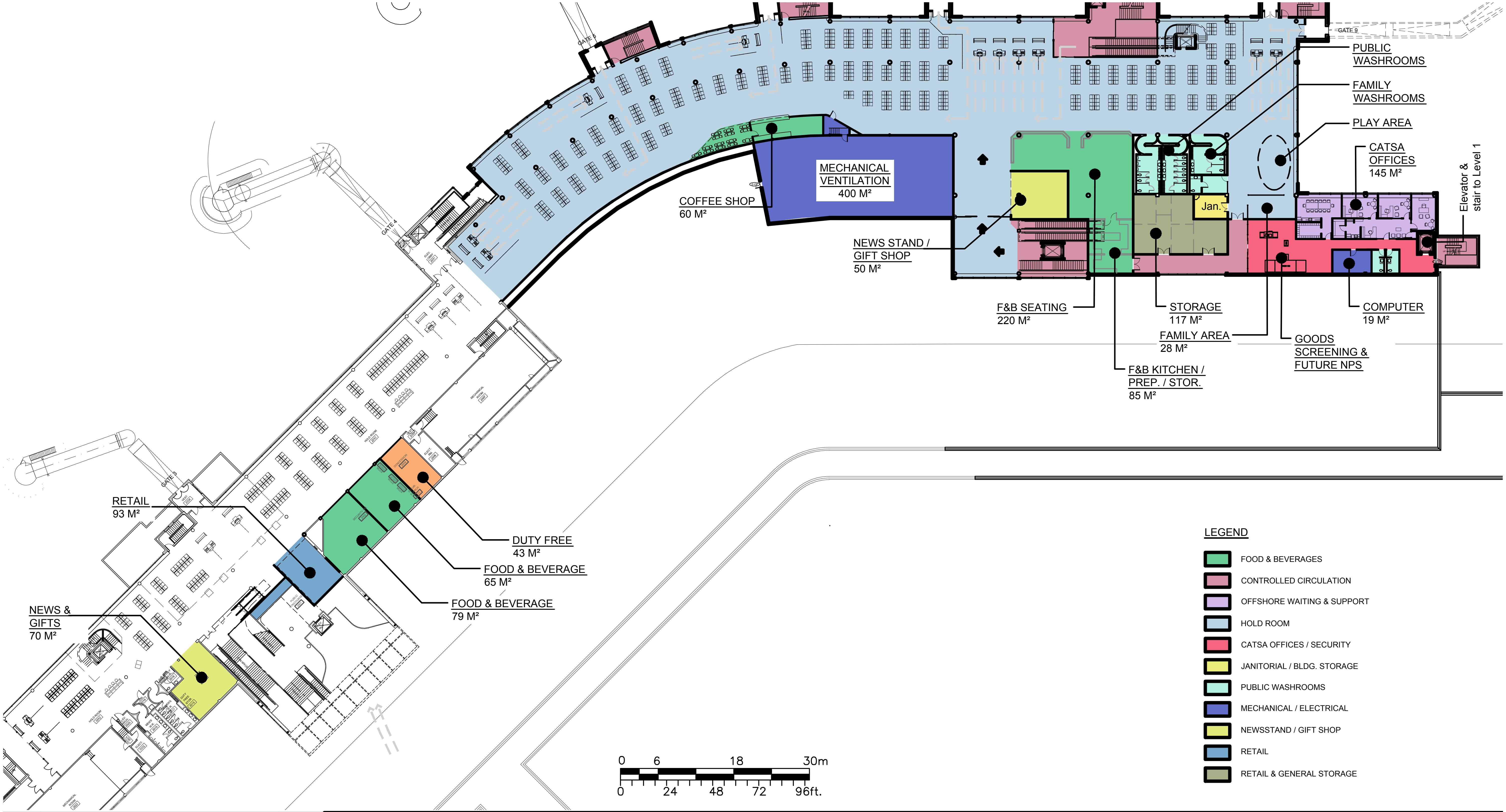
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

FLOOR PLAN
TERMINAL LEVEL 2

DATE 13/05/22

REV. 2

PL-2.1



2	DESIGN DEVELOPMENT REPORT	14/07/23
1	GENERAL REVISIONS	14/04/28
0	CONCEPT DESIGN REPORT - FINAL	13/12/13
A	ISSUED FOR REVIEW	13/05/22
REV.	REVISIONS	DATE

JOHN HEARN architect incorporated

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ST. JOHN'S International Airport Authority

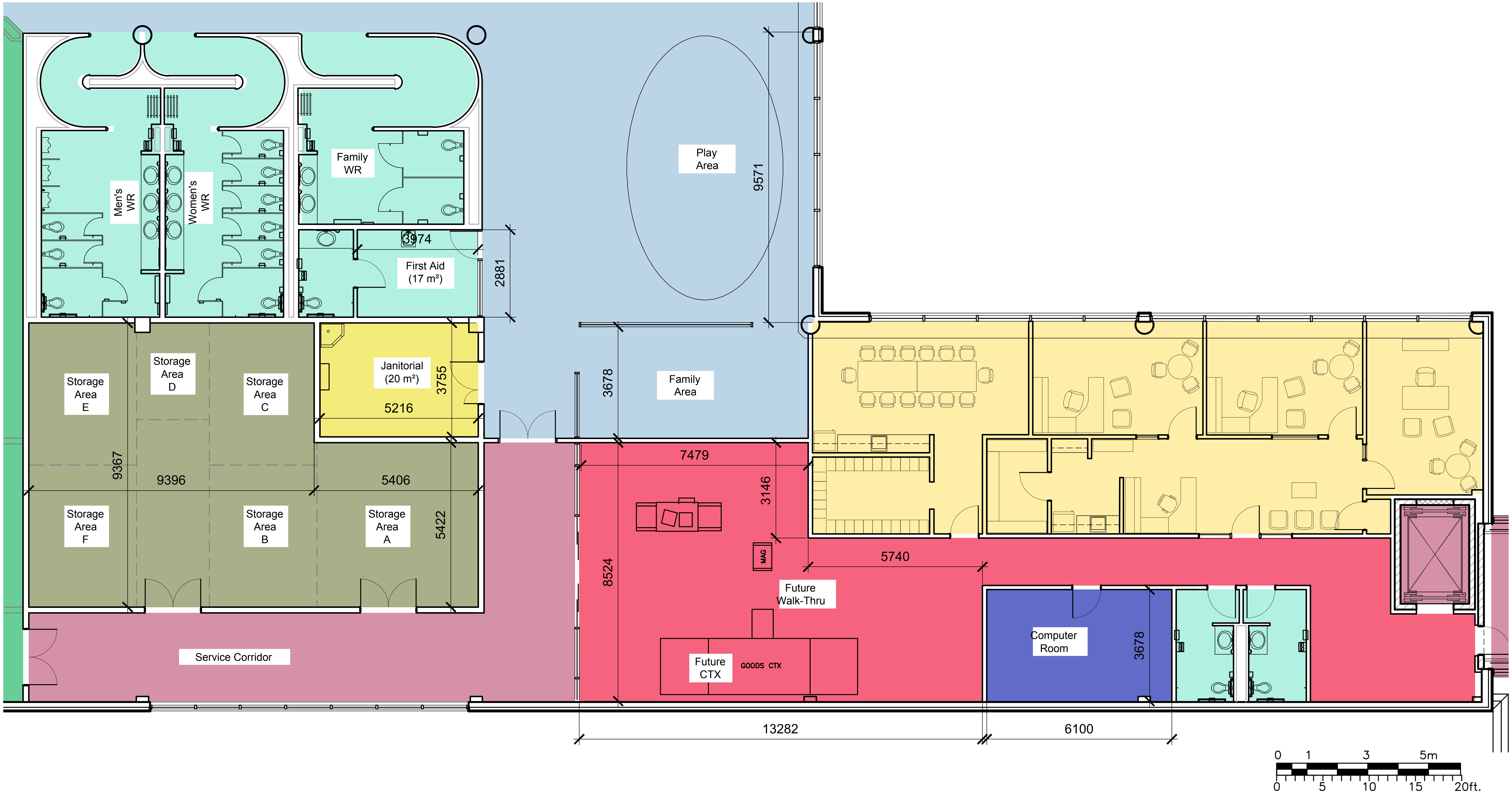
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

BLOW-UP PLAN
LEVEL 2 CONCESSIONS

DATE 13/05/22

REV. 2

PL-2.2



REV.	REVISIONS	DATE
3	GENERAL REVISIONS	
2	DESIGN DEVELOPMENT REPORT	14/07/23
1	GENERAL REVISIONS	14/04/28
0	CONCEPT DESIGN REPORT - FINAL	13/12/13
A	ISSUED FOR REVIEW	13/09/10

JOHN HEARN architect incorporated

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ST. JOHN'S International Airport Authority

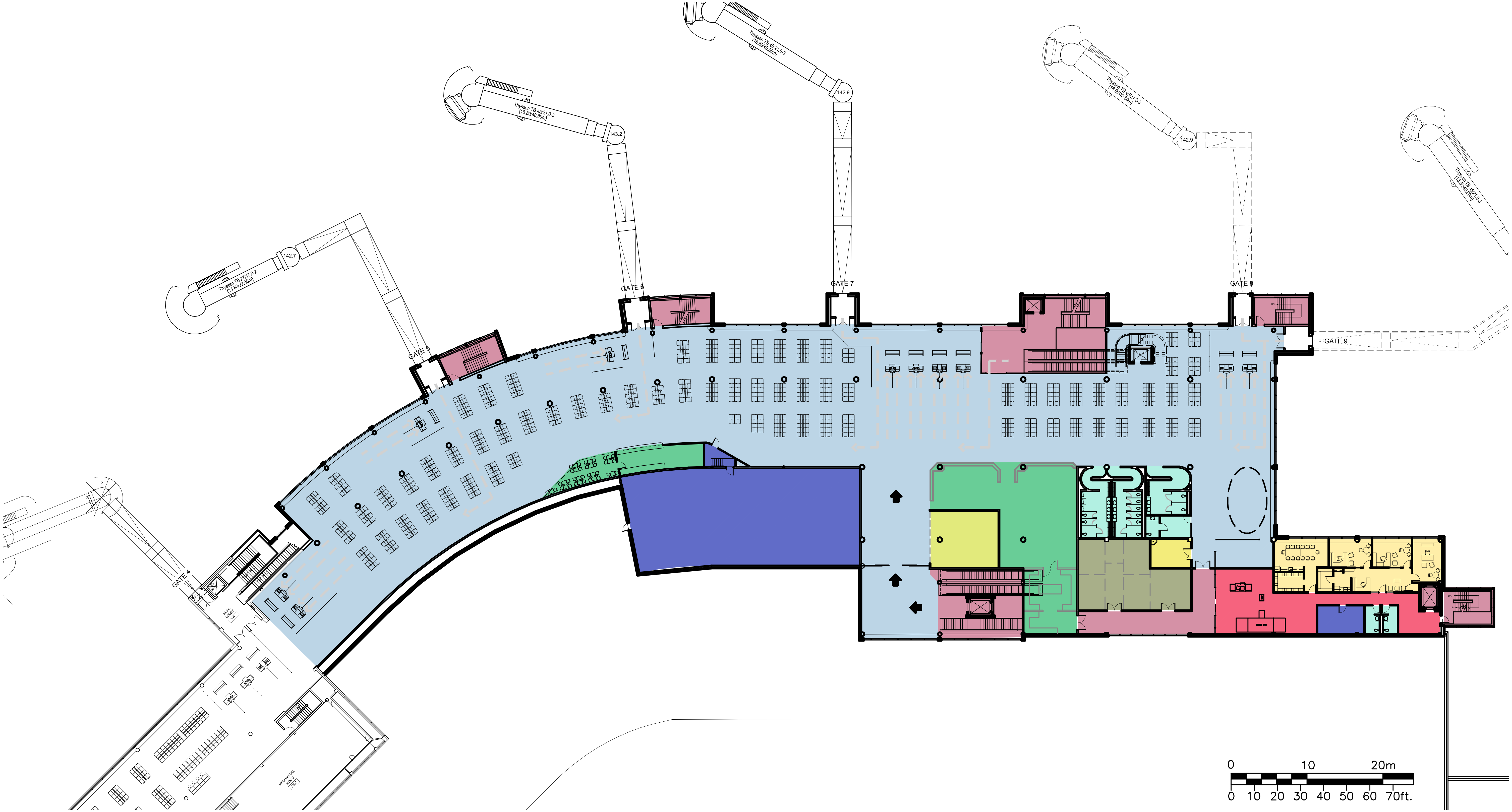
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

BLOW-UP PLAN
GOODS SCREENING

DATE 13/05/22

REV. 3

PL-2.3



REV.	REVISIONS	DATE
2	DESIGN DEVELOPMENT REPORT	14/07/23
1	GENERAL REVISIONS	14/04/28
0	CONCEPT DESIGN REPORT - FINAL	13/12/13
A	ISSUED FOR REVIEW	13/09/16

JOHN HEARN architect incorporated

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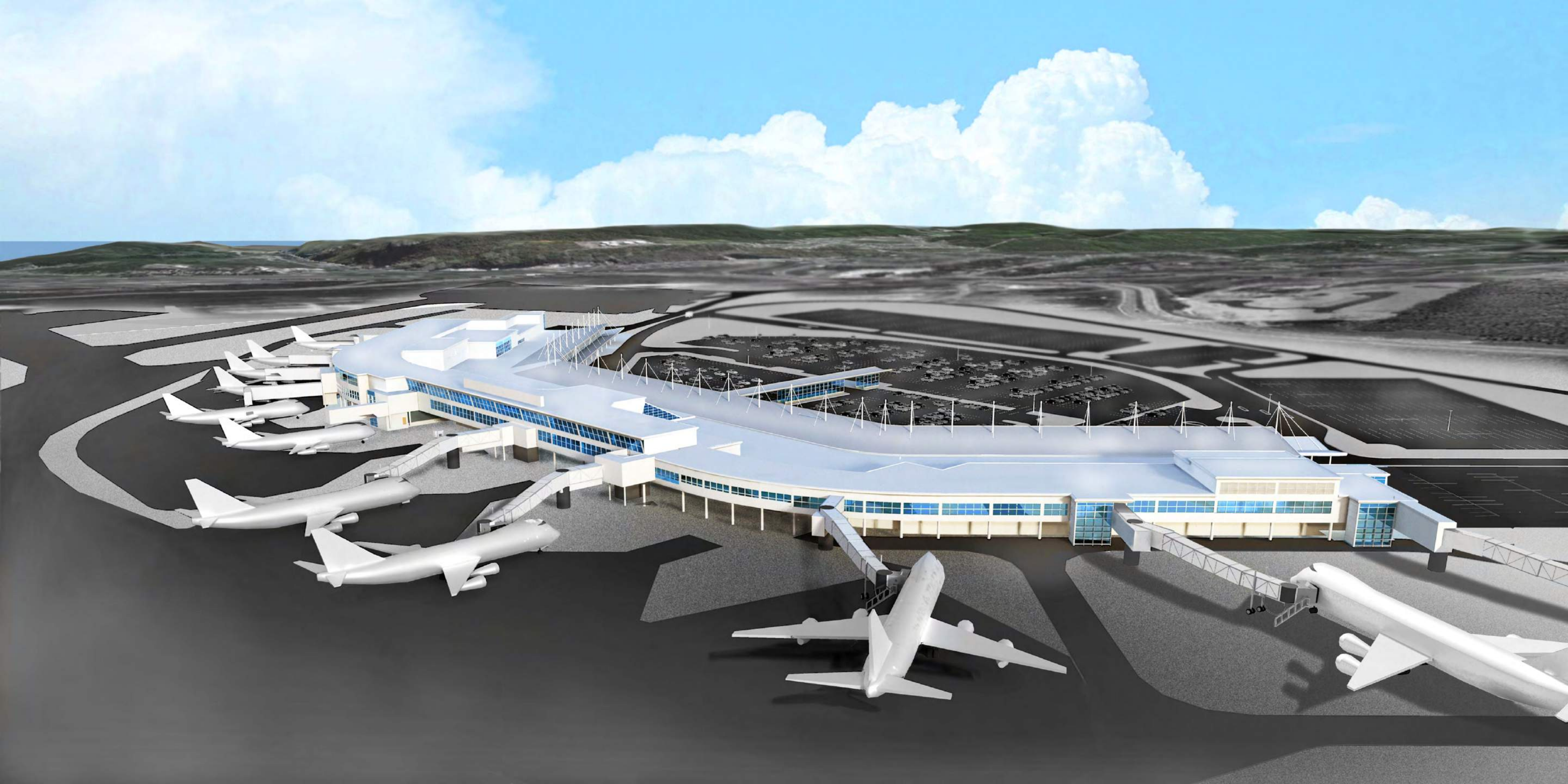
AIR TERMINAL BUILDING
EAST EXPANSION - YEAR 2020

BLOW-UP PLAN
SWITCHBACK RAMPS

DATE 13/05/22

REV. 2

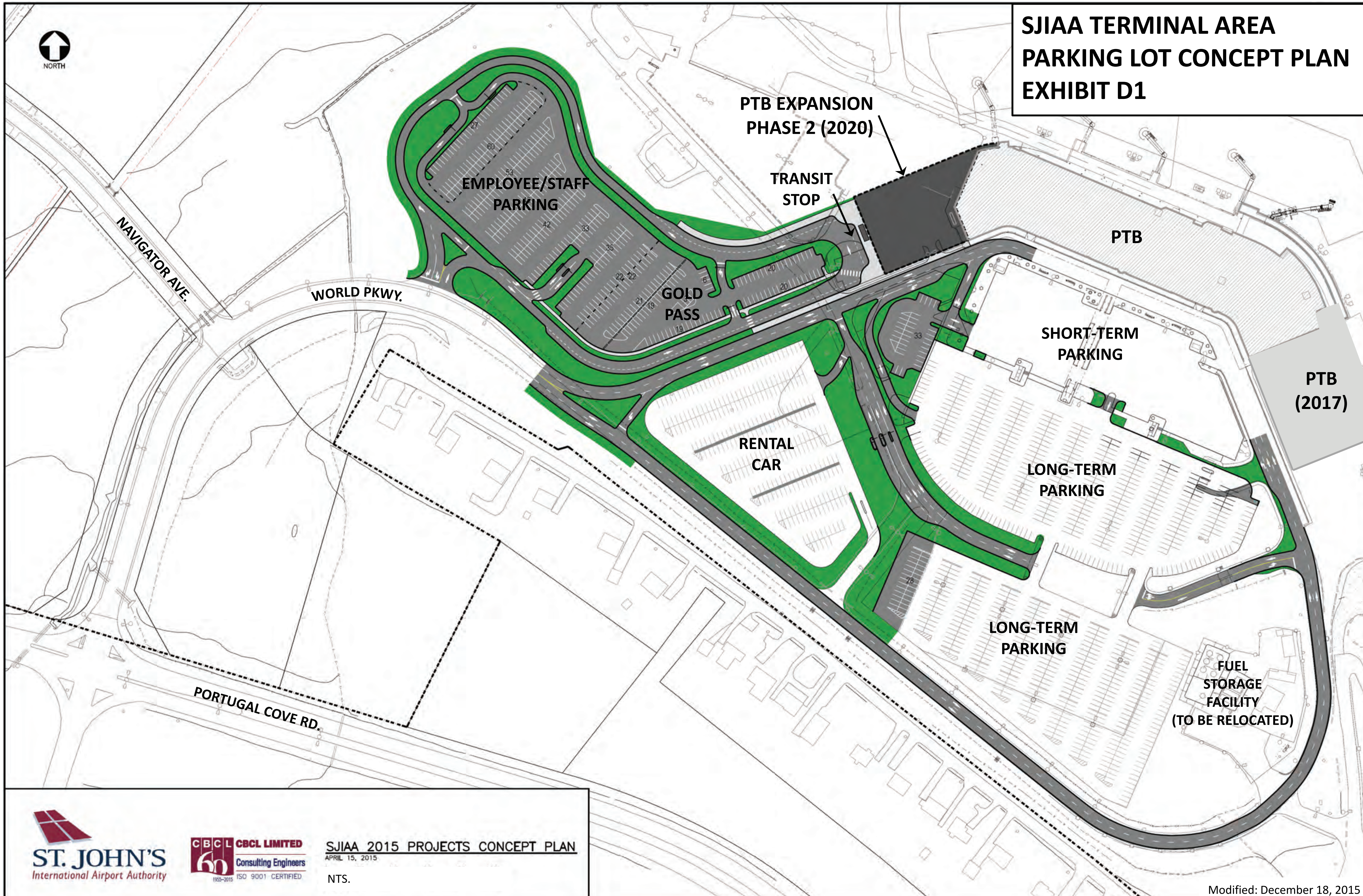
PL-2.5



APPENDIX D

PARKING LOT CONCEPTUAL LAYOUT PLANS

ST. JOHN'S
International Airport Authority



ST. JOHN'S
International Airport Authority

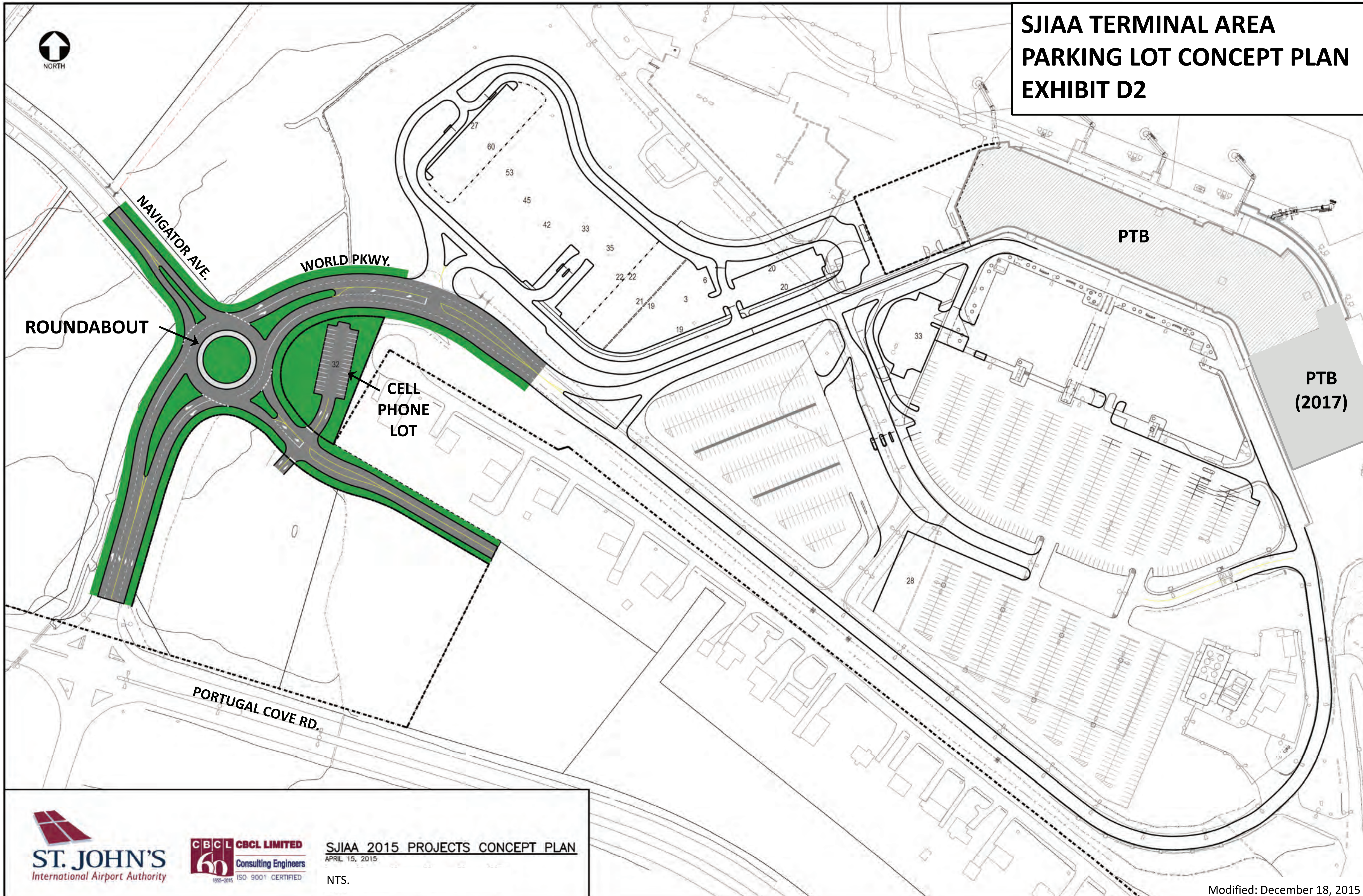
CBCL LIMITED
Consulting Engineers
ISO 9001 CERTIFIED

SJIAA 2015 PROJECTS CONCEPT PLAN
APRIL 15, 2015

NTS.

Modified: December 18, 2015

SJIAA TERMINAL AREA PARKING LOT CONCEPT PLAN EXHIBIT D2



ST. JOHN'S International Airport Authority

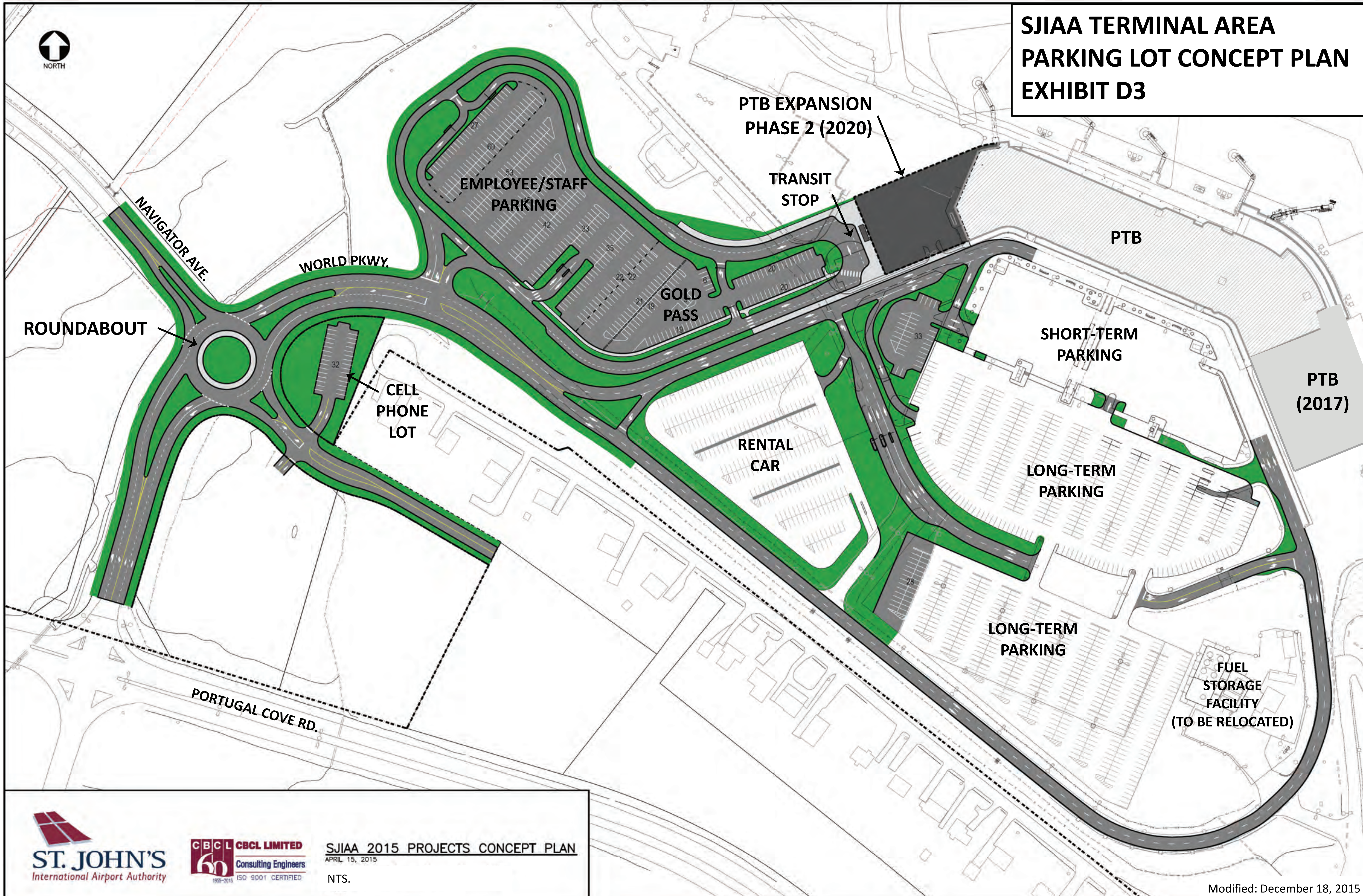
CBCL LIMITED Consulting Engineers ISO 9001 CERTIFIED

SJIAA 2015 PROJECTS CONCEPT PLAN
APRIL 15, 2015

NTS.

Modified: December 18, 2015

SJIAA TERMINAL AREA PARKING LOT CONCEPT PLAN EXHIBIT D3



ST. JOHN'S International Airport Authority

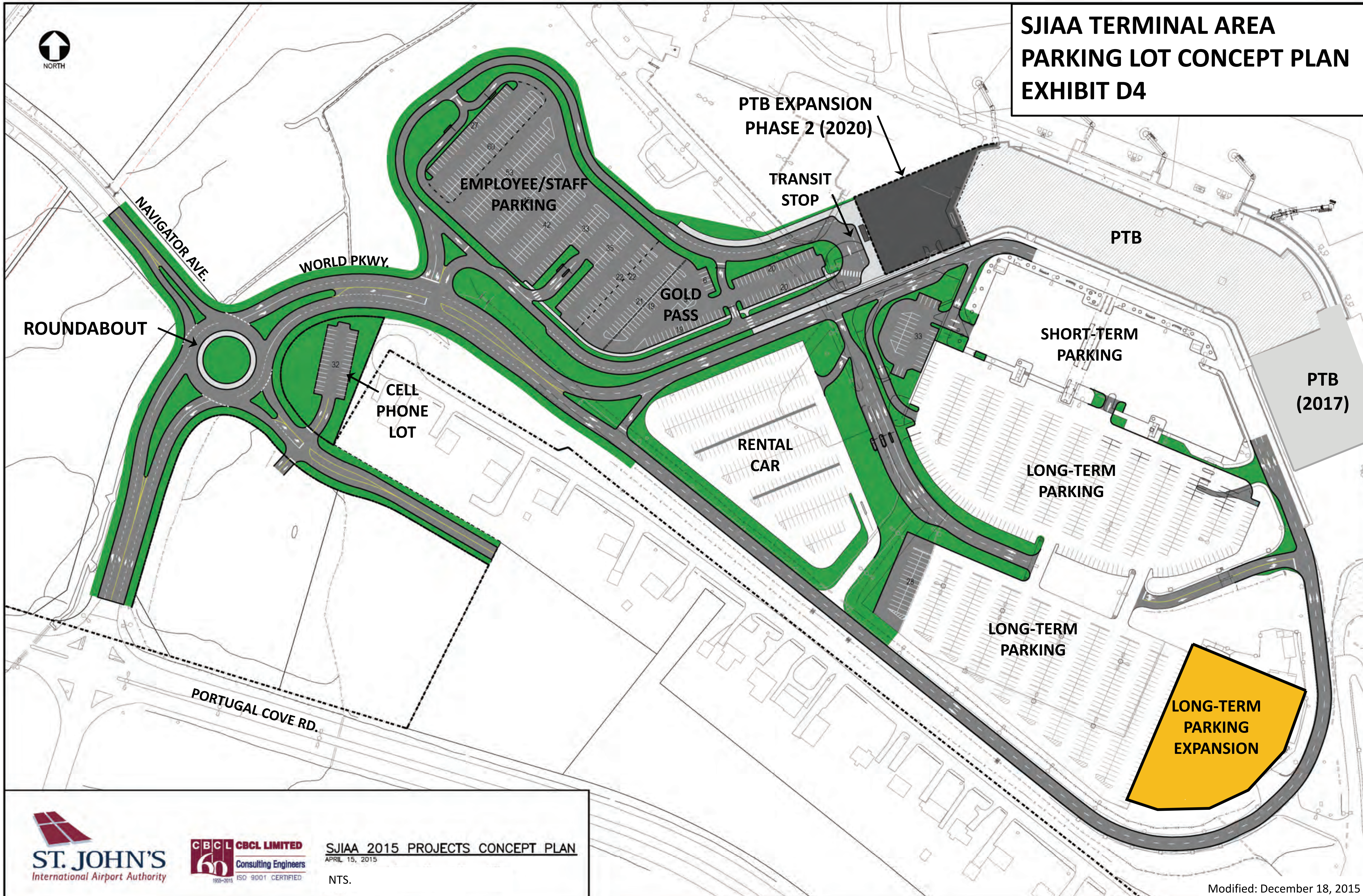
CBCL LIMITED Consulting Engineers ISO 9001 CERTIFIED 1955–2015

SJIAA 2015 PROJECTS CONCEPT PLAN
APRIL 15, 2015

NTS.

Modified: December 18, 2015

SJIAA TERMINAL AREA PARKING LOT CONCEPT PLAN EXHIBIT D4



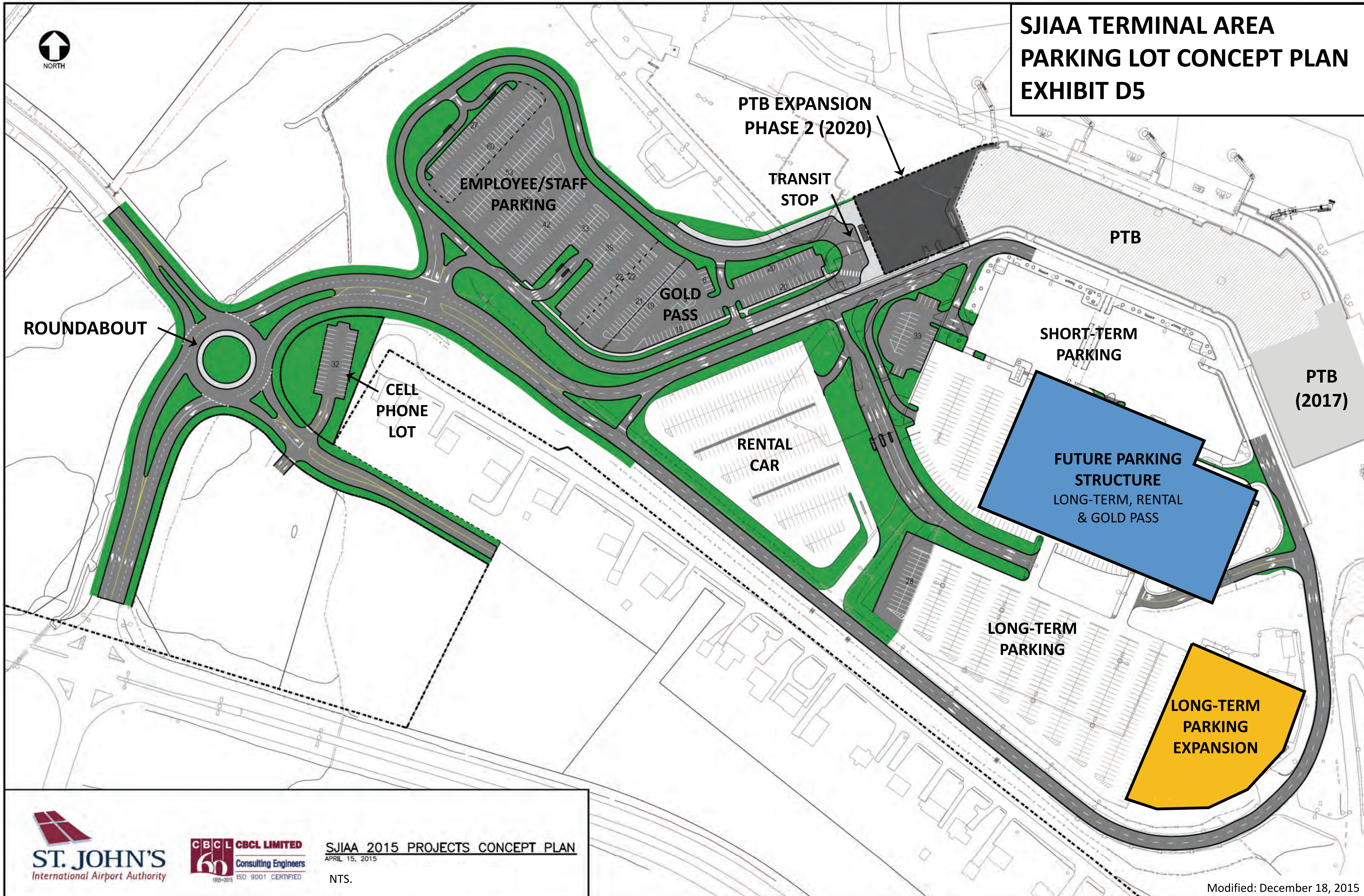
ST. JOHN'S
International Airport Authority

CBCL LIMITED
Consulting Engineers
1955–2015 ISO 9001 CERTIFIED

SJIAA 2015 PROJECTS CONCEPT PLAN
APRIL 15, 2015

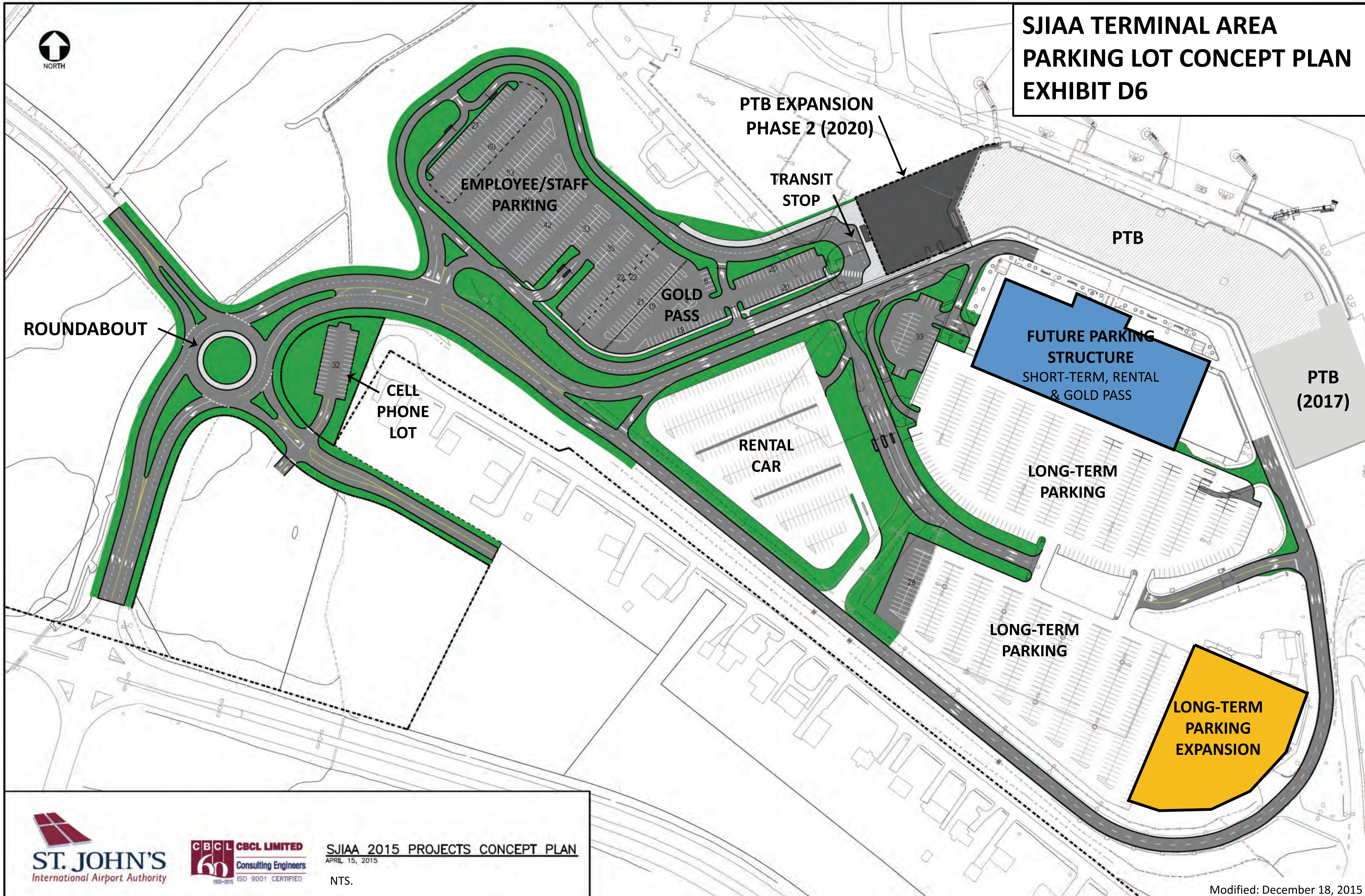
NTS.

Modified: December 18, 2015


SJIAA TERMINAL AREA
PARKING LOT CONCEPT PLAN
EXHIBIT D5
NORTH
PTB EXPANSION
PHASE 2 (2020)
TRANSIT
STOP
EMPLOYEE/STAFF
PARKING
GOLD
PASS
PTB
ROUNDABOUT
CELL
PHONE
LOT
SHORT-TERM
PARKING
PTB
(2017)
RENTAL
CAR
FUTURE PARKING
STRUCTURE
LONG-TERM, RENTAL
& GOLD PASS
LONG-TERM
PARKING
LONG-TERM
PARKING
EXPANSION
ST. JOHN'S
International Airport Authority
CBCL LIMITED
Consulting Engineers
ISO 9001 CERTIFIED
SJIAA 2015 PROJECTS CONCEPT PLAN
APRIL 15, 2015
NTS.
Modified: December 18, 2015

HJ1

SJIAA TERMINAL AREA PARKING LOT CONCEPT PLAN EXHIBIT D6



ST. JOHN'S International Airport Authority

CBCL LIMITED Consulting Engineers ISO 9001 CERTIFIED

SJIAA 2015 PROJECTS CONCEPT PLAN

APRIL 15, 2015

NTS.

Modified: December 18, 2015

APPENDIX E

PHASING PLAN AND AIRSIDE IMPROVEMENTS EVALUATION

ST. JOHN'S
International Airport Authority

CAPITAL PHASING LEGEND

ITEM	
DEVELOPMENT BY OTHERS	(yellow)
SHORT - TERM DEVELOPMENT (0-5 YEARS) 2015-2020	(dark green)
MEDIUM - TERM DEVELOPMENT (6-10 YEARS) 2021-2025	(cyan)
LONG - TERM DEVELOPMENT (11-20 YEARS) 2026-2035	(magenta)
ULTIMATE DEVELOPMENT (20+ YEARS) 2030+	(dashed)

LEGEND

ITEM
AIRPORT PROPERTY LINE
AIRFIELD PAVEMENT
ROADWAY AND PARKING
BUILDINGS
RUNWAY END SAFETY AREA (RESA)
AIRPORT SECURITY FENCE

No.	DATE	DESCRIPTION	BY	QA/QC
5	JAN. 2017	FINAL REPORT	JRM	JJH
4	12/23/2016	FINAL DRAFT	JRM	JJH
4	01/31/2015	FINAL DRAFT	JJH	JJH
3	12/21/2015	DRAFT	JJH	JJH
2	12/15/2015	DRAFT	JJH	JJH

REVISION / ISSUE

Notes

1. DRAWING IS TO BE USED FOR PANNING PURPOSES ONLY.

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:7000

100 0 50 100 250 500 METRES

250 0 250 500 1000 1500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035 RECOMMENDED CAPITAL PHASING PLAN

Project No. 141-25347-00

EXHIBIT E1

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\CYYT Capital Phasing Plan r3a.dwg
January 13, 2017

Table 10-1 Infrastructure Evaluation

Component		Triggers for Improvement					Overall Score	Rank
Designation(s) & Phase	ID	Operational Safety and/or Regulatory Compliance	Airfield Capacity and/or Operational Efficiency	Environmental Impact	Commercial Opportunity	Life-Cycle Replacement		
Weighting Factor		*1.5*	*1.4*	*1.3*	*1.2*	*1.1*	*Max 32.5*	*1 to 25*
T/W A 02-20 Short-Term	n/a	Low 1.5	Medium 4.2	Low 1.3	High 6	High 5.5	18.5	1
T/W C Medium-Term	TWY-C1	High 7.5	Low 1.4	Low 1.3	Medium 3.6	Low 1.1	14.9	5
T/W H Short-Term	TWY-H1	Low 1.5	High 7	Low 1.3	n/a 0	Medium 3.3	13.1	8
T/W K Long-Term	TWY-K1	Low 1.5	Low 1.4	Low 1.3	High 6	n/a 0	10.2	15
T/W L Short-Term	TWY-L1	Medium 4.5	High 7	Low 1.3	Low 1.2	n/a 0	14	7
T/W M & N Short-Term	TWY-M+N	High 7.5	High 7	Medium 3.9	n/a 0	n/a 0	18.4	3
T/W N Long-Term	TWY-N1	Low 1.5	Medium 4.2	Low 1.3	n/a 0	n/a 0	7	20
T/W N Long-Term	TWY-N2	Low 1.5	Medium 4.2	Low 1.3	Low 1.2	n/a 0	8.2	19
T/W P Holding Bay Short-Term	TWY-P1	Medium 4.5	High 7	Low 1.3	n/a 0	n/a 0	12.8	9
T/W Q Medium-Term	TWY-Q1	Medium 4.5	High 7	Low 1.3	n/a 0	n/a 0	12.8	11
T/W Q Medium-Term	TWY-Q+R	Medium 4.5	High 7	Low 1.3	n/a 0	n/a 0	12.8	10
T/W Q & H Medium-Term	TWY-Q+H	Low 1.5	High 7	Low 1.3	n/a 0	n/a 0	9.8	16
T/W Q & N Long-Term	TWY-Q+N	Low 1.5	Low 1.4	Low 1.3	n/a 0	n/a 0	4.2	24
T/W S Medium	TWY-S1	Medium 4.5	High 7	n/a 0	n/a 0	n/a 0	11.5	12
T/W T Short-Term	TWY-T1	Low 1.5	High 7	Low 1.3	Medium 3.6	Medium 3.3	16.7	4
T/W U Long-Term	TWY-U1	Low 1.5	Medium 4.2	n/a 0	n/a 0	n/a 0	5.7	23
T/W W Long-Term	TWY-W1	Low 1.5	Low 1.4	n/a 0	n/a 0	n/a 0	2.9	25
APR-1-EXP1 Long-Term	APR-1-EXP1	Low 1.5	Medium 4.2	n/a 0	Low 1.2	n/a 0	6.9	21
Apron 1 Long-Term	APR-1-EXP2	Low 1.5	Medium 4.2	n/a 0	Low 1.2	n/a 0	6.9	22
Apron 1 Long-Term	APR-1-EXP3	Low 1.5	Medium 4.2	n/a 0	Medium 3.6	Low 1.1	10.4	14
Apron 1 Short-Term	APR-1-EXPW	Low 1.5	High 7	n/a 0	High 6	n/a 0	14.5	6
Vehicle Holding Bay Short-Term	VEC-BAY	High 7.5	High 7	Medium 3.9	n/a 0	n/a 0	18.4	2
CDF Medium-Term	APR-4-CDF1	Low 1.5	Medium 4.2	Medium 3.9	Low 1.2	n/a 0	10.8	13
CDF Long-Term	APR-4-CDF2	Low 1.5	Low 1.4	Low 1.3	Low 1.2	Medium 3.3	8.7	18
R/W 34 Ext Long-Term	RWY-34-EXT	Low 1.5	Low 1.4	n/a 0	Low 1.2	High 5.5	9.6	17

Priority Factors

x1 = Low "Little to no impact"

x3 = Medium "Indirectly related"

x5 = High "Directly related"

APPENDIX F

CDF EXPANSION CONCEPTUAL PHASING PLANS

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\CYYT CDF Figures v2a.dwg
February 1, 2016

2	01/31/2016	FINAL DRAFT	JRM	JH
1	12/15/2015	DRAFT	JRM	JH
0	12/08/2015	PRELIMINARY DRAFT	JRM	JH
No.	DATE	DESCRIPTION	BY	QA/QC

REVISION / ISSUE

Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY
2. AGN III IS EQUIVALENT TO CODE C WITH A MAXIMUM WING SPAN OF 24m.
3. AGN IV IS EQUIVALENT TO CODE D WITH A MAXIMUM WING SPAN OF 36m.
4. AGN V IS EQUIVALENT TO CODE E WITH A MAXIMUM WING SPAN OF 52m

North Arrow

Consultant

WSP

Client

ST. JOHN'S
International Airport Authority

Scale

Scale 1:2000

25 0 10 25 50 100 150 METRES

100 0 50 100 200 500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035
CENTRAL DEICING FACILITY EXPANSION
SHORT-TERM PHASE 1

Project No. 141-25347-00

EXHBIT F1

No.	DATE	DESCRIPTION	BY	QA/QC
2	01/31/2016	FINAL DRAFT	JRM	JH
1	12/11/2015	DRAFT	JRM	JH
0	12/08/2015	PRELIMINARY DRAFT	JRM	JH

REVISION / ISSUE

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\CYYT CDF Figures v2a.dwg
February 1, 2016

Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY
2. AGN III IS EQUIVALENT TO CODE C WITH A MAXIMUM WING SPAN OF 24m.
3. AGN IV IS EQUIVALENT TO CODE D WITH A MAXIMUM WING SPAN OF 36m.
4. AGN V IS EQUIVALENT TO CODE E WITH A MAXIMUM WING SPAN OF 52m

DRAFT

North Arrow

Consultant

WSP

Client

ST. JOHN'S International Airport Authority

Scale

Scale 1:2000

25 0 10 25 50 100 150 METRES

100 0 50 100 200 500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035
CENTRAL DEICING FACILITY EXPANSION
SHORT-TERM PHASE 2

Project No. 141-25347-00

EXHIBIT F2

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\CYYT CDF Figures v2a.dwg
February 1, 2016

No.	DATE	DESCRIPTION	BY	QA/QC
2	01/31/2016	FINAL DRAFT	JRM	JH
1	12/15/2015	DRAFT	JRM	JH
0	12/08/2015	PRELIMINARY DRAFT	JRM	JH

REVISION / ISSUE

Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY
2. AGN III IS EQUIVALENT TO CODE C WITH A MAXIMUM WING SPAN OF 24m.
3. AGN IV IS EQUIVALENT TO CODE D WITH A MAXIMUM WING SPAN OF 36m.
4. AGN V IS EQUIVALENT TO CODE E WITH A MAXIMUM WING SPAN OF 52m

DRAFT

North Arrow

Consultant

WSP

Client

ST. JOHN'S
International Airport Authority

Scale

Scale 1:2000

25 0 10 25 50 100 150 METRES

100 0 50 100 200 500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015-2035
CENTRAL DEICING FACILITY EXPANSION
MEDIUM-TERM/LONG-TERM PHASE 3

Project No. 141-25347-00

EXHIBIT F3

No.	DATE	DESCRIPTION	BY	QA/QC
2	01/31/2016	FINAL DRAFT	JRM	JH
1	12/15/2015	DRAFT	JRM	JH
0	11/20/2015	PRELIMINARY DRAFT	JRM	JH

REVISION / ISSUE

Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY
2. AGN III IS EQUIVALENT TO CODE C WITH A MAXIMUM WING SPAN OF 24m.
3. AGN IV IS EQUIVALENT TO CODE D WITH A MAXIMUM WING SPAN OF 36m.
4. AGN V IS EQUIVALENT TO CODE E WITH A MAXIMUM WING SPAN OF 52m

DRAFT

North Arrow

Consultant

WSP

Client

ST. JOHN'S
International Airport Authority

Scale

Scale 1:2000

25 0 10 25 50 100 150 METRES

100 0 50 100 200 500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015 - 2035
CENTRAL DEICING FACILITY EXPANSION
LONG-TERM PHASE 4

Project No. 141-25347-00

EXHIBIT F4

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\CYYT CDF Figures v2a.dwg
February 1, 2016

2	01/31/2016	FINAL DRAFT	JRM	JH
1	12/15/2015	DRAFT	JRM	JH
0	11/20/2015	PRELIMINARY DRAFT	JRM	JH
No.	DATE	DESCRIPTION	BY	QA/QC

REVISION / ISSUE

P:\CYYT 141-25347-00 St. John's Master Plan\CAD\CYYT CDF Figures v2a.dwg
February 1, 2016

Notes

1. DRAWING IS TO BE USED FOR PLANNING PURPOSES ONLY
2. AGN III IS EQUIVALENT TO CODE C WITH A MAXIMUM WING SPAN OF 24m.
3. AGN IV IS EQUIVALENT TO CODE D WITH A MAXIMUM WING SPAN OF 36m.
4. AGN V IS EQUIVALENT TO CODE E WITH A MAXIMUM WING SPAN OF 52m

North Arrow

Consultant

WSP

Client

ST. JOHN'S
International Airport Authority

Scale

Scale 1:2000

25 0 10 25 50 100 150 METRES

100 0 50 100 200 500 FEET

SCALE BASED ON SHEET SIZE 22" X 34"

Location: ST. JOHN'S, NEWFOUNDLAND & LABRADOR

Airport: ST. JOHN'S INTERNATIONAL AIRPORT (CYYT)

Title: AIRPORT MASTER PLAN UPDATE 2015 - 2035
CENTRAL DEICING FACILITY EXPANSION
LONG-TERM / ULTIMATE PHASE 5

Project No. 141-25347-00

EXHIBIT F5

APPENDIX G

AIRCRAFT REFERENCE GUIDE

Design Aircraft Characteristics Reference Guide (Rev. 1)

Scheduled Aircraft

ITEM	DESCRIPTION	
ICAO Code	C	IMAGE NOT AVAILABLE
AGN (RWY/TWY)	IIIA/IIIA	
Aircraft Type	Q300 (DHC-8-300)	
Length	25.70m (84.3ft)	
Wingspan	27.40m (90.0 ft)	
Height	7.64m (24.1ft)	
MTOW	19,500 kg (43,000 lbs)	
MLW	19,050 kg (42,000 lbs)	
Max. Range	924 nm	
# of Passengers	Up to 56	
Takeoff Field Length	1,180m (3,870 ft)	
Landing Field Length	1,040m (3,415 ft)	
Notes:	1. Source: Bombardier. 2. Range based on HGW variant, 50 PAX, LRC, ISA, zero winds, and standard reserves. 3. Takeoff field length based on F.A.R., MTOW, ISA, SL, and a dry paved level surface. 4. Landing field length based on F.A.R., MLW, ISA, SL, and a dry paved level surface.	

ITEM	DESCRIPTION	
ICAO Code	C/D*	
AGN (RWY/TWY)	IIIA-B/IIIA	
Aircraft Type	Q400	
Length	32.83m (107.71ft)	
Wingspan	28.42m (93.24 ft)	
Height	8.38m (27.49ft)	
MTOW	29, 257 kg (64,500 lbs)	
MLW	28,009 kg (61,750 lbs)	
Max. Range	1,114 nm	
# of Passengers	Up to 86	
Takeoff Field Length	1,425m (4,675 ft)	
Landing Field Length	1,289m (4,230 ft)	
Notes:	1. Source: Bombardier. 2. Operated by Sky Regional as Air Canada Express and by Porter Airlines. 3. Range based on HGW variant. 4. Takeoff field length based on HGW variant, F.A.R., MTOW, ISA, SL, and a dry paved level surface. 5. Landing field length based on HGW variant, F.A.R., MTOW, ISA, SL, and a dry paved level surface. 6. Routinely operated as Code C.	

ITEM	DESCRIPTION
ICAO Code	B
AGN (RWY/TWY)	IIIA or IIIB/II
Aircraft Type	EMB120ER
Length	20.0m (65.62 ft)
Wingspan	19.78m (64.90 ft)
Height	6.53 (21.42ft)
MTOW	11,990 kg (26,433 lbs)
MLW	11,700 kg (25,794 lbs)
Max. Range	1,610 nm
# of Passengers	Up to 30
Takeoff Field Length	1,650m (5,413 ft)
Landing Field Length	1,345m (4,413 ft)

Notes:
1. Source: Embraer and Burns & McDonnell Aircraft Characteristics manual 9th Ed.
2. Takeoff field length based on F.A.R., MTOW, ISA, SL, and a dry paved level surface.
3. Landing field length based on F.A.R., MLW, ISA, SL, and a dry paved level surface.
4. AGN IIIA based on TP312 5th edition; AGN IIB based on FAA AC 150/5300-13A.

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB
Aircraft Type	ERJ 145XR
Length	29.87m (98.00 ft)
Wingspan	21.0m (68.90 ft)
Height	6.74m (22.11ft)
MTOW	24,100 kg (53,131 lbs)
MLW	20,000 kg (44,092 lbs)
Max. Range	2,000 nm
# of Passengers	Up to 50
Takeoff Field Length	2,070m (6,791 ft)
Landing Field Length	1,430m (4,692 ft)

Notes:
1. Source: Embraer.
2. Takeoff field length based on J.A.R., MTOW, ISA, SL, and a dry paved level surface.
3. Landing field length based on J.A.R., MLW, ISA, SL, and a dry paved level surface.

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB
Aircraft Type	CRJ 900LR (705)
Length	36.2m (118.77 ft)
Wingspan	24.9m (81.69 ft)
Height	7.5m (24.61 ft)
MTOW	38,330 kg (84,500 lbs)
MLW	34,065 kg (75,100 lbs)
Max. Range	1,553 nm
# of Passengers	Up to 90
Takeoff Field Length	1,939m (6,360 ft)
Landing Field Length	1,632m (5,355 ft)

Notes:
1. Source: Bombardier.
2. Operated by Air Canada Jazz as Air Canada Express.
3. Range based on full PAX, LRC, zero wind, and standard reserves.
4. Takeoff field length based on F.A.R., MTOW, ISA, SL, and a dry paved level surface.
5. Landing field length based on F.A.R., MTOW, ISA, SL, and a dry paved level surface.

Aircraft Design Characteristics (Continued)

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB
Aircraft Type	E175 STD/LR/AR
Length	31.7m (104.0 ft)
Wingspan	26.0m (85.30 ft)
Height	9.82m (32.22 ft)
MTOW	40,370 kg (89,000 lbs)
MLW	34,100 kg (75,178 lbs)
Max. Range	2,000 nm
# of Passengers	Up to 88
Takeoff Field Length	2,244m (7,362 ft)
Landing Field Length	1,304m 4,278 ft)

Notes:

1. *Source: Embraer.*
2. *Operated by Sky Regional as Air Canada Express.*
3. *Range based on AR variant, 78 PAX, and LRC.*
4. *Takeoff field length based on AR variant, MTOW, ISA, SL, and a dry paved level surface.*
5. *Landing field length based on AR variant, MLW, ISA, SL, and a dry paved level surface.*

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB
Aircraft Type	E195 STD/LR/AR
Length	38.67m (126.87 ft)
Wingspan	28.72 (94.22 ft)
Height	10.55m (34.61 ft)
MTOW	52,290 kg (115,280 lbs)
MLW	45,800 kg (100,972 lbs)
Max. Range	1,800 nm
# of Passengers	Up to 118
Takeoff Field Length	1,936m (6,350 ft)
Landing Field Length	1,533m (5,030 ft)

IMAGE NOT AVAILABLE

Notes:

1. *Source: Embraer.*
2. *Range based on AR variant, 118 PAX, 0.78 Mach, typical mission reserve and 100 nm alternate.*
3. *Takeoff field length based on AR variant with CF34-10E5 or -10E6 engines, MTOW, ISA, SL, dry hard paved level surface.*
4. *Landing field length based on AR variant with CF34-10E5 or -10E6 engines, MLW, ISA, SL, dry hard paved level surface.*

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB
Aircraft Type	E175-E2
Length	32.3m (105.97 ft)
Wingspan	31m (101.71 ft)
Height	9.98m (32.74 ft)
MTOW	44,650 kg (98,436 lbs)
MLW	39,850 kg (87,854 lbs)
Max. Range	2,060 NM
# of Passengers	Up to 88
Takeoff Field Length	1,900m (6,234 ft)
Landing Field Length	1,300m (4,265 ft)

Notes:

1. *Source: Embraer preliminary data.*
2. *Range based on full PAX in single class seating, LRC, typical reserves, and 100nm alternate.*
3. *Takeoff field length based on MTOW, ISA, SL, and average engine performance.*
4. *Landing field length based on MLW, ISA, and SL.*

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB
Aircraft Type	E190-E2/195-E2
Length	41.5m (136.15 ft)
Wingspan	33.7m (110.56 ft)
Height	10.9m (35.76 ft)
MTOW	58,700 kg (129,411 lbs)
MLW	54,030 kg (119,116 lbs)
Max. Range	2,000 NM
# of Passengers	Up to 132
Takeoff Field Length	1,880m (6,168 ft)
Landing Field Length	1,400m (4,593 ft)

Notes:

1. *Source: Embraer preliminary data.*
2. *Specifications listed based on most critical variant.*
3. *Range from E190-E2 based on full PAX in single class seating, LRC, typical reserves, 100nm alternate.*
4. *Takeoff field length from E195-E2 based on MTOW, ISA, SL, and average engine performance.*
5. *Landing field length from E195-E2 based on MLW, ISA, and SL.*

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB/IIIB
Aircraft Type	B737-600
Length	31.24m (102.5ft)
Wingspan	34.32 (112.61ft)
Height	12.57m (41.2ft)
MTOW	65,544 kg (144,500 lbs)
MLW	55,111 kg (121,500 lbs)
Max. Range	1950 nm to 3,650 nm
# of Passengers	Up to 130
Takeoff Field Length	1,768m (5,800 ft)
Landing Field Length	1,372m (4,500 ft)

Notes:

1. *Source: Boeing.*
2. *Operated by WestJet.*
3. *MTOW based on HGW variant.*
4. *Range based on HGW variant with CFM56-7B engines, LRC, MTOW and variations of max payload v. max fuel.*
5. *Takeoff field length based on F.A.R., ISA, SL, dry paved level surface, zero wind, a/c off, and optimum flap setting.*
6. *Landing field length based on F.A.R., ISA, SL, dry paved level surface, zero wind, and auto spoilers and anti-skid active.*

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB/IIIB
Aircraft Type	B737-700/W
Length	33.63m (110.3ft)
Wingspan	35.79m (117.4ft)
Height	12.57m (41.2ft)
MTOW	70,080 kg (154,500 lbs)
MLW	58,604 kg (129,200 lbs)
Max. Range	2,150 nm to 3,400 nm
# of Passengers	Up to 148
Takeoff Field Length	2,865m (9,400ft)
Landing Field Length	1,494m (4,900 ft)

IMAGE NOT AVAILABLE

Notes:

1. *Source: Boeing.*
2. *Operated by WestJet and United.*
3. *Range based on HGW variant with CFM56-7B engines, LRC, MTOW and variations of max payload v. max fuel.*
4. *Takeoff field length based on F.A.R., ISA, SL, dry paved level surface, zero wind, a/c off, and optimum flap setting.*
5. *Landing field length based on F.A.R., ISA, SL, dry paved level surface, zero wind, and auto spoilers and anti-skid active.*

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB/IIIB
Aircraft Type	B737-800/W
Length	39.47m (129.5ft)
Wingspan	35.79m (117.4ft)
Height	12.55m (41.2ft)
MTOW	79,016 kg (174,200 lbs)
MLW	66,361 kg (146,300 lbs)
Max. Range	2,025 nm to 5,050 nm
# of Passengers	Up to 184
Takeoff Field Length	2,362m (7,750 ft)
Landing Field Length	1,738m (5,700 ft)

Notes:

1. *Source: Boeing*
2. *Operated by WestJet and United.*
3. *Range based on HGW variant with CFM56-7B engines, LRC, MTOW and variations of max payload v. max fuel.*
4. *184 in single class configuration with 30-inch pitch. 175 in 32-in pitch.*
5. *Takeoff field length based on F.A.R., ISA, SL, dry paved level surface, zero wind, a/c off, and optimum flap setting.*
6. *Landing field length based on F.A.R., ISA, SL, dry paved level surface, zero wind, and auto spoilers and anti-skid active.*

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB/IIIB
Aircraft Type	B737-900/W
Length	42.11m (138.2 ft)
Wingspan	35.79m (117.4ft)
Height	12.55m (41.2ft)
MTOW	79,016 kg (174,200 lbs)
MLW	66,814 kg (147,300 lbs)
Max. Range	1975 nm to 2750 nm
# of Passengers	Up to 215
Takeoff Field Length	2,819m (9,250ft)
Landing Field Length	1,814m (5,950 ft)

Notes:

1. *Source: Boeing.*
2. *Operated by United.*
3. *Range based on HGW variant with CFM56-7B engines, LRC, MTOW and variations of max payload v. max fuel.*
4. *215 in single class configuration with 28-inch pitch. 214 in 30-in pitch, 177 in 32-in pitch.*
5. *Takeoff field length based on F.A.R., ISA, SL, dry paved level surface, zero wind, a/c off, and optimum flap setting.*
6. *Landing field length based on F.A.R., ISA, SL, dry paved level surface, zero wind, and auto spoilers and anti-skid active.*

ITEM	DESCRIPTION	
ICAO Code	C	IMAGE NOT AVAILABLE
AGN (RWY/TWY)	IIIB/IIIB	
Aircraft Type	B737-900ER/ERW	
Length	42.11m (138.2 ft)	
Wingspan	35.79m (117.4ft)	
Height	12.55m (41.2ft)	
MTOW	85,139 kg (187,700 lbs)	
MLW	71,350 kg (157,300 lbs)	
Max. Range	1700 nm to 4800 nm	
# of Passengers	Up to 215	
Takeoff Field Length	2987m (9,800ft)	
Landing Field Length	1,707m (5,600 ft)	

Notes:
1. *Source: Boeing.*
2. *Operated by United.*
3. *Range based on HGW variant with CFM56-7B engines, LRC, MTOW and variations of max payload v. max fuel.*
4. *215 in single class confiuration with 28-inch pitch. 214 in 30-in pitch, 177 in 32-in pitch.*
5. *Takeoff field length based on F.A.R., ISA, SL, dry paved level surface, zero wind, a/c off, and optimum flap setting.*
6. *Landing field length based on F.A.R., ISA, SL, dry paved level surface, zero wind, and auto spoilers and anti-skid active.*

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB/IIIB
Aircraft Type	B737-8 "MAX"
Length	39.12m (128.3ft)
Wingspan	35.92m (117.8ft)
Height	12.42m (40.7ft)
MTOW	82,190 kg (181,200 lbs)
MLW	69,308 kg (152,800 lbs)
Max. Range	N/A
# of Passengers	Up to 189
Takeoff Field Length	N/A
Landing Field Length	N/A

Notes:
1. *Source: Boeing preliminary data.*

ITEM	DESCRIPTION
ICAO Code	*C*
AGN (RWY/TWY)	*IIIB/IIIB*
Aircraft Type	*A 319-100*
Length	*33.8m (111.0ft)*
Wingspan	*34.1m (111.9ft)*
Height	*12.4m (40.8ft)*
MTOW	*168,653 lbs*
Max. Range	*2,500 to 2,850 NM*
# of Passengers	*Up to 156*
Takeoff Field Length	*2,900m (9,514ft)*
Landing Field Length	*1,570m (5,150ft)*

Notes:

1. *MTOW from WV010*
2. *Max. range indicates range between operational points where the aircraft carries its max payload. Takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full*
3. *Take-off field length and landing field length based on ISA conditions of CFM56 Series Engine at sea level*
4. *Airbus Aircraft Characteristics - Airport and Maintenance Planning A319/A319NEO*

ITEM	DESCRIPTION
ICAO Code	*C*
AGN (RWY/TWY)	*IIIB/IIIB*
Aircraft Type	*A 319 NEO*
Length	*33.8m (111.0ft)*
Wingspan	*35.8m (117.5ft)*
Height	*12.4m (40.8ft)*
MTOW	*167,331 lbs*
Max. Range	*2,750 to 3,650 NM*
# of Passengers	*Up to 156*
Takeoff Field Length	*2,900m (9,514ft)*
Landing Field Length	*1,570m (5,150ft)*

Notes:

1. *MTOW from WV055*
2. *Max. range indicates range between operational points where the aircraft carries its max. payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full*
3. *Takeoff field length and landing field length based on ISA conditions of A 319-100 CFM56 Series Engine at sea level*
4. *Airbus Aircraft Characteristics - Airport and Maintenance Planning A319/A319NEO*

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB/IIIB
Aircraft Type	A 321-200
Length	44.5m (146.0ft)
Wingspan	34.1m (111.9ft)
Height	12.5m (40.9ft)
MTOW	206,132 lbs
Max. Range	2,250 NM
# of Passengers	Up to 220
Takeoff Field Length	3,700m (12,139ft)
Landing Field Length	1,900m (6,234ft)

Notes:

1. MTOW from WV011
2. Max. range indicates where the aircraft carries its max. payload with max. takeoff gross weight
3. Takeoff field length and landing field length based on ISA conditions of CFM56 Series Engine at sea level
4. Airbus Aircraft Characteristics - Airport and Maintenance Planning A321/A321NEO

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB/IIIB
Aircraft Type	A 320 NEO
Length	37.6m (123.3ft)
Wingspan	35.8m (117.5ft)
Height	12.4m (40.8ft)
MTOW	174,165 lbs
Max. Range	2, 450 to 3,300 NM
# of Passengers	Up to 180
Takeoff Field Length	40572m (15,000ft)
Landing Field Length	1,981m (6,500ft)

Notes:

1. MTOW from WV055
2. Max. range indicates range between operational points where the aircraft carries its max. payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full
3. Takeoff field length and landing field length based on ISA conditions of CFM56 Series Engine at sea level
4. Airbus Aircraft Characteristics - Airport and Maintenance Planning A320/A320NEO

ITEM	DESCRIPTION
ICAO Code	*D*
AGN (RWY/TWY)	*IV/IV*
Aircraft Type	*B767-300ER*
Length	*54.9m (180.2ft)*
Wingspan	*47.6m (156.1ft)*
Height	*16.0m (52.6ft)*
MTOW	*412,000 lbs*
Max. Range	*3,800 to 5,900 NM*
# of Passengers	*Up to 290*
Takeoff Field Length	*3,185m (10,450ft)*
Landing Field Length	*1,737m(5,700ft)*

Notes:

1. *Source: 767 Airplane Characteristics for Airport Planning, Boeing Company, 2011*
2. *Max. range indicates range between operational points where the aircraft carries its max. payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full*
3. *Based on PW4062 engines*
4. *Takeoff field length based on ISA conditions at sea level*
5. *Landing field length based on flaps 25, dry runway at sea level*

ITEM	DESCRIPTION
ICAO Code	*E*
AGN (RWY/TWY)	*V/V*
Aircraft Type	*A 330-300*
Length	*63.7m (209.0ft)*
Wingspan	*60.3m (197.8ft)*
Height	*18.6m (57.7ft)*
MTOW	*533,519 lbs*
Max. Range	*3,700 to 5550 NM*
# of Passengers	*Up to 440*
Takeoff Field Length	*4,572m (15,000ft)*
Landing Field Length	*2,134m (7,000ft)*

Notes:

1. *Source: Airbus Aircraft Characteristics - Airport and Maintenance Planning A330*
2. *MTOW from WV081*
3. *Max. range indicates range between operational points where the aircraft carries its max. structural payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full*
4. *Take-off field length and landing field length based on ISA conditions of PW4000 Series Engine at sea level*

Aircraft Design Characteristics (Continued)

ITEM	DESCRIPTION
ICAO Code	E
AGN (RWY/TWY)	V/V
Aircraft Type	A 350-900
Length	66.6m (218.5ft)
Wingspan	64.8m (212.4ft)
Height	18.3m (60.0ft)
MTOW	606,272 lbs
Max. Range	7,748 NM
# of Passengers	Up to 440
Takeoff Field Length	2,620m (8,596ft)
Landing Field Length	1,980m (6,496ft)

Notes:

1. *Source: Airbus Aircraft Characteristics - Airport and Maintenance Planning A350*
2. *MTOW from WV001*
3. *Take-off field length and landing field length based on ISA conditions at sea level*

ITEM	DESCRIPTION
ICAO Code	E
AGN (RWY/TWY)	V/V
Aircraft Type	B 777-200
Length	63.7m (209.1t)
Wingspan	60.9m (199.9ft)
Height	18.8m (61.5ft)
MTOW	660,000 lbs
Max. Range	3,300 to 6,450 NM
# of Passengers	Up to 500
Takeoff Field Length	2,438m (8,000ft)
Landing Field Length	1,600m (5,250ft)

Notes:

1. *Source: 777 200/300 Airplane Characteristics for Airport Planning, Boeing Company, 2000*
2. *MTOW based on General Electric Engines*
3. *Max. range indicates range between operational points where the aircraft carries its max. payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full*
4. *Payload/range is for 0.84 Mach Cruise (baseline airplane)*
5. *Takeoff field length based on standard day of baseline airplane at sea level*
6. *Landing field length based on dry runway at sea level*

ITEM	DESCRIPTION
ICAO Code	*E*
AGN (RWY/TWY)	*V/V*
Aircraft Type	*B 787-800*
Length	*56.7m (186.0ft)*
Wingspan	*60.1m (197.2ft)*
Height	*16.9m (55.5ft)*
MTOW	*502,500 lbs*
Max. Range	*5,550 to 9450 NM*
# of Passengers	*Up to 242*
Takeoff Field Length	*3,100m (10,168ft)*
Landing Field Length	*1,631m (5,350ft)*

Notes:

1. *Source: 787-8/-9 Airplane Characteristics for Airport Planning, Boeing Company, 2014*
2. *Max. range indicates range between operational points where the aircraft carries its max. payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full*
3. *Takeoff field length based on typical thrust rating at sea level*
4. *Landing field length based on dry runway at sea level*

ITEM	DESCRIPTION
ICAO Code	*E*
AGN (RWY/TWY)	*V/V*
Aircraft Type	*B 787-900*
Length	*62.8m (206.1ft)*
Wingspan	*60.1m (197.2ft)*
Height	*17.0m (55.8ft)*
MTOW	*557,000 lbs*
Max. Range	*5,200 to 8,250 NM*
# of Passengers	*Up to 290*
Takeoff Field Length	*3,277m (10,750ft)*
Landing Field Length	*1,554m (5,100 ft)*

Notes:

1. *Source: 787-8/-9 Airplane Characteristics for Airport Planning, Boeing Company, 2014*
2. *Max. range indicates range between operational points where the aircraft carries its max. payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full*
3. *Takeoff field length based on typical thrust rating at sea level*
4. *Landing field length based on dry runway at sea level*

ITEM	DESCRIPTION
ICAO Code	F or E when folded
AGN (RWY/TWY)	VI or V when folded/VI or V
Aircraft Type	B 777-9X
Length	76.7m (251.6ft)
Wingspan	71.8m (235.6ft) Or 64.8m(212.6ft) when folded
Height	19.7m (64.6ft)
MTOW	777,000 lbs
Max. Range	7,600NM
# of Passengers	Up to 425
Takeoff Field Length	N/A
Landing Field Length	N/A
Notes:	1. 777X Airport Compatibility Brochure, 2015 2. Revealed - Aspire Aviation Boeings Wide Body Dominance Hinges on 777x Success

ITEM	DESCRIPTION
ICAO Code	E
AGN (RWY/TWY)	V/V
Aircraft Type	B 747-400
Length	69.9m (229.2ft)
Wingspan	64.9m (213.0ft)
Height	19.5m (64.0ft)
MTOW	875,000 lbs
Max. Range	5,200 to 7,050 NM
# of Passengers	N/A
Takeoff Field Length	3,215m (10,550ft)
Landing Field Length	2,450m (8,038ft)
Notes:	1. Source: 747-400 Airplane Characteristics for Airport Planning, Boeing Company,2011 2. Max. range indicates range between operational points where the aircraft carries its max. payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full 3. Takeoff field length at MTOW at sea level 4. Landing field length based on flaps 25 at sea level

ITEM	DESCRIPTION
ICAO Code	F
AGN (RWY/TWY)	VI/VI
Aircraft Type	B 747-8
Length	75.2m (246.9ft)
Wingspan	68.4m (224.4ft)
Height	19.5m (64.0ft)
MTOW	987,000 lbs
Max. Range	5,910 to 8,000 NM
# of Passengers	Up to 410
Takeoff Field Length	3,109m (10,200ft)
Landing Field Length	2,359m (7,740ft)

Notes:

1. *747-8 Airplane Characteristics for Airport Planning, Boeing Company,2012*
2. *Max. range indicates range between operational points where the aircraft carries its max. payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full*
3. *Takeoff field length at sea level*
4. *Landing field length based on flaps 25 at sea level*

ITEM	DESCRIPTION
ICAO Code	F
AGN (RWY/TWY)	VI/VI
Aircraft Type	A 380-800
Length	72.7m (238.6ft)
Wingspan	79.8m (261.7ft)
Height	26.1m (85.7ft)
MTOW	1,267,658 lbs
Max. Range	6,550 to 8,800 NM
# of Passengers	Up to 854
Takeoff Field Length	5,182m (17,000ft)
Landing Field Length	2,140m (7,021ft)

Notes:

1. *Airbus Aircraft Characteristics - Airport and Maintenance Planning A380*
2. *MTOW from WV008*
3. *Max. range indicates range between operational points where the aircraft carries its max. structural payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full*
4. *Take-off field length based on ISA conditions of GP7200 Series Engine at sea level*
5. *Landing field length based on dry runway at sea level*

Corporate

ITEM	DESCRIPTION
ICAO Code	A
AGN (RWY/TWY)	II/II
Aircraft Type	Beechcraft King Air B350
Length	14.2m (46.6ft)
Wingspan	17.7m (57.9ft)
Height	4.4m (14.3ft)
MTOW	15,000 lbs
Max. Range	930 to 1,850 NM
# of Passengers	Up to 11
Takeoff Field Length	1,006m (3,300ft)
Landing Field Length	821m (2,692ft)

Notes:

1. *Max. range indicates range between operational points where the aircraft carries its max. payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full*
2. *Takeoff field length based on flaps approach at 15,000 lb, ISA at sea level*
3. *Landing field length based on normal landing distance with flaps down at 15°C, sea level*
4. *Beechcraft Aviation King Air 350 Specifications*

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIA/IIIA
Aircraft Type	Gulfstream G550
Length	29.4m (96.4ft)
Wingspan	28.5m (93.5ft)
Height	7.9m (25.8ft)
MTOW	91,000 lbs
Max. Range	6,750 NM
# of Passengers	Up to 19
Takeoff Field Length	1,801.4m (5,910ft)
Landing Field Length	844.3m (2,770ft)

Notes:

1. *Golfstream Aerospace Aircraft data, 2014*

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIA/IIIA
Aircraft Type	Gulfstream G650
Length	30.40m (99.75ft)
Wingspan	30.35m (99.58ft)
Height	7.82m (25.67ft)
MTOW	99,600 lbs
Max. Range	7,000 NM
# of Passengers	Up to 19
Takeoff Field Length	1,785.5m (5,858ft)
Landing Field Length	915.0m (3,002ft)

Notes:

1. *Golfstream Aerospace Aircraft data, 2014*

ITEM	DESCRIPTION
ICAO Code	B
AGN (RWY/TWY)	II/II
Aircraft Type	Cessna Citation X
Length	22.0m (72.3ft)
Wingspan	19.4m (63.6ft)
Height	5.9m (19.2ft)
MTOW	36,100 lbs
Max. Range	2,700 to 3,070 NM
# of Passengers	Up to 12
Takeoff Field Length	1,566.7m (5,140ft)
Landing Field Length	1,036.3 m (3,400ft)

Notes:

1. Max. range indicates range between operational points where the aircraft carries its max. payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full
2. Cessna Citation X Flight Planning Guide, 2004

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIA/IIIA
Aircraft Type	Dassault Falcon 7X
Length	23.4m (76.7ft)
Wingspan	26.21m (86.0ft)
Height	8.0m (26.1ft)
MTOW	70,000 lbs
Max. Range	5,950 NM
# of Passengers	Up to 19
Takeoff Field Length	1,800m (5,906ft)
Landing Field Length	1,030m (3,370ft)

Notes:

1. Takeoff field length based on dry runway at sea level, 0°C
2. Landing field length at sea level
3. Dassault Aviation Falcon 7X Airplane Characteristics for Airport Planning, 2010

ITEM	DESCRIPTION
ICAO Code	B
AGN (RWY/TWY)	II/II
Aircraft Type	Dassault Falcon 2000EX
Length	20.2m (66.4ft)
Wingspan	19.3m (63.4ft)
Height	7.0m (22.9ft)
MTOW	42,400 lbs
Max. Range	3,850 NM
# of Passengers	Up to 19
Takeoff Field Length	1,780m (5,840ft)
Landing Field Length	1,180m (3,871ft)

Notes:

1. Takeoff field length based on dry runway at sea level, 0°C
2. Landing field length at sea level
3. Dassault Aviation Falcon 2000 Airplane Characteristics for Airport Planning, 2008
4. Dassault Aviation Aerospace Aircraft data, 2014

ITEM	DESCRIPTION
ICAO Code	A
AGN (RWY/TWY)	I/I
Aircraft Type	Bombardier Learjet 45
Length	17.6m (57.6ft)
Wingspan	14.6m (47.8ft)
Height	4.3m (14.1ft)
MTOW	20,500 lbs
Max. Range	2,098 NM
# of Passengers	Up to 9
Takeoff Field Length	1,326m (4,350ft)
Landing Field Length	811m (2,660ft)

Notes:

1. *Max. range based on IFR reserves, ISA, with 4 pax/2 crew*
2. *Takeoff field length based on ISA, MTOW at sea level*
3. *Landing field length based on ISA, MLW at sea level*
4. *Bombardier Learjet 45 factsheet, Bombardier*
5. *Bombardier Aerospace Aircraft data, 2014*

ITEM	DESCRIPTION
ICAO Code	B
AGN (RWY/TWY)	II/II
Aircraft Type	Raytheon Hawker 800XP
Length	15.6m (51.2ft)
Wingspan	15.7m (51.4ft)
Height	5.5m (18.1ft)
MTOW	28,000 lbs
Max. Range	2,540 nm
# of Passengers	Up to 8
Takeoff Field Length	1,533m (5,030ft)
Landing Field Length	808m (2,650ft)

Notes:

1. *Max. range based on 800lb payload*
2. *Takeoff field length based on MTOW, ISA, sea level*
3. *Landing field distance based on MLW, ISA, sea level*
4. *Hawker 80XP Product Analysis*
5. *Sky Quest LLC Aircraft data*

ITEM	DESCRIPTION
ICAO Code	C
AGN (RWY/TWY)	IIIB/IIIB
Aircraft Type	Boeing 737-700W (BBJ)
Length	33.6m (110.2ft)
Wingspan	35.8m (117.5ft)
Height	12.6m (41.3ft)
MTOW	171,000 lbs
Max. Range	3,200 to 6,000 nm
# of Passengers	Up to 189
Takeoff Field Length	2,347m (7,700ft)
Landing Field Length	1,509m (4,950ft)

Notes:

1. *Max. range indicates range between operational points where the aircraft carries its max. zero fuel weight payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full with 9 tanks*
2. *Takeoff field length based on standard day at sea level*
3. *Landing field length based on MTOW at sea level*
4. *Boeing Company BBJ Aircraft data*
5. *Passenger count is based on economy class only. However, the aircraft operator/owner chooses the configuration and interior.*

Military

ITEM	DESCRIPTION
ICAO Code	C
Aircraft Type	C130J- Hercules
Length	29.3m (96.1ft)
Wingspan	39.7m (130.2ft)
Height	11.9m (39.0ft)
MTOW	164,000 lbs
Max. Range	1,800 NM
# of Troops	Up to 128
Takeoff Field Length	N/A
Landing Field Length	N/A
Notes:	1. US Airforce C-130 Hercules fact sheet, C130 investigators handbook

ITEM	DESCRIPTION
ICAO Code	C
Aircraft Type	P-3 Orion
Length	35.6m (116.8ft)
Wingspan	30.4m (99.7ft)
Height	11.8m (38.7ft)
MTOW	142,000 lbs
Max. Range	4,830 NM
# of Troops	N/A
Takeoff Field Length	1,293m (4240.0ft)
Landing Field Length	884 (2900.0ft)
Notes:	1. Lockheed Martin P-3 Orion Specifications

ITEM	DESCRIPTION
ICAO Code	D
Aircraft Type	P-8A Poseidon
Length	39.5m (129.5ft)
Wingspan	37.6m (123.6ft)
Height	12.8m (42.1ft)
MTOW	1,892,000 lbs
Max. Range	4,000 NM
# of Troops	Up to 9
Takeoff Field Length	N/A
Landing Field Length	N/A
Notes:	1. Boeing P-8A Poseidon, Royal Australian Airforce P-8A Poseidon

ITEM	DESCRIPTION
ICAO Code	E
Aircraft Type	C-17
Length	53.0m (174.0ft)
Wingspan	51.8m (169.0ft)
Height	16.8m (55.0ft)
MTOW	585,000 lbs
Max. Range	2,400NM
# of Troops	Up to 102
Takeoff Field Length	2,316m (7600.0ft)
Landing Field Length	915m (3000.0ft
Notes:	1. FAS Military Analysis Network C-17 Globemaster III 2. Boeing, C-17 Globemaster III

ITEM	DESCRIPTION
ICAO Code	F
Aircraft Type	C-5 Galaxy
Length	75.5m (247.8ft)
Wingspan	67.9m (222.8ft)
Height	19.8m (65.1ft)
MTOW	840,000 lbs
Max. Range	4,800 NM
# of Troops	Up to 81
Takeoff Field Length	2,532m (8300.0ft)
Landing Field Length	1,495m (4900.0ft)
Notes:	1. Lockheed Martin C-5M Specifications, The Aviation Zone Lockheed C-5 Galaxy 2. US Air Force, C-5A/B/C Galaxy and C-5M Super Galaxy 3. Max range indicated is based on cargo load of 120,000lbs. The range increases to 7,000NM with no cargo on board.

ITEM	DESCRIPTION
ICAO Code	E
Aircraft Type	KC-10
Length	55.4m (183.0ft)
Wingspan	50.4m (165.5ft)
Height	17.7m (58.0ft)
MTOW	585,327lbs
Max. Range	9,993 NM
# of Troops	Up to 75
Takeoff Field Length	N/A
Landing Field Length	N/A
Notes:	1. Burns and McDonnell Aircraft Characteristics 9th Edition

ITEM	DESCRIPTION
ICAO Code	D
Aircraft Type	A400M
Length	45.1m (148.0ft)
Wingspan	42.4m (139.0ft)
Height	14.7m (48.0ft)
MTOW	310,850 lbs
Max. Range	1780 to 4,700 NM
# of Troops	Up to 116
Takeoff Field Length	980m (3,214.4ft)
Landing Field Length	770m (2,525.6ft)

Notes:
1. Airbus A400M Specifications
2. Maximum range based on maximum payload to ferry
3. Airbus Defense and Space A400M Specifications, Airvectors - The Boeing C-17 and Airbus A400M

ITEM	DESCRIPTION
ICAO Code	D
Aircraft Type	A310-300
Length	46.4m (152.3ft)
Wingspan	43.9m (144.0ft)
Height	15.9m (52.1ft)
MTOW	361,557 lbs
Max. Range	2,750 to 3,700 NM
# of Troops	Up to 220
Takeoff Field Length	3,292m (10,800ft)
Landing Field Length	1,737m (5,700ft)

Notes:
1. A310 Airbus Airplane Characteristics for Airport Planning AC
2. Max. range indicates range between operational points where the aircraft carries its max. zero fuel weight payload with max. takeoff gross weight and the range-payload compromise when the fuel tanks of the aircraft are full, based on PW-JT9D-7R4 engine
3. Airlines Inform World Commercial Aircraft A310, 2012

Cargo

ITEM	DESCRIPTION
ICAO Code	*F*
Aircraft Type	*An124*
Length	*69.1m (226.7ft)*
Wingspan	*73.3m (240.4ft)*
Height	*20.8m (68.1ft)*
MTOW	*892,872 lbs*
Max. Range	*2,430 NM*
# of Passengers	*Up to 10*
Takeoff Field Length	*2,520m (8,265.6ft)*
Landing Field Length	*900m (2,952.0ft)*

Notes:

1. *The Aviation Zone Antonov An-124 Ruslan Condor, Extreme Cargo Group AN124-100 "Ruslan"*
2. *Jane's Aircraft Recognition Guide, David Rendall, Antonov AN124-Condor*

ITEM	DESCRIPTION
ICAO Code	*F*
Aircraft Type	*An225*
Length	*84.0m (276.0ft)*
Wingspan	*88.4m (290.0ft)*
Height	*18.2m (60.0ft)*
MTOW	*1,322,750 lbs*
Max. Range	*2,425 NM*
# of Passengers	*Up to 70*
Takeoff Field Length	*N/A*
Landing Field Length	*N/A*

Notes:

1. *Airvectors - The Aviation Giants: A22, An-124, and An-225, Axelgeeks Antonov AN-225 Mriya*
2. *Jane's Aircraft Recognition Guide, David Rendall, Antonov AN225-Mriya*

Helicopters

ITEM	DESCRIPTION
ICAO Code	*-*
Aircraft Type	*S92*
Length	*20.9m (68.5ft)*
Rotor Diameter	*17.2m (56.3ft)*
Height	*5.5m (17.9ft)*
MTOW	*29,300 lbs*
Max. Range	*547 NM*
# of Passengers	*Up to 19*
Source:	*1. Sikorsky S-92 Executive Transport Helicopter Specifications 2014*

ITEM	DESCRIPTION
ICAO Code	*-*
Aircraft Type	*Bell 204*
Length	*12.7m (41.7ft)*
Rotor Diameter	*14.6m (47.9ft)*
Height	*4.5m (14.6ft)*
MTOW	*9,500 lbs*
Max. Range	*300 NM*
# of Passengers	*Up to 10*
Source:	*1. Premier Jet Aviation Bell204B Specifications*

ITEM	DESCRIPTION
ICAO Code	*-*
Aircraft Type	*AW 139*
Length	*16.7m (54.6ft)*
Rotor Diameter	*13.8m (45.3ft)*
Height	*5.0m (16.3ft)*
MTOW	*14,110 lbs*
Max. Range	*675 NM*
# of Passengers	*Up to 15*
Source:	*1. AgustaWestland - Simply No Rivals AW139 Technical Data*

ITEM	DESCRIPTION
ICAO Code	*-*
Aircraft Type	*CH 124 Sea King*
Length	*16.7m (54.7ft)*
Rotor Diameter	*18.9m (62.0ft)*
Height	*5.8m (19.0ft)*
MTOW	*20,542 lbs*
Max. Range	*400 NM*
# of Passengers	*Up to 3*
Source:	*1. Royal Canadian Air Force CH-124 Sea King* *2. MTOW based on maximum gross weight*

ITEM	*DESCRIPTION*
ICAO Code	-
Aircraft Type	*CH 146 Griffon*
Length	*17.1m (56.1ft)*
Rotor Diameter	*14.0m (45.9ft)*
Height	*4.6m (15.1ft)*
MTOW	*11,905 lbs*
Max. Range	*354 NM*
# of Passengers	*Up to 10*
Source:	*1. Royal Canadian Air Force CH-146 Griffon*

ITEM	*DESCRIPTION*
ICAO Code	-
Aircraft Type	*CH 147F Chinook*
Length -Body	*15.9m(52.2ft)*
-Blade tips	*30.2m(99.0ft)*
Rotor Diameter	*18.3m(60.0ft)*
Height	*5.8m(18.9ft)*
MTOW	*54,009 lbs*
Max. Range	*613 NM*
# of Passengers	*55, 24 stretchers*
Source:	*1. MTOW based on maximum gross weight* *2. Royal Canadian Air Force CH-147 Chinook* *3. Jane's Aircraft Recognition Guide, David Rendall, Boeing Vertol CH-47 Chinook*

ITEM	*DESCRIPTION*
ICAO Code	-
Aircraft Type	*CH 149 Cormorant (AW101)*
Length	*22.9m(75.0ft)*
Rotor Diameter	*18.6m(61.0ft)*
Height	*6.7m(21.8ft)*
MTOW	*32,188 lbs*
Max. Range	*750 NM*
# of Troops	*40*
Source:	*1. Royal Canadian Air Force CH-149 Cormorant* *2. MTOW based on maximum gross weight*

Notes:

1. *Takeoff Distance is based on Sea Level (SL), International Standard Atmosphere (ISA), Maximum Takeoff Weight (MTOW) and dry runway conditions.*
2. *Landing Distance is based on Sea Level (SL), International Standard Atmosphere (ISA), Maximum Landing Weight (MLW) and dry runway conditions.*

APPENDIX H

SUPPORTING STUDIES AND DOCUMENTATION

PRYDE SCHROPP McCOMB INC.

June 28, 2007
File: 10861

COURIER

St. John's International Airport
Box 1, Airport Terminal Building
80 Airport Terminal Access Road
St. John's, NL A1A 5T2

Tel: 709-758-8506
Fax: 709-758-8521
Email: pavery@stjohnsairport.com

Attention: Mr. Peter Avery, Director of Infrastructure

Dear Mr. Avery:

Reference: St. John's International Airport
Runway 11-29 Extension Assessment

We are pleased to submit our final report for the above noted study. Enclosed, please find the following:

1. Two (2) copies of the Runway 11-29 Extension Assessment for the St. John's International Airport.

2. Two (2) copies of large scale drawings for Appendix E of the Runway 11-29 Extension Assessment for the St. John's International Airport.

3. We have submitted an electronic version for the report via E-mail in PDF format.

If you have any questions, please do not hesitate to contact our office.

Sincerely,

PRYDE SCHROPP McCOMB, INC.

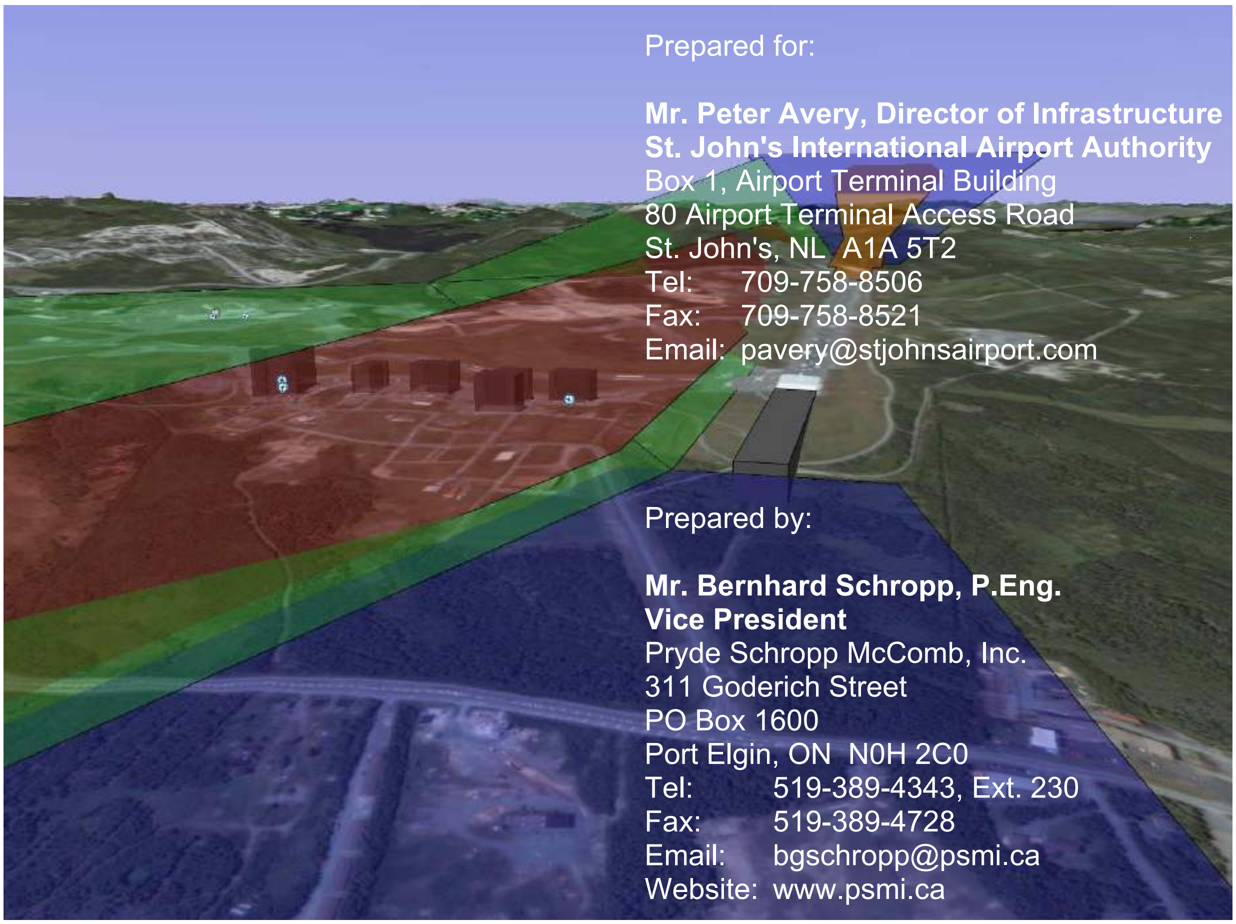
Bernhard G. Schropp, P.Eng.
Vice President

Enclosures

R:\PSMI-Operations\Working_Files\Projects\10861-St. John's Intl - Rwy 11-29 Ext Assess\Reports\10861 le avery kp 062707.doc

RUNWAY 11-29 EXTENSION ASSESSMENT

ST. JOHN'S INTERNATIONAL AIRPORT, NL



Prepared for:

Mr. Peter Avery, Director of Infrastructure
St. John's International Airport Authority
Box 1, Airport Terminal Building
80 Airport Terminal Access Road
St. John's, NL A1A 5T2
Tel: 709-758-8506
Fax: 709-758-8521
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Prepared by:

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Email: bgschropp@psmi.ca
Website: www.psmi.ca

PSMI No. 10861 June, 2007

EXECUTIVE SUMMARY

The St. John's International Airport Authority (SJIAA), identified an interest in developing a better technical understanding of extending Runway 11-29 by 1,500 ft. (457.2 m). The 2002 Airport Master Plan provided some recommendations for an easterly extension and has shown land reserves accordingly. Within past Airport Master Plans, an extension to the west was ruled out due to terrain conflicts that could impact the instrument landing system.

Given recent air route development opportunities, which may require additional runway length, the SJIAA commissioned this study to conduct a thorough analysis of the extension opportunities for Runway 11-29. Using the most current airport design standards and best practices, the objectives of this study are summarized below:

1. To understand the potential benefits of extending Runway 11-29 by 1,500 ft. from the perspective of increased range of serviceability by larger and more heavily loaded aircraft;

2. To identify the physical challenges to extending Runway 11-29 by 1,500 ft.;

3. To identify the estimated capital costs to extend Runway 11-29 by 1,500 ft.;

4. To identify a preferred runway configuration to increase the length of Runway 11-29 by 1,500 ft.;

5. Based on the above, re-validate the existing land use plan;

6. Based on the above, re-prioritize the CAT II approach lighting upgrade project program for Runway 29;

7. To identify any technical challenges with constructing a Runway End Safety Area (RESA) off the 16 End.

It was further confirmed that extending the runway by 1,500 ft. would improve the serviceability of the Airport for long-haul, passenger flights to destinations as far as Athens. However, it was also observed that at 80% load factors, both the B767 and B747-400 could serve destinations as far as Athens and Vancouver using the existing runway length and conditions at St. John's. The most significant benefit of the 1,500 ft. extension would be unrestricted load factors for the B767 and B747 to as far as Athens. The extension would also permit the new B777-300 acquired by Air Canada to operate under unrestricted load factors as far as Frankfurt.

The analysis of options proved a complex task involving many evaluation criteria and technical stakeholder inputs including NAV CANADA. The various evaluation criteria were subject to a ranking system and the results concluded that an extension off the 20 End towards the east would be the preferred. The final recommended configuration for the extension is summarized below:

1. Should a runway extension be considered by the SJIAA, Runway 11-29 should be extended off the 29 End by 1,500 ft. to the east.

2. A 150m RESA could be constructed off the 29 End within the existing airport boundary.

3. The CAT II lighting system should be installed based on the existing threshold location. The proposed CAT II tower profile should take into consideration the future runway extension profile.

4. The extend portion of the runway should be displaced in accordance with TP312 standards only restricting the available landing distance available for Runway 29 to the existing 8,502 ft. All other declared distances would increase by 1,500 ft. The resulting declared distances for Runway 11-29 are shown below:

Declared Distances (ft.)	Runway 11 Existing	Runway 11 with 29 End Extension	Runway 29 Existing	Runway 29 with 29 End Extension
TORA	8502	10000	8502	10000
TODA	9502	11000	9502	11000
ASDA	8502	10000	8502	10000
LDA	8502	10000	8502	8502 ***Note:*** *Reduced due to displaced Threshold*

Note: The above would reflect the published declared distances. As discussed in Section 5.7, the effective takeoff runway length is not a published value is subject to air carrier operational policies.

5. The Glidepath antenna for the Runway 29 approach can remain in its existing location.

6. The Runway 11 Localizer off the 29 End would need to be relocated to accommodate the extension. The final elevation of the antenna and associated support structure height and earth berming would require additional technical review and approvals through NAV CANADA and Transport Canada.

7. The Airport Zoning Regulations should be updated to reflect the new runway configuration and the latest restrictive clause including those required for aeronautical facilities. The immediate need to amend the Airport Zoning Regulation would be somewhat mitigated using the displaced threshold. There would be only a small shift in the position of the Takeoff-Approach surface which would still effectively protect the runway. Should the AZR be updated, it should be based on a non-displaced configuration.

8. The SJIAA should prepare and publish official ICAO Type A Charts for Runway 11-29 to capture the off-site terrain limitations of both runway ends.

The preliminary Class 'D' cost estimate for the 29 End extension in 2007 Canadian dollars was estimated at $25.9 million.

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LIST OF APPENDICES

LIST OF DRAWINGS

(LARGE SCALE DRAWINGS SUBMITTED UNDER SEPARATE COVER – SAME AS APPENDIX E)

1.0 Introduction

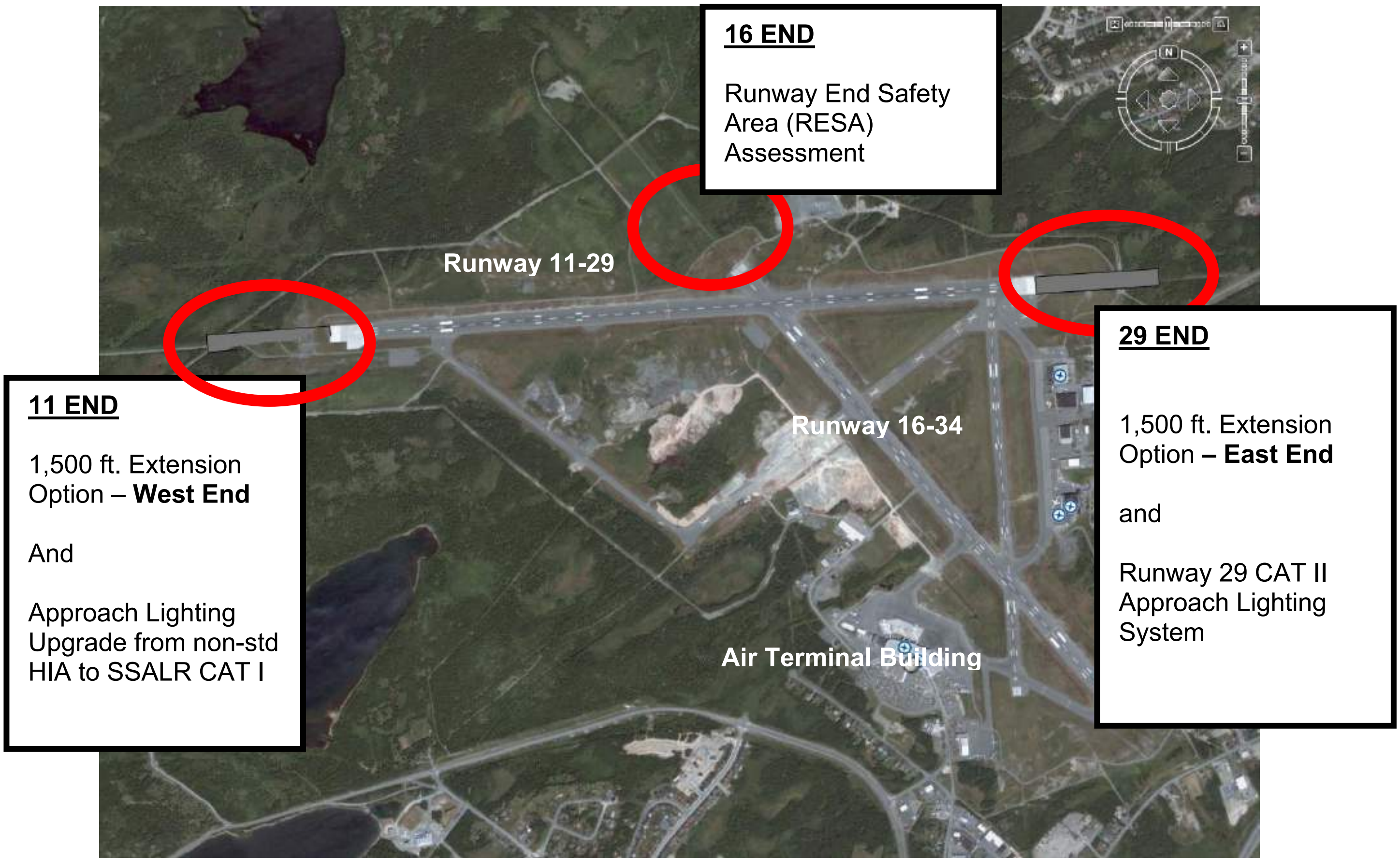
1.1 BACKGROUND

The St. John's International Airport Authority (SJIAA) identified an interest in developing a better technical understanding of extending Runway 11-29 by 1,500 ft. (457.2 m). The 2002 Airport Master Plan provided some recommendations for an easterly extension and has shown land reserves accordingly. Within the Airport Master Plan, an extension to the west was ruled out due to terrain conflicts that could impact the instrument landing system. Furthermore, concerns have also been expressed in the past by land owners to the east of the airport (off the 29 End) and in particular off the end of the runway as to the impacts of an extension on noise and general activity in close proximity to their lands. In 2004-2005, SJIAA began preparations for the upgrading and rehabilitation of the Runway 29 CAT II approach lighting system. The lighting system does not meet the current standards outlined in Transport Canada's TP312 4th Edition. Furthermore, some components require re-lifing due to their age and general overall poor condition.

It should be noted that in late 2005, the Runway 29 CAT II Rehabilitation Project was put on hold pending a review of all infrastructure projects being contemplated at St. John's International Airport (SJIA) over the next 5-10 years. Since then, the priority has shifted to better understanding the future runway extension configuration on Runway 11-29 before further investment is made in upgrading the Runway 29 CAT II approach lighting. Since the CAT II lighting system is very much integrated with the physical runway features, both must be properly planned and integrated to ensure investments are protected and scheduling is coordinated.

Figure 1-1 shows the areas of interest off both ends of Runway 11-29 associated with this study. The scope of this study also included a review of constructing a Runway End Safety Area (RESA) off the north end of Runway 16-34 as shown in Figure 1-1.

Figure 1-1 St. John's International Airport - Aerial Site Plan



1.2 OBJECTIVES

Using the most current airport design standards and best practices, the objectives of this study are summarized below:

1. To understand the potential benefits of extending Runway 11-29 by 1,500 ft. from the perspective of increased range of serviceability by larger and more heavily loaded aircraft;

2. To identify the physical challenges to extending Runway 11-29 by 1,500 ft.;

3. To identify the estimated capital costs to extend Runway 11-29 by 1,500 ft.;

4. To identify a preferred runway configuration to increase the length of Runway 11-29 by 1,500 ft.;

5. Based on the above, re-validate the existing land use plan;

6. Based on the above, re-prioritize the CAT II approach lighting upgrade project program for Runway 29;

7. To identify any technical challenges with constructing a Runway End Safety Area (RESA) off the 16 End.

1.3 APPROACH AND METHODOLOGY

The study involved acquiring information from various sources and applying various methods of technical analysis. In general, the following approach was taken:

1. Background document research and Airport Staff interviews;

2. Field inspections;

3. Preliminary field investigations including geotechnical and topographical surveys;

4. Desktop analysis;

5. Application of applicable Transport Canada, ICAO and best practices design standards;

6. Aircraft performance projections using manufacturer's Airport Planning Manuals and performance charts.

All of the above was considered, analyzed and synthesized into this report. The following sections present the detailed results of the study.

2.0 Background

2.1 GENERAL

As part of completing this study, it was considered prudent to understand the history of the airport and in particular the development history of Runway 11-29. To this end, various sources of information were obtained and considered. The following sections provide historical information relevant to Runway 11-29.

2.2 1983 AIRPORT MASTER PLAN (DRAFT)

The 1983 Draft Airport Master Plan was obtained through the Client's technical data centre. Runway 11-29 was discussed in this document as follows:

> *Source: St. John's Airport Master Plan 1983 (Draft) – Section 1*
>
> *Page 12-15 - Airfield*
>
> *"…..Runways – Runway 11-29 may have to be extend to the east in the event that St. John's Airport is ever designated for international status because the longer flight stage-lengths necessitate longer runways. An extension to the west would be impossible due to flightway zoning restrictions. The land located between the threshold of Runway 29 and Torbay Road should be protected to this effect, in accordance with the Aerodrome Standards, Physical Characteristics and Obstacle Limitations……."*

This document identified topographical constraints to the west that would hamper an extension of Runway 11-29 off the 11 End. The plan recommended reserving lands off the 29 End towards Torbay Rd.

2.3 1984 AIRPORT MASTER PLAN

The 1984 Airport Master Plan was obtained through the Client's technical data centre. Runway 11-29 was discussed in this document as follows:

> *Source: St. John's Airport – Master Plan 1984*
>
> *Section 5 - Airfield*
>
> *5.1 Inventory – Runways*
>
> *"…..The primary Runway 11-29 is 2591 metres in length and meets the requirements of the critical aircraft, the DC-8 Series 60, and also the DC-10, L1011 and B747 with full passengers and cargo over a stage length of 2,100 nautical miles on a zero wind reference temperature (20.1^{o}C) day.*

> *5.5 Future Expansion (1992-2000)*
>
> *"…..Runway 11-29 cannot be extended to the west because of flightway zoning but it could be extended to the east for 2,000 ft. or more. Such an extension would be expensive due to the significant amounts of fill that would be required to bring an extension up to grade of 11-29……"*

This document confirmed that the existing runway at 8,500 ft. was adequate to serve the current design aircraft and the target markets up to 2,100 nautical miles (England). The plan also identified topographical constraints to the west that would hamper an extension of Runway 11-29 off the 11 End. It further indicated the need for a significant amount of fill material should extensions be contemplated for Runway 11-29.

2.4 2002 AIRPORT MASTER PLAN UPDATE

A copy of the most recent Airport Master Plan was also reviewed. The information contained in this document further emphasized the disadvantages of extending Runway 11-29 to the west off the 11 End. The following information was extracted as related to Runway 11-29:

> *"Section IV-Airside*
>
> *2. Runway Development Recommendations*
>
> *"……existing runway configuration was extremely limited due to terrain both on the airport and within the approaches….*
>
> *In considering the terrain, it was noted that the airport elevation is 461 ft. ASL. The airport is located on a knoll and the land falls quickly in all directions, and then rises abruptly to the west and southwest of the airport. Extensive quantities of fill would be needed if the runways were to be extended. As well, the extension of Runway 11-29 in a westward direction could require extensive excavation to maintain the present glide slope…."*

The plan provides similar conclusions to the previous master plans, suggesting that an extension off the 11 End towards the west would impact the glide slope and requires significant amounts of fill.

The 2002 Airport Master Plan did however show and reserve land for a potential 1,500 ft. extension off the 29 End towards the east, as shown in Figure 2-1. Although the Airport Land Use Plan reserves lands specifically for the 29 End extension, an extension off the 11 End towards the west would also be in accordance with the Land Use Plan, as this area is reserved for the *"Runway System"*

Figure 2-1 2015 Land Use Plan – 2002 Airport Master Plan

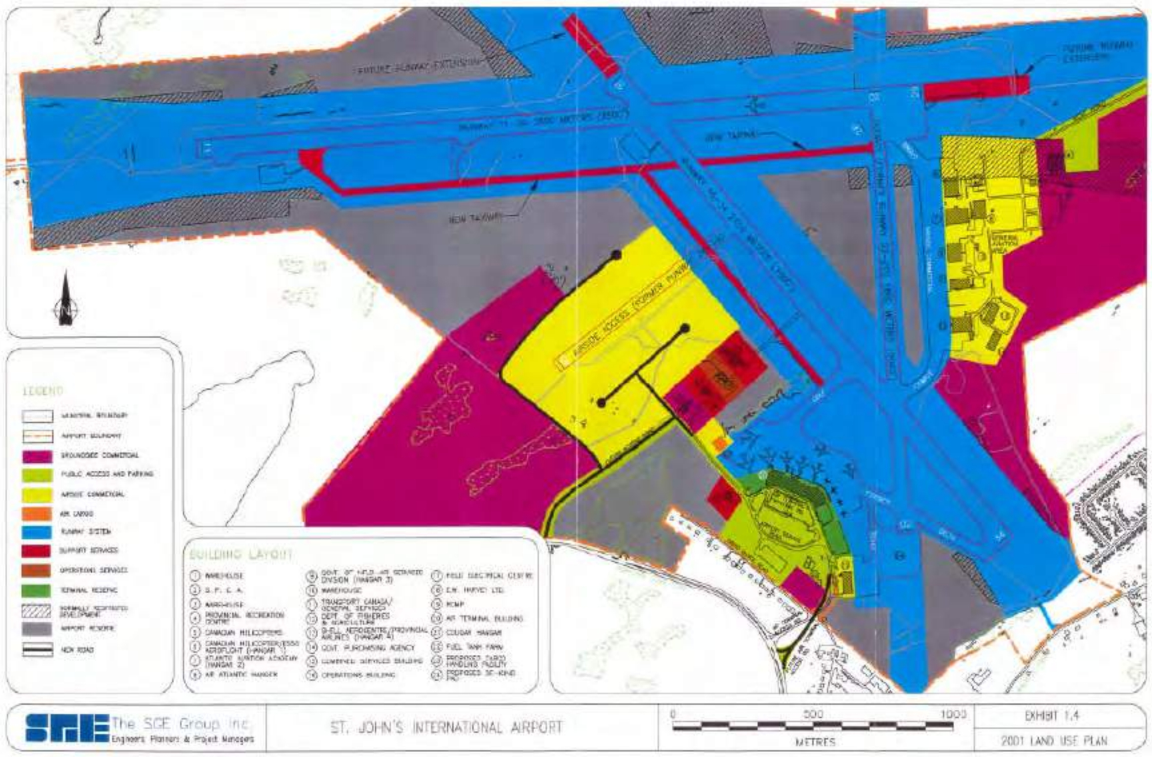


Exhibit XII-2. Proposed Land Use Plan to 2015

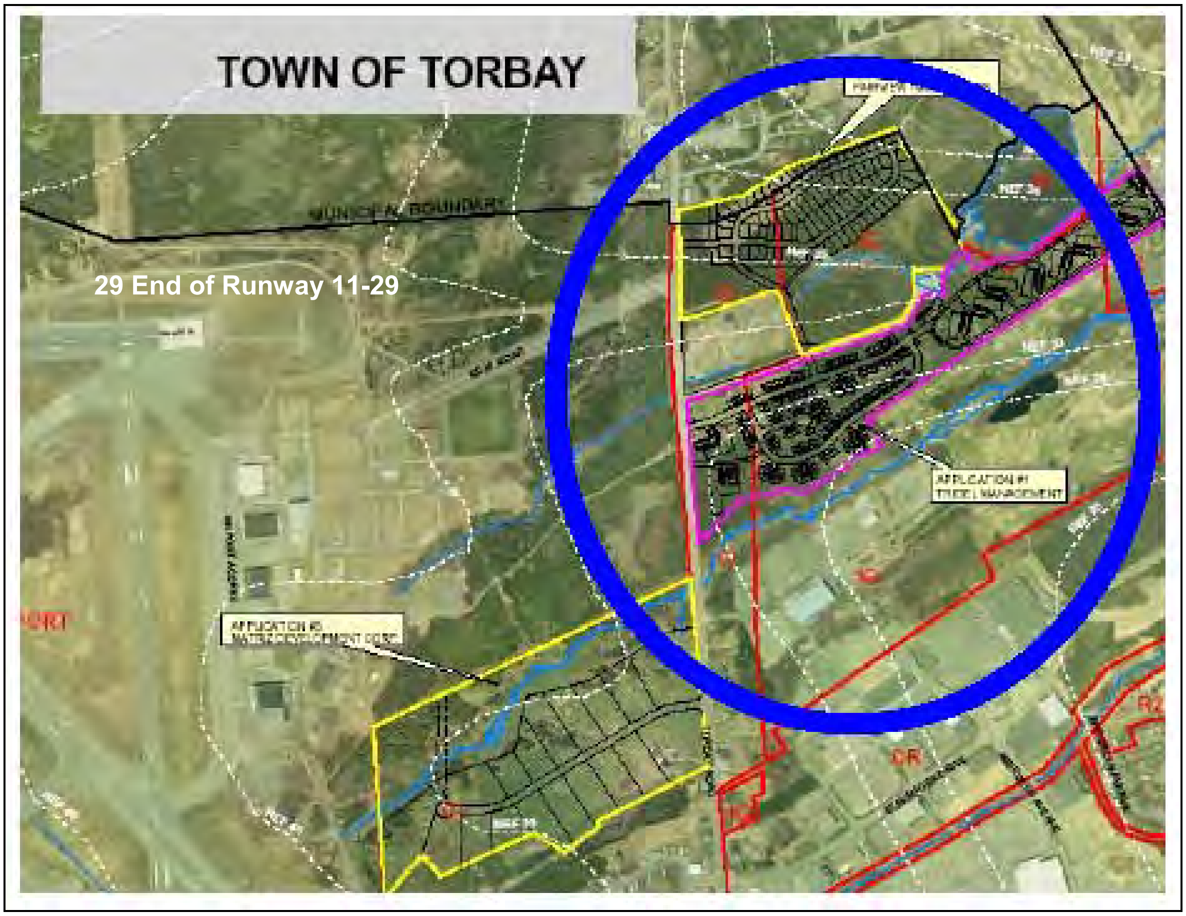
St. John's International Airport Master Plan

2.5 AIRPORT NOISE EXPOSURE FORECASTING AND SURROUNDING LAND USE

In 2005, a Noise Exposure Forecasting Study was completed for SJIAA in response to residential development proposals off the east side of the Airport (off the 29 End), as shown in Figure 2-2. The study completed by PSMI is contained in Appendix A.

The study projected aircraft noise at the Airport into the future and estimated the impacts of a 1,500 ft. extension off the 29 End towards the east. The local municipality accepted the results of the study and did not approve any residential development off the runway end.

Figure 2-2 Residential Development Proposals 2005



The following recommendations were made and adopted by the SJIAA in the 2005 report:

"….Based on the above, we offer the following summary and recommendations:

1. *Based on current national practice at other major airports in Canada and Transport Canada's recommendations, the 30 NEF should be recognized as the line above which no new residential development should be permitted. Based on this criteria, the proposed development should not be permitted as proposed. It appears that the 35 NEF has been used as the guideline in the layout of the proposal.*

2. *The aircraft noise environment in the area of the proposed development will become louder once the future expansion of the airport Runway 11-29 is realized. By extending the east end of Runway 11-29 by 1,500 ft., the proposed development could be affected by the 40 NEF contour and the 35 NEF will extend into the development. Based on this* observation*, the proposed development should not be permitted as proposed….."*

Figures 2-3 and 2-4 show the resulting NEF contours from the analysis and the impacts off the east end of the airport. This information is relevant as it provides a reasonable estimate of the noise impacts of extending Runway 11-29 by 1,500 ft. to the east. It further suggests that by accepting the results of the noise study, the municipality has in effect ensured long-term land use compatibility with a potential 1,500 ft. extension off the 29 End. This will protect the extension option for the SJIAA and also ensure that should it occur, that no significant impacts on surrounding land use would occur related to aircraft noise issues.

From the noise contours shown in Figure 2-3, it is also evident that any extension off the 11 End towards the west would have limited impacts on surrounding land use towards the west given that there are no significant residential or other sensitive land uses in this area.

Figure 2-3 2025 Noise Exposure Planning Contours – 1500 ft. Extension off 29 End

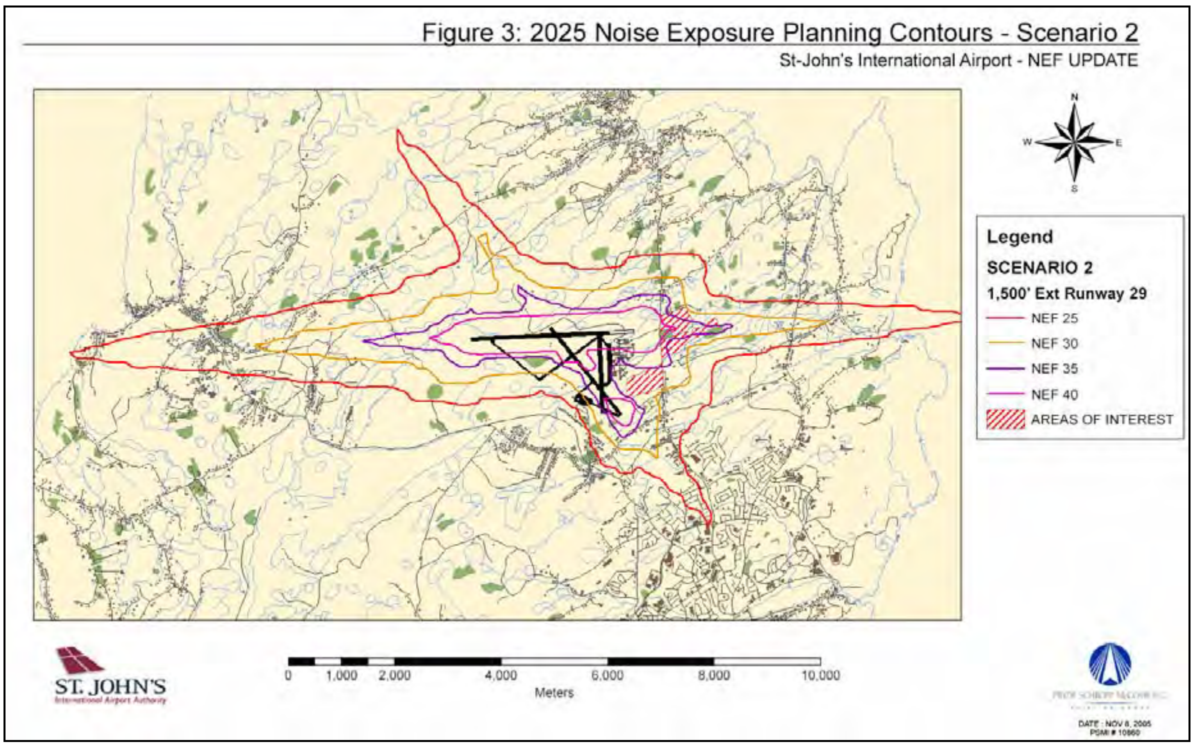
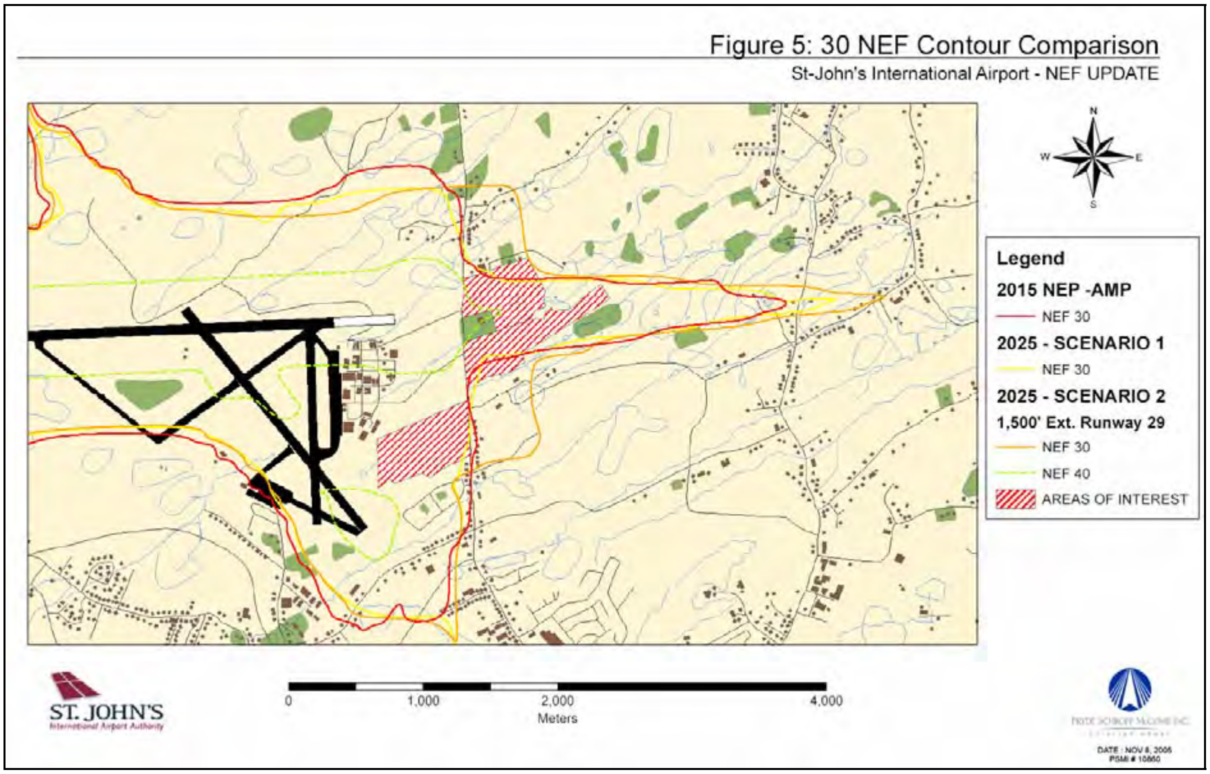


Figure 2-4 2025 Noise Exposure Planning Contours 29 End Only



2.6 EXISTING AIRPORT FEDERAL ZONING REGULATIONS

An Airport Zoning Regulation (AZR) is presently in effect at SJIA which includes registered instruments filed within the local Land Registry Offices. The AZR was created in 1978 and was subsequently amended as recently as 1984, when restrictive clauses related to *Natural Growth and Disposal of Waste* were added. The existing AZR only protects Runway 11-29 to its current 8,500 ft. length. The following confirmatory text has been extracted from the regulation:

> *1.1.1.1 "….PART V*
>
> *1.1.1.2 Description of Strips*
>
> *The strip associated with runway 11-29 is one thousand (1,000) feet in width, five hundred (500) feet being on each side of the centre line of the runway, and eight thousand nine hundred (8,900) feet in length;…"*[1]

It is recommended that the AZR be modified to protect the Obstacle Limitation Surfaces (OLS) for an extended Runway 11-29. The modifications would be required regardless of which end or combination of ends are extended.

[1] The length of a runway strip is made up of the physical runway length plus 200 ft. off either end for a graded area.

Should the AZR be updated, additional restrictive clauses should be considered to ensure full protection under the authority of the Federal Aeronautics Act. The following restrictive clauses have been included in recent AZR updates at other larger international airports in Canada:[2]:

BUILDING RESTRICTIONS

> ***3***. *No person shall erect or construct, on land to which these Regulations apply, a building, structure or object, or an addition to an existing building, structure or object, the highest point of which will exceed in elevation at the location of that point*
>
> *(a) the approach surfaces;*
>
> *(b) the outer surface; or*
>
> *(c) the transitional surfaces.*

AERONAUTICAL FACILITIES

> ***4***. *No owner or lessee of land to which these Regulations apply shall permit any part of that land to be used or developed in a manner that causes interference with signals or communications to and from*
>
> *(a) an aircraft; or*
>
> *(b) facilities used to provide services relating to aeronautics.*

NATURAL GROWTH

> ***5***. *No owner or lessee of land to which these Regulations apply shall permit an object of natural growth that is on that land to grow to a height that exceeds in elevation at the location of the object any of the surfaces referred to in section 3.*

DISPOSAL OF WASTE

> ***6***. *No owner or lessee of land within the limits of the bird hazard zone, as described in Part VII of the schedule, shall permit any part of that land to be used for the disposal of waste that is attractive to birds.*

The Aeronautical Facilities clause above would be relevant to SJIA since it covers the protection of electronic navigational aids and other facilities including radars and communication towers from incompatible land uses. The existing AZR does not include any protection for such facilities.

2.7 RUNWAY 11-29 REHABILITATION HISTORY

Runway 11-29 was originally constructed in 1942 and the pavement was last rehabilitated in 1999. Appendix B contains a copy of the full pavement construction history for Runway 11-29. The runway was also extended in various stages over its history as shown in the table in Appendix B.

[2] Obtained from Toronto-Pearson International Airport Zoning Regulations Updated 2000

The existing Runway 29 CAT II lighting system was rehabilitated about eight (8) years ago which included the following component upgrades:

a. Transformer boxes,
b. Secondary cables and ducts,
c. Transformers,
d. Secondary cable pipe extensions on towers,
e. Fixtures,
f. Threshold Lights including pulpits, secondaries and transformers, and
g. Additional threshold light positions were pre-installed including pullpits and secondary ducting for future threshold lights (at 1.5 metre +/- spacing).

The runway pavements are coming due for rehabilitation in the next 5-7 years. The CAT I and CAT II approach lighting systems are due for rehabilitation due to the age of the various components along with the need to address geometric layout non-compliances with current TP312 design standards.

2.8 ICAO TYPE A CHARTS

In accordance with Transport Canada Standards, an ICAO Type A Chart shall be prepared for all runways at an international airport. SJIAA is in the process of developing these charts since 2005. Formal charts are currently not available. This work was initiated in response to Transport Canada's Aviation Circular ASR 2001-009 and to ensure regulatory compliance. Appendix C contains a copy of the ASR and a sample ICAO Type A Chart for Sydney NS.

It should also be noted that the topographical survey data prepared by SJIAA for the ICAO Type A chart development work was used in this study. This information proved to be very valuable in understanding off-site topographical constraints and for the Obstacle Limitation Surface analysis.

As the SJIAA continues to pursue international carriers and markets, the finalization of the ICAO Type A charts remains an important action item. It is recommended that the official charts be finalized and published for St. John's. This will ensure a high level of safety by advising carriers of the surrounding terrain challenges unique to St. John's and also to ensure compliance with Transport Canada certification standards.

3.0 Field Investigations

3.1 TOPOGRAPHICAL SURVEY

Preliminary topographical surveys were completed off both runway ends of Runway 11-29. At the 11 End (West End), additional details were collected along the rising ground south of existing runway since it currently has been marked with hazard beacons due to some transitional zoning non-compliance. Updating the ground elevations as part of this study allowed for a more accurate assessment of the existing situation along with the proposed extended runway scenarios. The topographical survey was completed by Aubrey K. Burt Surveys Ltd., St. John's, NL.

The survey data supplemented an existing electronic mapping database from which the report mapping and analysis was completed. As noted in Section 2, previous obstacle/terrain surveys completed in 2005, by Aubrey K. Burt Surveys Ltd. for the development of ICAO Type A charts was incorporated into this study.

3.2 GEOTECHNICAL INVESTIGATION

Test pits were excavated on both ends of Runway 11-29 and soil observations made as part of this study. The final report is contained in Appendix D. The report concluded that both ends of the runway are suitable for the proposed extension development. In general, based on existing geological information and previous experience, the natural overburden material in the area beneath surficial organic and fill materials consists of silty sand and gravel (glacial till) extending to bedrock. The Geotechnical Investigation was completed by Jacques Whitford and Associates Limited, St. John's, NL.

3.3 SITE INSPECTIONS

The runway ends were inspected by the Consultant at the start of the study. Table 1 presents a photographic summary along with some of the Consultant's observations.

Table 1 Runway 11-29 Consultant Site Inspection (November 2006)

Photograph	Observation
11 END (WEST END)	
	View from the 11 End looking West. Note the rise in terrain in the distance.
	Falling terrain off the 11 End. Approach lighting towers shown here increasing in height. Any proposed extension would require significant fill off this end along with relocation of the localizer antenna.

Photograph	Observation
	Rising terrain directly south of the 11 End. These areas require routine clearing of trees and brush. Some areas remain non-compliant with respect to transitional zoning but are marked with hazard beacons. These areas are primarily comprised of rock outcrops making it financially impractical to remove the features to meet compliance. These areas are noted deviations within the Airport Operations Manual.
29 END (EAST END)	
	View towards the east from the 29 End near the localizer antenna. Similar to the 11 End, approach lighting towers shown here are increasing in height. Any proposed extension would require significant fill off this end along with relocation of the localizer antenna.

Photograph	Observation
	Standing at the threshold at the 29 End (East End) looking towards the East. Rising terrain also in the background but not as significant as off the 11 End.

4.0 Design Criteria and Preliminary Layouts

4.1 DESIGN STANDARDS

The following airport design reference documents were used in the preparation of this study:

1. Transport Canada, Aerodrome Standards and Recommended Practices, TP 312, 4th Ed., March 1993;
2. Transport Canada, Land Use in the Vicinity of Airports, 8th Ed., May 2005;
3. FAA, AC No: 120-91, Airport Obstacle Analysis (Specifically for Engine Out Performance Analysis);
4. ICAO Annex 4, Aeronautical Charts, 10th Ed, July 2001.

4.2 DESIGN AIRCRAFT

While the Airport Operations Manual identifies the Boeing 767 as the critical aircraft for St. John's, the aircraft shown in Table 2 were selected to represent a possible cross-section of large, long-haul aircraft which could be targeted by SJIAA for new air route development. The Boeing 777 has been selected as it has recently been purchased by Air Canada for long-haul flights. The B767 has been retained and the B747-400 was included to represent a potential long-haul charter or scheduled service or cargo aircraft.

Table 2 Design Aircraft Characteristics

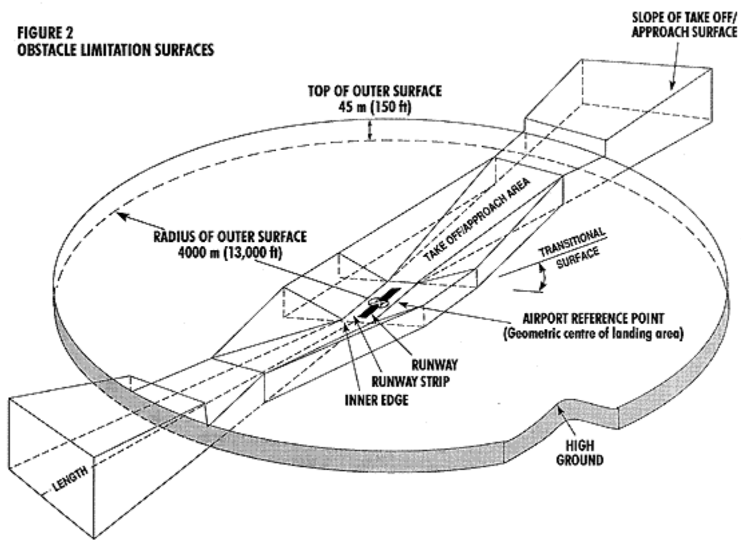
Planning Parameter	Boeing 777-300	Boeing 767-300 ER	Boeing 747-400
Tire Pressure	1.5 MPa	1.38 MPa	1.5 MPa
Wing Span	64.8 m	47.57m	64.94m
Gear Spacing	10.97m	10.95m	11.0m
Code Letter	E	D	E
PLR/ALR	12	11	12
Tail Height	18.75m	16.03m	19.51
Taxiway Width	23 m	23m	23m

4.3 RUNWAY AND OBSTACLE LIMITATION SURFACE CHARATERISTICS

Obstacle Limitation Surfaces are established around an airport to ensure a satisfactory level of safety. These surfaces normally extend well beyond the boundary of the airport and therefore require protection by the enactment of Zoning Regulations or Legal Instruments which will prohibit the erection of structures which would violate any of the defined plane surfaces. These surfaces are shown in the adjacent diagram and are described below:

Outer Surface

An outer surface shall be established where required for the protection of aircraft conducting a circling procedure or manoeuvring in the vicinity of an aerodrome.



Takeoff/Approach Areas And Surfaces

They are established for each runway direction intended to be used for the takeoff and landing of aircraft.

Transitional Surface

Transitional surface is a complex surface along the sides of the runway strip and part of the approach surface that slopes up to the outer surface. Its purpose is to ensure the safety of aircraft at low altitudes displaced from the runway centre line in the approach or missed approach phase.

Buildings, structures or natural growth protruding into the Obstacle Limitation Surfaces are prohibited. The maximum height of any structure is governed by its proximity to the runways, taxiways and any electronic or navigational-aid equipment.

All airport development falling within the affected zones are also subject to these restrictions and guidelines to remain in compliance with the airport's operating certificate.

Runway 11-29 physical and OLS characteristics are shown in Table 3 below. From Tables 2 and 3, it was concluded that Runway 11-29 could support the design aircraft. Furthermore, the taxiway routing to the main Terminal Apron would also support these aircraft.

Table 3 Runway 11-29 and Obstacle Limitation Surface Characteristics

Description	Existing Conditions (8,502 ft.)	Proposed Conditions (10,000 ft.)
Physical Characteristics		
Code	4-E	4-E
Instrument Approach	Precision (CAT I – Rwy 11, CAT II Rwy 29)	Precision (CAT I – Rwy 11, CAT II Rwy 29)
Runway Dimensions		
Length	2,591m (8,502 ft.)	3,048 m (10,000 ft.)
Width	60 m (200 ft.)	60 m (150 ft.)
Runway Strip		
Length	2,711 m (8,902 ft.)	3,168 m (10,400 ft.)
Width	300 m (1,000 ft.)	300 m (1,000 ft.)
Graded Area	90 m either side of centreline Max. Transverse slope -2.5%	90 m either side of centreline Max. Transverse slope - 2.5%
Transverse Slope Runway Pavement	1.5% Max	1.5% Max
Longitudinal Slope Runway Centreline	1.5% Max. downward slope calculated at 0.8% for extensions	1.5% Max. downward slope calculated at 0.8% for extensions
Obstacle Limitation Surfaces		
Takeoff/Approach Slope	1:50	1:50
Divergence	15%	15%
Length of Takeoff / Approach Surface	15,000 m	15,000 m
Length of Inner Edge	150 m	150 m
Transitional Surface Slope	1:7	1:7
Lighting		
Edgelights	High Intensity	High Intensity
Approach Slope Indicators	PAPI (Rwy 11 only)	PAPI (Rwy 11 and 29)
Approach Lights		
Runway 11	Non Std HIA	SSALR, CAT I
Runway 29	Non Std. CAT II	ALSF2, CAT II
Pavements		
Pavement Load Rating	12	12

4.4 PROPOSED EXTENSION LAYOUTS

Based on the above, Drawings No. SP1, C1 and C2 contained in Appendix E were prepared. Figures 4-1 and 4-2 also depict a generalized 3-D perspective of the extensions which were intended to capture the falling terrain off both ends and a general layout of the extensions.

Drawing C3 in Appendix E, also shows the proposed Runway End Safety Area (RESA) off the 16 End.

Figure 4-1 29 End Extension – Topographical Relief[3]

[3] 3 times vertical exaggeration used to improve visual impact.

Figure 4-2 11 End Extension – Topographical Relief[4]

The following key design notes apply to these drawings:

1. The extensions were designed using the maximum downward slopes for both longitudinal and transverse slopes to minimize fill requirements.

2. The top of the localizer antenna elevation was maintained to ensure no electronic signal degradation following relocation. This has resulted in the need for earth berming, as shown in the technical drawings.

3. It was assumed that the localizer antenna leg heights could not be increased due to structural and vibration considerations. As such, the grade differential was made up by constructing an earth berm as shown on the technical drawings. This approach has been used at other international airports in Canada.

[4] 3 time vertical exaggeration used to improve visual impact. Some of the 11 End runway has been removed to show underlying terrain.

4. The extensions would be constructed to the TP312 recommended 60m runway width for Code E and F compatibility.

5. The extensions would be constructed using a flexible (asphalt) pavement structure.

6. For the purpose of the study, turning pads are not shown but would be required to similar dimensions as the existing one on the 11 End.

7. Runway End Safety Areas (RESA) have been shown based on the minimum recommend length and maximum downward slopes in accordance with TP312.

8. Is assumed that perimeter swales and rip rapped swales would be provided as part of the extensions to channel any water to the existing outlets at either end. No significant increase in run off is predicted and can be managed through rock check dams and vegetation buffers.

9. Fill slopes and limits have been estimated based on the preliminary survey results.

10. While the drawings show extensions off both ends in increments of 500 ft., the overall physical impact assessment has been based on a full 1,500ft. extension.

5.0 Technical Assessment

5.1 GENERAL

The purpose of this section was to filter the proposed extension concepts developed in Section 4 through various technical assessment criteria. These criteria were established as part of the original proposal for the study and represent key technical considerations. Based on these results, Section 8 further refines the assessment by comparing each extension direction (i.e. east or west) and then ranked each one based on a number of evaluation criteria. The final outcome of was the identification of a preferred option.

5.2 AIRPORT PROPERTY BOUNDARY AND FEATURES

The airport property boundary was extracted from existing electronic base mapping supplied by the airport. The boundary has been shown on the technical drawings contained in Appendix E.

29 End Extension (East End)

For a runway extension off the east end from the 29 End no additional lands would be required to construct a 1,500 ft. extension. However, to install the CAT II lighting system off an extended 29 End, acquisition of lands or and easement on the east side of Torbay Road up to about 210 metres in length would be required. This would not be required if a displaced threshold is considered when extending off the 29 End.

The CAT II lighting and threshold for an extended 29 End could move about 300m eastward from the existing threshold position while still being contained within the existing property boundary. It was further confirmed that a 150m RESA plus the 1,500 ft. extension could be contained within the airport boundary. Refer to Section 5.5 for more discussion related to Obstacle Limitation Surfaces and Displaced Thresholds and Section 5.9 discusses RESAs in more detail.

A possible negative impact was identified on an existing airport access road off Torbay Road as shown on Drawing No. C2. This would need additional technical analysis to validate but has been noted as a possible issue for the east end extension. The road may need to be re-aligned to accommodate the extension and the 150m RESA.

11 End Extension (West End)

The technical drawings indicate that the fill limits off the extended 11 End would likely extend past the property line. Furthermore, the CAT I approach lights would need to project beyond the current boundary/easement requiring revisions. Similar to the 29 End, the lights could be inset into the pavement as part of a displaced threshold avoiding any need for additional land requirements off the west end. Refer to Section 5.5 for more discussion related to Obstacle Limitation Surfaces and Displaced Thresholds.

5.3 VERY LARGE AIRCRAFT OPERATIONS (CODE F)

While the Airbus A380 is not being contemplated for operations at SJIAA in the medium term, it should be noted that the runway extensions at a 60m width would be able to support this aircraft. While ICAO recommends additional paved shoulders up to 7.5m in width, they are not mandatory. For limited use, stabilized turf shoulders would suffice. For more frequent operation, paved shoulders between 3 - 7.5metres may be considered.

Based on the above, the proposed extensions will not prevent future operations of very large aircraft. Proposed turning pad areas off each end will further improve aircraft operations when conducting full 180 degree turns at the new runway ends.

5.4 RUNWAY END DISTRIBUTION

A review of aircraft movement statistics was completed for Runway 11-29. The focus of the analysis was to understand the runway end distribution for aircraft departures. Departures or takeoffs are the most demanding operation in terms of runway length requirements. Aircraft in this configuration are heavily loaded with passengers, cargo and fuel.

Based on historical statistics, when aircrafts are departing on Runway 11-29, 87-90% departs Runway 29 and 10-13% departs Runway 11. These statistics are significant in that they demonstrate that the preferred runway for departures is clearly Runway 29, i.e. towards the west. The 29 End is also best served by the existing taxi routes, reducing runway occupancy time.

5.5 OBSTACLE LIMITATION SURFACES – EXISTING

Figure 5-1 shows the existing Obstacle Limitation Surfaces (OLS) for Runway 11-29 superimposed on aerial imagery of the airport. Both ends of the runway are free of any penetrations related to the Takeoff-Approach Surfaces.

However, terrain penetrates the Transitional Surface on the south side of Runway 11 as noted earlier. This area is marked by hazard beacons and is shown in greater detail in Figure 5-2. While the images produced in these figures are based on terrain data supplied by Google Earth, the Consultant has independently verified the information using the topographic data collected as part of the preliminary topographic survey. The limits of penetration shown in Figure 5-2 should be considered a reasonable representation of the actual conditions.

Figure 5-1 shows an area within the Takeoff-Approach Surface that only marginally clears the terrain by about 10 metres. Trees can easily continue to grow and penetrate this area. This area must be closely monitored by SJIAA. This area is subject to the authority of the Airport Zoning Regulations for the airport given the SJIAA authority to manage natural growth.

Figure 5-1 Runway 11-29 - Existing OLS

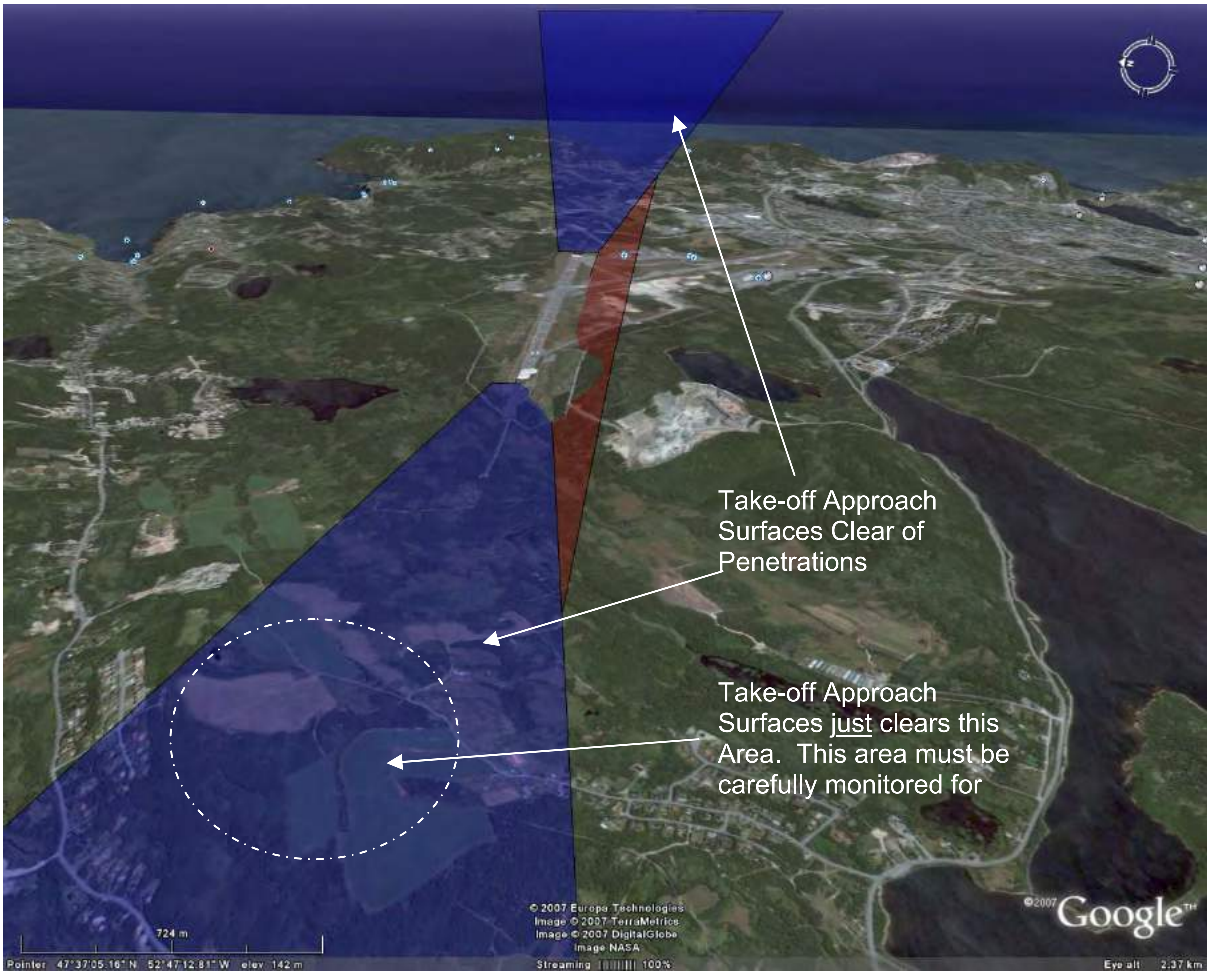
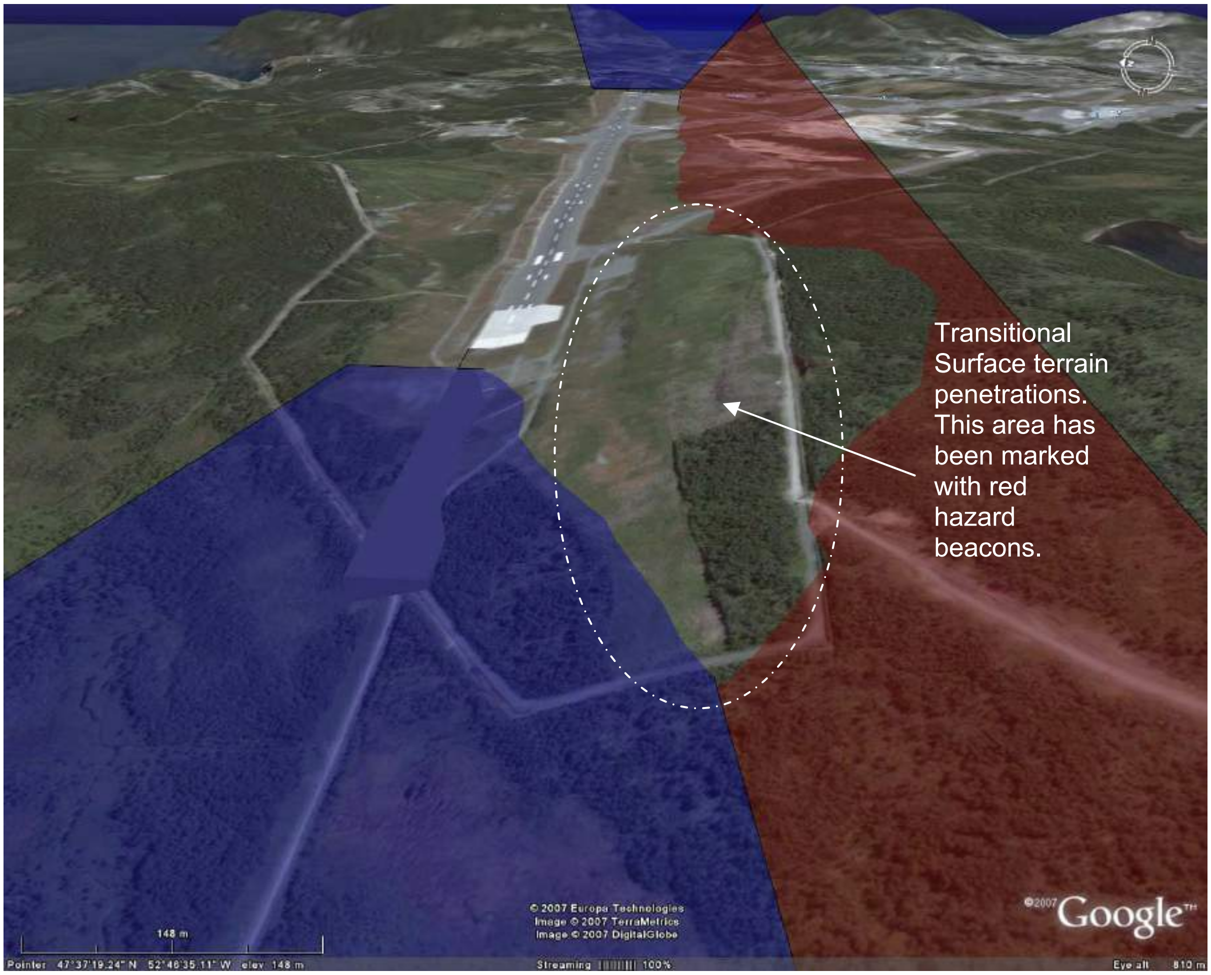


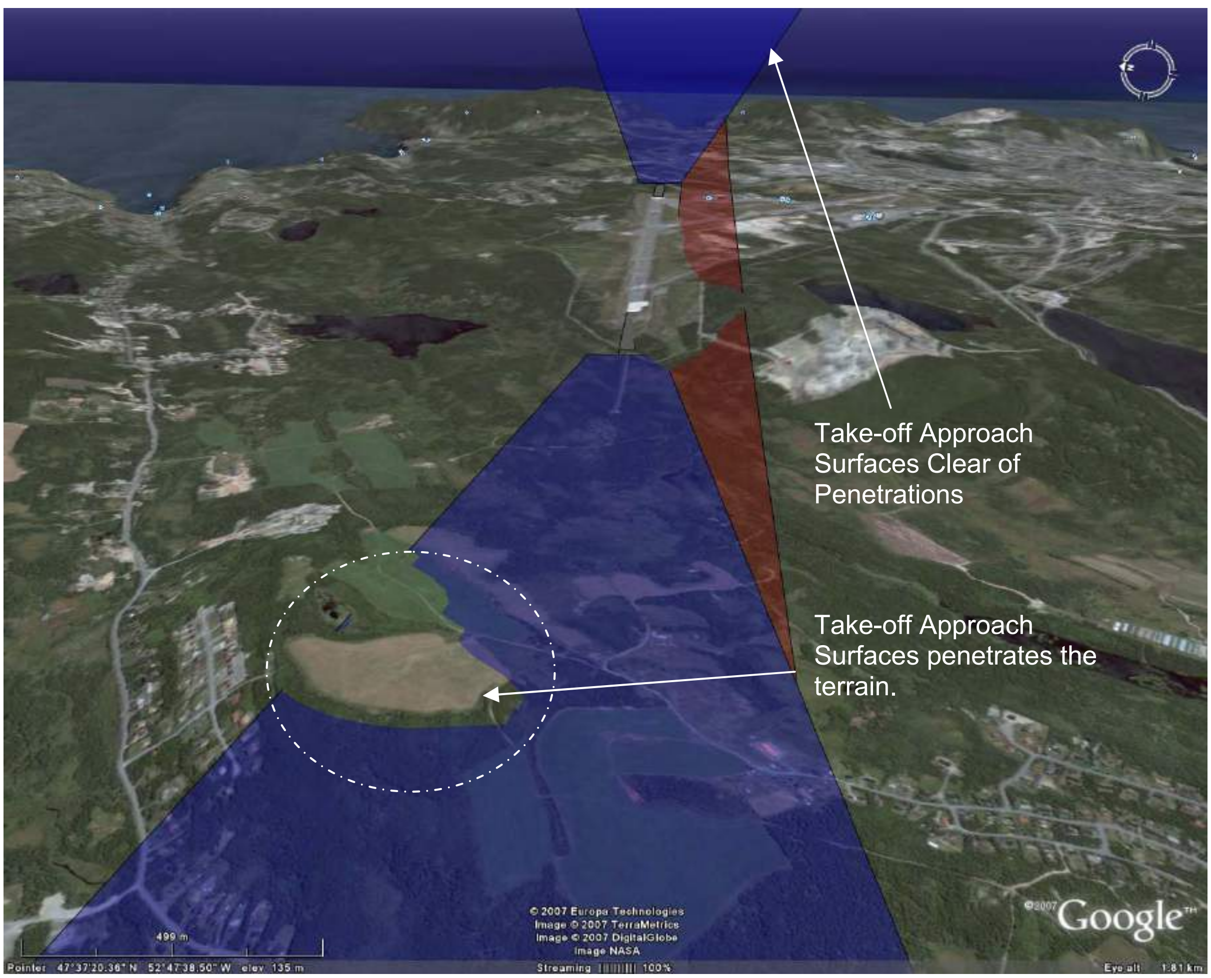
Figure 5-2 Runway 11 End Transitional Surface Non-Compliance - Existing OLS



5.6 OBSTACLE LIMITATION SURFACES - PROPOSED

Figure 5-3 shows the proposed Obstacle Limitation Surfaces for Runway 11-29 superimposed on aerial imagery of the airport for 1,500 ft. extensions off both ends. There are no penetrations of the Takeoff Approach Surface for the extension off the 29 End. However, terrain penetrates the Takeoff Approach Surface for the extension off the 11 End. As noted under the existing OLS analysis, this area has marginal clearances under the existing situation. It is recommended that the threshold position for the 11 End be maintained at its existing location. This does not however preclude extending the pavement towards the west to increase runway length for takeoff and landing. This would result in a displaced threshold configuration similar to that shown in Figure 5-4.

Figure 5-3 Runway 11 End Transitional & Take-off Approach Non-Compliance – Proposed OLS



Displaced thresholds only impact the landing distance available for aircraft arriving on the runway. The displacement can be used for takeoff in both directions and landing from the opposite direction.

Figure 5-4 Sample Displaced Threshold Configuration[5]

5.7 ENGINE OUT PERFORMANCE (EOP) OBSTACLE ANALYSIS

As noted above, even though the OLS analysis has suggested a possibility of displacing runway ends, this analysis does not take into consideration engine-out performance criteria for multi-engine aircraft. Given the terrain issues at St. John's and SJIAA's desire to attract new international air carriers, the need to fully understand and publish obstacle data via ICAO Type A Charts must be considered.

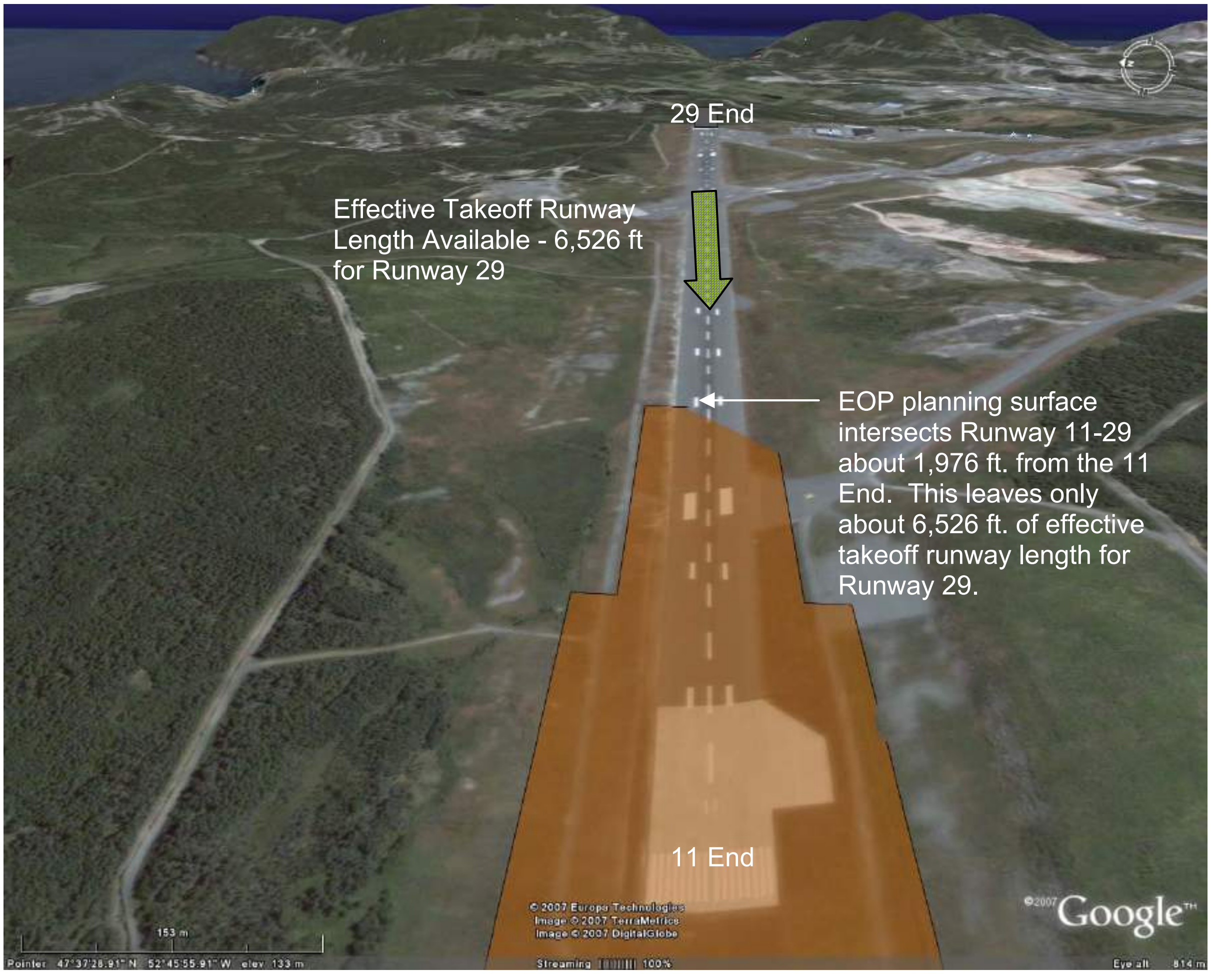
[5] Windsor Airport, Ontario, Runway 07, Displaced Threshold.

While every air carrier will have their own operational criteria for their fleet and origin/destinations, we have applied a planning level method to estimate the impacts of off-site obstacle impacts on engine-out aircraft performance. To this end, an engine-out-performance limitation surface was drawn at 1.6% as shown on Drawing No. C4. The surface must clear the most critical object by 35 ft. (10.67m). The point at which this surface intersects Runway 11-29 establishes the limit of the "effective" runway length available for takeoff calculations for Runway 29. In this case, this point falls about 1,976 ft. from the 11 End leaving only about 6,526 ft. of effective runway length available for Runway 29. Figures 5-5 and 5-6 show the surface and the approximate position on the runway.

The results of this analysis were significant since it suggested that any extension off the 11 End would not increase the effective takeoff length for Runway 29. As noted earlier, Runway 29 is used about 90% of the time for departures.

Figure 5-5 Runway 11 End Engine Out Performance Topographical Constraint (1.6%)

Figure 5-6 Engine Out Performance Effective Runway Length for Runway 29



5.8 PROPOSED TORBAY ROAD RE-ALIGNMENT

In early 2007 the province approached the SJIAA about a possible re-alignment of Torbay Road east of the 29 End. The re-alignment contemplated the acquisition of some lands from the airport off the 29 End. Drawings SP1 and C2 in Appendix E show the proposed re-alignment details. An initial assessment of the impacts of this proposal was provided by the Consultant as summarized in Appendix F. In June 2007, the province notified the SJIAA that the re-alignment proposal has been cancelled.

This study identified the following impacts of the Torbay Road re-alignment on the easterly extension off the 29 End as follows:

1. A 1,500 ft. extension and 150m RESA could be constructed and remain within the revised property boundary.

2. Appropriate obstacle clearances could be maintained over the proposed road elevations including a potential "fly-over".

3. The most significant constraint associated with the Torbay Road re-alignment was its impact on the location of the CAT II approach lighting system. The following summarizes our observations:

   3.1 Based on Drawing C2, if the CAT II lighting system were fully relocated 1,500 ft. in conjunction with the extension, the approach towers being an average height of 17-19m would have to travel through the new right-of-way and into lands east of Torbay Road. At these tower heights, the towers would have to be guyed with wires resulting in a very complex layout of towers and wires through the right-of-way. Furthermore, land acquisition or easements would be required on the east side of the Torbay Road for towers that could exceed close to 25 m in height. It was concluded that this layout would not be practical and that the CAT II lighting system should be planned to be contained within the airport boundary.

   3.2 The CAT II lighting system could be contained within the airport property for both the existing property conditions and those potentially modified due to the Torbay Road re-alignment. Refer to Drawing C2 for additional details. In both cases, a portion of the CAT II lights would be inset into the extension pavements. Figure 5-7 below shows a similar arrangement based on a CAT II approach at Hamilton International Airport. This arrangement would be co-located with a displacement threshold configuration as shown above in Figure 5-4.

   3.3 Any street lighting plans would need to be reviewed in greater detail by Transport Canada and NAV CANADA for impacts on the CAT II approach to Runway 29 under low visibility conditions.

Figure 5-7 Inset CAT II Approach Lighting within Displaced Threshold[6]

5.9 RUNWAY END SAFETY AREAS

Runway end safety areas (RESA) are defined by Transport Canada as:

> *"An area symmetrical about the extended runway centre line and adjacent to the end of the strip primarily intended to reduce the risk of damage to an aeroplane undershooting or overrunning the runway."*

The specifications for the RESA go on to describe the strength of the area as follows:

> *"A runway end safety area should be so prepared or constructed as to reduce the risk of damage to an aeroplane undershooting or overrunning the runway and facilitate the movement of rescue and fire fighting vehicles."*

To date, RESA's in Canada are not mandatory and are only recommended under the current regulatory environment. However, since the Air France incident at Toronto Pearson International Airport on August 5, 2005, Transport Canada has been actively re-considering the status of RESAs at airports. Working groups have been established and while no official announcements are being made, industry expectations are that the minimum RESA length will be 150m and the maximum downward slope of 5% will be maintained.

[6] Hamilton International Airport, On, Runway 12, CAT II Approach

In accordance with TP312 recommendations a RESA should be at least two times the width of the runway and at least 90m in length. Our analysis considered these minimum dimensions. ICAO minimum recommended dimensions however suggest a minimum length of 240m. As noted above, we have also considered a 150m RESA in our analysis off the 29 End.

Drawings C1 and C2 show various configurations for the runway extensions considering a RESA. The preliminary design suggested sloping the RESA downwards at the maximum 5% slope to minimize fill requirements. This approach would however require a berm at the end of the RESA to elevate the Localizer antennas. This arrangement should be reviewed further with Transport Canada. The alternative would be to construct the RESA at a minimum slope to minimize the berm height. This approach would however significantly increase the earth fill requirements increasing the cost of the extension work.

With respect to the 16 End, Drawing No. C3 demonstrates that the terrain will be conducive to the construction of a RESA. About 14,000 cubic metres of material will be required. It is recommended that the RESA be capped with at least 150mm of compacted granular base material and then topped with topsoil and grass. Some of the fill requirements can be made up of excavated materials from the proposed blast pad construction off the 16 End. The balance can be generated from and on-site or off-site source.

5.10 NAV CANADA IMPACT ASSESSMENT

NAV CANADA was consulted early in the process through their Land Use Proposal Process. Appendix G contains their official response to the extension proposals. The following summarizes the comments made by NAV CANADA:

<u>Runway 11 extension of 1500' (29 End Extension):</u>

- The ASDE (Airport Service Detection Equipment) coverage will be compromised due to the extension and existing runway slope at that end. The adverse impacts can be mitigated if the sloping is reduced in the vicinity -0.4% like the current last 1000 feet at that runway end.

  Consultant Comments:

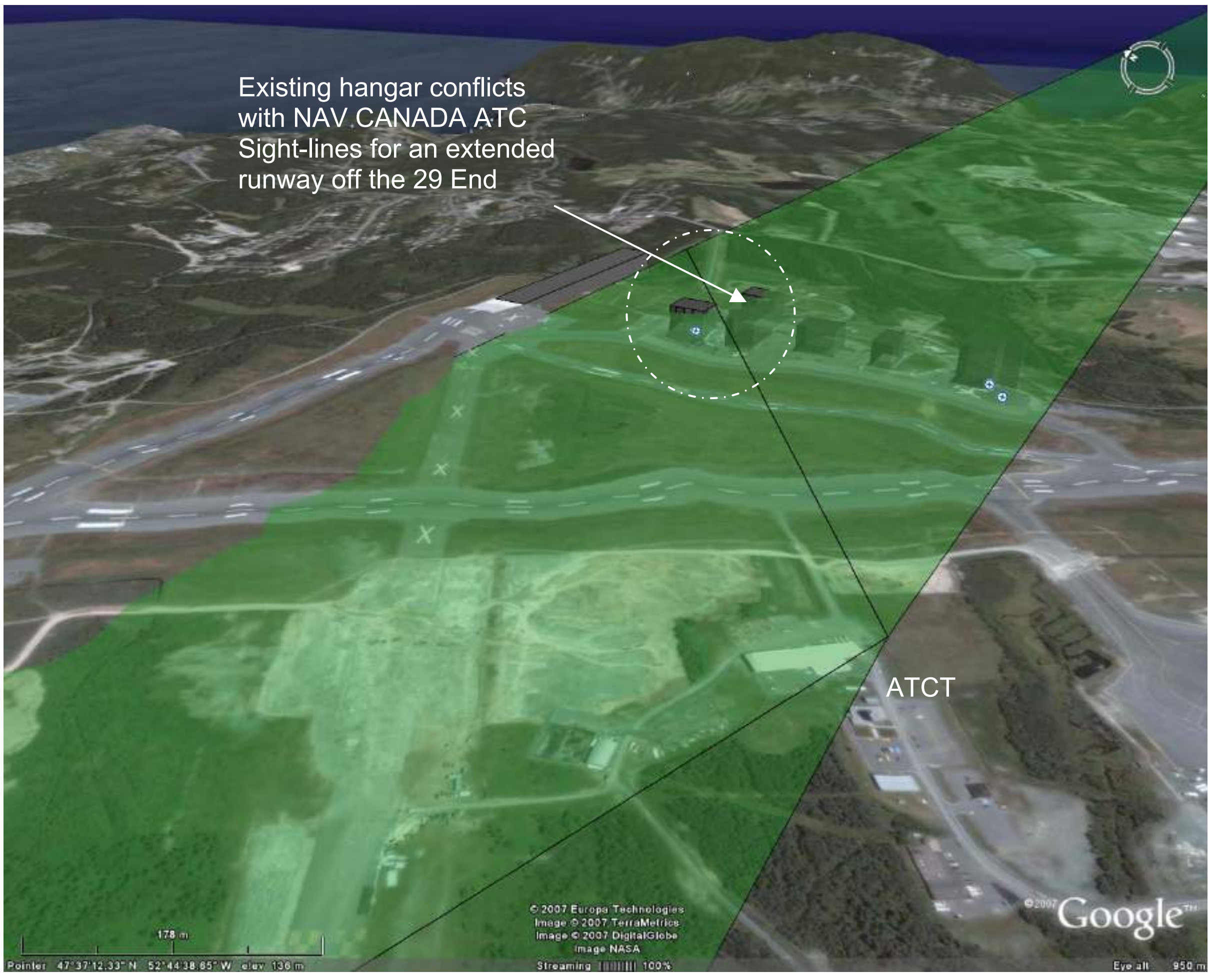
  Reducing the slope is a reasonable request but would increase the amount of earth fill required to construct the extension. Currently a downward slope of 0.8% has been shown to minimize fills.

- Sightlines from the Tower may be impacted by the northern-most building on the apron II based on an extension greater than 800' plus 200' for the runway zone. Should this option be pursued sightline drawings will be required.

Consultant Comments:

This observation was also validated by the Consultant through an independent review of sight-line constraints. Figure 5-8 provides a 3-D interpretation of the sight-line conflicts of the subject buildings

Figure 5-8 29 End ATCT Sight-Line Constraints - Proposed



***Runway 29 extension of 1500' (11 End Extension)*:**

- Sightlines from the Tower to the runway extension will be obscured by hills. Due to sightline requirements, this would be unacceptable unless the hills are removed.

Consultant Comments:

This observation was also validated by the Consultant through an independent review of sight-line constraints. Figures 5-9 and 5-10 provides a 3-D interpretation of the sight-line conflicts with terrain at the 11 End for both existing and proposed extension conditions. An extension of the 11 End would further aggravate the existing limitations.

Figure 5-9 Runway 11 End ATCT Sight-Line Constraints - Existing

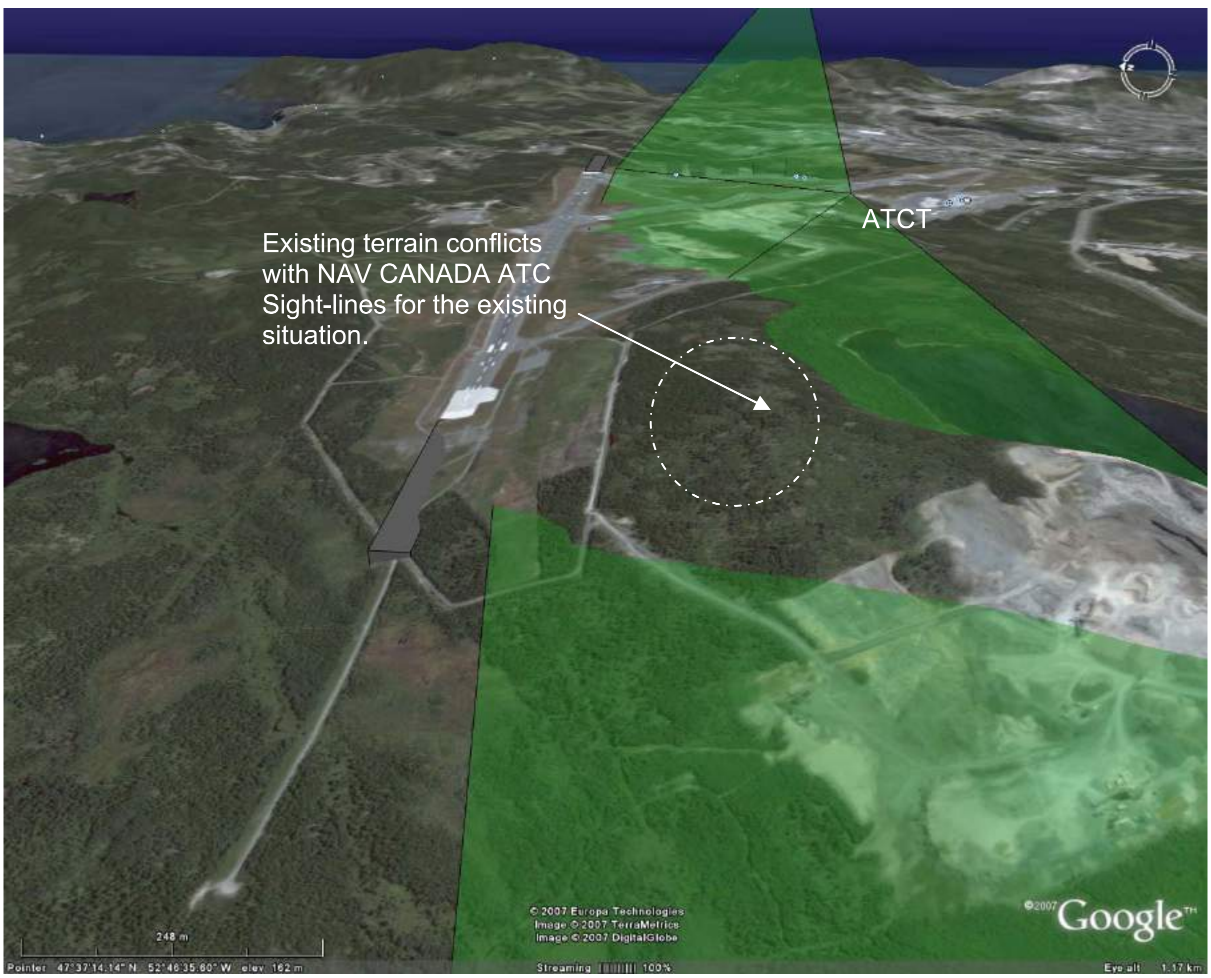
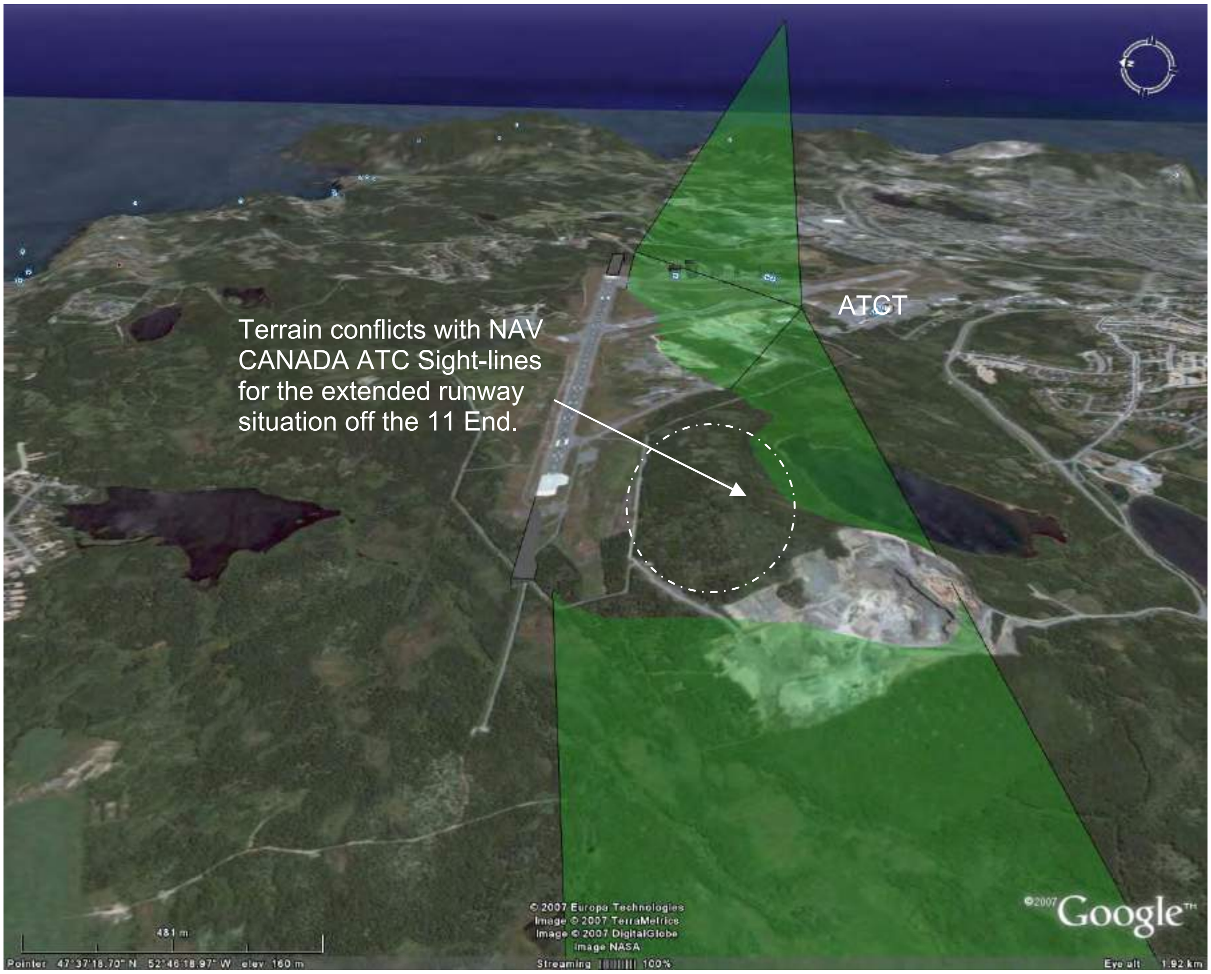


Figure 5-10 11 End ATCT Sight-Line Constraints – Proposed



- Runway extension would require at minimum a slope of 0% or preferably higher to ensure ASDE (Airport Service Detection Equipment) coverage, especially for small vehicles. Any downward slope in the extension would be unacceptable as surface detection will be compromised.

  Consultant Comments:

  Reducing the slope is a reasonable request but would increase the amount of earth fill required to construct the extension. Currently a downward slope of 0.8% has been shown to minimize fills. Changing to 0% or an upwards slope will significantly increase the cost of this extension.

- From an operational stand point, aircraft taxiing to the threshold 29 would require additional time.

Consultant Comments:

Both for the 11 End and 29 End extensions, additional taxi time will be required and has been noted in the analysis.

Common problems on any runway extension:

- Both ILS will be impacted no matter where the runway extension takes place. The topography isn't good for ILS relocation because of it sloping, which means that the localizer will need to probably be replaced at one end, where the extension will occur. Cat II will no longer be available during construction, and a recertification after the commissioning could be requested.

  Consultant Comments:

  Noted.

- In worst case, we are talking in replacing 2 full systems to meet the minimum requirements. A site selection is required to determine the location of the 2 ILS.

  Consultant Comments:

  The analysis is suggesting only one end would be extended requiring the need for relocating only one Glidepath, one Localizer and associated RVR equipment.

  Relocating the GP at the 29 End would require significant fill to provide an appropriate platform around and in front on the south and north side. Alternatives are shown on Drawings No. C2 on the north side to move the GP out of the way of a potential parallel taxiway extension along the south side of the extended 29 End.

- All published procedures will need to be modified. This will require a 6 months time frame.

  Consultant Comments:

  Noted.

All NAV CANADA comments have been considered in the analysis and for the most part were independently verified through the Consultant's technical analysis.

5.11 CAT II APPROACH LIGHTING SYSTEM RUNWAY 29

The existing CAT II approach lighting system for Runway 29 is scheduled for rehabilitation in the near-term to re-life the towers, footings and to re-configure the system to comply with current TP312 standards. This study was a critical first step in understanding the preferred extension configuration to properly plan the rehabilitation project.

As noted under Section 5.8, the new CAT II lighting system (ALSF-2) can be accommodated within the airport boundary for any runway extension configuration. It is recommended that the lighting system not project beyond the property due to land acquisition/easement requirements and the excessive height of the towers. As a result, the system would be partially embedded in the extended pavement should the runway be extended off the 29 End. This configuration is feasible and would be coordinated with a displaced threshold layout as described in Section 5.8.

It is recommended that the design of the CAT II system consider the potential runway extension in establishing its final vertical profile. This approach would ensure that the lights beyond the extended pavement would integrate with the future extended runway profile and not required adjustments. The lights on towers within the extension would need to be replaced with inset pavement lights at the time the extension is constructed.

5.12 CAT I APPROACH LIGHTING SYSTEM RUNWAY 11

The existing CAT I high intensity approach lighting system serving Runway 11 is not compliant with current TP312 standards. It is scheduled for replacement in the near-term with a SSALR system. Should the runway be extended off the 11 End, the new approach lighting system would project beyond its existing location as shown in Drawing C1. Based on terrain and design criteria constraints, the new tower profile would require towers 12-14 metres in height through most of its length. These towers would need to be guyed resulting in increased costs.

Should an extension be constructed off the 11 End, the CAT I system would need to be partially installed in the pavement and integrated with a displaced threshold configuration due to off-site terrain constraints related to the Takeoff-Approach Surface.

5.13 OTHER AIRPORT GROUND LIGHTING SYSTEMS

A preliminary review of the affected ground lighting systems was completed. The following general observations were made based on a field inspection and airport staff interviews:

1. Regulators in the FEC are Westinghouse High Boys, 2400V, 20KW type.

2. Anticipate reuse and upgrade of the affected existing regulators to digital doors as the RWY 11-29 approaches are upgraded and the runway extended.

3. Affected regulators are:

System	Cell No.	Circuit No.	Present Regulator Output Voltage, V
RWY 11-29 Edge	2	1	1700
RWY11-29 Edge	3	2	1800
RWY 11-29 CL	7	9	800
RWY 11-29 CL	8	10	800
RWY 11-29 CL	9	11	800
TDZ 29	10	12	1300
TDZ 29	11	13	1300
TDZ 29	12	14	1300
Existing Approach 29	Not checked	Not Checked	
Existing Approach 11	Not checked	Not Checked	

4. Runway 11-29 edge, centerline and touchdown zone (TDZ) Runway 29 lighting was rehabilitated in 1998/99.

5. Existing CAT I Approach Runway 11:

   5.1 Original installation from 1981.

   5.2 Non standard high intensity approach.

   5.3 Scheduled for replacement.

6. Existing CAT II Approach Runway 29:

   6.1 Towers are from original 1972 installation.

   6.2 Approach was re-cabled, new light fixtures, new transformers in 1998.

   6.3 Homerun cabling from approach to FEC is original 1972 installation.

   6.4 Existing steady light fixtures are ADB/Siemens type and could be reused on new ALSF-2 approach.

   6.5 Scheduled for replacement.

7. 2400V power supply cabling to Navaids sites (GP11, LOC 11, GP26, LOC 26) is 2 x #6 power cables, 1981 or older vintage. Cables have been patched over the years. Likely new cable runs to FEC required with any Navaids relocates.

8. Electrical issues with RWY extension on 11 End:

   8.1 If runway extension is on this end, there appears to be less grade drop on approach - new approach towers would be shorter, less costly than towers on 29 end.

   8.2 Two hazard beacons on hillside south of approach.

   8.3 Existing access roadway in place along the existing approach.

9. Electrical issues with RWY extension on 29 End:

   9.1 If runway extension is on this end, there appears to be more grade drop on approach, new approach towers would be higher and more costly than towers on 11 End.

   9.2 TDZ 29 was installed in 1998. Extending the runway 1500 ft. on this end would result in abandoning 450m of TDZ lighting and adding 450m of new TDZ lighting. This would represent approx 1/3 waste of the 1998 rehabilitation value and an additional approx 1/3 cost to extend the TDZ- (i.e. approx 2/3 of the cost for the TDZ would have capitalized again). This could be avoided by extending the 29 End and displacing the threshold to the existing threshold location. This way there would be no change to the TDZ lighting on 29. Refer to Section 5.8 for a discussion on a displaced threshold option.

   9.3 The last tower on the existing approach is approx 800 ft. from Torbay Road which crosses the approach. A runway extension would result in the new approach crossing this main road and would extend beyond the road unless the extension is displaced as discussed in Section 5.8.

In addition to the above, an extension off the 11 End will require a possible relocation of the PAPI. If the runway is displaced the PAPI may not require relocation. Wind direction indicators would need to be re-positioned for the extensions and new runway edgelighting and centerline lighting will be required. Should the runways be displaced, the edgelighting would be two colours i.e. blue on the approach side and white on the takeoff side.

5.14 AIRPORT OPERATIONS IMPACT

Extending the runways will increase the pavement areas and electrical loads. This will directly impact operating costs. The existing airfield maintenance equipment is expected to be sufficient to manage the additional 2.7 ha of pavement associated with the extensions. The increased power consumption associated with the additional edgelighting and centreline lighting is also not expected to be significant.

5.15 ENVIRONMENTAL

The proposed extensions are not expected to infringe on any environmentally significant features off either end. The work should be subject to environmental screening process under the Canadian Environmental Assessment Act (CEAA). The Canadian Airports Council (CAC) makes a standard form available for these types of environmental screening which should completed as part any further preliminary engineering work. Appropriate siltation control measures would be mandatory around the construction areas to ensure the protection of local watercourse protected under the Torbay Watershed Protection Area.

6.0 Aircraft Performance and Range Circles

6.1 GENERAL

Based on results of the technical assessment, aircraft performance and range calculations were completed for Runway 29. Runway 29 is the primary departure runway and its effective take-off run is controlled by terrain constraints to the west as described in Section 5.7. This runway is the primary takeoff runway, but is also the most constrained. As such it becomes the controlling runway for the aircraft performance assessment.

It should be noted that the runway landing length available at St. John's would adequately serve the needs of the design aircraft. The length combined with plans to install runway end safety areas will provide a safe landing environment.

6.2 AIRCRAFT AND DESTINATION SELECTION

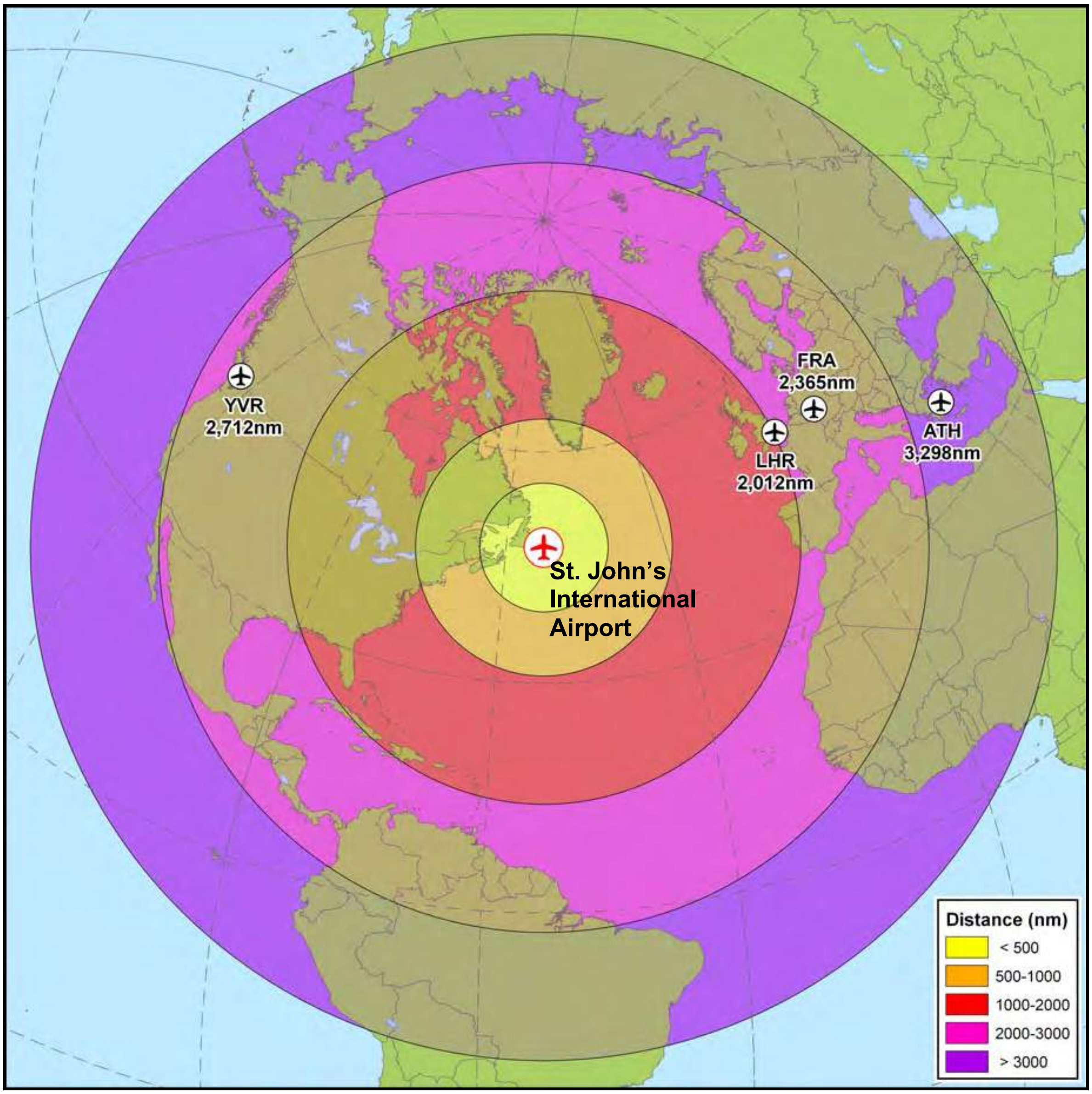
Three (3) wide-body, long-haul aircrafts were chosen for this analysis, including the B767-300ER, B747-400 and the B777-300, which was recently acquired by Air Canada, as shown in Figure 6-1.

Figure 6-1 New Air Canada B777-300

A range of potential destinations were selected to assist the SJIAA in understanding the potential benefits of a runway extension. Figure 6-2 shows the selected destination including associated great circle range circles in nautical miles (nm) centred on St. John's. The selected destinations included:

- London Heathrow – 2,012 nm (LHR)
- Frankfurt – 2,365 nm (FRA)
- Athens – 3,298 nm (ATH)
- Vancouver – 2,712 nm (YVR) (Reference only)

Figure 6-2 Range Circles for St. John's International Airport (Nautical Miles)[7]



[7] Based on Great Circle Distances (nautical miles)

6.3 ANALYSIS

The following guiding principles were applied for this analysis:

1. The analysis was completed using aircraft performance characteristics from the manufacturers planning manuals. Appendix G contains additional technical details associated with this analysis.

2. The airport reference temperature for planning purposes was 20.1^{o}C.

3. The airport elevation is 461 ft. above Sea Level, as taken from the Canada Flight Supplement.

4. The aircraft were configured for passenger service only and do not account for cargo operations. This is normally referred to as Maximum Passengers and Bags (MP&B). Analysis was not completed based on Maximum Takeoff Weight (MTOW).

5. The effective takeoff runway length was based on 6,526 ft. as shown in the Technical Drawing No. C4 contained in Appendix E and as discussed in Section 5.7. Off-site topographic features to the west restrict the effective takeoff length under engine out conditions. The associated charts in Appendix G refer to this as the *"Existing Runway Length"*.

6. The *"Proposed Runway Length"* referred to in the charts assumes a 1,500 ft. extension off the 29 End towards the east. This would increase the effective takeoff length for Runway 29 to 8,026 ft. *Note: Any extension off the 11 End would not increase the effective takeoff length for Runway 29. See Section 5.7 for more details.*

7. The information presented if for planning purposes only. Air Carriers have there own policies and guidelines when determining takeoff runway length requirements for their fleet and destinations. This information presented should only be used as an indicator of the potential benefits of a runway extension. It is recommended that individual airlines be consulted prior to making any final commitments.

8. All distances were based on great circle distance in nautical miles.

9. The following tables present a synopsis of the technical analysis in the form of colour coded tables based on the following:

Aircraft Can Reach Desired Destination	
Aircraft Cannot Reach Desired Destination	

10. Table 4 summarizes the existing Runway 29 situation based on the selected aircraft-destination combinations. The analysis included aircraft load factors of 80%, 90% to 100%.

Table 4 Aircraft Range Summary Tables for Existing Runway 29

LOAD FACTOR = 100% - EXISTING RUNWAY 29			
Aircraft	**LHR (2012 nm)**	**FRA (2365 nm)**	**ATH (3298 nm)**
B767			
B747			
B777			

LOAD FACTOR = 90% - EXISTING RUNWAY 29			
Aircraft	**LHR (2012 nm)**	**FRA (2365 nm)**	**ATH (3298 nm)**
B767			
B747			
B777			

LOAD FACTOR = 80% - EXISTING RUNWAY 29			
Aircraft	**LHR (2012 nm)**	**FRA (2365 nm)**	**ATH (3298 nm)**
B767			
B747			
B777			

11. Table 5 summarizes the proposed extended Runway 29 situation based on the selected aircraft-destination combinations. The analysis included aircraft load factors of 80%, 90% to 100%.

Table 5 Aircraft Range Summary Tables for Extended Runway 29

LOAD FACTOR = 100% - EXTENDED RUNWAY 29 (10,000 ft.)			
Aircraft	**LHR (2012 nm)**	**FRA (2365 nm)**	**ATH (3298 nm)**
B767			
B747			
B777			

LOAD FACTOR = 90% - EXTENDED RUNWAY 29 (10,000 ft.)			
Aircraft	**LHR (2012 nm)**	**FRA (2365 nm)**	**ATH (3298 nm)**
B767			
B747			
B777			

LOAD FACTOR = 80% - EXTENDED RUNWAY 29 (10,000 ft.)			
Aircraft	**LHR (2012 nm)**	**FRA (2365 nm)**	**ATH (3298 nm)**
B767			
B747			
B777			

6.4 SUMMARY OF ANALYSIS

The following summarizes key observations related to this analysis:

1. Incremental extensions i.e. 500 ft., 1000 ft. are not recommended since minor reductions in load factors will provide additional range. If an extension is planned it should be based on 1,500 ft. to maximize the cost-benefit.

2. At 80% load factors, the existing runway can serve passenger destinations as far as Athens using typical long-haul aircraft like B767 and B747.

3. The proposed 1500 ft. extension would result in unrestricted load factors for B767 and B747 aircraft for all destinations and permit larger aircraft like the B777 to operate with unrestricted load factors to as far as Frankfurt.

7.0 Capital Cost Estimate

7.1 GENERAL

The following Class "D" cost estimates are based on preliminary engineering data and are to be used for budgetary considerations only. The costs are based on 2007 dollars and construction costs reflective of the industry at the time of preparing this study. Appendix I contains additional detailed costing data for reference.

The costing estimates reflect work associated with the preliminary design layouts shown in Appendix E. Applicable notes are included to describe impacts on the costs should recommendations of NAV CANADA be incorporated. Refer to Section 5.10 for additional details related to NAV CANADA comments.

The purpose of the cost estimates was to provide an order of magnitude understanding of the potential investment required to extend the runway. Appropriate contingencies have been included to reflect the preliminary nature of these estimates.

7.2 11 END EXTENSION (WEST END)

The 11 End 1,500 ft. extension costs are presented in Table 6. Significant increases in earth fill quantities and associated costs would result should the recommendations of NAV CANADA be considered to raise the profile rather than having it fall as shown on Drawing C1 in Appendix E. Additional notes that apply to Drawing C1 and this cost estimate are summarized below:

1. The costs shown in Table 6 only consider rock excavation along the southern area to address transitional zoning issues and not the sight-line issues raised by NAV CANADA.

2. It would not be practical to remove all of the conflicting terrain to address ATC sight-line issues as part of the project given the extent of the terrain affected.

3. The threshold of Runway 11 would be displaced to its existing location. This would require the CAT I lighting system to be partially installed in the extension. Furthermore, by displacing the threshold, the existing NAV CANADA sight-lines would be maintained for approaching aircraft.

4. The costs include an allowance to update the Airport Zoning Regulation.

Table 6 Capital Cost Estimated 11 End Extension (West End)

Item	Preliminary Cost Estimate Summary		Total
1.0	General Construction Items		$1,030,000
2.0	Runway 11 End Extension (1500 ft.) – Civil Works		$15,478,558
3.0	Runway 11 End Extension (1500 ft.) – Electrical Works		$769,000
4.0	**Sub-Total Construction Costs**		**$17,277,558**
5.0	Engineering/Design/Professional Services/SJIAA Costs	15%	$2,591,633
6.0	Project General Contingencies	20%	$3,455,511
7.0.	**Total Preliminary Project Cost Estimate (Excluding HST)**		**$23,324,702**

7.3 29 END EXTENSION (EAST END)

The 29 End 1,500 ft. extension costs are presented in Table 7. An increase in earth fill quantities and associated costs would result should the recommendations of NAV CANADA be considered to raise the profile rather than having it fall as shown on Drawings C2 in Appendix E. Additional notes that apply to Drawing C2 and this cost estimate are summarized below:

1. The costs shown in Table 7 assume the CAT II lighting system would be installed partially in the pavement and the runway would be displaced to its existing location. As a result, no relocation of the TDZ lighting would be required.

2. It was assumed that the sight-line issues identified by NAV CANADA could be addressed using ASDE coverage and secondary video surveillance. By leaving the threshold in its current location by displacing the extension, sight-lines for an approaching aircraft would not be impacted. The impacts of the building interference would only be observed during aircraft taxiing and takeoff from the new extended runway end.

3. The cost includes the installation of new towers for the CAT II lighting system for the portion that projects beyond the runway.

4. A new PAPI system has been included in these costs to serve the 29 approach.

5. The costs include an allowance to update the Airport Zoning Regulation.

Table 7 Capital Cost Estimated 29 End Extension (East End)

Item	Preliminary Cost Estimate Summary		Total
1.0	General Construction Items		$1,030,000
2.0	Runway 29 End Extension (1500 ft.) – Civil Works		$15,878,058
3.0	Runway 29 End Extension (1500 ft.) – Electrical Works		$2,274,000
4.0	**Sub-Total Construction Costs**		**$19,182,058**
5.0	Engineering/Design/Professional Services/SJIAA Costs	*15%*	**$2,877,308**
6.0	Project General Contingencies	20%	**$3,836,411**
7.0	**Total Preliminary Project Cost Estimate (Excluding HST)**		**$25,895,777**

7.4 16 END RESA (NORTH END)

The costs for the 16 End RESA are based on constructing a paved blast pad (60m x 45m) at the same time. Table 8 presents the estimated costs.

Table 8 Capital Cost Estimated 16 End Blast Pad and RESA

Item	Preliminary Cost Estimate Summary		Total
1.0	General Construction Items		$65,000
2.0	Runway 16 End RESA & Blast Pad – Civil Works		$299,462
3.0	Runway 16 End RESA & Blast Pad – Electrical Works		$34,400
4.0	**Sub-Total Construction Costs**		**$398,862**
5.0	Engineering/Design/Professional Services/SJIAA Costs	*15%*	**$59,829**
6.0	Project General Contingencies	10%	**$79,772**
7.0.	**Total Preliminary Project Cost Estimate (Excluding HST)**		**$538,463**

8.0 Runway Extension Evaluation Matrix

8.1 GENERAL

Table 10 was developed to provide a summary matrix of various planning and design criteria related to the assessment of extending either the 11 End or the 29 End. This approach permitted each extension option to be compared side-by-side against the various evaluation criteria.

Ranking has been based on a simple premise that a "1" is assigned to the option which best meets the evaluation criteria. Where the options have no distinctive advantage over the other, both are assigned an "0". A preferred option was then based on the total of the individual rankings. The construction costs were then identified separately for a final determination of the preferred option.

Based on the results of the matrix evaluation, the 29 End (East End) extension ranks the highest. The following Runway 11-29 configuration is recommended should SJIAA develop the appropriate business case for a longer runway:

1. Should a runway extension be considered by the SJIAA, Runway 11-29 should be extended off the 29 End by 1,500 ft. to the east.

2. A 150m RESA could be constructed off the 29 End within the existing airport boundary.

3. The CAT II lighting system should be installed based on the existing threshold location. The proposed CAT II tower profile should take into consideration the future runway extension profile.

4. The extend portion of the runway should be displaced in accordance with TP312 standards only restricting the available landing distance available for Runway 29 to the existing 8,502 ft. All other declared distances would increase by 1,500 ft. The resulting declared distances for Runway 11-29 are shown below:

Declared Distances (ft.)	Runway 11 Existing	Runway 11 with 29 End Extension	Runway 29 Existing	Runway 29 with 29 End Extension
TORA	8502	10000	8502	10000
TODA	9502	11000	9502	11000
ASDA	8502	10000	8502	10000
LDA	8502	10000	8502	8502 ***Note:*** *Reduced due to displaced Threshold*

Note: The above would reflect the published declared distances. As discussed in Section 5.7, the effective takeoff runway length is not a published value is subject to air carrier operational policies.

5. The Glidepath antenna for the Runway 29 approach can remain in its existing location.

6. The Runway 11 Localizer off the 29 End would need to be relocated to accommodate the extension. The final elevation of the antenna and associated support structure height and earth berming would require additional technical review and approvals through NAV CANADA and Transport Canada.

7. The Airport Zoning Regulations should be updated to reflect the new runway configuration and the latest restrictive clause including those required for aeronautical facilities. The immediate need to amend the Airport Zoning Regulation would be somewhat mitigated using the displaced threshold. There would be only a small shift in the position of the Takeoff-Approach surface which would still effectively protect the runway. Should the AZR be updated, it should be based on a non-displaced configuration.

8. The SJIAA should prepare and publish official ICAO Type A Charts for Runway 11-29 to capture the off-site terrain limitations of both runway ends.

9. The preliminary Class 'D' cost estimate for the 29 End extension in 2007 Canadian dollars was estimated at $25.9 million.

Table 9 Runway 11-29 Extension Evaluation Matrix

Criteria	29 End Extension (East End)	Ranking	11 End Extension (West End)	Ranking
Planning Guidelines/Documents				
Historical Airport Master Plans	Previous master plans have suggested that an extension off the 29 End would be the preferred option due to terrain issues to the west of the airport	1	Previous master plans did not support extending the runway off the 11 End due to terrain conflicts.	0
Airport Land Use Plan Compliance	Would comply with the existing 2015 Airport Land Use Plan. A 1,500 ft. has been shown on the Land Use Plan	1	Would comply with existing 2015 Airport Land Use Plan but no extension has been shown. The area has been reserved for the runway system	0
TP312 Compliance	The extension would be designed and comply with the most recent airport design standards	0	The extension would be designed and comply with the most recent airport design standards	0
Airport Zoning Regulations	The proposed extension would trigger the need to update the existing airport zoning regulations. If the runway extension is displaced the impacts on zoning are less significant.	0	The proposed extension would trigger the need to update the existing airport zoning regulations. If the runway extension is displaced the impacts on zoning are less significant.	0

Criteria	29 End Extension (East End)	Ranking	11 End Extension (West End)	Ranking
Land Use Compatibility – NEF Contours	The 29 End extension would impact existing land uses the most due to the close proximity to the existing development east of the airport. However, recent municipal planning decisions have limited any further encroachment of incompatible land uses using updated NEF contours based on a 1,500 ft. extension off the 29 End. Therefore the impacts have been mitigated.	0	Given the rural and relatively undeveloped areas off the west end of Runway 11-29, the noise impacts would have less of an impact for an 11 End extension.	1
Future Very Large Aircraft (Code F)	The proposed extension could support Code F aircraft.	0	The proposed extension could support Code F aircraft.	0
Infrastructure Rehabilitation	Pavements are planned for rehabilitation for Runway 11-29 in 2010 +/-. The CAT II lighting system is in need for upgrades. This end has a higher priority due to low visibility operations.	1	Pavements are planned for rehabilitation for Runway 11-29 in 2010 +/-. The CAT I lighting system is in need for upgrades.	0
Off-site Impacts/Property Boundary Constraints				
Construction Limits	An extension off the 29 End would be captured within the existing airport boundaries	1	An extension off the 11 End may require the construction footprint to extend outside the airport boundary.	0

Criteria	29 End Extension (East End)	Ranking	11 End Extension (West End)	Ranking
Approach Lighting	Relocating and upgrading the CAT II lighting system could be accommodated within the airport boundary if a displaced threshold is considered. If the threshold is not displaced, the light towers will go beyond the airport property and require acquisition/easements. The land east of Torbay Road continues to fall and in a developed area.	0	Relocating and upgrading the CAT I lighting system could be accommodated within the airport boundary if a displaced threshold is considered. If the threshold is not displaced, the light towers will go beyond the airport property and require acquisition/easements. The lands west of the airport are generally undeveloped and rising making it more likely to be less complicated to acquire. Furthermore, there are less lights associated with a CAT I approach.	1
Torbay Road Re-alignment	The extension could accommodate this proposal but is no longer required since the Province has cancelled the project.	0	Not Applicable.	0
Aircraft Approach Profile	If the threshold is displaced to its existing location, there would be no change in the approach profile. If it is not, the approach would be slightly lower over the lands to the east.	0	Is the threshold is displaced to its existing location, there would be no change in the approach profile. If it is not, the approach would be slightly lower over the lands to the west which are for the most part undeveloped in close proximity to the airport.	1
Aircraft Departure Profile	Heavier and larger aircraft will tend to depart with lower profiles.	0	Heavier and larger aircraft will tend to depart with lower profiles.	0

Criteria	29 End Extension (East End)	Ranking	11 End Extension (West End)	Ranking
Terrain Constraints - OLS	There are no terrain/obstacle constraints towards the east.	1	Significant terrain constraints to the west which generally prevent and shift in the existing Take off Approach Surface. As such, the runway could be extended but it would need to be fully displaced.	0
Terrain Constraints – Engine Out Performance	There are no terrain/obstacle constraints towards the east.	1	Significant terrain constraints to the west reducing the effective runway takeoff length for Runway 29.	0
NAV CANADA				
ASDE Coverage	The runway design must consider a slight reduction in the downward slope of the runway from the planned 0.8% to about 0.4%. This can be accommodated but will increase earth fill requirements and costs.	1	The runway design must consider a significant reduction in the downward slope of the runway from the planned 0.8% to about 0.0% or greater. This can be accommodated but will significantly increase earth fill requirements for this end.	0
ATC Sightlines	Some impacts for the extended runway due to existing hangars. Could be mitigated with ASDE and video surveillance. Less impact than 11 End.	1	Existing sight-lines are hampered by terrain between the tower and the existing 11 End. An extension will further aggravate this situation and cause a larger impact area. It is not practical to remove the terrain to address this issue. Mitigations would need to be explored including ASDE and video surveillance, if any.	0

Criteria	29 End Extension (East End)	Ranking	11 End Extension (West End)	Ranking
Nav Canada IFR Instrument Approach Procedures	Will require changes to the published approaches due to possible changes in the threshold positions.	0	Will require changes to the published approaches due to possible changes in the threshold positions.	0
Electronic Navigational Aids (ILS) Impacts/Relocations (Glidepath, Localizer, RVR)	Would require the relocation of the Runway 11 localizer antenna. Subject to the final threshold position, the Glidepath antenna may need to be relocated for Runway 29. Options are provided for both the north and south sides of the runway. Based on the CAT II lighting system relocation constraint to remain within the airport property and the significant costs to relocate the TDZ lighting on Rwy 29, the Glidepath and threshold should remain in their existing locations.	0	Would require the relocation of the Runway 29 localizer antenna. Given the off-site terrain constraints to the west, the Glidepath for Runway 11 should not be moved.	0
Taxi Times/Operational Impacts	The added runway length will require additional taxi times for aircraft taxiing into position. The back track to the 29 End from the Bravo and the Runway 02-20 intersection is relatively short compared to the full back track required to Runway 11.	1	The added runway length will require additional taxi times for aircraft taxiing into position.	0

Criteria	29 End Extension (East End)	Ranking	11 End Extension (West End)	Ranking
Physical Characteristics/Features				
Terrain Conditions within Construction Limits	Falling terrain off the end.	0	Fall terrain off the end. Slightly less drop but longer distance	0
Soil Conditions	Suitable for construction of the extension.	0	Suitable for construction of the extension.	0
Runway Design Characteristics/Slopes/ Grading	Design based on TP312 standards and maximum "downward" slopes wherever possible to minimize fills.	0	Design based on TP312 standards and maximum "downward" slopes wherever possible to minimize fills.	0
Other Airfield Lighting Facilities i.e. edgelighting, PAPI, wind cones etc.	Some adjustments required and added edgelighting and centerline lights.	0	Some adjustments required and added edgelighting and centerline lights.	0
Aircraft Operations				
Primary Departure Runway	Extending the 29 End will add more effective runway length to the primary departure Runway 29.	1	Extending the 11 End would only increase the effective takeoff length for Runway 11 which is only used 10-13% of the time for departure.	0
Aircraft Service Range	Will improve the service the range of the selected aircraft fleet including the B777 based on the most restrictive but primary Runway 29	1	Would not improve the existing situation for aircraft operating on the primary Runway 29. Would provide significant improvement to aircraft operating on Runway 11 but is only used for departures 10-13% of the time.	

Criteria	29 End Extension (East End)	Ranking	11 End Extension (West End)	Ranking
Airport Operational Impacts				
Long-Term Maintenance/Operational Costs	Increased costs due to extra pavement and edgelighting.	0	Increased costs due to extra pavement and edgelighting.	0
Operational Impacts During Construction including facility closures, scheduling and phasing.	Impact can be mitigated through an appropriate plan of construction and phasing plan.	0	Impact can be mitigated through an appropriate plan of construction and phasing plan.	0
Environmental				
CEAA Screening	No significant impacts expected. Subject to further environmental screening.	0	No significant impacts expected. Subject to further environmental screening.	0
SUBTOTAL - RANKING		**11**		**3**
PROJECT CAPTIAL COST	**$25.9 million**		**$23.4 million** ***Note:*** *This cost will increase significantly to address the grading requirements for the ASDE coverage criteria. The costs could increase as much as 30%.*	

9.0 Existing Line of Sight Contours – ATCT to 11 End

At the special request by the SJIAA, Drawing C5 in Appendix E was prepared. The drawing shows both existing ground elevations and estimated NAV CANADA sight-line maximum allowable elevations from the Tower to the 11 End. The coverage shown coincides with potential commercial development areas being contemplated by the SJIAA. This contour information is a direct result of the analysis completed for this runway extension study.

This drawing should only be used for pre-planning purposes and that any final approvals for buildings and other development proposals should be obtained from NAV CANADA. The elevations shown only provide for height guidelines but do not consider electronic impacts due to building material and orientation on various NAV CANADA aeronautical facilities on-site.

10.0 Conclusions and Recommendations

Based on the foregoing, the following conclusions and recommendation were developed:

1. Should a runway extension be considered by the SJIAA, Runway 11-29 should be extended off the 29 End by 1,500 ft. to the east.

2. A 150m RESA could be constructed off the 29 End within the existing airport boundary.

3. The CAT II lighting system should be installed based on the existing threshold location. The proposed CAT II tower profile should take into consideration the future runway extension profile.

4. The extend portion of the runway should be displaced in accordance with TP312 standards only restricting the available landing distance available for Runway 29 to the existing 8,502 ft. All other declared distances would increase by 1,500 ft. The resulting declared distances for Runway 11-29 are shown below:

Table 10 Existing and Proposed Runway 11-29 Declared Distances

Declared Distances (ft.)	Runway 11 Existing	Runway 11 with 29 End Extension	Runway 29 Existing	Runway 29 with 29 End Extension
TORA	8502	10000	8502	10000
TODA	9502	11000	9502	11000
ASDA	8502	10000	8502	10000
LDA	8502	10000	8502	8502 ***Note:*** *Reduced due to displaced Threshold*

Note: The above would reflect the published declared distances. As discussed in Section 5.7, the effective takeoff runway length is not a published value is subject to air carrier operational policies.

5. The Glidepath antenna for the Runway 29 approach can remain in its existing location.

6. The Runway 11 Localizer off the 29 End would need to be relocated to accommodate the extension. The final elevation of the antenna and associated support structure height and earth berming would require additional technical review and approvals through NAV CANADA and Transport Canada.

7. The Airport Zoning Regulations should be updated to reflect the new runway configuration and the latest restrictive clause including those required for aeronautical facilities. The immediate need to amend the Airport Zoning Regulation would be somewhat mitigated using the displaced threshold. There would be only a small shift in the position of the Takeoff-Approach surface which would still effectively protect the runway. Should the AZR be updated, it should be based on a non-displaced configuration.

8. The SJIAA should prepare and publish official ICAO Type A Charts for Runway 11-29 to capture the off-site terrain limitations of both runway ends.

9. The preliminary Class 'D' cost estimate for the 29 End extension in 2007 Canadian dollars was estimated at $25.9 million.

All of which is respectfully submitted,

PRYDE SCHROPP McCOMB, INC.

Bernhard G. Schropp, P.Eng.
Vice President

June, 2007

R:\PSMI-Operations\Working_Files\Projects\10861-St. John's Intl - Rwy 11-29 Ext Assess\Reports\10861 SJIAA Final Rwy 11-29 Ext psmi ver 1h kp 062707.doc

APPENDIX A
NOISE EXPOSURE FORECAST ANALYSIS (NOVEMBER 2005)

PRYDE SCHROPP McCOMB INC.

November 8, 2005
File: 10860

BY EMAIL (PDF)

St. John's International Airport
Box 1, Airport Terminal Building
80 Airport Terminal Access Road
St. John's, NF A1A 5T2

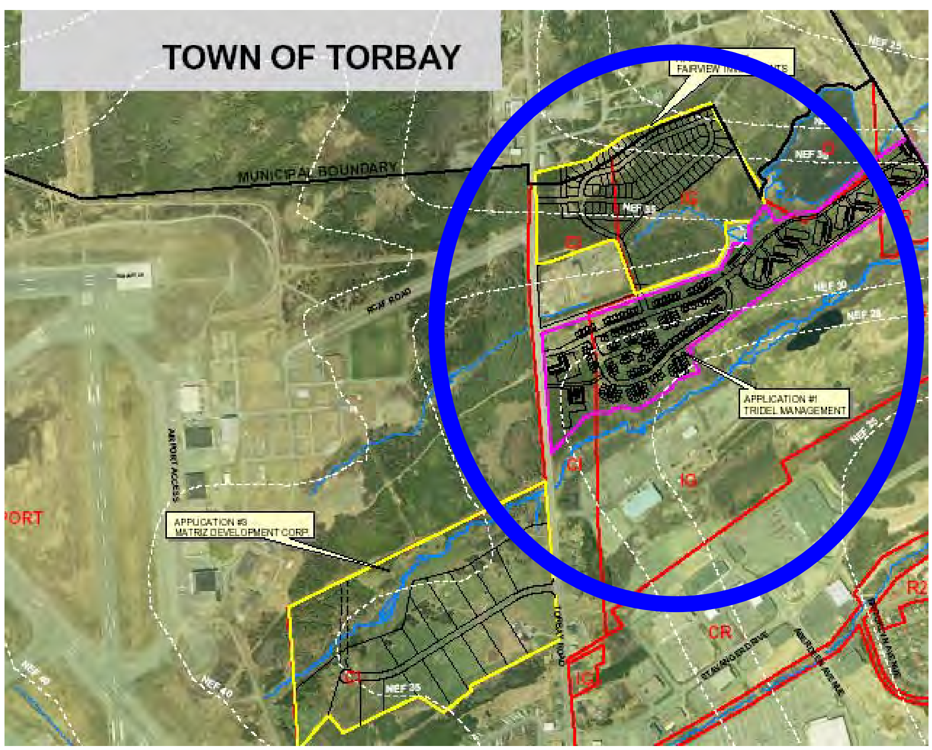
T: 709-758-8564
F: 709-758-8521

Attention: Ms. Marie Manning, Director, Marketing & Community Relations

Dear Ms. Manning:

Reference: St. John’s International Airport
Noise Exposure Forecast and Projections
Runway 11-29 Future Configurations

We have prepared this letter-report to assist you in your discussions with the City and land developer. As you can appreciate, the timelines for this assignment have been very tight. However, we believe the information to be a sound basis to make some initial decisions. We do however recommend that subject to the outcome of your meeting, that our work be re-visited and further refined to supplement and update your existing Airport Master Plan and the Noise Exposure Forecasts currently in place for the airport.



1.0 BACKGROUND

Based on our discussions, we understand that the City has been requested to consider a residential development proposal approximately 1,500 m off the end of the threshold of Runway 29 towards the east as shown in the diagram to the right.

The development has been designed up to the 35 NEF contour. The Airport does not support this proposal.

The St. John’s International Airport Authority has experienced exceptional growth in passenger traffic over the last few years and is concerned that noise sensitive land uses as proposed in

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TEL: 519-389-4343 FAX: 519-389-4728 info@psmi.ca www.psmi.ca

such close proximity to the airport are not in the best interest of both the Airport and the community. Furthermore, the airport has plans to extend their primary Runway 11-29 towards the east which would only bring aircraft noise and operations closer to the proposed development areas.

To this end, we have prepared additional Noise Exposure Projections for consideration by the Airport and City as they review these development proposals. Furthermore, we have offered an overview of national practices with respect to the 35 NEF and 30 NEF when considering new residential development, ie. noise sensitive developments, around airports. Finally, a brief summary of international practices is offered which clearly demonstrates both national and international trends are to recognize the 30 NEF and in some cases like Australia, the 20 NEF, when planning new residential developments around airports.

2.0 NOISE EXPOSURE FORECAST SCENARIOS

The attached Figures 1 through 5 present a number of NEF scenarios and summaries for consideration. The Figures are summarized below:

Figure 1 – 2015 NEP (Extracted from the 2002 Airport Master Plan)

- Based on 2002 Airport Master Plan
- Existing runway configurations
- Projected air traffic volumes based on approximately 1.5% growth rate (Slightly lower than E/D Pax Growth)
- Military traffic included

Figure 2 – 2025 NEP (Planning Contour)

- Existing runway configuration
- Project traffic volumes based on approximately 2.0% growth rate all segments (Baseline is 2004) – Higher rate than Airport Master Plan. Based on higher pax growth being observed
- Fleet mix modernization has been addressed, i.e. F28s converted to Regional Jets, BAE146 converted to Regional Jets etc.
- Military Traffic included

Figure 3 – 2025 NEP (Planning Contour)

- Same as Figure 2 but includes 1,500 ft. runway extension to the east off the 29 End.

Reference: **St. John's International Airport, NL**
Noise Exposure Forecast Update

Figure 4 – 35 NEF Contour Comparison all Scenarios

- This figure shows the 35 NEF contours for all of the above scenarios.
- The subject lands to the east of the airport are highlighted
- The subject development would be impacted by the runway extension as the 35 NEF contour would projected into the development area.

Figure 5 – 30 NEF Contour Comparison all Scenarios

- This figure shows the 30 NEF contours for all of the above scenarios. The 30 NEF is the recognized national standard above which no new residential development is recommend.
- The subject lands to the east of the airport are highlighted
- Using the 30 NEF standard, the new development would be significantly impacted.
- The future extension of Runway 11-29 would result in the entire development being within the 30 NEF and some of which may be impacted by the 40 NEF.

3.0 NOISE EXPOSURE FORECAST SYSTEM – NATIONAL AND INTERNATIONAL PRACTICES

3.1 NEF Explained

The Noise Exposure Forecast (NEF) is a single number rating of overall aircraft noise. It combines the noise levels of individual aircraft and the numbers of aircraft to give a single number rating of the average negative impact of the aircraft noise. The current NEF metric evolved from the earlier Composite Noise Rating (CNR) which was initially developed for general community noise situations and later modified to evaluate aircraft noise. While these measures were being developed in the United States, other early Aircraft noise measures were being developed in Europe.

The Canadian Noise Exposure Forecast (NEF) was developed to encourage compatible land use planning in the vicinity of airports. NEFs are official contours and Transport Canada will support them to the level of accuracy of the input data. The NEF has the additional benefit of providing recommended acoustic design criteria to obtain acceptable indoor noise levels for residential, commercial and other construction. The primary guiding document is ***TP 1247 - Land Use in the Vicinity of Airports, Seventh edition, last amended May 1996.***

Experience at 21 airports with respect to correlation's between noise complaints and the NEF contours are displayed below in Table 1 These response predictions were developed through statistical analysis of community response to aircraft noise in the 1960/70's.

As part of a 1996 NRC validation study of the Canadian NEF System, evidence from a study conducted for London's Heathrow airport and from major Swiss airports, which over a 20 year period showed no effect on changing attitudes to aircraft noise. This may suggest that Table 21

Reference: **St. John's International Airport, NL**
Noise Exposure Forecast Update

below may still be valid although it was developed on data that is some 30-40 years old. However, it is possible too, that different populations might react differently. As such the applicability of Table 1 in today's environment in Canada cannot be truly verified. Table 1 does however still form the basis of community noise response prediction in Canada and is supported by historical scientific research.

Table 1
Community Response Prediction and NEFs

RESPONSE AREA	RESPONSE PREDICTION *
1 (over 40 NEF)	Repeated and vigorous individual complaints are likely. Concerted group and legal action might be expected.
2 (35-40 NEF)	Individual complaints may be vigorous. Possible group action and appeals to authorities.
3 (30-35 NEF)	Individual complaints may be vigorous. Possible group action and appeals to authorities.
4 (25- 30 NEF)	Sporadic complaints may occur. Noise may interfere occasionally with certain activities of the resident. ***Note:*** For <30, annoyance caused by aircraft noise may begin as low as NEF 25. It is recommended that developers be made aware of this fact and that they undertake to so inform all prospective tenants or purchasers of residential units. In addition, it is suggested that development should not proceed until the responsible authority is satisfied that acoustic insulation features, if required, have been considered in the building design.
5 (below 25)	Generally noise is not a problem below 25. However, noise begins to become an issue starting as low as 25 NEF.
* It should be noted that the above community response predictions are generalizations based upon experience resulting from the evolutionary development of various noise exposure units used by other countries. For specific locations, the above response areas may vary somewhat in accordance with existing ambient or background noise levels and prevailing social, economic and political conditions.	

Source: http://www.tc.gc.ca/CivilAviation/Aerodrome/Environment/TP1247E/Part4/Table2.htm

Reference: **St. John's International Airport, NL**
Noise Exposure Forecast Update

Transport Canada has developed a number of land use compatibility tables for aircraft noise considerations. There tables are offered by Transport Canada as recommendations and can be modified to suite the local conditions. However, it is not recommended that airports consider a position less restrictive than the options offered in these tables. Below is an excerpt from Table 3 of Transport Canada's TP1247. Additional compatibility tables can be found at http://www.tc.gc.ca/CivilAviation/Aerodrome/Environment/TP1247E/Part4/Table3.htm .

TABLE 3
Land Use Tables
Aircraft Noise Considerations Only

This land use tabulation should not be considered as an exhaustive listing, but merely as examples of how various land uses would be assessed in the Noise Exposure Forecast zones in terms of community response predictions.

EXPLANATORY NOTES FOR TABLE 3

No	Indicates that new construction or development of this nature should not be undertaken.
No	Indicates that new construction or development of this nature should not be undertaken .
A	This particular land use may be acceptable in accordance with the appropriate note and subject to the limitations indicated therein.
Yes	The indicated land use is not considered to be adversely affected by aircraft noise and no special noise insulation should be required for new construction or development of this nature.

- Residential
- Recreational - Outdoor
- Commercial
- Public
- Municipal Utilities
- Industrial
- Transportation
- Agricultural

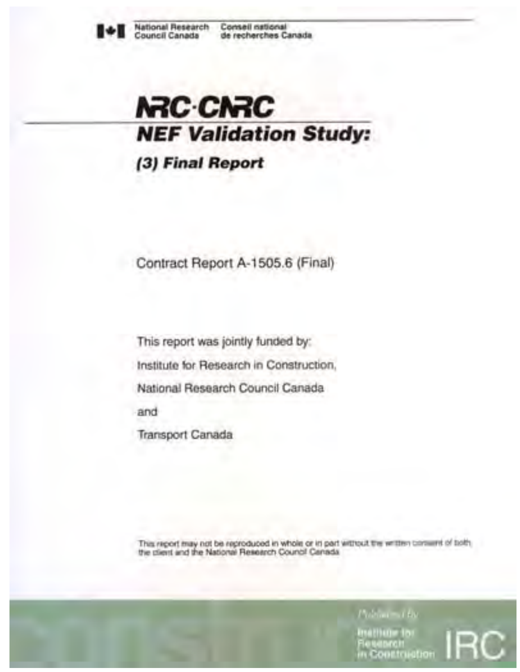
NOISE EXPOSURE FORECAST VALUES	>40	40-35	35-30	<30
RESPONSE AREAS	1	2	3	4
RESIDENTIAL				
Detached, Semi-Detached	No	No	No	A
Town Houses, Garden Homes	No	No	No	A
Apartments	No	No	No	A

Reference: **St. John's International Airport, NL**
Noise Exposure Forecast Update

Transport Canada does not support or advocate incompatible land use (especially residential housing) in areas affected by aircraft noise. These may begin as low as NEF 25. At NEF 30, speech interference and annoyance caused by aircraft noise are, on average, established and growing. By NEF 35, there effects are very significant. New residential development is therefore not compatible with NEF 30 and above, and should not be undertaken.

3.2 Validation of the Canadian Noise Metric

In 1996, Transport Canada commissioned the National Research Council to validate the Canadian NEF system. The following basic recommendations/conclusions were developed:



National Research Council Canada Conseil national de recherches Canada

NRC·CNRC

NEF Validation Study:

(3) Final Report

Contract Report A-1505.6 (Final)

This report was jointly funded by:
Institute for Research in Construction,
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and
Transport Canada

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1. Recommends additional surveys be done in Canada to validate the negative effects of aviation noise.

2. Upgrade the NEF system software

3. Consider adopting an A-weighted NEF Measures (to permit field measurements to correlated modeled information)

4. NEFs should be supplemented with single event noise limits using the SEL metric to ensure the general noise environment, including particular worst case situations are considered.

5. Establish clear criteria for acceptable land use at various NEF levels

6. Efforts should be made to publish revised version of CMHC document on new housing and aircraft noise.

7. Encourage uniform national approach of the NEF System

With respect to the above recommendations, the confirmed actions taken by Transport Canada include:

1. NEF system software is in process of being updated. Initial Beta Testing of the software began in 2003.

2. NRC has completed a study along with recommendations and software design (referred to as IBANA – Insulating Buildings

Reference: **St. John's International Airport, NL**
Noise Exposure Forecast Update

Against Noise from Aircraft) to reflect improved noise insulation techniques using current home building technology. The results of this work must now filter done to the provincial building code level which will involve a concerted effort on the part of Transport Canada and provincial authorities. The results of this study have no legal status in its current form. The system has limitations as it is only intended for use for construction using wood frames. It is the intent of this new software to provide a replacement for the old CMHC standards related to acoustic insulation and NEF.

3.3 NEF Limits For Residential Development – Federal Agencies

Transport Canada does not support residential development inside the 30 NEF contour. In 1996 Transport Canada clarified its position on this matter and amendment applicable guidance materials. Transport Canada has further modified their position and have included the following recommendation when considering residential development and new airports:

> *For new airports, Transport Canada recommends that no new noise sensitive land uses be permitted above 25 NEF/NEP. Noise sensitive land uses include residential, schools, day care centres, nursing homes and hospitals. This approach is the single most practical for reasons of ease of implementation and administration since below this threshold, all noise-sensitive land uses would be permitted without restrictions or limitations. The guidelines for all other land uses remain unchanged from Table 3. This buffer would also offer protection against the long term uncertainties inherent in planning for a new airport.*

Health Canada continues to study the impacts of aircraft noise on humans. To date, their studies have not concluded with certainty the relationship between human health and aircraft noise. Health Canada continues to support the recommendation of Transport Canada. Additional information can be found on the Health Canada website http://www.hc-sc.gc.ca/iyh-vsv/environ/noise-bruit_e.html .

Reference: **St. John's International Airport, NL**
Noise Exposure Forecast Update

3.3 THE CANADIAN EXPERIENCE

3.3.1 Review of the Ontario's Ministry of Municipal Affairs Provincial Policy Statement

The Ontario Ministry of Municipal Affairs Provincial Policy Statement is considered by municipalities as part of their planning processes. Specifically, the Ontario Planning Act states that the Minister, the council of a Municipality, or a local board or a planning board and the Municipal Board when carrying out their responsibilities must have regard for policy statements. Excerpts from the current policy statement are found below.

> *7.1 planning so that major facilities (such as airports, transportation corridors, […]) and sensitive land uses are appropriately designed, buffered and/or separated from each other to prevent adverse effects from odour, noise and other contaminants.*
>
> ***To protect airports from incompatible development:***
>
> 1. *New residential development and other sensitive land uses will be prohibited in areas near airports above 30 NEF/NEP, as set out on maps (as revised from time to time) approved by Transport Canada; but*
> 2. *Redevelopment of existing residential uses and other sensitive land uses or infilling of residential and other sensitive land uses may be considered above 30 NEF/NEP if it has been demonstrated that there will be no negative impacts on the long-term function of the airport.*

3.3.2 Review of Manitoba's Approach

Plan Winnipeg recognizes the economic importance of the Winnipeg International Airport and promotes the Airport as a centre of industrial development. The Plan is the most important document prepared by the City. It is a long-term plan that establishes direction for the City and the steps that need to be taken along the way. It requires that an Airport Vicinity Development Plan be prepared and endorsed by City Council. In addition, legislation passed by the Province of Manitoba, requires that an "Airport vicinity protection area" be designated in a Plan Winnipeg by-law amendment. Such changes to the Plan, and others, are necessary to clarify the original intent and to ensure that the policy statements become more closely tied to specifications.

3.3.3 Review of Alberta's Airport Vicinity Protection Area (AVPA) Regulation

The approach adopted by the province is prescriptive in nature, although applied in a somewhat limited manner. The enabling statue for municipal land use planning in Alberta is the Alberta Municipal Government Act. Part 17 entitled Planning and Development of this act replaces the former Planning Act. Division 12: Bylaws and Regulations contains section 693 entitled Airport Vicinity Regulations that reads:

> *693(1) The Lieutenant Governor* in *Council may make regulations establishing international airport vicinity protection areas surrounding the Calgary International Airport and the Edmonton International Airport; controlling, regulating or prohibiting any use and development of land within an international airport vicinity protection area.*
> *(Alberta Municipal Government Act 1995, s. 693.)*

Reference: **St. John's International Airport, NL**
Noise Exposure Forecast Update

While the above section makes specific mention of only the provinces two largest airports, section 693 (6) applies more generally to the remaining airports within the province:

> *(6) The Lieutenant Governor in Council may make regulations by which municipalities may define land in the vicinity of an airport for purposes of this section prescribing how municipalities are to manage the use and development of land in the vicinity of an airport, and respecting the control, use and development of land in the vicinity of an airport. (Alberta Municipal Government Act 1995, s. 693.)*

While the Alberta government seems to deal with its airports in two distinct manners, it is worth underlining that in neither case do they make the limits explicit in the legislation. Rather, it is in the regulations themselves that the real substance of the government's policy becomes clear. For the time being, only two regulations has been adopted and remain in force following these two sections. The Edmonton International Airport Vicinity Protection Area (EIA AVPA) and the Calgary International Airport Vicinity Protection Area (CIA AVPA) regulations address the specific problem of Aircraft noise and compatible land use planning.

3.3.4 Airport Specific Experiences

3.3.4.1 Ottawa International

The Official Plan for the Regional Municipality of Ottawa-Carlton has included an Airport Vicinity Development Zone. The AVDZ identifies areas around airports where aircraft noise, as well as aviation safety related factors, must be considered when developing nearby.

A supplementary zone, the Ottawa Airport Operating Influence Zone (OAOIZ) has also been delineated. This supplementary zone is a fixed line that follows physical features and is generally intended to follow the more restrictive of either the 30 NEF (1994) or 30 NEP (2014) contours. Within this prescribed zone, noise-sensitive developments, particularly residential, are not permitted except in particular circumstances.

Within the two zones mentioned above, the planning department is to apply the provisions of *Land Use in the Vicinity of Airports*, 7th Edition, published by Transport Canada. This document contains provisions that address noise, bird hazards, electromagnetic interference, obstacle limitation surfaces, and restrictions to visibility. Provisions included in *Noise Assessment Criteria in Land Use Planning, Publication LU-131*, October, 1997 published by the Ontario Ministry of the Environment must also be applied when determining the appropriateness of development within the zones.

Further constraints on development have also been implemented. For all land use proposals at or above the 25 NEF/NEP boundary a detailed noise study may be required as a condition of draft approval of subdivisions or condominiums, or as a condition of severance.

Residential infilling is permitted within the OAOIZ provided that it does not require approval of a plan of subdivision or amendment to a zoning by-law or official plan. However, the development must meet all noise attenuation requirements and other provisions of the Ottawa International Airport Zoning Regulations.

Finally, the regional Official Plan recognizes the need for consultation with various interests involved. The multi-agency Ottawa Airport Liaison Committee meets regularly to discuss and remedy any aircraft noise concerns. The regional government consults with the Airport Authority, Transport Canada and the Ministry of Municipal Affairs and Housing on issues that require expert advice.

3.3.4.2 Toronto Lester B. Pearson International

The authority that manages and operates LBPIA is the Greater Toronto Airports Authority GTAA. The authority is a not for profit corporation that was created in the context of the federal government's divestiture initiative embodied by the NAP. The GTAA professes the same noise policies as Transport Canada. In the Noise Management chapter of their Master Plan the GTAA states: "…that the most effective way to minimize the impact of noise is through proper land use planning in the vicinity of airports." (GTAA 1999, 48). To support this statement, the GTAA went further and defined a fixed Airport Operating Area (AOA) that is based on the 30 NEP contour.

The AOA approximates the 30 NEP contour projected to the maximum capacity of the airport. To facilitate the implementation and understanding of the area, rather than exactly following the ethereal path of the contour, the AOA is drawn to follow major physical features on the ground, such as arterial roads. In this way, the area does not cut lots in half and unduly complicate its interpretation. While the PPS and AOA do not explicitly encourage inter-jurisdictional decision-making, by establishing a boundary that crosses jurisdictions and is readily available for all, it allows for consistent planning efforts across municipal boundaries.

Having established this area and registered it with the Ministry of Municipal Affairs and Housing, the GTAA actively opposes all residential development within the 30 NEF contour. This is evident in the recent Ontario Municipal Board case between the GTAA and the Regional Municipality of Peel. The substance of this case was that the region wanted to amend its official plan to rezone previously established employment/industrial lands to residential. The airport objected to this on two fronts. The first was that much of the lands fell within the 30 NEF contour and all of the lands fell within the airport operating area. The second reason for the GTAA's opposition is not pertinent to the subject matter of this inquiry. Due to the timing of the case and of the development of the provincial policy statement, the Board's ruling was based on the previous policy context, which was significantly more relaxed than it is currently. The Board found that though residential development could meet the requirements set out in the previous policy environment, that it was obliged to determine "…whether a reasonable quality of residential environment' will result". The board ultimately concluded that it is not normal for residents to have to be enclosed by triple glazed windows with the air conditioning on to enjoy their gardens.

The operating area delineated by the GTAA is an attempt to acknowledge that the noise management issue crosses political boundaries. However, the GTAA clearly acknowledges that land use planning is a provincial jurisdiction and that the authority can only participate in an advisory role. The GTAA's noise management policy does not end with land use planning. Through noise abatement initiatives and operating restrictions, it attempts to deal with pollution at the source. Finally, the GTAA attempts to encourage partnerships, cooperation and facilitation by establishing various committees, forums and workshops to deal with noise management issues at the airport. These include the GTAA Consultative Committee and the Noise Management Committee. However, it must be underlined that these committees, forums and workshops do not derive from a provincially imposed legislative requirement.

It is important to acknowledge the single greatest failure of the Ontario approach. It fails to address those residents that are already living near the airport and adversely affected, or those who will become adversely affected by airport expansion. The exemptions allowing infilling and redevelopment directly negate the possibility of preventing the increase of people affected by the airport.

As mentioned in the previous chapter, the manner in which Ontario's legislation addresses the PPS is somewhat awkward. The combination of the terms "shall" and "have regard to" within the same sentence is complicating. Whereas "shall" is an obligation, "have regard to" is much less obligating. Consequently, the weight placed on issues of provincial interest by planners and ultimately the OMB is not definitive. As such, the effectiveness of the inclusion of the 30 NEF limit is reduced.

3.3.4.3 Winnipeg International

The City of Winnipeg has adopted the Airport Vicinity Development Plan (AVDP) to protect Winnipeg International Airport. The AVDP boundaries are approximated by the 25 NEF contour. The NEF configuration reflects the ultimate traffic volume at the airport and the potential for an additional runway to the northeast of the existing runway. Where possible the boundary follows major right-of-ways and individual property lines.

The development and implementation of the AVDP involves three entities. The Executive Steering Committee sets overall policy and direction for the plan. This committee includes senior political representatives from the City of Winnipeg and the Rural Municipality of Rosser. The Management Advisory Board provides input and advice on direction, and action and is comprised of both public and private representatives. The administrative Support Group delivers the process and includes 14 individuals from three levels of government.

The AVDP is broken down into three strategic issues: economic development, land use and noise. The land use component considers main city streets that are located within the 25 NEF contour and the development to occur along these streets. Residential development is unrestricted beyond the 25 NEF contour. Within the 35 NEF contour, single and multiple family dwellings are limited to current densities. Between the 25 and 35 NEF boundaries, residential development is permitted up to a density of 85 units per hectare. Residential development in specific areas around the airport will only be permitted if the construction meets CMHC standards.

Noise management is dealt with in a variety of manners. There are ongoing citizen and technical review meetings to address possible noise reduction alternatives through a comprehensive communication program. Noise reduction initiatives include:

- strict controls on engine run-ups;

- ensure assignment of calm wind runway preference to more equitable split of aircraft over residential area, and preferred runways for night-time use;

- maintain assigned departure tracks and climb profiles;

- measure and evaluate the effectiveness of all procedures.

3.3.4.4 Edmonton/Calgary International Airport Vicinity Protection Area

A number of aspects of this regulation are worth some mention. First, the regulation does not only address Aircraft noise, but also other land use issues that are addressed in Transport Canada's Land Use Planning in the Vicinity of Airports other 5 chapters. For example interference with radar, are considered. The area contained within the AVPA is larger than even the 25 NEF contour. The regulation is actually more of a broadly stroked development plan, identifying a variety of land use areas ranging from airport agricultural, airport residential to airport urban. Within each of the identified areas, various uses are identified and their permissibility for as many as 5 NEF ranges is stated. The tables within the regulation are an adaptation of Transport Canada's recommendations in TP1247 with some variations.

Finally, the EIA AVPA is particularly interesting since it is an overarching "development plan" that affects three municipalities, the City of Edmonton, the County of Leduc, No. 25 and the City of Leduc. While the municipalities can still approve development projects, they must meet the EIA AVPA requirements, as well as any requirements that the municipalities might also have. This allows for a consistent approach to a common problem faced by multiple municipalities.

However, the EIA AVPA has been undergoing changes. While the regulation has not been updated since the 1980s, Alberta Municipal Affairs has embarked on a process to update the regulation. This update is comprehensive since it considers not only the new NEF contours for the airport, but also rethinks it prescriptive approach to the issue of Aircraft noise and land use planning. Furthermore, it has been reconceived to ensure that jurisdictional boundaries have been carefully respected.

The NEF contours on which this regulation will be based are a composite of two different airport development scenarios in the distant future, 2040. It was determined that this was the best way to ensure that no new noise constituencies were created in the future and was a reasonable estimate of the airport's capacity considering their existing airside configuration.

Reference: **St. John's International Airport, NL**
Noise Exposure Forecast Update

3.3.5 INTERNATIONAL PERSPECTIVES ON AIRCRAFT NOISE AND RESIDENTIAL LAND USE

3.3.5.1 Australia NEF

The following is intended to provide a brief summary of the Australian NEF System:

- It began as the American NEF.
- A significant amount of research during the late 1970s developed dose-response curve specifically for Australia.
- The major differences between the ANEF and the Canadian NEF include:
  - o Night time is from 7pm to 7am and is weight at 6 dB as opposed to 10pm to 7 am weight at 12 dB.
  - o Australia shows the 20 ANEF contour on mapping. However, this contour is hard to predict accurately.
- Publications indicate the actual location of the 20 ANEF is difficult to define accurately, mainly because of variation in aircraft flight paths.
- Table 2.1 of AS2021 the Australian Standards document for compatible land use planning vis-à-vis aircraft noise recommends residential is acceptable less than 20 ANEF, conditionally acceptable between 20 and 25 ANEF and unacceptable above 25 ANEF.
- As a comparison to other international standards, the Australian approach appears to very conservative. The following is an excerpt from a Discussion Paper published by Australia's Department of Transport and Regional Services.
- A relatively new development in Australia is N70 mapping. The maps illustrate areas which have a certain number of events per day which are greater than 70 dBA. The contours usually go as low and 20 events per day of greater than 70 dBA. In the case of the EIS for the second Sydney Airport, a contour was shown for 10 – 20 events. It was found that this was not terribly accurate and was significantly larger than the 20 ANEF shown on typical maps.
- The N70 concept has proven to be extremely useful in communicating noise impacts with the general public in terms of every day concepts. It is not intended to replace the ANEF as a land use planning tool but rather to supplement it and provide additional information to the public within the ANEF contours and beyond as to the actual, practical noise impacts at their location. Another new tool being used in Australia is the Person-Events Index. (PEI).

Reference: **St. John's International Airport, NL**
Noise Exposure Forecast Update

- The Australian NEF has been developed as a National Standard. AS 2021-2000 : Acoustics – Aircraft noise intrusion – Building siting and construction. This is the 4th edition. Due to its development as a national standard, it has been rigorously evaluated.

3.3.5.2 American L_{dn}

Despite having been the original developers of the NEF system, the Americans never adopted the metric. Instead, in 1974, the American Environmental Protection Agency (EPA) identified the A-Weighted DNL metric was identified as the best descriptor. Part of the motivation for the development of the DNL was political pressure to have a single metric for all federal departments. At the time the EPA identified 55 dB as requisite to public health and welfare.
In 1979, the Federal Interagency Committee on Urban Noise (FICUN) was formed to develop Federal policy and guidance on noise. The committee's membership included the:

- Environmental Protection Agency (EPA),
- the FAA,
- the Federal Highway Administration, and the
- Departments of Defence (DOD), Housing and Urban Development (HUD), and Veterans Affairs (VA).

The report entitled *Guidelines for Considering Noise in Land Use Planning and Control* was issued in 1980. This report established the Federal government's DNL 65 dB standard and related guidelines. This is approximated by the Canadian 34 NEF.

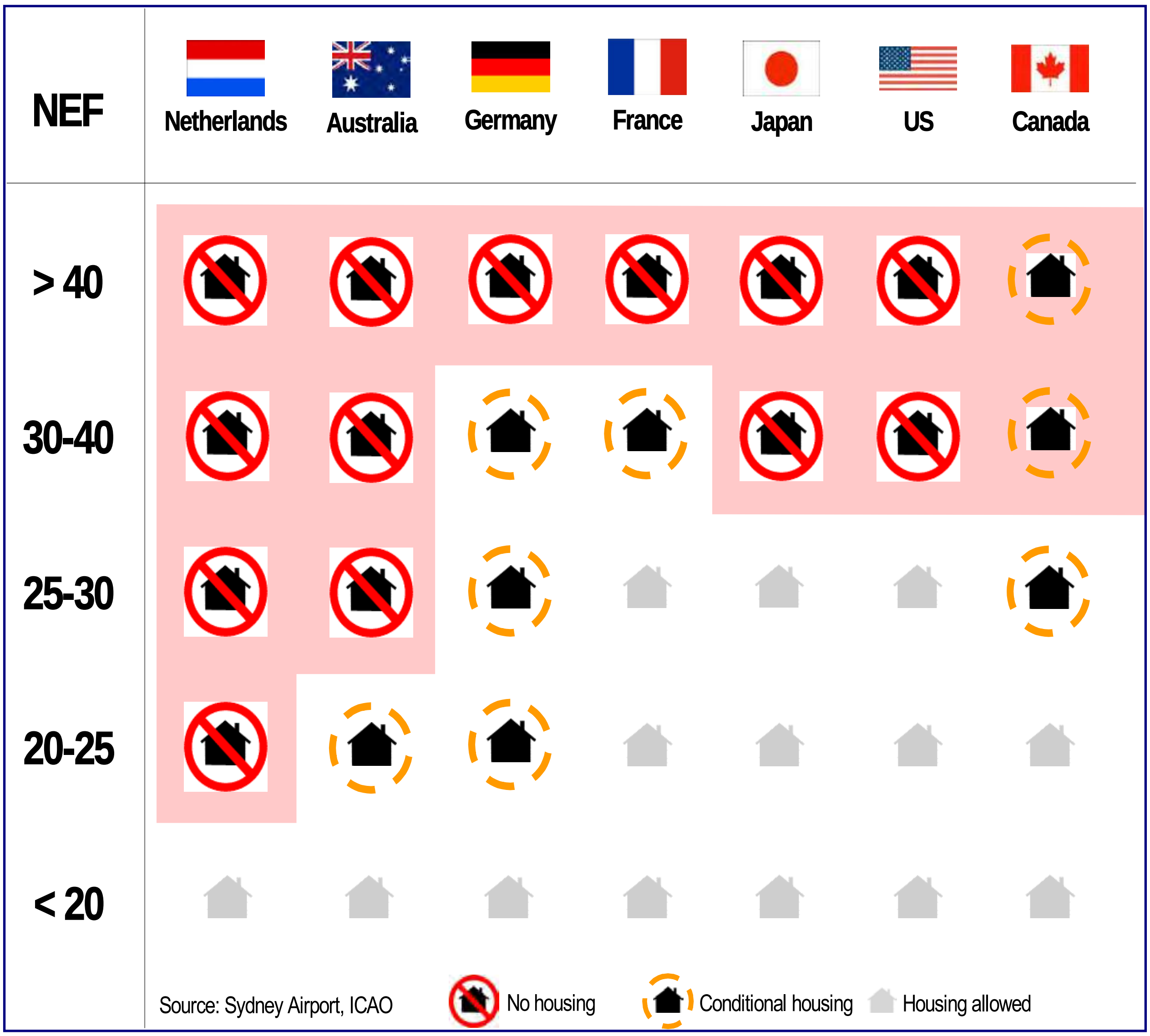
In 1992, the Federal Interagency Committee on Noise (FICON) reaffirmed the appropriateness of using DNL as the standard noise metric in their report *Federal Agency Review of Selected Aircraft noise Analysis Issues*.

The FAA has suggested that normal construction provides an outdoor to indoor Noise Level Reduction (NLR) of 20 dB. This suggests that an "acceptable" indoor noise level is 45 dB. This converts to approximately 10 NEF.

Reference: **St. John's International Airport, NL**
Noise Exposure Forecast Update

3.3.5.3 Summary of International Standards

The Figure 6 provides a very concise and generalize summary of aircraft noise and land use planning guidelines from an international perspective. This figure was extracted from the RAA Land Utilization Report (May 2005).



Source: Aircraft Noise and Residential Land Use Planning – Global Trends and Practices – prepared by InterVISTAS for RAA October 2004.

Figure 6 International Standards Related to Housing and NEF

Reference: **St. John's International Airport, NL**
Noise Exposure Forecast Update

4.0 SUMMARY AND RECOMMENDATIONS

Based on the above, we offer the following summary and recommendations:

1. Based on current national practice at other major airports in Canada and Transport Canada's recommendations, the 30 NEF should be recognized as the line above which no new residential development should be permitted. Based on this criteria, the proposed development should not be permitted as proposed. It appears that the 35 NEF has been used as the guideline in the layout of the proposal.
2. The aircraft noise environment in the area of the proposed development will become louder once the future expansion of the airport Runway 11-29 is realized. By extending the east end of Runway 11-29 by 1,500 ft., the proposed development could be affected by the 40 NEF contour and the 35 NEF will extend into the development. Based on this observation, the proposed development should not be permitted as proposed

Should you have any questions related to the above, please do not hesitate to contact the undersigned.

Sincerely,

PRYDE SCHROPP McCOMB, INC.

Bernhard G. Schropp, P.Eng.
Vice President, Eastern Operations

Enclosures (Figure 1 – 5)

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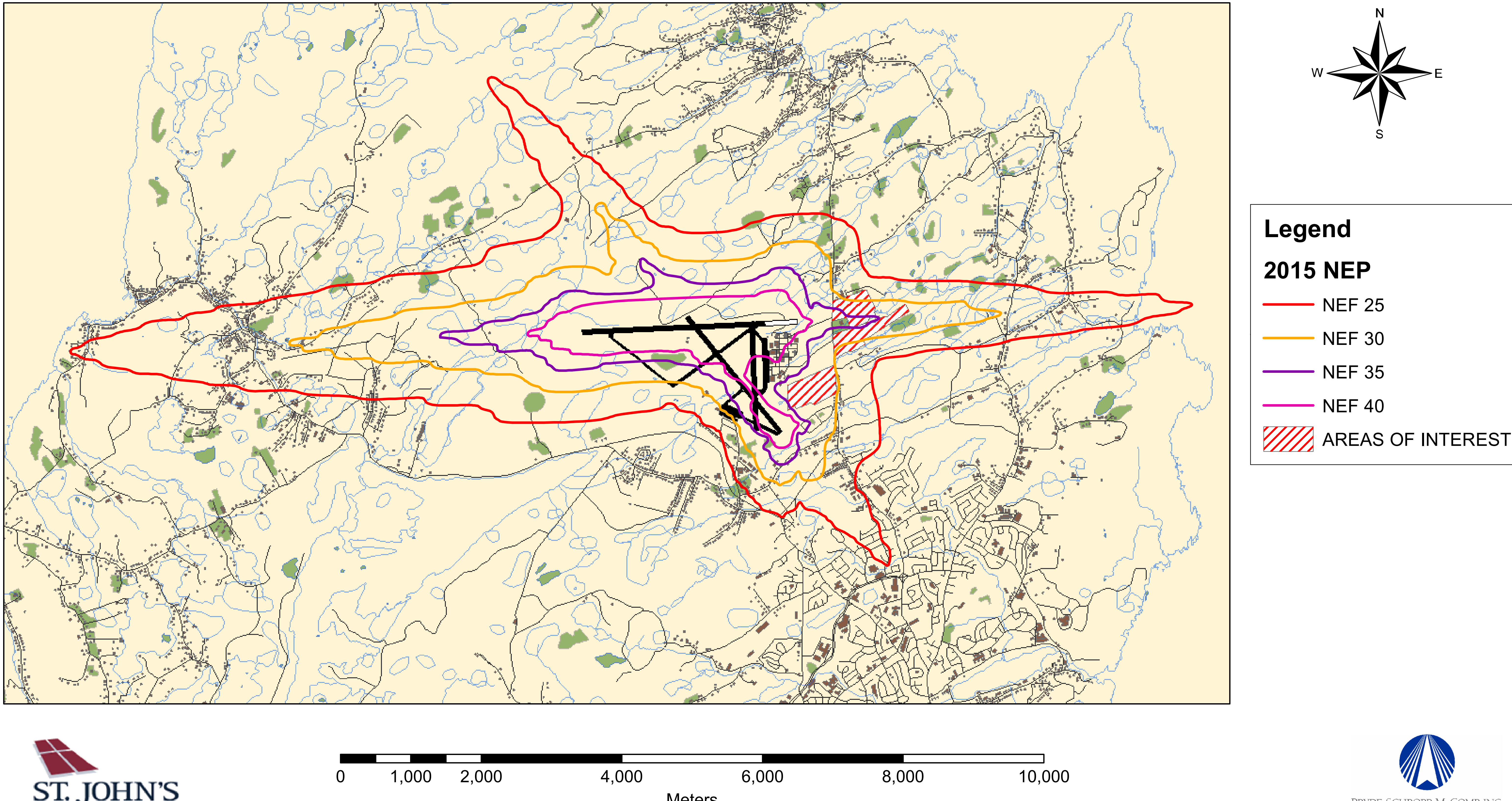
Figure 1: 2015 Noise Exposure Projection Contours

St-John's International Airport - NEF UPDATE



ST. JOHN'S International Airport Authority

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Figure 2: 2025 Noise Exposure Planning Contours - Scenario 1

St-John's International Airport - NEF UPDATE

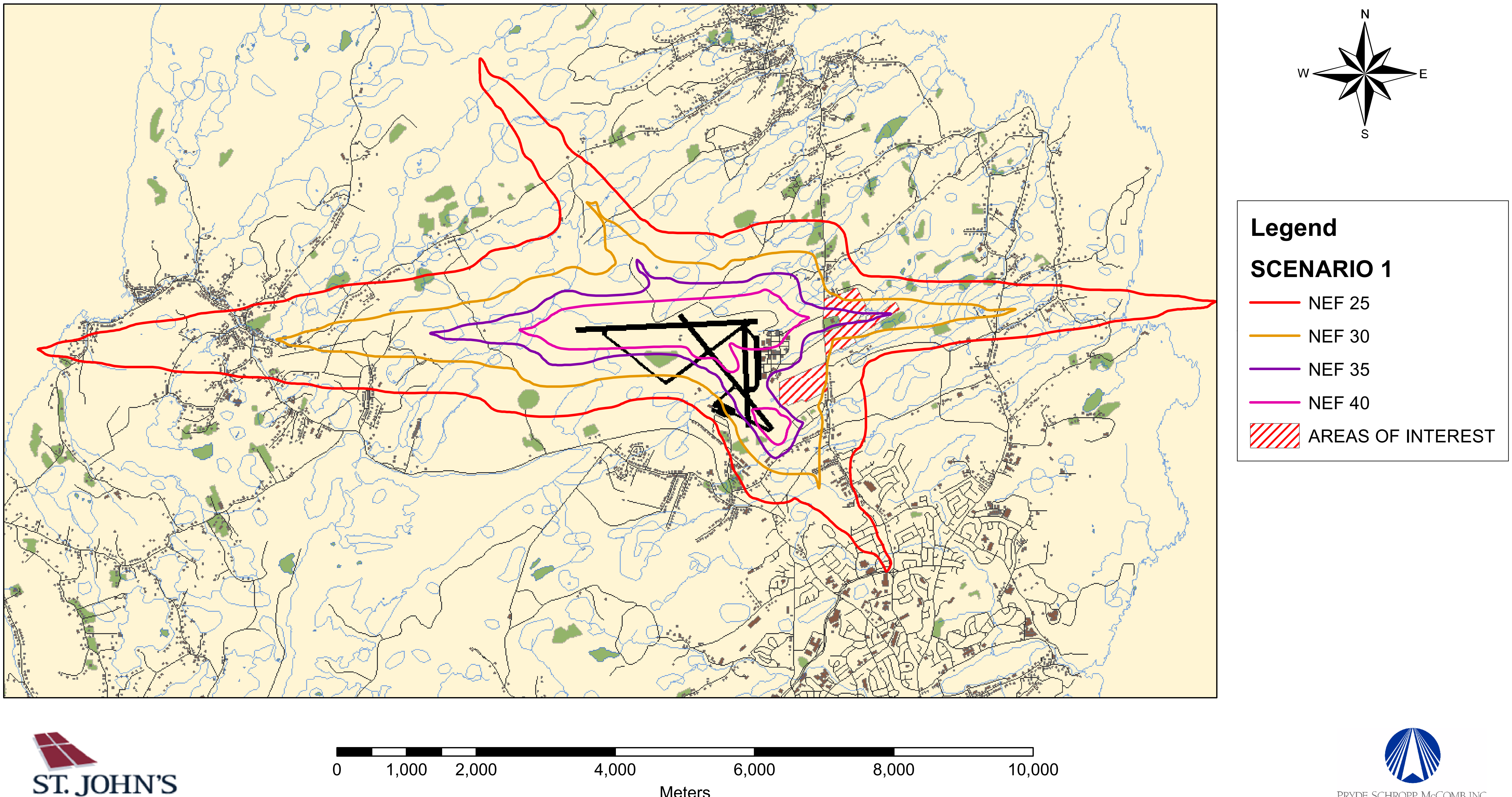

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Figure 3: 2025 Noise Exposure Planning Contours - Scenario 2

St-John's International Airport - NEF UPDATE

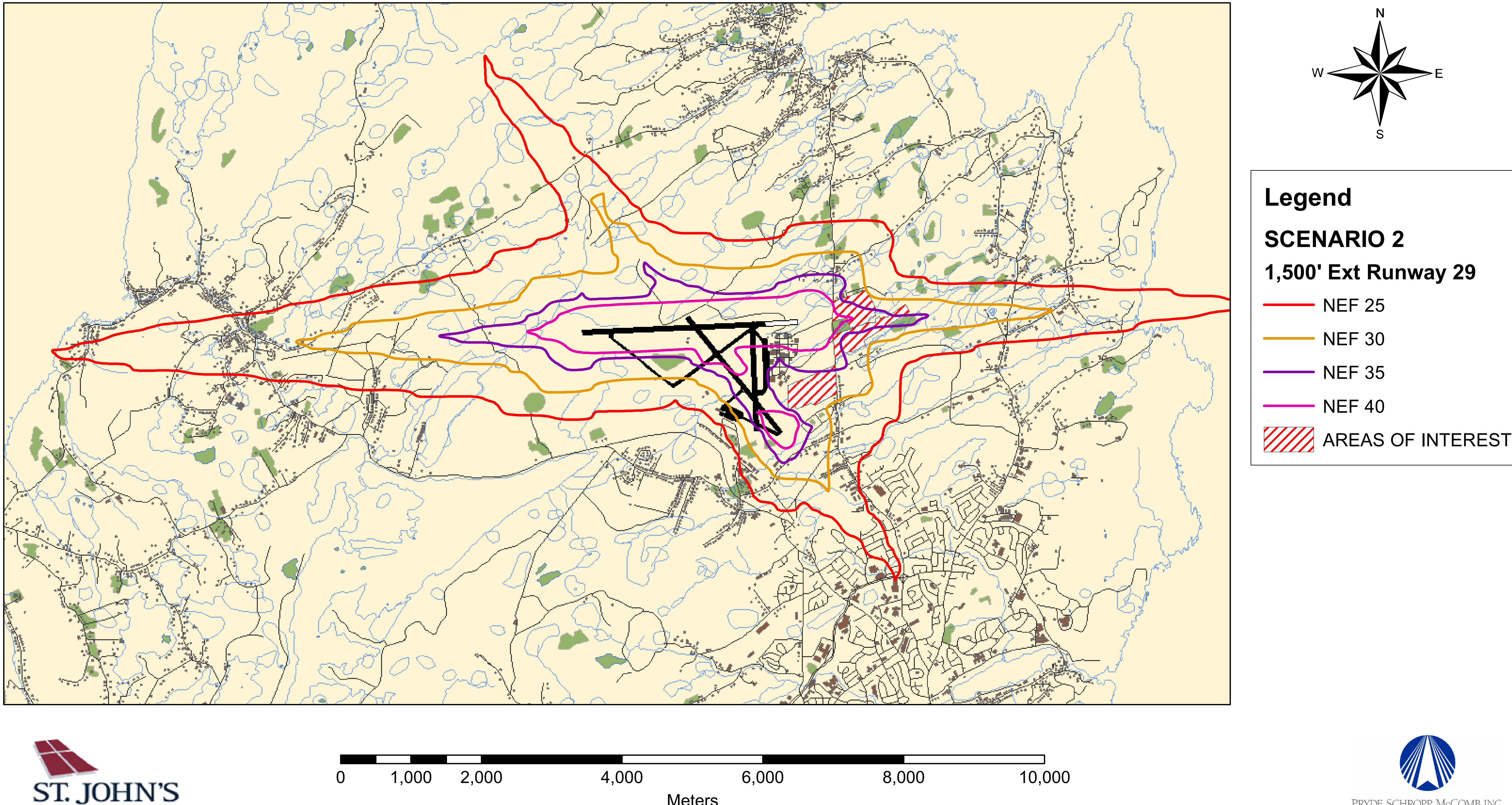

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Figure 4: 35 NEF Contour Comparison

St-John's International Airport - NEF UPDATE

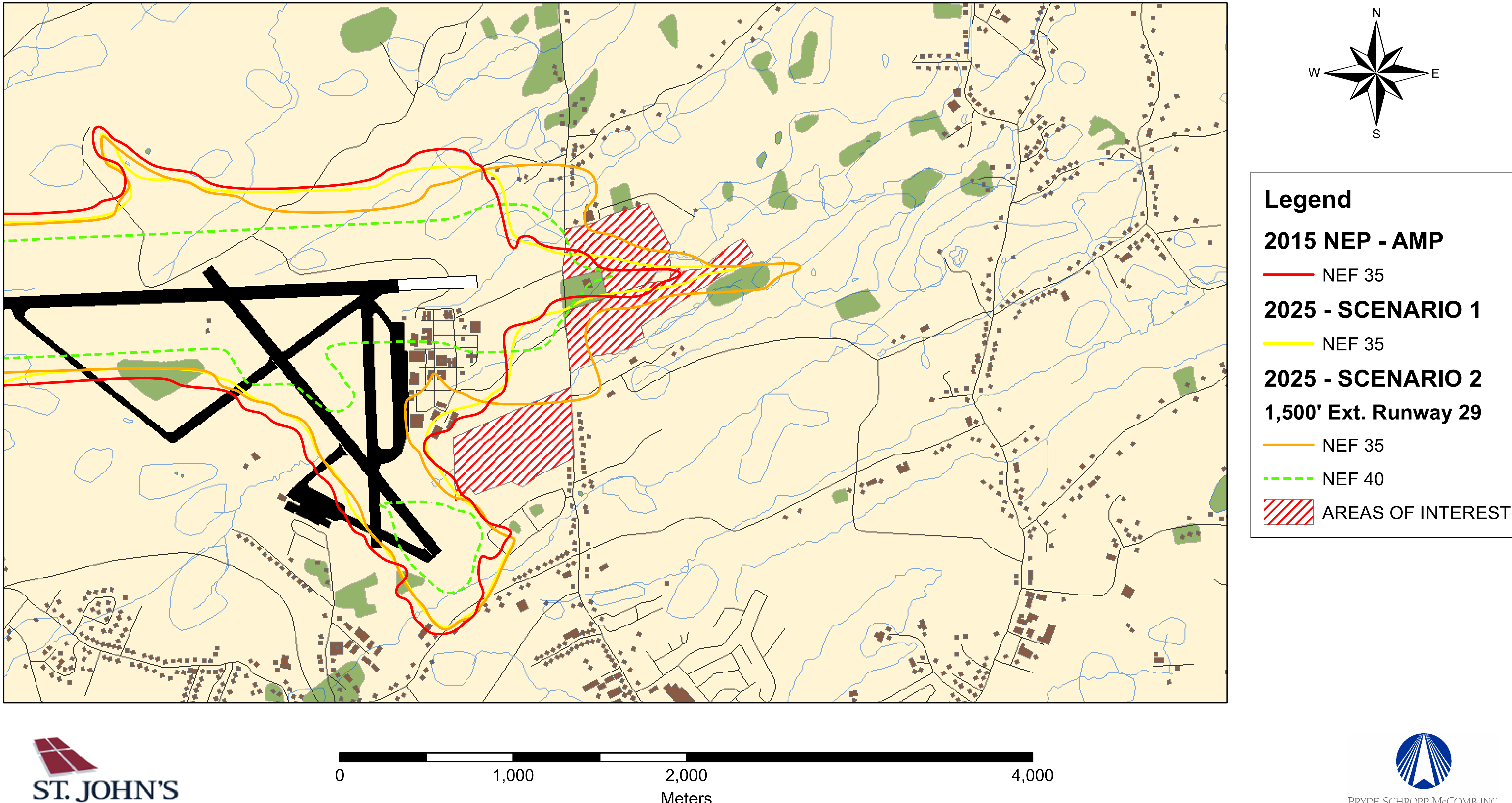

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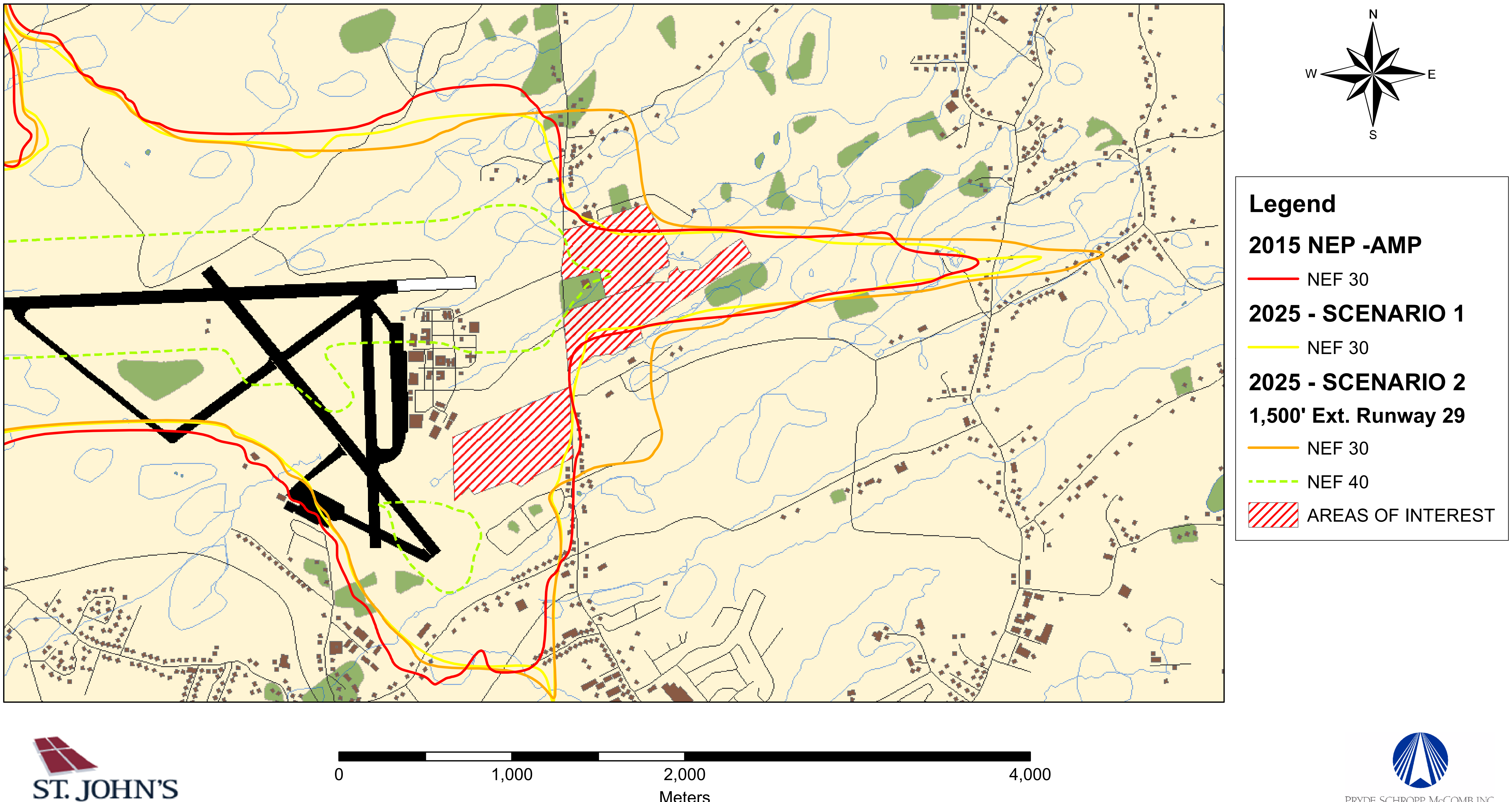
Figure 5: 30 NEF Contour Comparison

St-John's International Airport - NEF UPDATE



ST. JOHN'S International Airport Authority

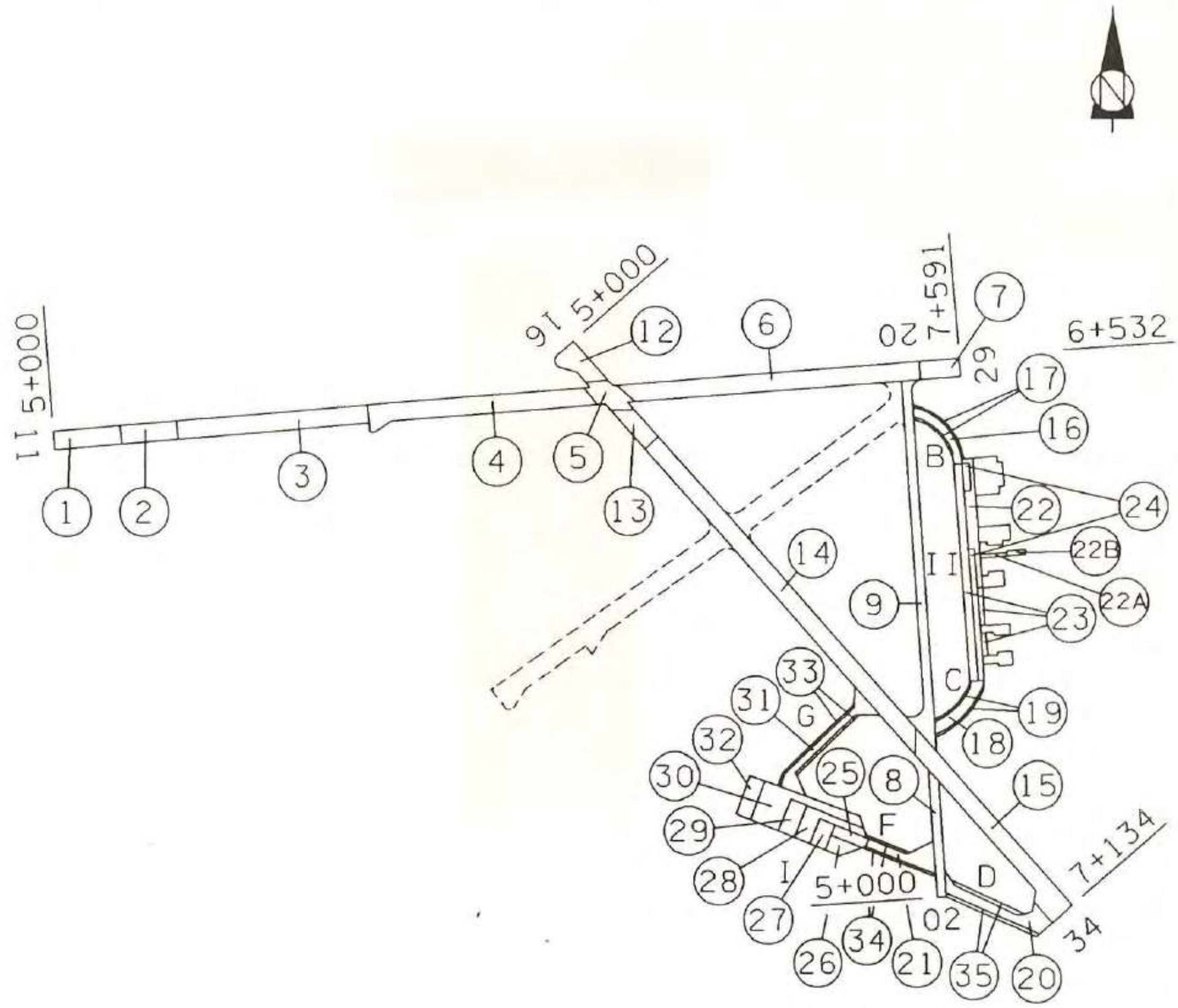
PRYDE SCHROPP McCOMB INC. AVIATION GROUP

DATE : NOV 8, 2005
PSMI # 10860

PRYDE SCHROPP McCOMB INC.
AVIATION GROUP

APPENDIX B
RUNWAY 11-29 PAVEMENT CONSTRUCTION HISTORY

TRANSPORT CANADA TRANSPORTS CANADA



0 500 1000

SCALE / ECHELLE
(METRES)

02-20 : 1532 x 30m
11-29 : 2591 x 61m
16-34 : 2134 x 61m

AIRFIELD PAVEMENT INVENTORY INVENTAIRE DES SURFACES PAVEES	
NAME/NOM: ST. JOHN'S, NFLD.	
REVISED/REVISION: FEBRUARY/FEVRIER, 1996	
OPERATOR/EXPLOITE PAR: TRANSPORT(S) CANADA	
REGION: ATLANTIC/ATLANTIQUE	SITE: A177

TRANSPORT CANADA - AIRFIELD PAVEMENT CONSTRUCTION HISTORY

Printed: 05/03/1998

Airport: ST. JOHN'S (NAS) Region: ATLANTIC

Revised: 05/03/1998

FACILITY DIMENSIONS					CONSTRUCTION HISTORY						PAVEMENT STRENGTH	
Pavement Facility	Plan Code	Chainage (m)	Width (m)	Area (m^2 x 1000)	Layer Thickness (cm) PCC	AC	B	SB	Contract Number	Year Built	Strength Code	Code PLR Field PLR
RUNWAY 02-20	8	5000 5610	30.5	11.20		9.5 8.9 5.0	8.9		 QM-2563	 1942 1987	S183t56	11 (1.0) 11
RUNWAY 02-20 Note: * Reconstructed.	9	5610 6312	30.5	28.90		10.0	30.0	23.0	QM-2563 *	1987	S183t73	12 11
RUNWAY 11-29	1	5000 5153	61	9.30	28.0		15.2		80361	1967	k121h28	10 12
RUNWAY 11-29	2	5153 5366	61	13.00		8.9 5.0	23.0		80361 QM-2387	1967 1984	S204t51	12 12
RUNWAY 11-29	3	5366 5915	61	33.50		8.9 5.1 5.0	23.0		52130 QM-719 QM-2387	1954 1968 1984	S204t61	12 12
RUNWAY 11-29	4	5915 6525	61	37.20		9.5 8.9 5.1 5.0	8.9 15.2		34841 52130 QM-719 QM-2387	1943 1954 1968 1984	S204t81	12 12
RUNWAY 11-29	5	6525 6678	61	9.30		9.5 8.9 3.8 5.0	8.9 15.2		34841 52130 78980 QM-2387	1943 1954 1965 1984	S204t79	12 12
RUNWAY 11-29	6	6678 7501	61	50.20		9.5 8.9 5.1 5.0	8.9 15.2		34841 52130 QM-719 QM-2387	1943 1954 1963 1984	S204t81	12 12
RUNWAY 11-29	7	7501 7591	61	5.50	28.0		15.2		80361	1967	k121h28	10 12
RUNWAY 16-34	12	5000 5153	61	9.30		9.5 3.8 5.0	8.9		33565 78980 QM-2387	1942 1965 1984	S204t46	~~11 (1.0)~~ 12 12
RUNWAY 16-34 Note: * Milled out 5.0 cm and replaced.	13	5244 5366	61	7.40		9.5 8.9 3.8 5.0 -5.0 5.0	8.9 15.2		32668 52130 78980 QM-1946 706718 * 706718 *	1941 1954 1965 1981 1991 1991	S278t79	12 12
RUNWAY 16-34 Note: * Milled out 5.0 cm and replaced.	14	5366 6434	61	65.10		8.9 5.0 -5.0 5.0	30.5		78980 QM-1946 706718 * 706718 *	1965 1981 1991 1991	S278t58	12 12
RUNWAY 16-34 Note: * Milled out 5.0 cm and replaced.	15	6617 7135	61	31.60		8.9 5.0 -5.0 5.0 -5.0 5.0	15.5	22.9	61551 QM-1946 QM-2312 * QM-2312 * 706718 * 706718 *	1958 1981 1983 1983 1991 1991	S278t66	12 (1.0) 12

1999 project to be added.

APPENDIX C
TRANSPORT CANADA AVIATION CIRCULAR ASC 2001-009 – ICAO TYPE A CHARTS

Transport Canada Transports Canada Canada

ASC 2001-009
2001.07.10

Subject

ICAO Type A Obstacle Charts

Purpose

The purpose of this Circular is to provide international airport operators with information about their responsibilities when preparing and updating ICAO Type A obstacle charts. Understanding and application of these requirements will contribute to the timely dissemination of this information to industry users.

Background

The circular has been coordinated with NAV CANADA. Airport operators are responsible for compiling ICAO Type A obstacle charts for all runways at airports identified in the *ICAO Navigation Plans* as international airports. This data is to be forwarded to the operator's respective Transport Canada (TC) regional Aerodrome Safety office. (A list of regional offices can be found in the "GEN" Section of the A.I.P. Canada and in the "General" Section of the *Canada Flight Supplement*. A list has also been included with this document).

TC defines the standards for these charts in Section 2.3.4 of *Aerodrome Standards and Recommended Practices* (TP 312) and reviews the data for compliance with these standards before it is transmitted to NAV CANADA.

NAV CANADA Aeronautical Information Services (AIS) is responsible for preparing and disseminating the Type A obstacle charts, as required under Chapter 3 of *Annex 4 to the Convention on International Civil Aviation*.

Application

New Charts:

Any international airport operator who requires a new ICAO Type A obstacle chart shall have the aerodrome surveyed in accordance with the requirements set out in Chapter 3 of Annex 4, "Aerodrome Obstacle Chart-ICAO Type A (Operating Limitations)" and in Section 2.3.4 of TP 312. This survey, clearly identifying which obstacles are to be depicted, will be sent to the appropriate regional Aerodrome Safety office.

A copy of Chapter 3 of Annex 4 is attached as Appendix 1. Appendix 2 illustrates what obstacle data is needed by NAV CANADA to prepare a Type A obstacle chart. International airport operators submitting information must supply the obstacle data using this or an equivalent format.

Revised Charts:

TC standards require that an obstacle survey review be conducted every five years or as determined by the certifying authority, taking into consideration the level of building activity in the area. Note that a survey is not required if it can be ascertained and reported that there are no new obstacles in the take-off flight path area.

If a correction is required, the current chart shall be submitted with appropriate markings indicating what is to be deleted and/or added.

All Charts:

AIS is responsible for drafting/revising the chart as requested, labeling it as "DRAFT" and returning it to the appropriate regional Aerodrome Safety office. When TC and the aerodrome operator have concurred with the draft chart, a written statement to that effect will be given to AIS, who will then remove the "DRAFT" label, have the chart published and advertise its availability in the next amendment of the *A.I.P. Canada*.

Procurement

Current ICAO Type A Charts are available for a fee from NAV CANADA at the address listed in paragraph 3.6.2 of the "MAP" Section in the *A.I.P. Canada*.

This Circular is available electronically at:
http://www.tc.gc.ca/civilaviation/AerodromeAirNav/AudInspMon/Program/SafetyCirculars/menu.htm

Original signed by:
John Maxwell (2001.07.10)
Director, Aerodrome Safety

Return to previous page

CHAPTER 3. AERODROME OBSTACLE CHART — ICAO TYPE A (OPERATING LIMITATIONS)

3.1 Function

This chart, in combination with the Aerodrome Obstacle Chart — ICAO Type C or with the relevant information published in the AIP, shall provide the data necessary to enable an operator to comply with the operating limitations of Annex 6, Parts I and II, Chapter 5, and Part III, Chapter 3.

3.2 Applicability

3.2.1 Aerodrome Obstacle Charts — ICAO Type A (Operating Limitations) shall be made available in the manner prescribed in 1.3.2 for all aerodromes regularly used by international civil aviation, except for those aerodromes where there are no significant obstacles in the take-off flight path areas.

3.2.2 Where a chart is not required because no significant obstacles exist in the take-off flight path area, a notification to this effect shall be published.

3.3 Units of measurement

3.3.1 Elevations shall be shown to the nearest half-metre or to the nearest foot.

3.3.2 Linear dimensions shall be shown to the nearest half-metre.

3.4 Coverage and scale

3.4.1 The extent of each plan shall be sufficient to cover all significant obstacles.

Note.— Isolated distant significant obstacles that would unnecessarily increase the sheet size may be indicated by the appropriate symbol and an arrow, provided that the distance and bearing from the end of the runway farthest removed and the elevation are given.

3.4.2 The horizontal scale shall be within the range of 1:10 000 to 1:15 000.

3.4.3 **Recommendation.—** *The horizontal scale should be 1:10 000.*

Note.— When the production of the charts would be expedited thereby, a scale of 1:20 000 may be used.

3.4.4 The vertical scale shall be ten times the horizontal scale.

3.4.5 *Linear scales.* Horizontal and vertical linear scales showing both metres and feet shall be included in the charts.

3.5 Format

3.5.1 The charts shall depict a plan and profile of each runway, any associated stopway or clearway, the take-off flight path area, and significant obstacles.

3.5.2 The profile for each runway, stopway, clearway and the obstacles in the take-off flight path area shall be shown above its corresponding plan. The profile of an alternative take-off flight path area shall comprise a linear projection of the full take-off flight path and shall be disposed above its corresponding plan in the manner most suited to the ready interpretation of the information.

3.5.3 A profile grid shall be ruled over the entire profile area exclusive of the runway. The zero for vertical coordinates shall be mean sea level. The zero for horizontal coordinates shall be the end of the runway furthest from the take-off flight path area concerned. Graduation marks indicating the sub-divisions of intervals shall be shown along the base of the grid and along the vertical margins.

3.5.3.1 **Recommendation.—** *The vertical grid should have intervals of 30 m (100 ft) and the horizontal grid should have intervals of 300 m (1 000 ft).*

3.5.4 The chart shall include:

a) a box for recording the operational data specified in 3.8.3;

b) a box for recording amendments and dates thereof.

3.6 Identification

The chart shall be identified by the name of the country in which the aerodrome is located, the name of the city or town, or area, which the aerodrome serves, the name of the aerodrome and the designator(s) of the runway(s).

3.7 Magnetic variation

The magnetic variation to the nearest degree and date of information shall be indicated.

3.8 Aeronautical data

3.8.1 Obstacles

3.8.1.1 Obstacles in the take-off flight path area which project above a plane surface having a 1.2 per cent slope and having a common origin with the take-off flight path area, shall be regarded as significant obstacles, except that significant obstacles lying wholly below the shadow of other significant obstacles as defined in 3.8.1.2 need not be shown. Mobile obstacles such as boats, trains, trucks, etc., which may project above the 1.2 per cent plane shall be considered significant obstacles but shall not be considered as being capable of creating a shadow.

3.8.1.2 The shadow of an obstacle is considered to be a plane surface originating at a horizontal line passing through the top of the obstacle at right angles to the centre line of the take-off flight path area. The plane covers the complete width of the take-off flight path area and extends to the plane defined at 3.8.1.1 or to the next higher significant obstacle if it occurs first. For the first 300 m (1 000 ft) of the take-off flight path area, the shadow planes are horizontal and beyond this point such planes have an upward slope of 1.2 per cent.

3.8.1.3 If the significant obstacle creating a shadow is likely to be removed, objects that would become significant obstacles by its removal shall be shown.

3.8.2 Take-off flight path area

3.8.2.1 The take-off flight path area consists of a quadrilateral area on the surface of the earth lying directly below, and symmetrically disposed about, the take-off flight path. This area has the following characteristics:

a) it commences at the end of the area declared suitable for take-off (i.e. at the end of the runway or clearway as appropriate);

b) its width at the point of origin is 180 m (600 ft) and this width increases at the rate of 0.25D to a maximum of 1 800 m (6 000 ft), where D is the distance from the point of origin;

c) it extends to the point beyond which no significant obstacles exist or to a distance of 10.0 km (5.4 NM), whichever is the lesser.

3.8.2.2 For runways serving aircraft having operating limitations which do not preclude the use of a take-off flight path gradient of less than 1.2 per cent, the extent of the take-off flight path area specified in 3.8.2.1 c) shall be increased to not less than 12.0 km (6.5 NM) and the slope of the plane surface specified in 3.8.1.1 and 3.8.1.2 shall be reduced to 1.0 per cent or less.

Note.— When a 1.0 per cent survey plane touches no obstacles, this plane may be lowered until it touches the first obstacle.

3.8.3 Declared distances

3.8.3.1 The following information for each direction of each runway shall be entered in the space provided:

a) take-off run available;

b) accelerate-stop distance available;

c) take-off distance available;

d) landing distance available.

Note.— In Annex 14, Volume I, Attachment A, Section 3, guidance is given on declared distances.

3.8.3.2 **Recommendation.—** *Where a declared distance is not provided because a runway is usable in one direction only, that runway should be identified as "not usable for take-off, landing, or both".*

3.8.4 Plan and profile views

3.8.4.1 The plan view shall show:

a) the outline of the runways by a solid line, including the length and width, the magnetic bearing to the nearest degree, and the runway number;

b) the outline of the clearways by a broken line, including the length and identification as such;

c) take-off flight path areas by a dashed line and the centre line by a fine line consisting of short and long dashes;

d) alternative take-off flight path areas. When alternative take-off flight path areas not centred on the extension of the runway centre line are shown, notes shall be provided explaining the significance of such areas;

e) obstacles, including:

1) the exact location of each significant obstacle together with a symbol indicative of its type;

2) the elevation and identification of each significant obstacle;

3) the limits of penetration of significant obstacles of large extent in a distinctive manner identified in the legend.

Note.— This does not exclude the necessity for indicating critical spot elevations within the take-off flight path area.

3.8.4.1.1 **Recommendation.—** *The nature of the runway and stopway surfaces should be indicated.*

3.8.4.1.2 **Recommendation.—** *Stopways should be identified as such and should be shown by a broken line.*

3.8.4.1.3 When stopways are shown, the length of each stopway shall be indicated.

3.8.4.2 The profile view shall show:

a) the profile of the centre line of the runway by a solid line and the profile of the centre line of any associated stopways and clearways by a broken line;

b) the elevation of the runway centre line at each end of the runway, at the stopway and at the origin of each take-off flight path area, and at each significant change in slope of runway and stopway;

c) obstacles, including:

1) each significant obstacle by a solid vertical line extending from a convenient grid line over at least one other grid line to the elevation of the top of the obstacle;

2) identification of each significant obstacle;

3) the limits of penetration of significant obstacles of large extent in a distinctive manner identified in the legend.

Note.— An obstacle profile consisting of a line joining the tops of each significant obstacle and representing the shadow created by successive significant obstacles may be shown.

3.9 Accuracy

3.9.1 The order of accuracy attained shall be shown on the chart.

3.9.2 **Recommendation.—** *The horizontal dimensions and the elevations of the runway, stopway and clearway to be printed on the chart should be determined to the nearest 0.5 m (1 ft).*

3.9.3 **Recommendation.—** *The order of accuracy of the field work and the precision of chart production should be such that measurements in the take-off flight path areas can be taken from the chart within the following maximum deviations:*

1) horizontal distances: 5 m (15 ft) at a point of origin increasing at a rate of 1 per 500;

2) vertical distances: 0.5 m (1.5 ft) in the first 300 m (1 000 ft) and increasing at a rate of 1 per 1 000.

3.9.4 *Datum.* Where no accurate datum for vertical reference is available, the elevation of the datum used shall be stated and shall be identified as assumed.

INFORMATION REQUIRED FOR AN ICAO TYPE A CHART

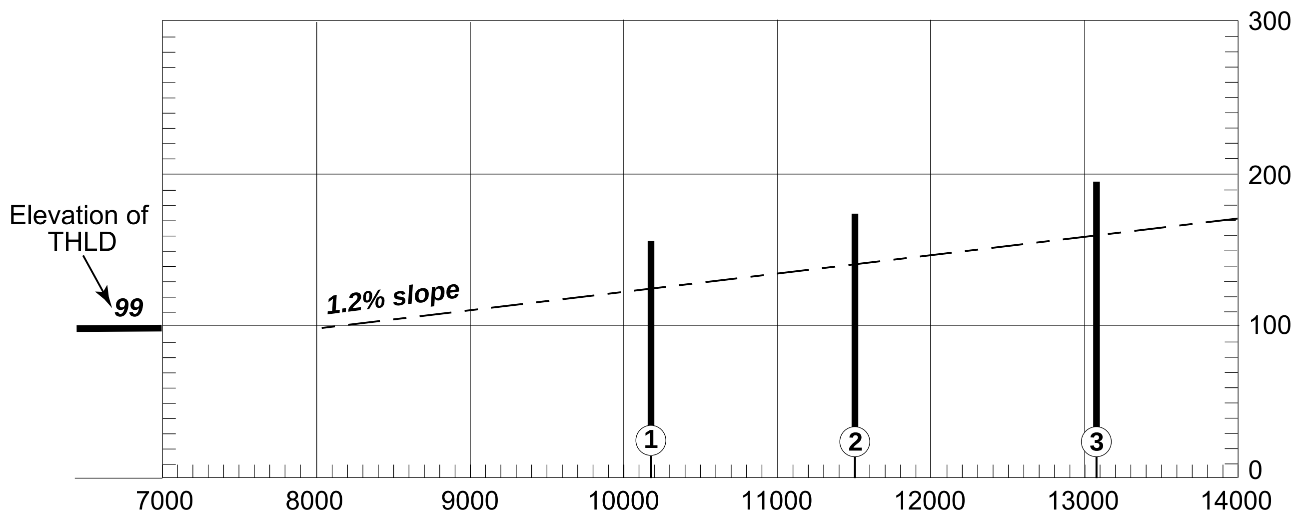
A. RUNWAY and CLEARWAY DATA: Provide information on the length, width and profile of each runway and clearway.

B. LIST OF OBSTACLES: Provide a list of the obstacles to be depicted at each end of the runway as shown in the sample list. Specify where the ground distance is measured from, whether it is the end of the clearway (line A-B) or the button of the departure runway.

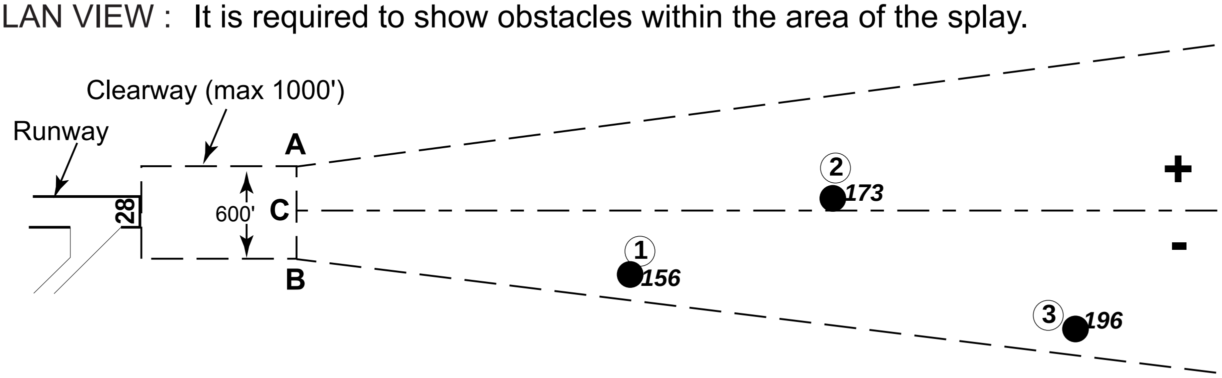
SAMPLE LIST

Number	Type of Feature	Elevation (Feet ASL)	Ground Distance (Feet) (from line A-B)	Ground Distance off Centreline (Feet) (from line C-D)
1.	Lamp Standard	155.95	2195.05	-410.11
2.	Tree-top	172.52	3500.10	75.54
3.	Tree-top	195.77	5090.20	-767.25

C. PROFILE VIEW : It is required to show obstacles which penetrate the 1.2% slope. It is not required to show obstacles in the shadow (See Appendix-1 para. 3.8.1.2.) of a previous obstacle even if it pentetrates the 1.2% slope.



D. PLAN VIEW : It is required to show obstacles within the area of the splay.



DEPARTMENT OF TRANSPORT

AERODROME OBSTACLE CHART—ICAO

TYPE A—OPERATING LIMITATIONS

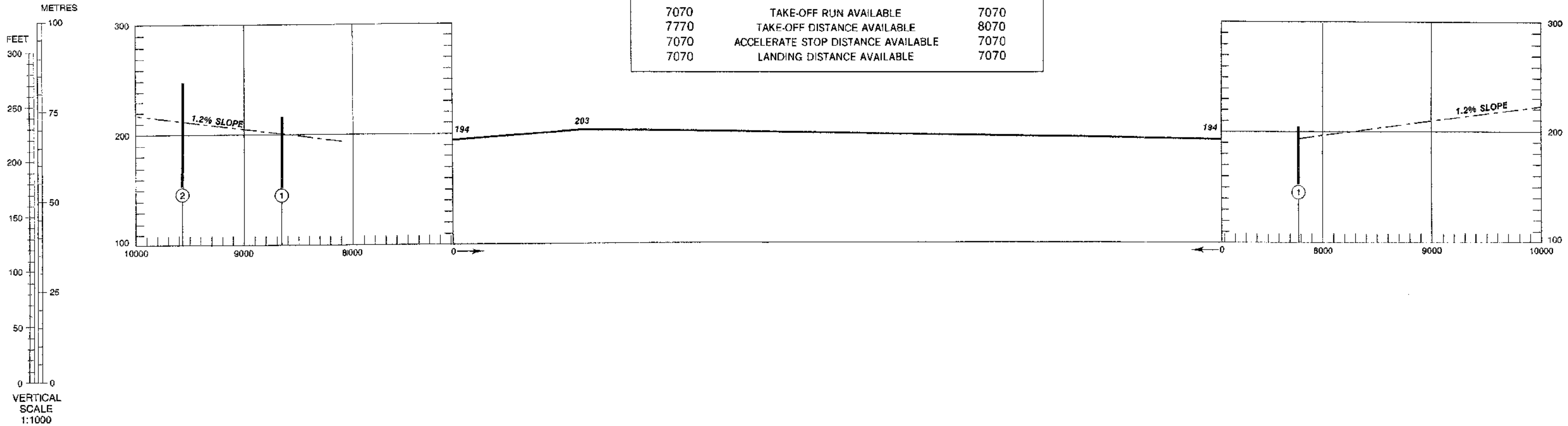
DIMENSIONS IN FEET ELEVATIONS IN FEET ABOVE MEAN SEA LEVEL

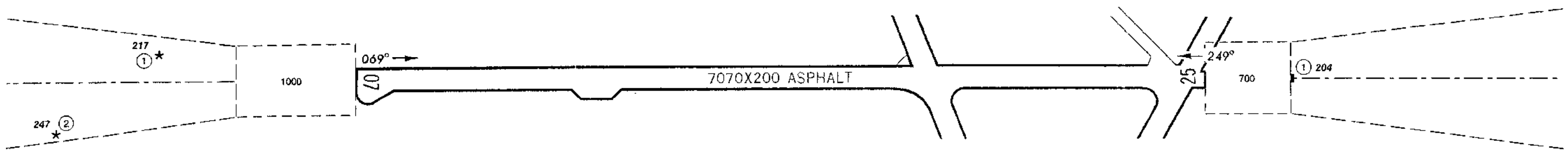
SYDNEY, CANADA

MAGNETIC VARIATION 23°W 1985
BEARINGS ARE MAGNETIC

RUNWAY 07-25

DECLARED DISTANCES		
RUNWAY 07		RUNWAY 25
7070	TAKE-OFF RUN AVAILABLE	7070
7770	TAKE-OFF DISTANCE AVAILABLE	8070
7070	ACCELERATE STOP DISTANCE AVAILABLE	7070
7070	LANDING DISTANCE AVAILABLE	7070

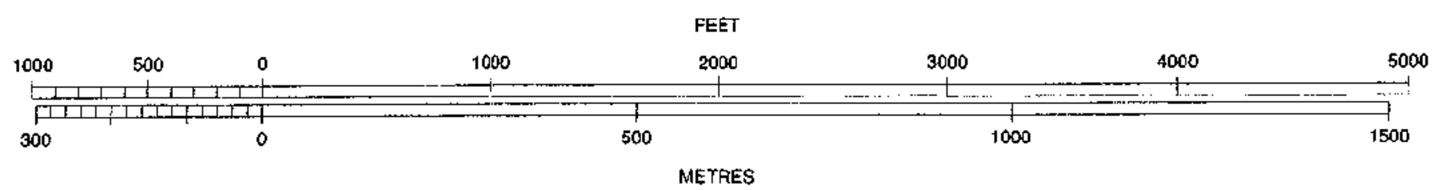




LEGEND

①	IDENTIFICATION NUMBER
★	TREE OR SHRUB
⊕	POLE, TOWER, SPIRE, ANTENNA ETC.
▬	BUILDING OR LARGE STRUCTURE
•	SPOT HEIGHT

HORIZONTAL SCALE 1:10,000



AMENDMENT RECORD		
NO.	DATE	ENTERED BY

Produced by the Canada Centre for Mapping
Department of Energy, Mines and Resources
from information supplied by Department of Transport.

SEVENTH EDITION SEPTEMBER 1990

PRYDE SCHROPP McCOMB INC.

AVIATION GROUP

APPENDIX D

PRELIMINARY GEOTECHNICAL INVESTIGATION

Jacques Whitford

Engineering, Scientific, Planning and Management Consultants

607 Torbay Road
St. John's NL
Canada A1A 4Y6

Bus 709 576 1458
Fax 709 576 2126

www.jacqueswhitford.com

JW Project No. 1019861

January 11, 2007

Mr. Bernhard Schropp
Pryde Schropp McComb Incorporated
311 Goderich Street, P.O. Box 1600,
Port Elgin, ON N0H 2C0

Fax : (519) 389-4728

Dear Mr. Schropp:

Re: Preliminary Geotechnical Investigation
Proposed Runway Extension (11-29)
St. John's International Airport, St. John's, NL

Further to your request and authorization on behalf of Pryde Schropp McComb Inc. (PSMI), Jacques Whitford Limited (JW) has completed a geotechnical investigation at the above-noted site. The purpose of the investigation was to gather information on subsurface soil and groundwater conditions for earthworks planning and design for a proposed runway extension.

The scope of work included:

- Excavation of nineteen (19) test pits. Eight (8) test pits at each end of Runway 11-29 and three (3) test pits in an area where line of sight with the tower may be an issue.
- A factual geotechnical report presenting the findings of the investigation.

This factual report has been prepared specifically and solely for the project described above and contains all of the findings of this investigation.

Site Description

The site is located at the St. John's International Airport in the City of St. John's, Newfoundland and Labrador. The proposed project would extend both Runway 11 and Runway 29, as shown on the attached plan, Drawing No. 1019861-GE-01. The proposed runway extension area is currently a filled area which extends into natural undeveloped ground with approach light systems extending through the investigation area. An embankment immediately south of Runway 11, which creates line of sight issues for the tower, was also included as part of the geotechnical investigation.

Based on existing geological information and previous experience, the natural overburden material in the area beneath surficial organic and fill materials consists of silty sand and gravel (glacial till) extending to bedrock.

Field Procedures

The field work consisted of completing seventeen (17) test pits on December 14 and 15, 2006 using a rubber tire backhoe to depths ranging from approximately 1.7 to 4.3 m below the existing ground surface. The test pits were backfilled with excavated material upon completion.

The original work scope for the geotechnical investigation included the completion of nineteen (19) test holes, however, due to poor terrain conditions and the limited accessibility of the backhoe, two (2) test hole locations, TP3 and TP18 could not be completed.

The field work was conducted under the supervision of a geotechnical technologist from JW who kept detailed records of subsurface conditions and recovered representative samples of the materials encountered. Soils were sampled directly from the test pit walls or from the excavator bucket.

All soil samples were stored in moisture proof containers and sent to our laboratory in St. John's for classification. Samples will be stored for a period of three months at which time they will be discarded unless instructions to the contrary are received.

Test pit locations were selected and established in the field by JW using the runway, access roads, and fencing as references. The test pit locations and elevations were surveyed in the field by Burt Aubrey K. Surveys, prior to the geotechnical investigation. During the site investigation several test pit locations were moved due to backhoe accessibility. The final test pit locations were measured from the original locations by JW and are shown in the attached plan.

Subsurface Conditions

Subsurface conditions encountered in the test pits are described below as two separate areas of interest: the embankment south of Runway 11 and the runway extensions of Runway 11-29. The subsurface conditions of the embankment south of Runway 11, Runway 11 and Runway 29 are summarized in Table 1, Table 2 and Table 3, respectively.

Embankment South of Runway 11

The subsurface conditions encountered at the embankment south of Runway 11 are summarized in Table 1 and described in detail below.

Table 1 Summary of Subsurface Conditions – Embankment South of Runway 11

Test Pit #	Depth of Organics/ Topsoil (m)	Depth of Weathered Till (m)	Depth to Till (m)	Depth to Inferred Bedrock (m)	Depth to Initial Groundwater Seepage (m)	Remarks
1	0.0 – 0.5	0.5 – 0.9	0.9 – 1.9	1.9	NE	Upper 0.4 m of Till is Weathered
2	0.0 – 0.5	NE	1.5 – 2.1	2.1	1.2	
3	Omitted – not accessible by backhoe due to poor terrain					

NE – Not Encountered

Organic and Topsoil Materials

A surficial layer of soft, black organic soil (OL) material was encountered at each of the two (2) test pit locations extending from the ground surface to a depth of 0.2 m at both locations. Underlying the surficial organic material, reddish-brown topsoil was encountered, consisting of gravel with sand (GW). The topsoil material was observed to be 0.3 m thick at both test pit locations. Therefore the total thickness of organic and topsoil materials at TP1 and TP2 was 0.5 m.

In terms of relative density, based on direct inspection in the test pits and excavator performance, the organic material is classified as soft or very loose and the topsoil material is classified as compact.

Glacial Till

A layer of natural, grey glacial till was encountered in both test pits underlying the surficial organic materials, at a depth of 0.5 m below the ground surface. Based on field observations and visual classification, the till material consisted of gravel with silt and sand (GW-GM) and occasional cobbles. The thickness of the till material ranged from 1.0 to 1.6 m. In TP1, the till was noted to be organic stained within the upper 0.4 m, a result of weathering.

In terms of relative density, based on direct inspection in the test pits and excavator performance, the glacial till material is classified as dense to very dense.

Inferred Bedrock

Based on the excavator refusal, bedrock was inferred at TP1 and TP2 at depths of 1.9 and 2.1 m, respectively, below ground surface. Bedrock coring was not completed to confirm bedrock or bedrock quality. Based on available geology mapping, bedrock in the area consists of siltstone, sandstone and shale of the Mistaken Point Formation in the Conception Group.

Groundwater

Groundwater seepage was encountered in TP2 at 1.2 m below the ground surface. Based on the observations during excavations, the rate of groundwater seepage was described as moderate. Groundwater depths may vary seasonally and in response to precipitation events.

Runway 11-29

The subsurface conditions encountered at the ends of Runway 11-29 are summarized in Tables 2 and 3 and described in detail below.

Table 2 Summary of Subsurface Conditions – Runway 11

Test Pit #	Depth of Organics/ Topsoil (m)	Depth of Fill (m)	Depth of Till (m)	Depth to Inferred Bedrock (m)	Depth to Initial Groundwater Seepage (m)	Remarks
4	NE	0.0 – 0.8	0.8 – 3.3	3.3	NE	
5	NE	0.0 – 1.8	1.8 – 4.0	NE	NE	TP terminated in till
6	0.0 – 0.2; **0.9 – 1.4**	0.2 – 0.9	1.4 – 1.7	1.7	1.6	
7	0.0 – 0.5	NE	0.5 – 3.0	3.0	NE	Surface water flow at 0.5 m
8	0.0 – 0.5	NE	0.5 – 3.5	3.5	3.0	
9	0.0 – 0.5	NE	0.5 – 2.5	2.5	1.8	
10	0.0 – 0.5	NE	0.5 – 2.5	2.5	1.2	
11	0.0 – 0.5	NE	0.5 – 2.5	2.5	1.2	

NE – Not Encountered

Table 3 Summary of Subsurface Conditions – Runway 29

Test Pit #	Depth of Organics/ Topsoil (m)	Depth of Fill (m)	Depth of Till (m)	Depth to Inferred Bedrock (m)	Depth to Initial Groundwater Seepage (m)	Remarks
12	0.0 – 0.1	0.1 – 2.1	2.1 – 4.2	NE	NE	TP terminated in till
13	0.0 – 0.1	0.1 – 3.0	3.0 – 4.3	NE	NE	TP terminated in till
14	0.0 – 0.1	0.1 – 0.5	0.5 – 4.1	NE	1.2	TP terminated in till
15	0.0 – 0.1	0.1 – 1.5	1.5 – 4.1	NE	NE	TP terminated in till
16	0.0 – 0.1	0.1 – 0.9	0.9 – 3.0	NE	2.0	TP terminated due to high GW flow
17	0.0 – 0.4	NE	0.4 – 2.2	NE	NE	TP terminated due to high surface water flow
18	Omitted – not accessible by backhoe due to poor terrain					
19	0.0 – 0.6	NE	0.6 – 2.2	2.2	1.0	

NE – Not Encountered

Organic Material

A surficial rootmat layer consisting of soft, black organic soil (OL) material was encountered at most test pits locations. Underlying the surficial organic material, topsoil was encountered at TP8, TP9 and TP10, which consisted of reddish brown gravel with silt and sand (GW-GM). The total thickness of the organic and topsoil materials ranged from 0.1 to 0.6 m.

In terms of relative density, based on direct inspection in the test pits and excavator performance, the organic material is classified as soft or very loose and the topsoil material is classified as compact.

At TP6, organic material was encountered underlying a layer of existing fill. The material consisted of soft, black organic soil (OL) with trace wood and roots and was encountered at depths ranging from 0.9 to 1.2 m, below the ground surface. Underlying the organic soil, topsoil was observed ranging in depth from 1.2 to 1.4 m. The topsoil material was comprised of reddish brown well-graded gravel with sand (GW).

Fill (Reworked Till)

Fill material was encountered at several test pit locations where previous site and runway construction had been completed. The fill was encountered at the ground surface or underlying surficial organic materials and ranges in thickness from 0.4 to 2.9 m. The fill material generally consisted of light brown, gravel with silt and sand (GW-GM) with occasional cobbles and is considered to be re-worked glacial till.

In terms of relative density, based on direct inspection in the test pits and excavator performance, the fill material is classified as dense to very dense.

Glacial Till

A layer of natural, grey glacial till was encountered at all test pit locations underlying the fill and organic materials. Based on field observations and visual classification, the till material consisted of gravel with silt and sand (GW-GM) and occasional cobbles. The thickness of the till material ranged from 0.3 to 3.0 m where determined. At several locations the test pit was terminated within the till layer and therefore the thickness of the till was not determined.

In terms of relative density, based on direct inspection in the test pits and excavator performance, the glacial till material is classified as very dense.

Inferred Bedrock

Based on the excavator refusal, bedrock was inferred at several test pits locations ranging at depths of 1.7 and 3.5 m below ground surface. Bedrock coring was not completed to confirm bedrock or bedrock quality. Based on available geology mapping, bedrock in the area consists of siltstone, sandstone and shale of the Mistaken Point Formation in the Conception Group.

Groundwater

Groundwater seepage was encountered at several test pit locations ranging from depths of 1.2 to 3.0 m below the ground surface. Based on the observations during the excavations, the rate of groundwater seepage was described as slow to rapid. Surface (or near-surface) water seepage was observed at TP17 and TP7, ranging at depths from the ground surface to 0.5 m, respectively. Groundwater depths may vary seasonally and in response to precipitation events.

Discussion

It is understood that extension of Runway 11-29 has been proposed within the areas assessed in this investigation. In general, the sites off each end of Runway 11-29 are suitable for the proposed development. We would be pleased to provide additional consultation as project planning and design proceeds.

Closure

This report has been prepared for the sole benefit of Pryde Schropp McComb Incorporated, and their agents, and may not be used by any third party without the express written consent of Jacques Whitford Limited and the client. Any use which a third party makes of this report is the responsibility of such third party.

A subsurface investigation is a limited sampling of a site. The conclusions given herein are based on information gathered at specific sampling locations and can only be extrapolated to an undefined limited area around these locations. Variations throughout the site may differ significantly from data collected at the sample locations. The extent of the limited area depends on the soil and groundwater conditions, as well as the history of the site reflecting natural, construction and other activities. Should any conditions at the site be encountered which differ from those at the test locations, we require that we be notified immediately in order to permit reassessment of our comments and recommendations.

This report has been prepared by Mr. Sterling D. Parsons M.Eng. E.I.T., and reviewed by Mr. James K. Powell, M.Eng, P. Eng. We trust this report meets your present requirements. Should any additional information be required, please do not hesitate to contact our office at your convenience.

Yours truly,

JACQUES WHITFORD LIMITED

For Sterling D. Parsons M.Eng. E.I.T.

James K. Powell, M. Eng., P. Eng.

REGISTERED PROFESSIONAL ENGINEER
JAMES POWELL
SIGNATURE
Jan 11/07
DATE
NEWFOUNDLAND & LABRADOR

Attachment: JW Drawings Nos. 1019861-GE-01 to 03: Test Pit Location Plans

PROVINCE OF NEWFOUNDLAND AND LABRADOR
PEG Newfoundland and Labrador
PERMIT HOLDER
This Permit Allows
JACQUES WHITFORD LIMITED
To practice Professional Engineering in Newfoundland and Labrador.
Permit No. as issued by PEG 2007
which is valid for the year 40194

LEGEND

TP1 TEST PIT

NOTES:
1. DRAWING BASED ON INFORMATION PROVIDED BY CLIENT.
2. DO NOT SCALE FROM DRAWING.
3. © JACQUES WHITFORD, 2007.

CLIENT

PRYDE SCHROPP McCOMB INC.

PROJECT TITLE

PROPOSED RUNWAY EXTENSION (11-29),
ST. JOHN'S INTERNATIONAL AIRPORT,
ST. JOHN'S , NL

DRAWING TITLE

TEST PIT LOCATION PLAN

Jacques Whitford
CONSULTING ENGINEERS

SCALE 1:12000	DATE JAN. 8, 2007
DRAWN BY N.M.	CHECKED BY
EDITED BY -	REV. No. 0
DRAWING No. 1019861-GE-01	
CADFILE 1019861-GE-01.DWG	

08JAN07 11:00AM

NOTES:
1. DRAWING BASED ON MAPPING PROVIDED BY THE CLIENT
2. DO NOT SCALE FROM DRAWING.
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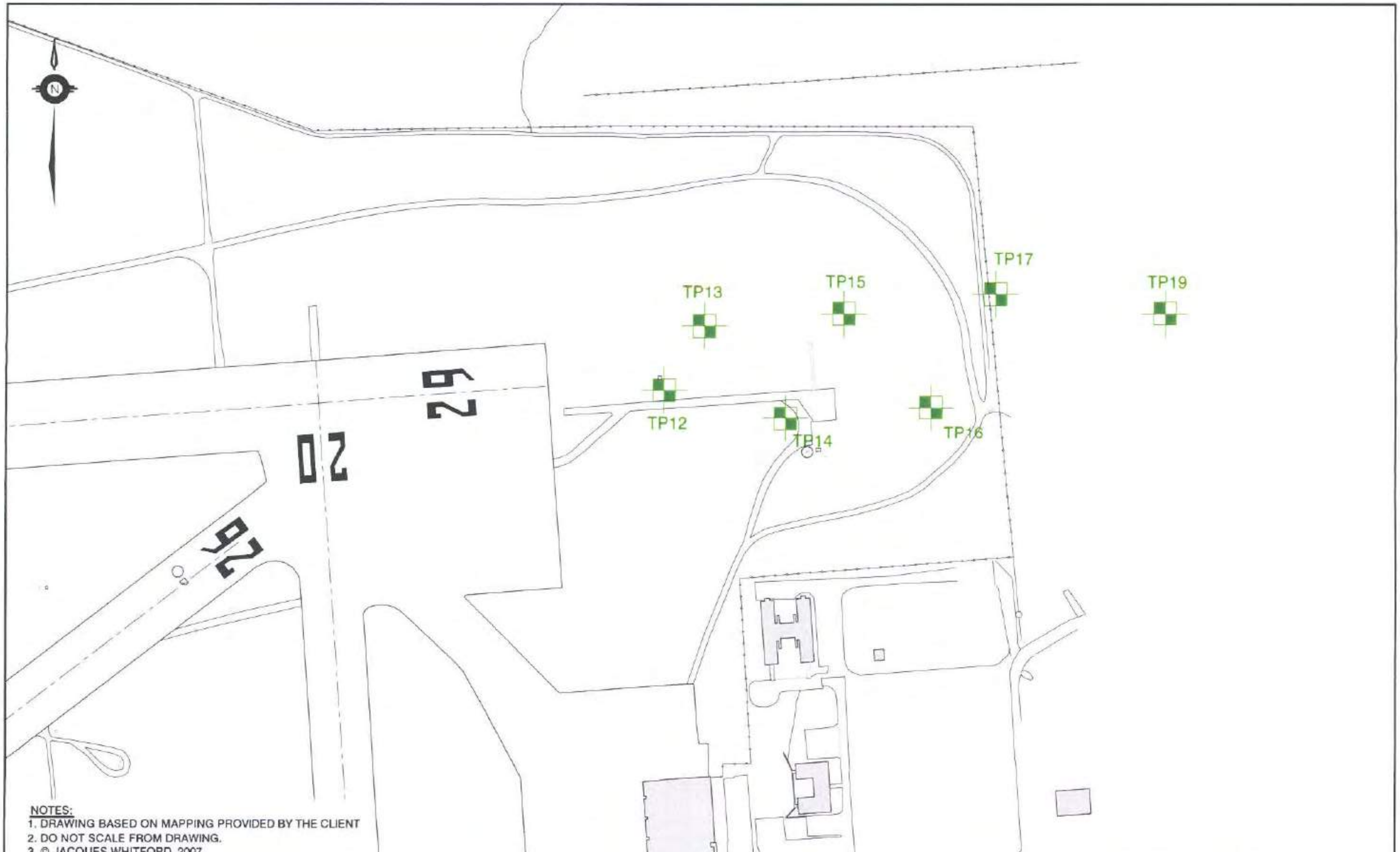
CLIENT: PRYDE SCHROPP McCOMB INC.	SCALE: 1:4000	DATE: JAN. 9, 2007	Jacques Whitford
	DRAWN BY: N.M.	CHECKED BY:	
PROJECT TITLE: PROPOSED RUNWAY EXTENTION (11-29) ST. JOHN'S INTERNATIONAL AIRPORT, ST. JOHN'S, NL	EDITED BY: J.B.	REV. No: 0	
DRAWING TITLE: TEST PIT LOCATION PLAN - RUNWAY 11	DRAWING No: 1019861-GE-02		
	CAD FILE: 1019861-GE-02.DWG		

09JAN07 4:00PM



NOTES:
1. DRAWING BASED ON MAPPING PROVIDED BY THE CLIENT
2. DO NOT SCALE FROM DRAWING.
3. © JACQUES WHITFORD, 2007.

CLIENT: PRYDE SCHROPP McCOMB INC.	SCALE: 1:4000	DATE: JAN. 9, 2007	Jacques Whitford
PROJECT TITLE: PROPOSED RUNWAY EXTENTION (11-29) ST. JOHN'S INTERNATIONAL AIRPORT, ST. JOHN'S, NL	DRAWN BY: N.M.	CHECKED BY:	
	EDITED BY: J.B.	REV. No.: 0	
DRAWING TITLE: TEST PIT LOCATION PLAN - RUNWAY 29	DRAWING No.: 1019861-GE-03		
	CAD FILE: 1019861-GE-03.DWG		

09JAN07 4:00PM

PRYDE SCHROPP McCOMB INC.
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APPENDIX E
TECHNICAL ANALYSIS DRAWINGS

LIST OF DRAWINGS:

SP1 Site Plan
C1 Runway 11 Approach Plan and Profile and Transitional Surface Intersection
C2 Runway 29 Approach Plan and Profile
C3 Runway 16 Approach Plan and Profile
C4 Runway 11-29 Overall Plan and Profile
C5 Line of Sight Contours

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ST. JOHN'S INTERNATIONAL AIRPORT

RUNWAY 11-29 EXTENSION ASSESSMENT
PRELIMINARY TECHNICAL ANALYSIS DRAWINGS

ST. JOHN'S
International Airport Authority

PSMI NO. 10861

DIRECTOR OF INFRASTRUCTURE : MR. PETER AVERY
AIRPORT OPERATIONS MANAGER : MR. RANDY MAHON

SHEET No.	DESCRIPTION
SP1	SITE PLAN
C1	RUNWAY 11 APPROACH PLAN AND PROFILE AND TRANSISTIONAL SURFACE INTERSECTION
C2	RUNWAY 29 APPROACH PLAN AND PROFILE
C3	RUNWAY 16 APPROACH PLAN AND PROFILE
C4	RUNWAY 11-29 OVERALL PLAN AND PROFILE
C5	LINE-OF-SIGHT CONTOURS

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FINAL REPORT
JUNE 22 2007
PSMI No. 10861

ORIGINAL SHEET – A1
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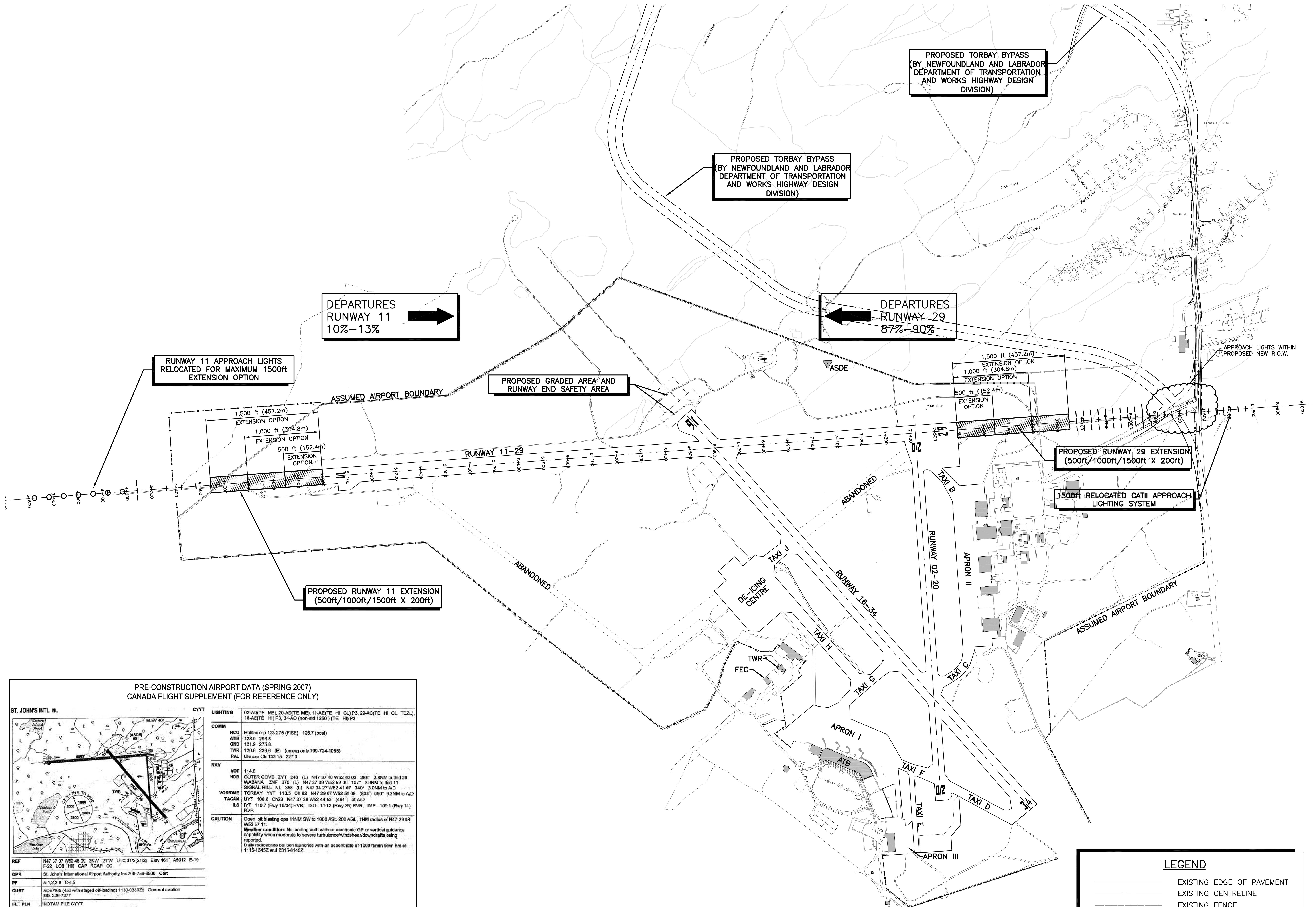
2007 May 28, 9:03 a.m.



PRE-CONSTRUCTION AIRPORT DATA (SPRING 2007)
CANADA FLIGHT SUPPLEMENT (FOR REFERENCE ONLY)

ST. JOHN'S INTL NL — CYYT

REF	N47 37 07 W52 45 09 3NW 21°W UTC-31/2(21/2) Elev 461' A5012 E-19 F-22 LO8 HI6 CAP RCAP OC
OPR	St. John's International Airport Authority Inc 709-758-8500 Cert
PF	A-1,2,3,6 C-4,5
CUST	AOE/165 (450 with staged off-loading) 1130-0330Z‡ General aviation 888-226-7277
FLT PLN	NOTAM FILE CYYT
FIC	Halifax 866-WXBRIEF or (French) 866-GOMÉTÉO
ACC	Gander 709-651-5225 or 888-751-5225. Flt Plns by Fax 709-651-5205 & include phone numbers where pilot can be reached prior to dep.
WX	METAR H24 TAF H24, issue times: 00, 06, 12, 18Z
PIK	General Services bldg, first floor, airside access
SERVICES	
FUEL	100LL, JA-1, FSII O/R (CON I IP JA-1, FSII)
OIL	All
S	1,2,4 DND svcs avbl thru ARAF 709-570-4900 Ext 4791 freq 131.02
ARFF	7 (Cat 8 avbl 30 min PNR)
SUP FL	LPOX, D & A-ice
JASU	CAN-A Elect Start 10/15
PVT ADV	Woodward Esso Aviation 123.5 709-579-3776 Fax 709-579-8513; Shell Aerocentre 123.0 709-576-4615 Fax 709-576-0768; Irving Aviation Svcs 122.9 709-758-3200 Fax 709-758-3201
MIL CON	Woodward Esso Aviation (Imperial Oil/Esso) 709-579-3776
RWY DATA	Rwy 11(107°)/29(287°) 8502x200 asphalt Rwy 16(160°)/34(340°) 7005x200 asphalt Rwy 16 down 0.32% Rwy 02(017°)/20(197°) 5028x100 asphalt
RCR	Opr CRFI, PLR/PCN
LIGHTING	02-AD(TE ME), 20-AD(TE ME), 11-AE(TE HI CL) P3, 29-AC(TE HI CL TDZL), 16-AE(TE HI) P3, 34-AO (non-std 1250') (TE HI) P3
COMM	
RCO	Halifax rdo 123.275 (FISE) 126.7 (bcst)
ATIS	128.0 293.8
GND	121.9 275.8
TWR	120.6 236.6 (E) (emerg only 709-724-1055)
PAL	Gander Ctr 133.15 227.3
NAV	
VOT	114.8
NDB	OUTER COVE ZYT 246 (L) N47 37 40 W52 40 02 288° 2.8NM to thld 29 WABANA ZNF 270 (L) N47 37 09 W52 52 00 107° 3.9NM to thld 11 SIGNAL HILL NL 358 (L) N47 34 27 W52 41 07 340° 3.0NM to A/D
VOR/DME	TORBAY YYT 113.5 Ch 82 N47 29 07 W52 51 08 (833') 050° 9.2NM to A/D
TACAN	UYT 108.6 Ch23 N47 37 38 W52 44 53 (491') at A/D
ILS	IYT 110.7 (Rwy 16/34) RVR; ISO 110.3 (Rwy 29) RVR; IMP 109.1 (Rwy 11) RVR
CAUTION	Open pit blasting ops 11NM SW to 1000 ASL 200 AGL, 1NM radius of N47 29 08 W52 57 11. **Weather condition:** No landing auth without electronic GP or vertical guidance capability when moderate to severe turbulence/windshear/downdrafts being reported. Daily radiosonde balloon launches with an ascent rate of 1000 ft/min btwn hrs of 1115-1345Z and 2315-0145Z.

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LEGEND

- EXISTING EDGE OF PAVEMENT
- EXISTING CENTRELINE
- EXISTING FENCE
- ASSUMED AIRPORT BOUNDARY
- EXISTING BUILDING
- EXISTING PAVEMENT
- PROPOSED EDGE OF PAVEMENT
- PROPOSED EXTENSION OPTION

Notes

1. PROPOSED TORBAY BYPASS DRAWING BY NEWFOUNDLAND AND LABRADOR DEPARTMENT OF TRANSPORTATION AND WORKS HIGHWAY DESIGN DIVISION RECIEVED FROM CLIENT JAN 02, 2007. DRAWING WAS SCALED AND ALIGNED TO BASE MAP USING THRESHOLD LOCATIONS SHOWN IN TORBAY BYPASS DRAWING.
2. PROPERTY BOUNDARY DERIVED FROM EXISTING FENCES AND IS APPROXIMATE ONLY.

Revision

No.	Description	By	Appd.	Date
0	BYPASS ROUTE REVIEW	CT	BGS	2007.01.04
1	NAV CANADA REVIEW	CT	BGS	2007.01.25
2	DRAFT CLIENT REVIEW	PA	BGS	2007.06.04
3	FINAL REPORT	PH	BGS	2007.06.22

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ST. JOHN'S INTERNATIONAL AIRPORT

RUNWAY 11-29 EXTENSION ASSESSMENT

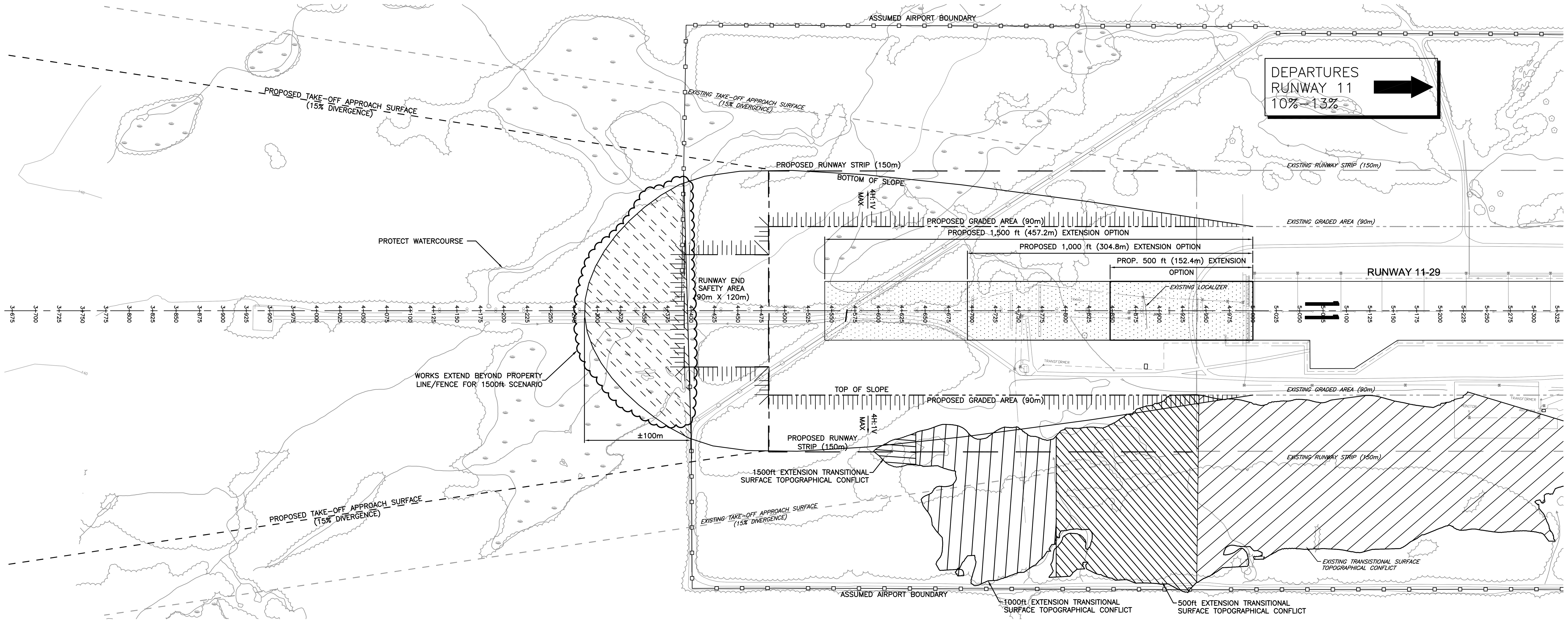
St. John's, Newfoundland & Labrador

Title

SITE PLAN

Project No.	Scale	Dwn by.
10861	1:7500	PJA

Drawing No.	Revision
SP1	3



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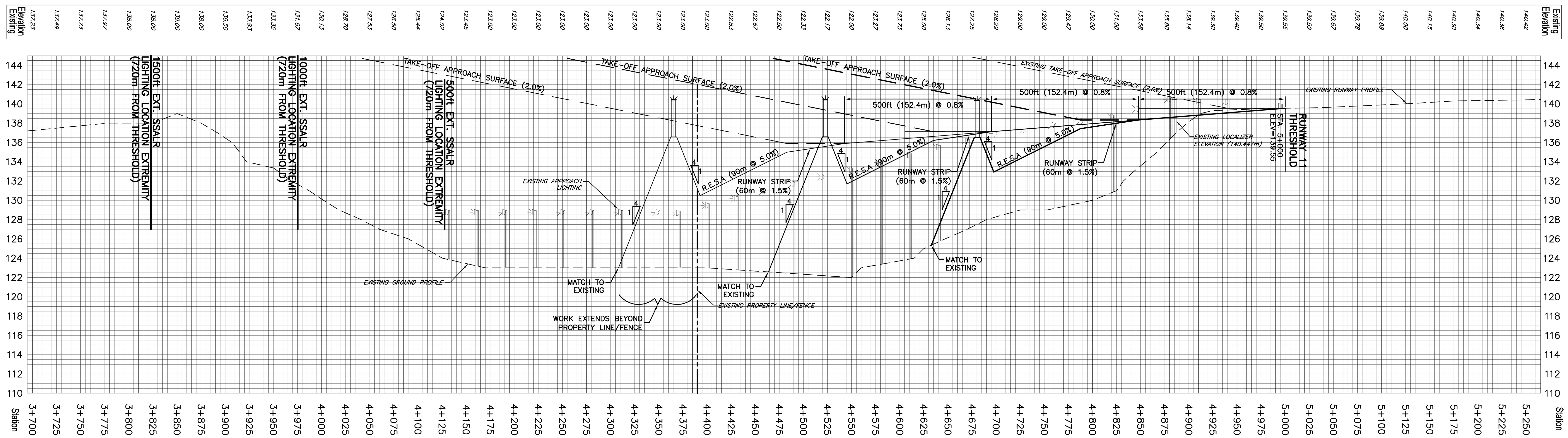

Notes

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2. PROPERTY BOUNDARY DERIVED FROM EXISTING FENCES AND IS APPROXIMATE ONLY.

LEGEND

- EXISTING TRANSITIONAL SURFACE TOPOGRAPHICAL CONFLICT
- EXTENSION 1 TRANSITIONAL SURFACE TOPOGRAPHICAL CONFLICT
- EXTENSION 2 TRANSITIONAL SURFACE TOPOGRAPHICAL CONFLICT
- EXTENSION 3 TRANSITIONAL SURFACE TOPOGRAPHICAL CONFLICT
- PROPOSED EXTENSION OPTION
- ASSUMED AIRPORT BOUNDARY
- EXISTING TAKE-OFF APPROACH SURFACE
- PROPOSED TAKE-OFF APPROACH SURFACE
- EXISTING EDGE OF PAVEMENT

Revision

No.	Description	By	Appd.	Date
0	NAV CANADA REVIEW	BGS	BGS	2001.01.25
1	FOR DRAFT CLIENT REVIEW	PJA	BGS	2007.06.04
2	FINAL REPORT	PJA	BGS	2007.06.22

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ST. JOHN'S INTERNATIONAL AIRPORT

RUNWAY 11-29 EXTENSION ASSESSMENT

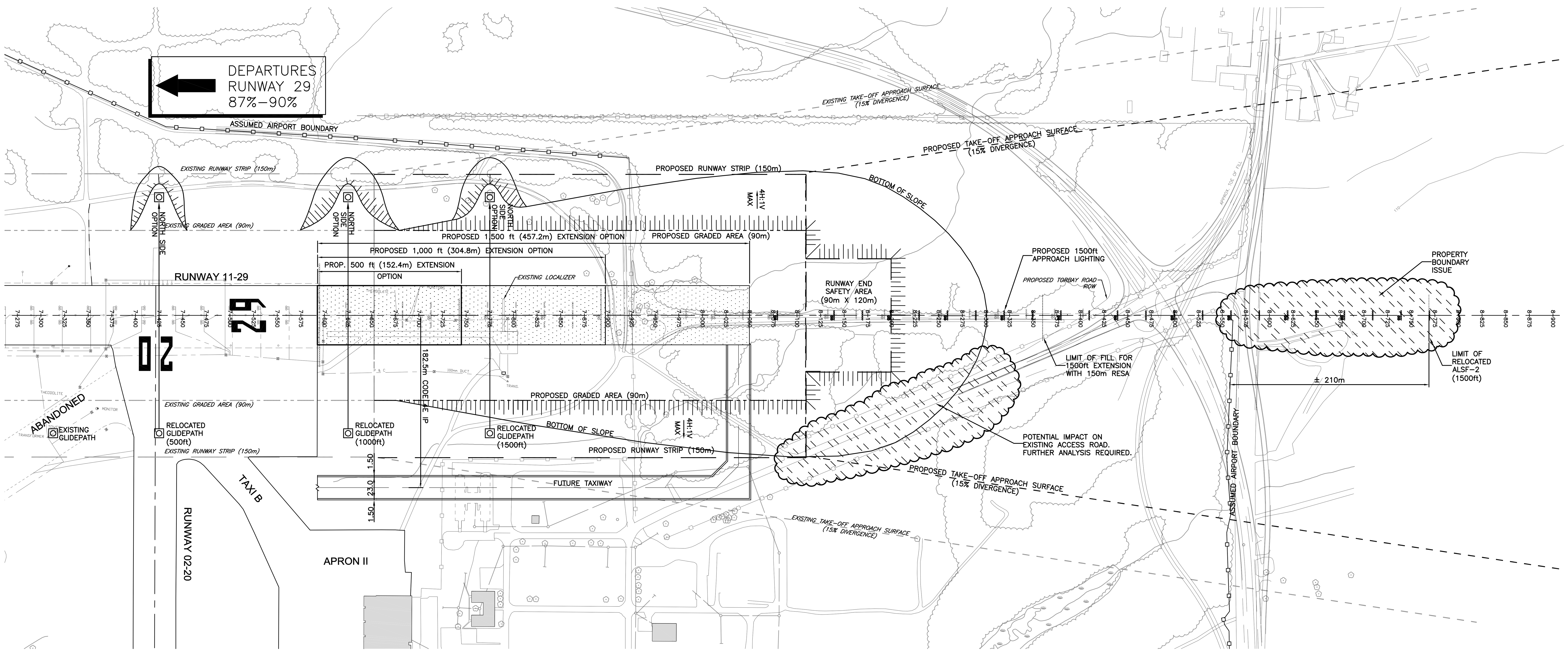
St. John's, Newfoundland & Labrador

Title

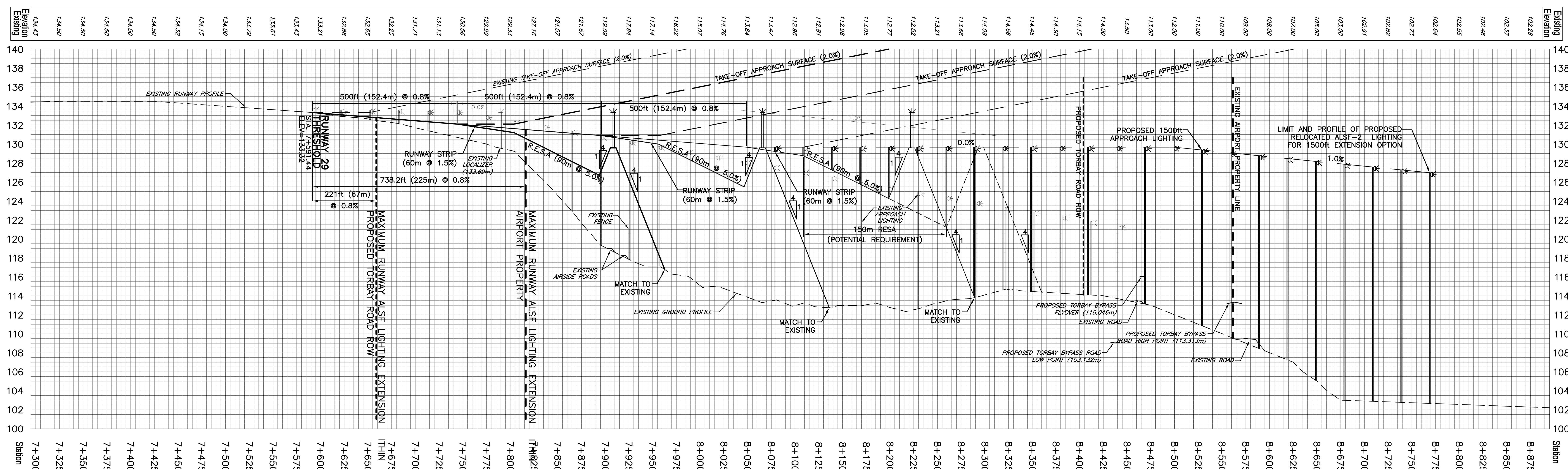
RUNWAY 11 APPROACH PLAN AND PROFILE AND TRANSITIONAL SURFACE INTERSECT.

Project No.	Scale	Dwn by.
10861	H 1:2500 v 1:250	PJA

Drawing No.	Revision
C1	2



THESE DRAWINGS TO BE REVIEWED IN CONJUNCTION WITH THE REPORT ENTITLED "ST. JOHN'S INTERNATIONAL AIRPORT RUNWAY 11-29 EXTENSION ASSESSMENT", JUNE 2007 BY PRYDE SCHROPP McCOMB, INC.



Notes

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2. PROPERTY BOUNDARY DERIVED FROM EXISTING FENCES AND IS APPROXIMATE ONLY.

LEGEND

- PROPOSED EXTENSION OPTION
- ASSUMED AIRPORT BOUNDARY
- EXISTING TAKE-OFF APPROACH SURFACE
- PROPOSED TAKE-OFF APPROACH SURFACE
- EXISTING EDGE OF PAVEMENT
- EXISTING APPROACH LIGHT
- PROPOSED APPROACH LIGHT

Revision

No.	Description	By	Appd.	Date
0	NAV CANADA REVIEW	BGS	BGS	2001.01.25
1	FOR DRAFT CLIENT REVIEW	PJA	BGS	2007.06.04
2	FINAL REPORT	PJA	BGS	2007.06.22

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ST. JOHN'S INTERNATIONAL AIRPORT

RUNWAY 11-29 EXTENSION ASSESSMENT

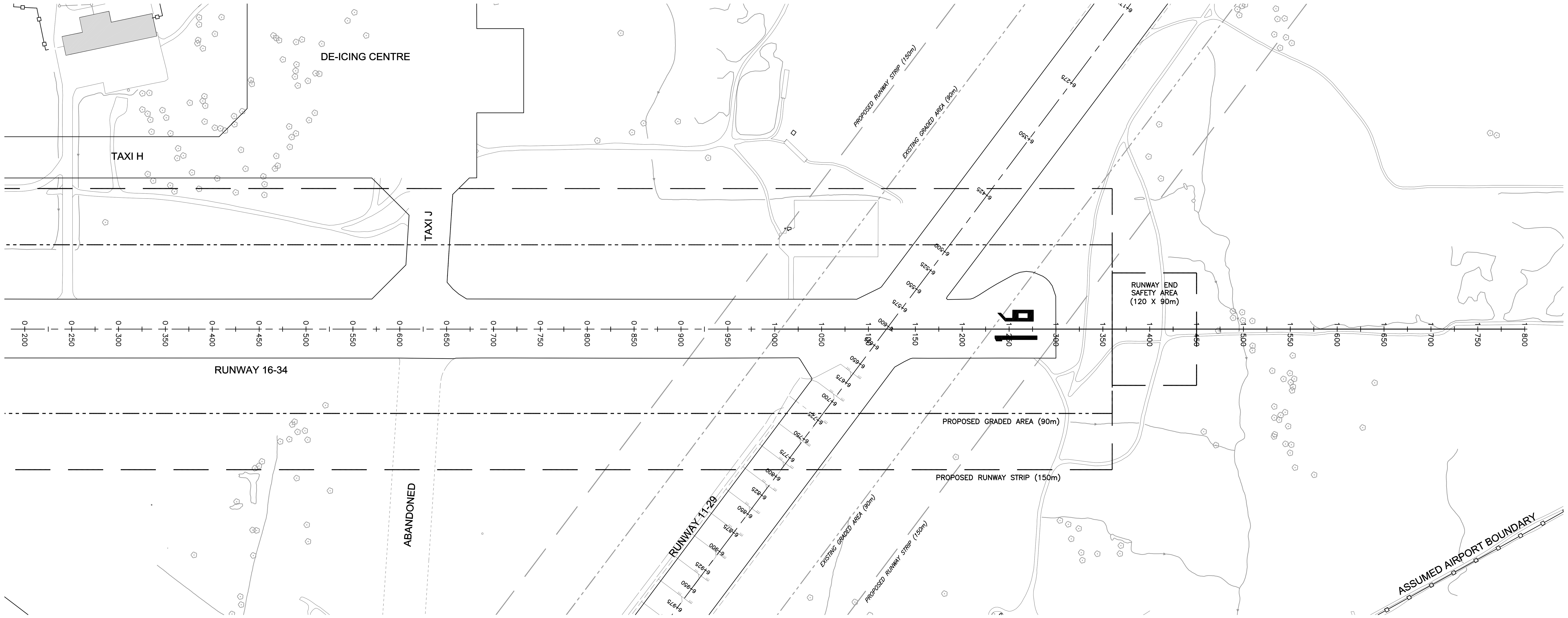
St. John's, Newfoundland & Labrador

Title

RUNWAY 29 APPROACH PLAN AND PROFILE

Project No.	Scale	Dwn by.
10861	H 1:2500 V 1:250	PJA

Drawing No.	Revision
C2	2



EXTENSION OPTION VOLUME QUANTITIES

	CUT (m^3)		FILL (m^3)		NET (m^3)	
EXT.	11	29	11	29	11	29
500 ft	11842	6385	161924	73694	150082	67309
1000 ft	11517	6533	504766	472672	493249	466139
1500 ft	11108	8328	866494	944181	855356	935853

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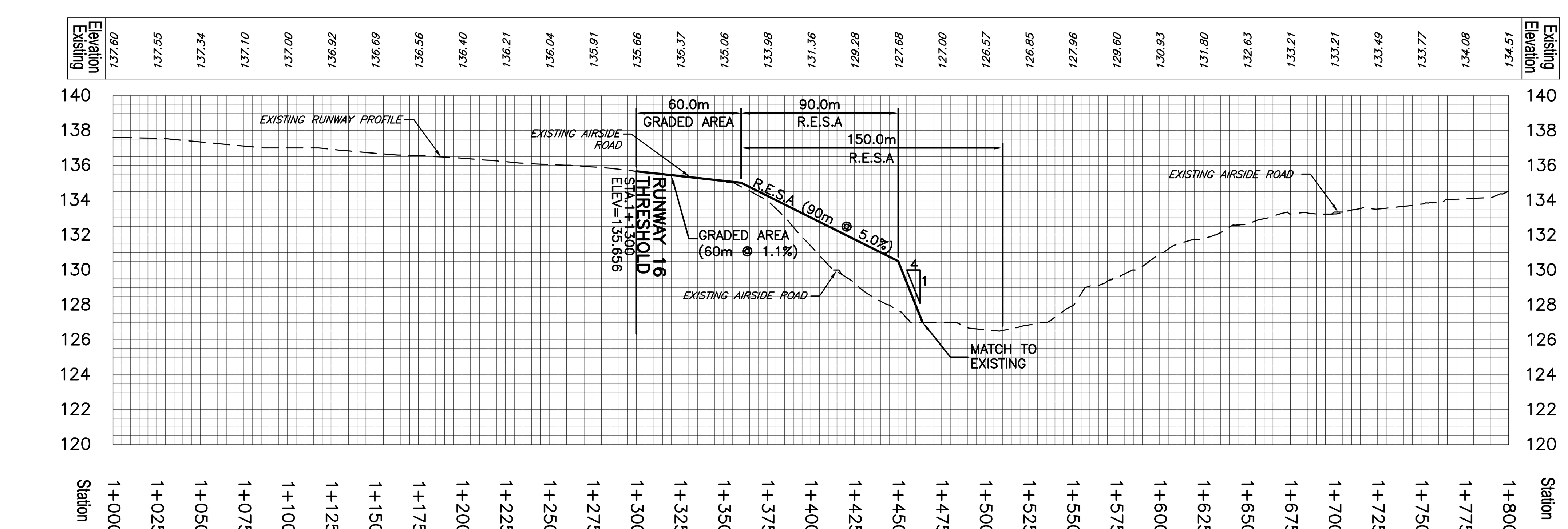

Notes

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2. PROPERTY BOUNDARY DERIVED FROM EXISTING FENCES AND IS APPROXIMATE ONLY.

LEGEND

- ASSUMED AIRPORT BOUNDARY
- EXISTING EDGE OF PAVEMENT

Revision

No.	Description	By	Appd.	Date
0	NAV CANADA REVIEW	BGS	BGS	2001.01.25
1	FOR DRAFT CLIENT REVIEW	PJA	BGS	2007.06.04
2	FINAL REPORT	PJA	BGS	2007.06.22

Seals

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Client/Project

ST. JOHN'S INTERNATIONAL AIRPORT

RUNWAY 11-29 EXTENSION ASSESSMENT

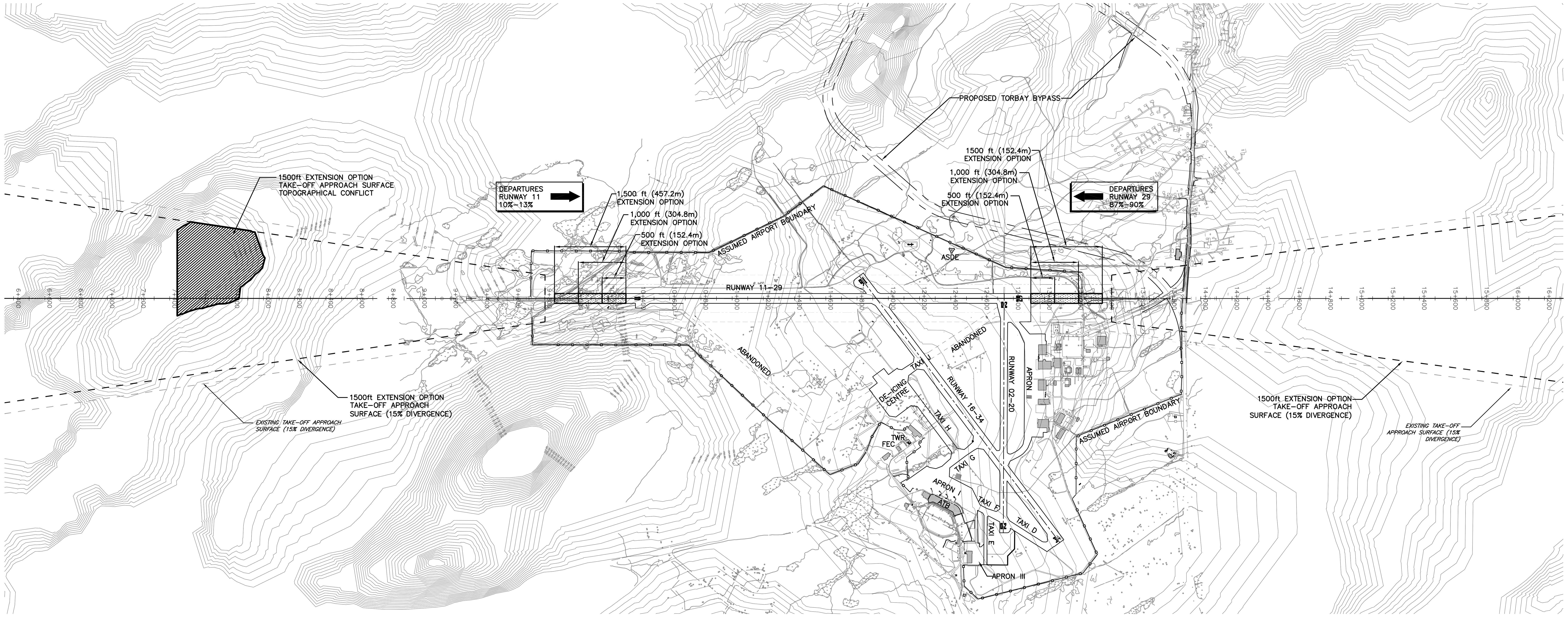
St. John's, Newfoundland & Labrador

Title

RUNWAY 16 APPROACH PLAN AND PROFILE

Project No.	Scale	Dwn by:
10861	H 1:2500 V 1:250	PJA

Drawing No.	Revision
C3	2



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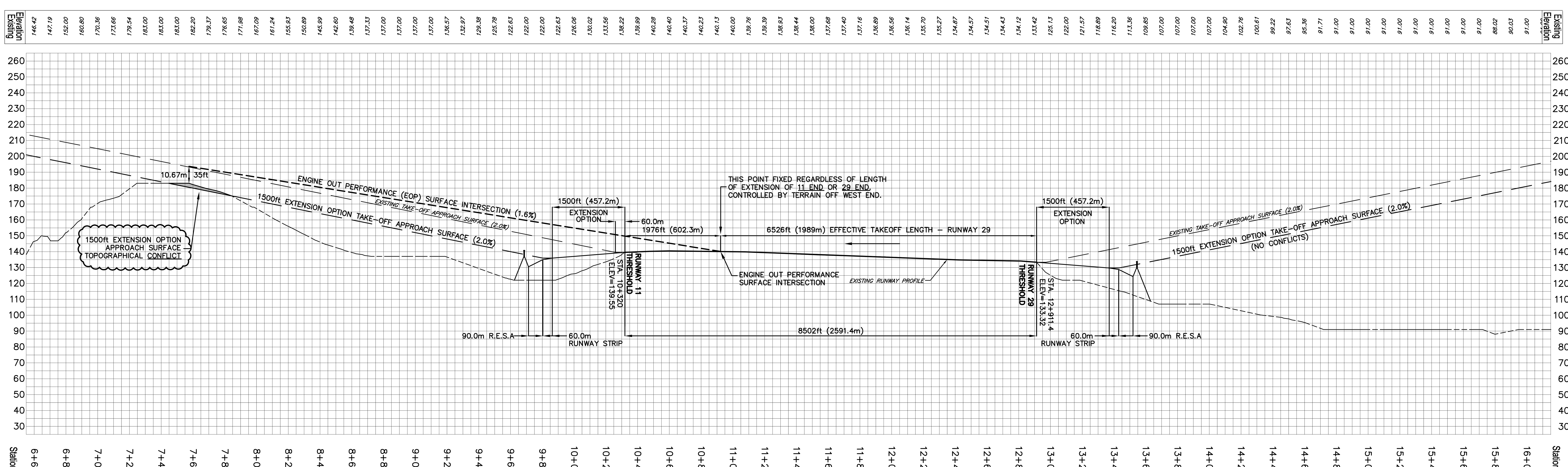

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Notes

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2. PROPERTY BOUNDARY IS APPROXIMATE ONLY.
3. STATIONING STARTS AT EXTREMITY OF 11 END TAKE-OFF APPROACH SURFACE (1+000).

LEGEND

- PROPOSED EXTENSION OPTION
- ASSUMED AIRPORT BOUNDARY
- EXISTING TAKE-OFF APPROACH SURFACE
- PROPOSED TAKE-OFF APPROACH SURFACE
- EXISTING EDGE OF PAVEMENT

Revision

No.	Description	By	Appd.	Date
0	NAV CANADA REVIEW	BGS	BGS	2001.01.25
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ST. JOHN'S INTERNATIONAL AIRPORT

RUNWAY 11-29 EXTENSION ASSESSMENT

St. John's, Newfoundland & Labrador

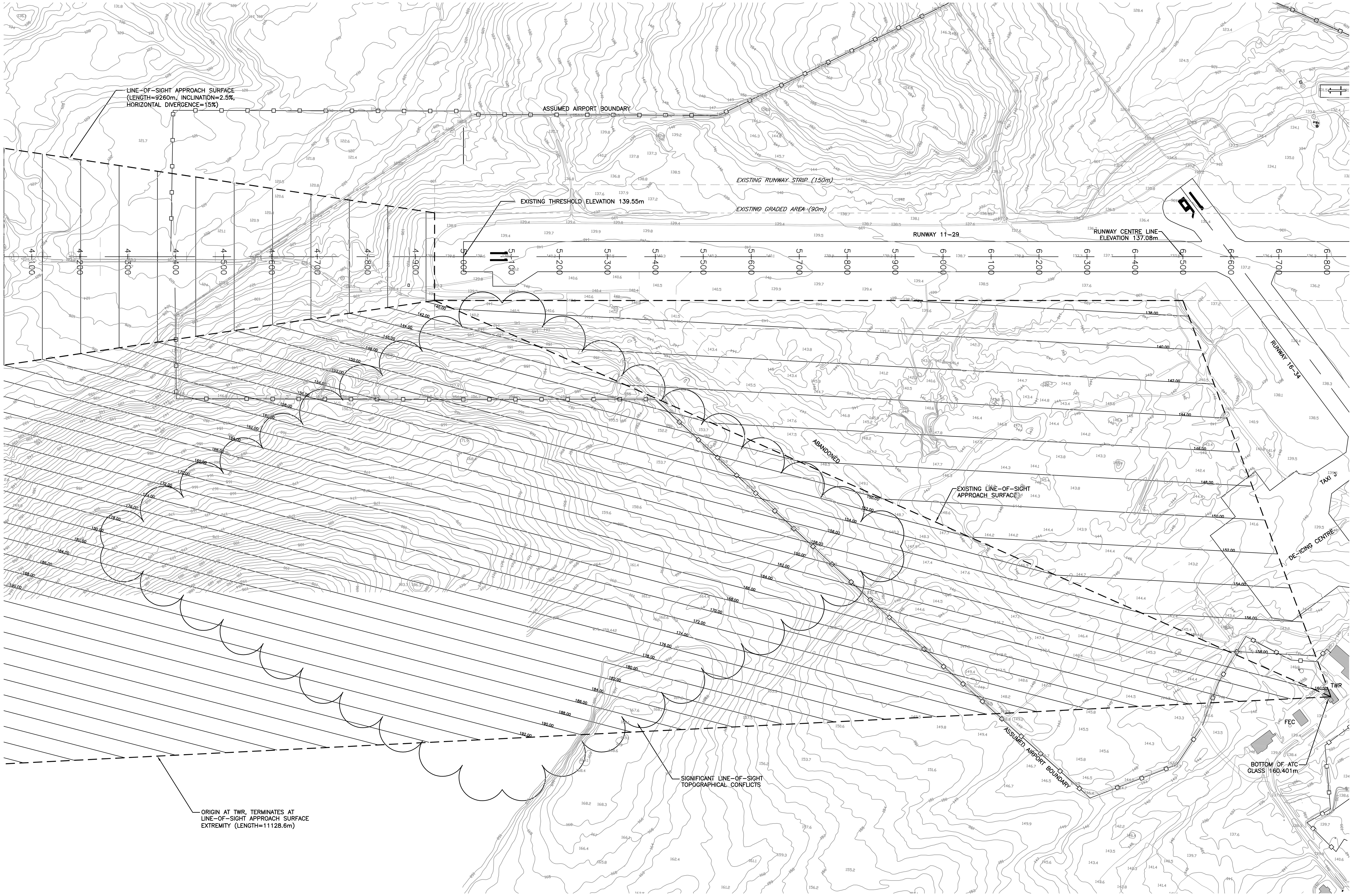
Title

RUNWAY 11-29 OVERALL PLAN AND PROFILE

Project No.	Scale	Dwn by.
10861	H 1:15000 V 1:1500	PJA

Drawing No.	Revision
C4	2

ORIGINAL SHEET - A1
2007 May 28, 9:03 a.m.



THESE DRAWINGS TO BE REVIEWED IN CONJUNCTION WITH THE REPORT ENTITLED "ST. JOHN'S INTERNATIONAL AIRPORT RUNWAY 11-29 EXTENSION ASSESSMENT", JUNE 2007 BY PRYDE SCHROPP McCOMB, INC.

Notes

1. PROPERTY BOUNDARY IS APPROXIMATE ONLY.

LEGEND

- PROPOSED EXTENSION SCENARIO
- 140.00 LINE-OF-SIGHT CONTOURS
- 140.00 EXISTING GROUND CONTOURS
- ASSUMED PROPERTY BOUNDARY
- LINE-OF-SIGHT APPROACH SURFACE

Revision

No.	Description	By	Appd.	Date
0	NAV CANADA REVIEW	BGS	BGS	2001.01.25
1	FOR DRAFT CLIENT REVIEW	PJA	BGS	2007.06.04
2	FINAL REPORT	PJA	BGS	2007.06.22

Seals

NOT FOR CONSTRUCTION

PRYDE SCHROPP McCOMB INC.
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www.psmi.ca

Client/Project

ST. JOHN'S INTERNATIONAL AIRPORT

RUNWAY 11-29 EXTENSION ASSESSMENT

St. John's, Newfoundland & Labrador

Title

LINE-OF-SIGHT CONTOURS
EXISTING RUNWAY 11-29 - 11 END

Project No.	Scale	Dwn by.
10861	H 1:4000	PJA

Drawing No.	Revision
C5	2

PRYDE SCHROPP McCOMB INC.
AVIATION GROUP

APPENDIX F
PRELIMINARY ANALYSIS OF TORBAY ROAD RE-ALIGNMENT – JANUARY 2007

1.0 PURPOSE

The following was prepared as an interim analysis to identify potential impacts of the proposed Torbay Road Re-Alignment off the eastern limits of the St. John's International Airport. In particular, the focus of the analysis was the test the runway extension off the 29 End.

1.1 ASSUMPTIONS

The following assumptions were made:

1. The full 450m (1,500 ft.) extension was considered off the 29 End.

2. TP312 RESA and ICAO RESA criteria were considered.

3. The Torbay Road elevations will closely follow the existing ground elevations.

4. The proposed runway extension will have limited opportunity for downward slope to minimize fills. The existing runway threshold elevation has been assumed for the extend runway. Results in about 18-20metres fills.

1.2 LIMITATIONS

The following limitations are noted:

1. The analysis is preliminary and not considered final in terms of our proposed scope of work.

2. No information was available showing the proposed road cross-section, elevations and lighting and signage plans.

3. The final configuration for the 29 End extension is subject to a more comprehensive total runway analysis which is currently in progress. As such, the final length of the extension off the 29 End has yet to be fully understood and analyzed.

1.3 INITIAL OBSERVATIONS

The following initial observations are noted below. Refer to the hand-sketch diagram attached for additional details.

1. Consider possible relocation of the main intersection south.

    a. Large intersection makes the CAT II approach lighting through this area impractical at 30m spacing.

2. Consider possible re-alignment of the existing internal road.

    a. Potential conflict of this road with large fill slopes for the extension and the RESAs.

3. The proposed R.O.W. is scaled at 60m. We will need a median to permit installation of an approach light barrette.

    a. SJIAA should request details on the standard cross-section for the proposed road.

4. Potential conflict with the Takeoff/Approach Surface for the extended runway with high-mast light standards.

    a. SJIAA should request details on proposed lighting for road. We have assumed 30m high mast lights.

5. Potential glare issue with lights and Nav Canada ATC.

    a. SJIAA should request details on proposed lighting for road. We have assumed 30m high mast lights.

    b. PSMI will conduct preliminary analysis but Nav Canada will need to be consulted.

6. The 300m CAT II Approach lighting Bar would remain on airport property.

7. The LOC antenna could be installed within existing property.

8. When overlaying the CAD file provided for the Torbay Road project, the coordinate systems did not match and the runway systems did not align perfectly.

    a. SJIAA should request details on the source of the base mapping of the Torbay Road project and coordinate systems.

    b. It will be very important to ensure the two projects are properly linked with coordinate systems.

9. The new road would be subject to the existing Airport Registered Zoning. The airport could rely on this for height protection enforcement but the new extension will introduce new limitations. The new limitations would need to be endorsed as part of the road project.

10. Below is our working checklist.

Criteria	29 End Extension
RESA	Checked
Fill Limits	Checked
Road Re-alignment	Checked
Light Standards	Checked
ASDE Coverage	Checked
ATC Sightlines (Nav Canada)	Checked
Nav Canada IFR Instrument Approach Procedures	Not Checked
Noise – NEF	Not Checked
Noise – Single Event	Not Checked
Electronic Navigational Aids (ILS) Impacts/Relocations	Checked
Visual Aids (Approach Lighting, CAT II, PAPI, Edgelighting)	Checked
Airfield Lighting Capacity (FEC)	Not Checked
Parallel Taxiway Configuration	Checked
Taxi Times/Operational Impacts	Not Checked
Airport Boundary	Checked
Airport Zoning Regulations	Checked
Long-Term	Not Checked

Criteria	29 End Extension
Maintenance/Operational Costs	
Aircraft Arrival Profiles (Height above surrounding lands)	Not Checked
Aircraft Departure Profiles (Height above surrounding lands)	Not Checked
Operational Impacts During Construction including facility closures, scheduling and phasing.	Not Checked
Project Costs	Not Checked

1.4 SJIAA INFORMATION REQUIREMENTS.

The following information should be forward to PSMI for further analysis:

1. CAD drawing of the official airport boundary
2. Historical Footing Design Drawings for the 29 Approach
3. Contact for Torbay Road Engineering and Planning
    a. PSMI could contact them directly for technical data requirements as outlined above including:
        i. Preliminary elevations of road
        ii. Road X-Section
        iii. Lighting System and mast heights
        iv. Coordinate System for layout of road

Bernhard Schropp, P.Eng.

January 5, 2007

PSMI No. 10861

Notes

1. AIRPORT BASE PLAN SUPPLIED BY ST. JOHN'S AIRPORT.
2. TOPOGRAPHICAL SURVEY BY AUBREY K. BURT NLS, DEC 2006.

From Client Jan 2
(By Pass)
From Client Dec 20

Revision

No.	Description	By	Appd.	Date
0	BYPASS ROUTE REVIEW	CT	EGS	2007.01.04

Seals

PRYDE SCHROPP McCOMB INC.
AVIATION GROUP

APPENDIX G
NAV CANADA COMMENTS

April 26, 2007

Your file
St. John's International Airport
Our file
07-0041

Mr. Bernhard Schropp
Pryde Schropp McComb Inc.
311 Goderich St.
Port Elgin, ON
N0H 2C0

RE: Airport Project: Runway Extension 11-29 (N47° 37' 07" W52° 45' 09") - St. John s, Nfld.

Dear Mr. Schropp,

We have evaluated the captioned proposal and NAV CANADA submitted through the NAV CANADA Land Use Submission Process. Based on the information provided, we have the following concerns and have grouped them according to the following runway extension scenarios:

Runway 11 extension of 1500':

- The ASDE (Airport Service Detection Equipment) coverage will be compromised due to the extension and existing runway slope at that end. However, the adverse impacts can be mitigated if the sloping is reduced in the vicinity of -0.4% like the current last 1000 feet at that runway end.
- Sightlines from the Tower may be impacted by the northern-most building on the apron II based on an extension greater than 800' plus 200' for the runway zone. Should this option be pursued, sightline drawings will be required.

Runway 29 extension of 1500':

- Sightlines from the Tower to the runway extension will be obscured by hills. Due to sightline requirements, this would be unacceptable unless the hills are removed.
- Runway extension would require at minimum a slope of 0% or preferably higher to ensure ASDE (Airport Service Detection Equipment) coverage, especially for small vehicles. Any downward slope in the extension would be unacceptable as surface detection will be compromised.
- For an operational stand point, aircraft taxiing to the threshold 29 would require additional time.

Common problems on any runway extension:

- Both ILS will be impacted no matter where the runway extension takes place. The topography isn't good for ILS relocation because of it sloping, which means that the localizer will need to probably be replaced at one end, where the extension will occur. Cat II will no longer be available during construction, and a recertification after the commissioning could be requested.
- In worst case, we are talking in replacing 2 full systems to meet the minimum requirements. A site selection is required to determine the location of the 2 ILS.
- All published procedures will need to be modified. This will require a 6 months time frame.

- To decrease expenses and operational impact, you may consider a single end of the runway be extended, as opposed to extending both ends.

  As the resulting construction would then be outside the critical area on one Localizer system, construction activities could be controlled to ensure that the reciprocal LOC only approach could remain in service during the construction period.

<u>Future airport expansion:</u>

- I would like to add one additional concern to the proposed new hangar northwest of the tower. The ASDE may be susceptible to reflections from buildings with certain angles. It should probably be verified that this building not be placed in such a manner as to create reflections/multipath's. I do know of at least one example where we turned a building 8 degrees to eliminate reflection.
- Plans to add a new taxiway for runway 11 were not provided. Is this an option?

The final project must provide us with the detailed survey of the new runway layout, including thresholds coordinates, thresholds elevations and elevations along the runway from threshold to threshold at 100' intervals. The survey must include the departure and final approach areas and the changes to the approach light system.

In the interest of aviation safety, it is incumbent on NAV CANADA to maintain up-to-date aeronautical publications, and issue Notices to Airmen (NOTAM) as required. To assist us in that end, we ask that you notify us at least 30 business days prior to the start of construction. This notification requirement can be satisfactorily met by returning a completed, signed copy of the attached form to us by mail, or fax at (613) 248-4094. In the event that you should decide not to proceed with this project or if the structure is dismantled, please advise us accordingly so that we may formally close the file.

If you have any questions, contact the Land Use Department by telephone at 1-866-577-0247 or e-mail at landuse@navcanada.ca

NAV CANADA's land use evaluation is valid for a period of 12 months. It neither constitutes nor replaces any approvals or permits required by Transport Canada, Industry Canada, other Federal Government departments, Provincial or Municipal land use authorities or any other agency from which approval is required.

Yours truly,

Paul W. Pinard
for
Tom Hollinger
Manager, Data Collection
Aeronautical Information Services

cc Stafford Cripps, Atlantic Region Transport Canada
Andrew Campbell, NAV CANADA, Vice President, Customer and Commercial Services
James Vey, NAV CANADA, St. John's Tower Manager
Trevor Sokolich, NAV CANADA, Manager Airport Operations, Atlantic

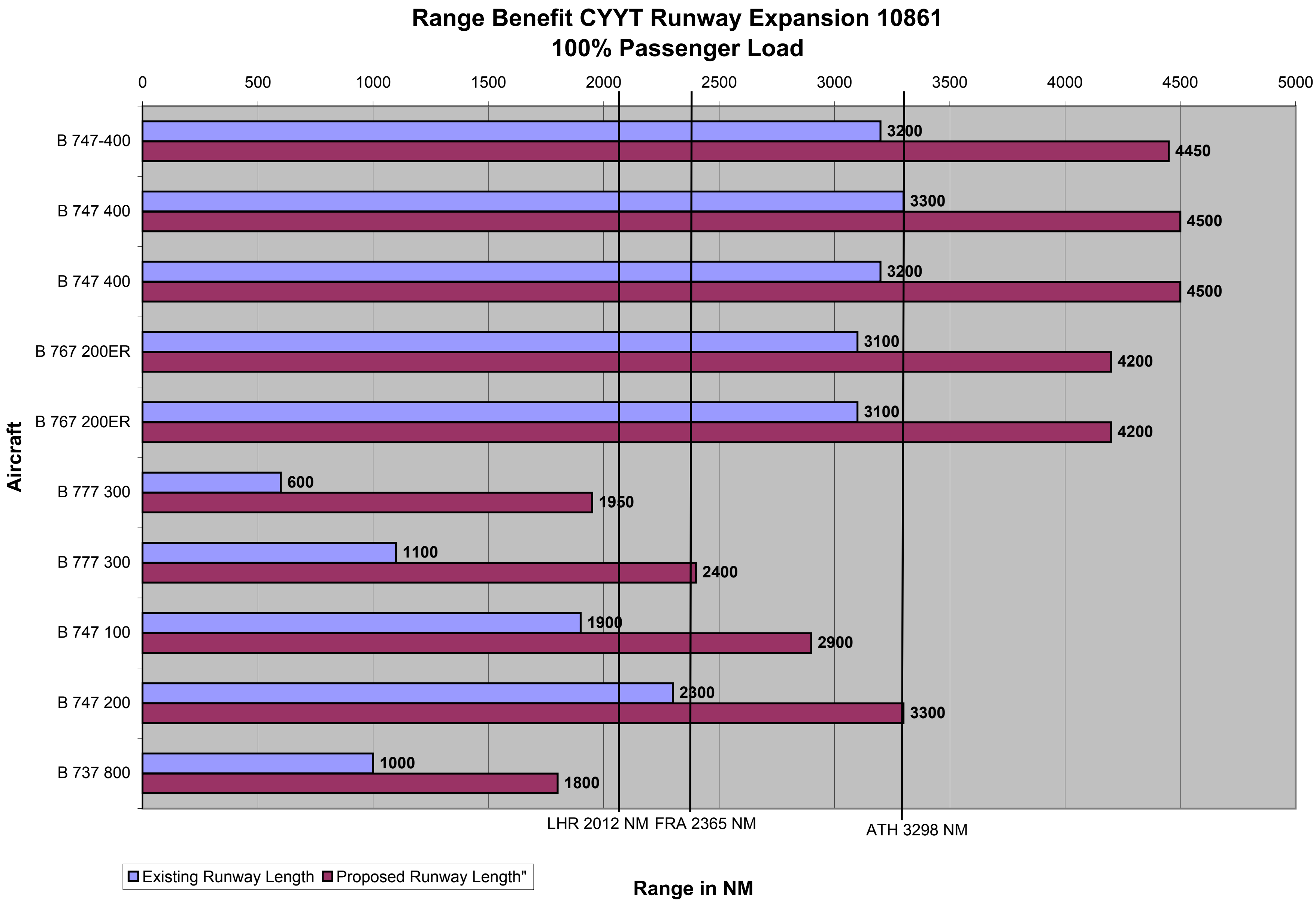
John Mundy, NAV CANADA, Chief Technical Flight Inspector
Martin Berthelot, NAV CANADA, Eastern CNS Engineer
Gerald Stuckless, NAV CANADA, Manager CNS, Gander ACC
Léon Huyberechts, NAV CANADA, AIS & Flight Inspection
Jeff MacDonald, NAV CANADA, Manager – ANS Plans and Program Coordination
Anne Demers, NAV CANADA, Special Application Radar Systems
Craig McMullen, Transport Canada, Meteorological Services of Canada – Atlantic Region

APPENDIX H
AIRCRAFT RANGE ANALYSIS

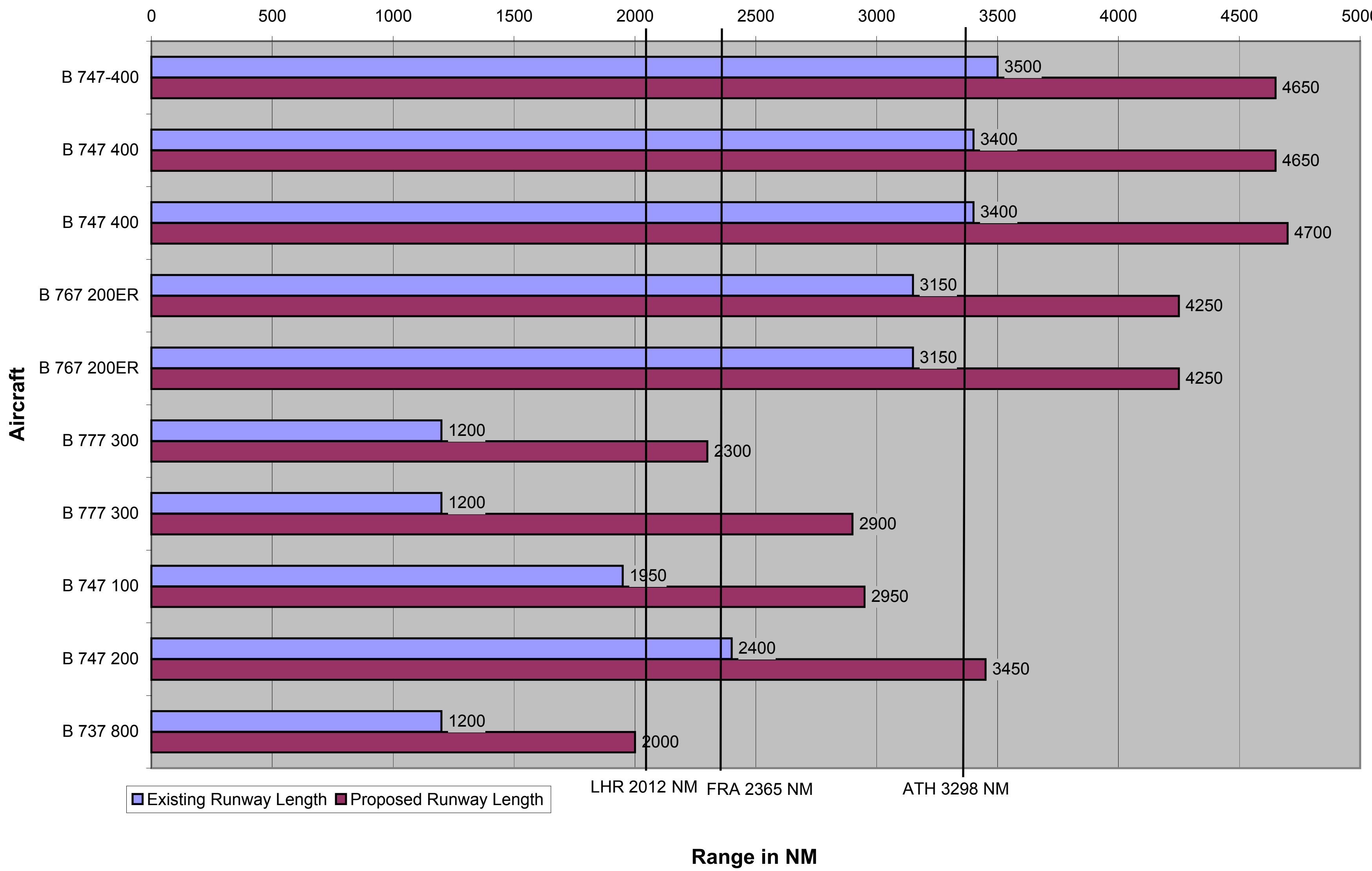
PRYDE SCHROPP McCOMB INC.
AVIATION GROUP

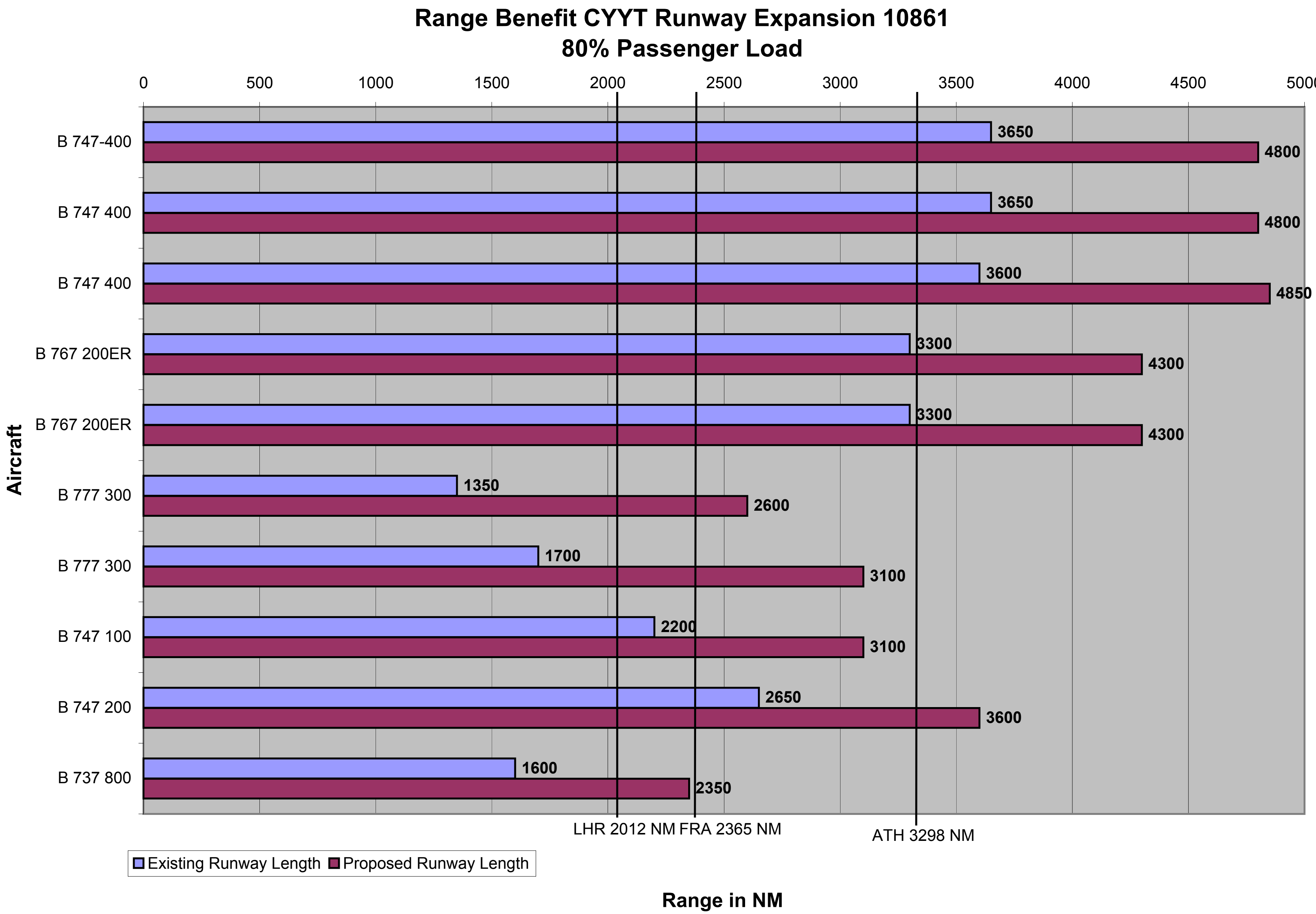
NOTES:

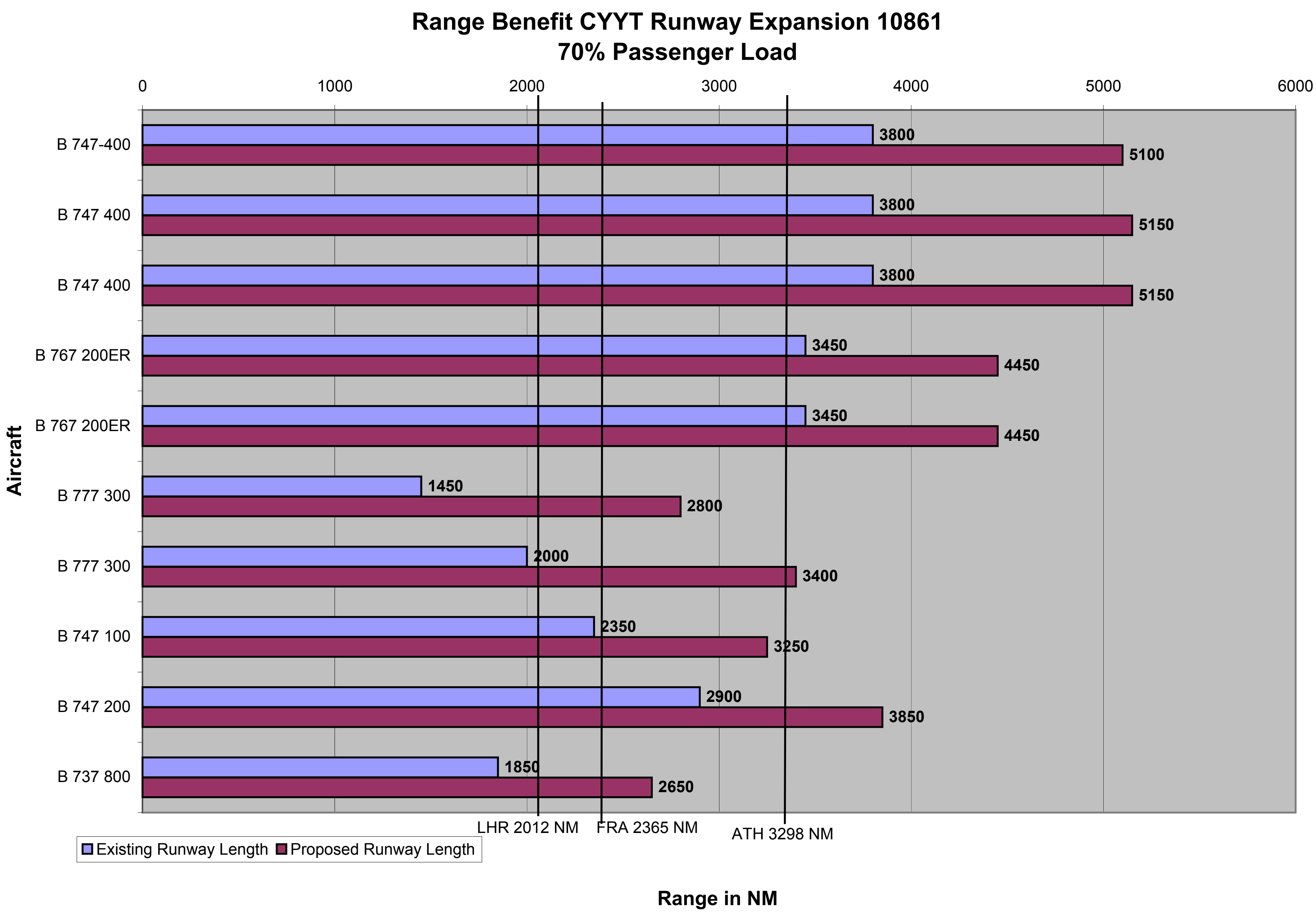
1. The analysis was completed using aircraft performance characteristics from the manufacturers planning manuals.
2. The aircraft were configured for passenger service only and do not account for cargo operations.
3. The effective takeoff runway length was based on 6526 ft. as shown in the Technical Drawing No. C4 contained in Appendix E. Off-site topographic features to the west restrict the effective takeoff length under engine out conditions. The charts refer to this as the ***Existing Runway Length***. The limiting direction is Runway 29 but it is also the predominant takeoff direction at about 85-90%.
4. The ***Proposed Runway Length*** referred to in the charts assumes a 1,500 ft. extension off the 29 End towards the east. This would increase the effective takeoff length for Runway 29 to 8,026 ft.
5. The information presented if for planning purposes only. Air Carriers have there own policies and guidelines when determining takeoff runway length requirements for their fleet and destinations. This information presented should only be used as an indicator of the potential benefits of a runway extension. It is recommended that individual airlines be consulted prior to making any final commitments.
6. Distances based on great circle distance


Range Benefit CYYT Runway Expansion 10861
100% Passenger Load
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Aircraft
B 747-400
B 747 400
B 747 400
B 767 200ER
B 767 200ER
B 777 300
B 777 300
B 747 100
B 747 200
B 737 800
3200
4450
3300
4500
3200
4500
3100
4200
3100
4200
600
1950
1100
2400
1900
2900
2300
3300
1000
1800
LHR 2012 NM
FRA 2365 NM
ATH 3298 NM
Existing Runway Length
Proposed Runway Length"
Range in NM

Range Benefit CYYT Runway Expansion 10861
90% Passenger Load




Range Benefit CYYT Runway Expansion 10861
80% Passenger Load
0
500
1000
1500
2000
2500
3000
3500
4000
4500
5000
Aircraft
B 747-400
B 747 400
B 747 400
B 767 200ER
B 767 200ER
B 777 300
B 777 300
B 747 100
B 747 200
B 737 800
3650
4800
3650
4800
3600
4850
3300
4300
3300
4300
1350
2600
1700
3100
2200
3100
2650
3600
1600
2350
LHR 2012 NM
FRA 2365 NM
ATH 3298 NM
Existing Runway Length
Proposed Runway Length
Range in NM



Range Benefit CYYT Runway Expansion 10861
70% Passenger Load
0
1000
2000
3000
4000
5000
6000
Aircraft
B 747-400
B 747 400
B 747 400
B 767 200ER
B 767 200ER
B 777 300
B 777 300
B 747 100
B 747 200
B 737 800
3800
5100
3800
5150
3800
5150
3450
4450
3450
4450
1450
2800
2000
3400
2350
3250
2900
3850
1850
2650
LHR 2012 NM
FRA 2365 NM
ATH 3298 NM
Existing Runway Length
Proposed Runway Length
Range in NM

PRYDE SCHROPP McCOMB INC.
AVIATION GROUP

APPENDIX I
CAPITAL COST ESTIMATES – CLASS ‘D’

PSMI No. 10861					**June 19 2007**
	29 END EXTENSION (457m - 1500 ft.) **PRELIMINARY DESIGN** **COST ESTIMATE CLASS "D"**				
No.	**Summary**				**Total**
CONSTRUCTION COST SUMMARY					
1	General Construction Items				$1,030,000.00
2	Runway 29 End Extension (1500 ft.) – Civil Works				$15,878,058.00
3	Runway 29 End Extension (1500 ft.) – Electrical Works				$2,274,000.00
4	**Sub-total Construction Costs**			**Sub-total**	**$19,182,058.00**
5	Engineering/Project Management/Environmental/SJIAA Costs			*15%*	**$2,877,308.70**
6	Contingency			*20%*	**$3,836,411.60**
7	**Total Estimated Project Cost (Excluding HST)**				**$25,895,778.30**
Item No.	**Class of Work Including Labour, Plant and Material**	**Unit of Measurement**	**Estimated Quantity Unit**	**Unit Price**	**Estimated Price**
GENERAL					
A	**General Construction Items**				
1	Security Allowance	CA	1	$100,000.00	$100,000.00
2	Supply, installation, adjustment, relocation and removal of taxiway and runway closure barriers and delineators and Red obstruction lights and/or reflectors, installation, handling, maintain and removal. (PCO Maintenance)	LS	1	$150,000.00	$150,000.00
3	Update Airport Zoning Reuglation (Not mandotory as part of construction but recommended)	LS	1	$200,000.00	$200,000.00
4	NAV CANADA Localizer Relocation/Recalibration	LS	1	$500,000.00	$500,000.00
5	Environmental Protection	LS	1	$80,000.00	$80,000.00
				SUBTOTAL	**$1,030,000.00**

Item No.	Class of Work Including Labour, Plant and Material	Unit of Measurement	Estimated Quantity Unit	Unit Price	Estimated Price
CIVIL WORKS					
B	**29 END EXTENSION CIVIL WORKS**				
1	Topsoil stripping	m3	45,000	$10.00	$450,000.00
2	Common Excavation and on-site disposal	m3	7,560	$10.00	$75,600.00
3	Asphalt Removal full depth (off-site disposal)	m2	300	$5.00	$1,500.00
4	Partial Depth Milling (60mm)	m2	300	$3.00	$900.00
5	Pavement Subgrade Compaction	m2	30,000	$1.50	$45,000.00
6	Borrow/Fill (Rock Fill)	m3	700,000	$10.00	$7,000,000.00
7	Rock Excavation disposal on-site (Transitional Penetrations from 11 End)	m3	250,000	$25.00	$6,250,000.00
8	Granular Base (300mm) including RESA at 150mm depth	tonne	30,888	$13.00	$401,544.00
9	Tack Coat	m2	28,701	$1.00	$28,701.00
10	HMAC Surface (125mm)	tonne	9,471	$100.00	$947,133.00
11	Supply and install new CBHM and connections	Each	8	$4,500.00	$36,000.00
12	200mm Dia. Subdrains	m	1,014	$120.00	$121,680.00
13	100mm Topsoil	m2	150,000	$1.50	$225,000.00
14	Hydraulic Seed Including Rock Excavation Area	m2	275,000	$1.00	$275,000.00
15	Pavement Line markings	LS	1	$20,000.00	$20,000.00
	SUBTOTAL CIVIL WORKS				**$15,878,058.00**
ELECTRICAL WORKS					
C	**29 END EXTENSION ELECTRICAL WORKS**				
1	Supply and install new HI Edgelighting including trenching and cabling	m	460	$200.00	$92,000.00
2	Supply and install new inset runway centreline lighting including new cables	ea	31	$6,000.00	$186,000.00
3	Supply and install new inset runway threshold lighting	ea	42	$6,000.00	$252,000.00
4	Relocate wind direction indicator	LS	1	$8,000.00	$8,000.00
5	Supply and install inset portion of CAT II lighting system including threshold	ea	161	$6,000.00	$966,000.00
6	Supply and install elevated portion of CAT II lighting system (11 Towers)	LS	1	$600,000.00	$600,000.00
7	Complete work associated with modifications to existing airfield regulators as described on the Drawings and Specifications.	LS	1	$20,000.00	$20,000.00
8	New PAPI Installation	LS	1	$150,000.00	$150,000.00
	SUBTOTAL ELECTRICAL WORKS				**$2,274,000.00**
	TOTAL CIVIL & ELECTRICAL				**$18,152,058.00**

The estimate of construction costs is provided for budgetary purposes only. This is not to be interpreted as a guarantee by Pryde Schropp McComb Inc. of the actual project cost. The final cost of the project will be determined by the tendering and construction process.

PSMI No. 10861 **June 19 2007**

11 END EXTENSION (457m - 1500 ft.)
PRELIMINARY DESIGN
COST ESTIMATE CLASS "D"

No.	Summary				Total
CONSTRUCTION COST SUMMARY					
1	General Construction Items				$1,030,000.00
2	Runway 11 End Extension (1500 ft.) – Civil Works				$15,478,558.00
3	Runway 11 End Extension (1500 ft.) – Electrical Works				$769,000.00
4	**Sub-total Construction Costs**			**Sub-total**	**$17,277,558.00**
5	Engineering/Project Management/Environmental/SJIAA Costs			*15%*	**$2,591,633.70**
6	Contingency			*20%*	**$3,455,511.60**
7	**Total Estimated Project Cost (Excluding HST)**				**$23,324,703.30**

Item No.	Class of Work Including Labour, Plant and Material	Unit of Measurement	Estimated Quantity Unit	Unit Price	Estimated Price
GENERAL					
A	**General Construction Items**				
1	Security Allowance	CA	1	$100,000.00	$100,000.00
2	Supply, installation, adjustment, relocation and removal of taxiway and runway closure barriers and delineators and Red obstruction lights and/or reflectors, installation, handling, maintain and removal. (PCO Maintenance)	LS	1	$150,000.00	$150,000.00
3	Update Airport Zoning Reuglation (Not mandotory as part of construction but recommended)	LS	1	$200,000.00	$200,000.00
4	NAV CANADA Localizer Relocation/Recalibration	LS	1	$500,000.00	$500,000.00
5	Environmental Protection	LS	1	$80,000.00	$80,000.00
				SUBTOTAL	**$1,030,000.00**

Item No.	Class of Work Including Labour, Plant and Material	Unit of Measure ment	Estimated Quantity Unit	Unit Price	Estimated Price
CIVIL WORKS					
B	**11 END EXTENSION CIVIL WORKS**				
1	Topsoil stripping	m3	52,800	$10.00	$528,000.00
2	Common Excavation and on-site disposal	m3	7,560	$10.00	$75,600.00
3	Asphalt Removal full depth (off-site disposal)	m2	300	$5.00	$1,500.00
4	Partial Depth Milling (60mm)	m2	300	$3.00	$900.00
5	Pavement Subgrade Compaction	m2	30,000	$1.50	$45,000.00
6	Borrow/Fill (Rock Fill)	m3	650,000	$10.00	$6,500,000.00
7	Rock Excavation disposal on-site (Transitional Penetrations)	m3	250,000	$25.00	$6,250,000.00
8	Granular Base (300mm) Including RESA 150mm Depth	tonne	30,888	$13.00	$401,544.00
9	Tack Coat	m2	28,701	$1.00	$28,701.00
10	HMAC Surface (125mm)	tonne	9,471	$100.00	$947,133.00
11	Supply and install new CBHM and connections	Each	8	$4,500.00	$36,000.00
12	200mm Dia. Subdrains	m	1,014	$120.00	$121,680.00
13	100mm Topsoil	m2	150,000	$1.50	$225,000.00
14	Hydraulic Seed Including Rock Excavation Area	m2	275,000	$1.00	$275,000.00
15	Fence Relocation	m	300	$75.00	$22,500.00
16	Pavement Line markings	LS	1	$20,000.00	$20,000.00
	SUBTOTAL CIVIL WORKS				**$15,478,558.00**
ELECTRICAL WORKS					
C	**11 END EXTENSION ELECTRICAL WORKS**				
1	Supply and install new HI Edgelighting including trenching and cabling	m	460	$200.00	$92,000.00
2	Supply and install new inset runway centreline lighting including new cables	ea	31	$6,000.00	$186,000.00
3	Relocate wind direction indicator	LS	1	$8,000.00	$8,000.00
4	Supply and install inset portion of CAT I lighting system including threshold	ea	66	$6,000.00	$396,000.00
5	Supply and install elevated portion of CAT I lighting system (5 RAIL)s	LS	1	$50,000.00	$50,000.00
6	Complete work associated with modifications to existing airfield regulators as described on the Drawings and Specifications.	LS	1	$20,000.00	$20,000.00
7	CAT I Lighting Brush clearing	ha	2	$8,500.00	$17,000.00
	SUBTOTAL ELECTRICAL WORKS				**$769,000.00**
				TOTAL CIVIL & ELECTRICAL	**$16,247,558.00**

The estimate of construction costs is provided for budgetary purposes only. This is not to be interpreted as a guarantee by Pryde Schropp McComb Inc. of the actual project cost. The final cost of the project will be determined by the tendering and construction process.

PSMI No. 10861					**June 19 2007**
	16 END RESA & BLAST PAD **PRELIMINARY DESIGN** **COST ESTIMATE CLASS "D"**				
No.	**Summary**				**Total**
CONSTRUCTION COST SUMMARY					
1	General Construction Items				$65,000.00
2	Runway 16 RESA&Blast Pad – Civil Works				$299,462.54
3	Runway 16 RESA&Blast Pad – Electrical Works				$34,400.00
4	**Sub-total Construction Costs**			**Sub-total**	**$398,862.54**
5	Engineering/Project Management/Environmental/SJIAA Costs			*15%*	**$59,829.38**
6	Contingency			*20%*	**$79,772.51**
7	**Total Estimated Project Cost (Excluding HST)**				**$538,464.43**
Item No.	**Class of Work Including Labour, Plant and Material**	**Unit of Measurement**	**Estimated Quantity Unit**	**Unit Price**	**Estimated Price**
GENERAL					
A	**General Construction Items**				
1	Security Allowance	CA	1	$25,000.00	$25,000.00
2	Supply, installation, adjustment, relocation and removal of taxiway and runway closure barriers and delineators and Red obstruction lights and/or reflectors, installation, handling, maintain and removal. (PCO Maintenance)	LS	1	$20,000.00	$20,000.00
3	Update Airport Zoning Reuglation (Not mandotory as part of construction but recommended)	N/A	N/A	N/A	N/A
4	Environmental Protection	LS	1	$20,000.00	$20,000.00
				SUBTOTAL	**$65,000.00**

Item No.	Class of Work Including Labour, Plant and Material	Unit of Measurement	Estimated Quantity Unit	Unit Price	Estimated Price
B	**BLAST PADS (16 End) - Civil Works**				
1	Topsoil stripping	m3	592	$10.00	$5,922.00
2	Excavation and on-site disposal	m3	592	$10.00	$5,922.00
	Pavement Subgrade Compaction	m2	2,961	$1.50	$4,441.50
4	Granular Base (250mm)	tonne	1,954	$13.00	$25,405.38
	HMAC Surface (65mm)	tonne	508	$100.00	$50,810.76
5	Catchbasins	Each	4	$4,200.00	$16,800.00
6	200mm Dia. Subdrains	m	157	$120.00	$18,840.00
7	100mm Topsoil	m2	550	$4.00	$2,198.00
8	Hydraulic Seed	m2	550	$1.00	$549.50
				SUBTOTAL	**$130,889.14**
C	**Runway 16 End RESA - Civil Works**				
1	Topsoil stripping	m3	3,240	$10.00	$32,400.00
2	Excavation and on-site disposal	m3	500	$10.00	$5,000.00
	Pavement Subgrade Compaction	m2	10,800	$1.50	$16,200.00
4	Granular Base (150mm)	tonne	4,277	$13.00	$55,598.40
7	100mm Topsoil	m2	11,875	$4.00	$47,500.00
8	Hydraulic Seed	m2	11,875	$1.00	$11,875.00
				SUBTOTAL	**$168,573.40**
	SUBTOTAL CIVIL WORKS				**$299,462.54**
ELECTRICAL WORKS					
C	**16 END ELECTRICAL WORKS (Blast Pad)**				
1	Temporarily Remove Threshold Lights and Edgelights Pullpits	LS	1	$5,000.00	$5,000.00
2	New Polyethylene cabling pullpit	ea	10	$900.00	$9,000.00
3	Concrete Encased ducts	m	80	$150.00	$12,000.00
4	Re-install Lights c/w new transformers in new pullpits in pavement	ea	8	$750.00	$6,000.00
5	New ASLC in 50mm PVC duct concrete encased	m	80	$30.00	$2,400.00
	SUBTOTAL ELECTRICAL WORKS				**$34,400.00**
	TOTAL CIVIL & ELECTRICAL				**$333,862.54**

The estimate of construction costs is provided for budgetary purposes only. This is not to be interpreted as a guarantee by Pryde Schropp McComb Inc. of the actual project cost. The final cost of the project will be determined by the tendering and construction process.

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DRAFT NOTE

St John's International Airport Air Traffic Forecast Review

PREPARED FOR
St. John's International Airport Authority

PREPARED BY
Inter*VISTAS* Consulting Inc.

March 2014

Contents

1 Introduction

In November 2010, Inter*VISTAS* Consulting Inc. (Inter*VISTAS*) produced long-term air traffic forecasts for St John's International Airport (YYT) which forecast annual passenger volumes and aircraft movements from 2010 to 2030 at 5-year intervals.[1]

In March 2014, St John's International Airport Authority commissioned Inter*VISTAS* to undertake a review of the forecasts produced in 2010 to assess their validity and any requirement for updates or revisions to the forecasts. This note summarises the findings from that review.

[1] The methodology and findings from these forecasts are documented in the report*, St. John's International Airport Air Traffic Forecasts*, produced by Inter*VISTAS* Consulting Inc., November 2010.

2 Review of the 2010 Forecasts

The review assessed a number of factors relevant to the air traffic forecasts including:

- Traffic trends at YYT since the forecasts were produced;
- The historic and forecast economic developments in the local, national, and global economy.
- The development of air service at YYT and the air service development plans of the airport authority.

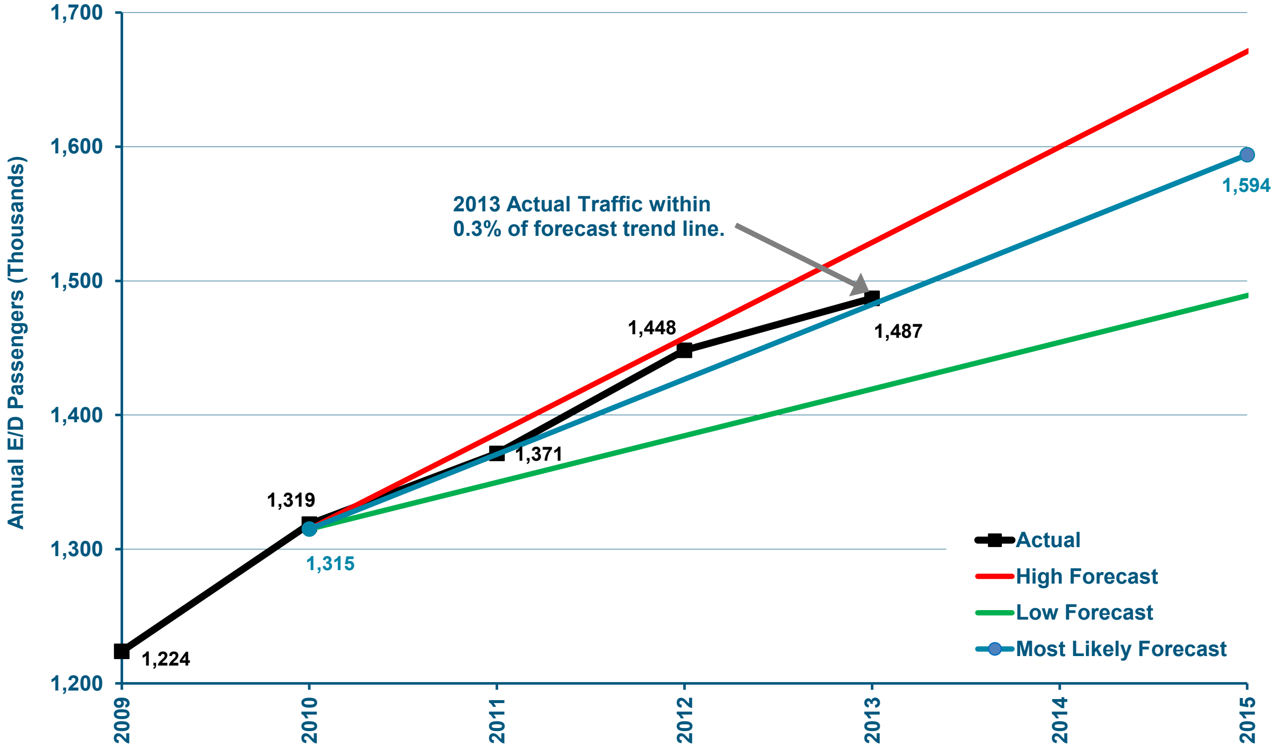
The key factors expected to impact traffic in the updated forecast are discussed in more detail in the sections below.

2.1 Traffic Trends at YYT

2.1.1 Passenger Traffic

Figure 2-1 shows total annual enplaned/deplaned (E/D) passenger traffic at YYT from 2009 to 2013 alongside the forecasts produced in 2010.

Figure 2-1: Forecast and Actual E/D Passenger Traffic at YYT, 2009-15



Source: St. John's International Airport Authority and the 2010 air traffic forecasts.

It should be noted that the forecasts were developed for long-term planning purposes and are not designed to provide accurate predictions of traffic volumes in specific years. Some years may be above the forecast trend line while others may be below it; it is the long-term trend that is important for planning purposes. Nevertheless, it is informative to compare actual traffic volumes against the forecast to ascertain whether there is evidence of an unanticipated change in traffic development.

As can be seen, actual passenger traffic volumes at YYT have closely followed the forecast trend in the Most Likely forecast. Total E/D passenger traffic in 2013 was 0.3% higher than the forecast trend line.[2]

There is also a close match in the forecasts at the sector level, as illustrated in **Figure 2-2**. Domestic, transborder, and international traffic development has closely matched the forecast trend line in the Most Likely forecast.[3]

Figure 2-2: Forecast and Actual E/D Passenger Traffic at YYT in 2013 by Sector

Sector	Actual Traffic	Most Likely Forecast Trend Line	% Difference
Domestic	1,356,650	1,350,240	+0.5%
Transborder	59,500	61,640	-3.5%
International	70,800	70,520	+0.4%
Total	**1,486,950**	**1,482,400**	**+0.3%**

Source: St. John's International Airport Authority and the 2010 air traffic forecasts.
Passenger traffic by geographic market estimated based on carrier traffic figures provided by St. John's Airport Authority and schedule data from Diio Database.

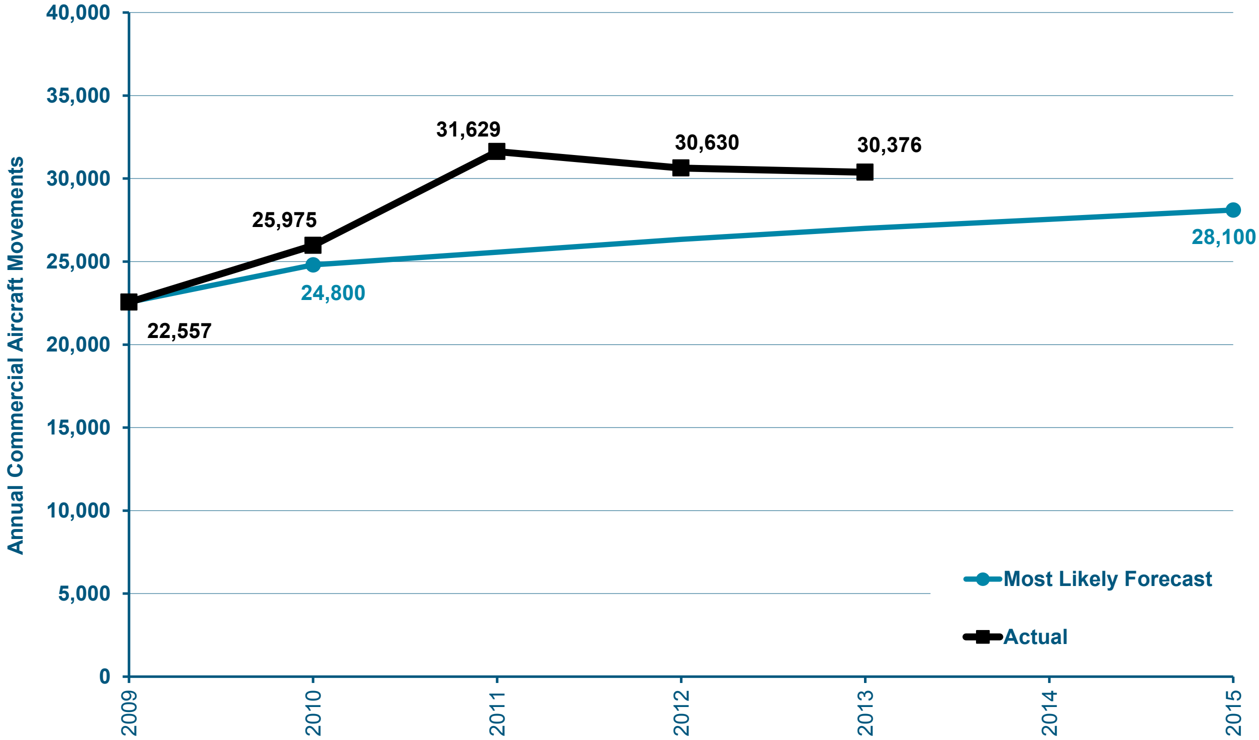
[2] The forecast trend line is the straight-line interpolation between the 2010 and 2015 forecasts provided in the 2010 forecast report.

[3] The complete Most Likely passenger forecast is provided in Appendix B.

2.1.2 Aircraft Movements

Figure 2-3 shows actual and forecast commercial passenger aircraft movements (Level I-III) at YYT. As can be seen, growth in aircraft movements significantly exceeded the forecast in 2010 and 2011, but has declined in 2012 and 2013. Nevertheless, actual movements in 2013 were 12% above the Most Likely forecast trend line.

Figure 2-3: Forecast and Actual Commercial Passenger Aircraft Movements (Level I-III) at YYT, 2009-15



Source: Source: Statistics Canada, Aircraft Movement Statistics: NAV CANADA Towers and Flight Service Stations (TP 141 and TP 577).

One of the contributors to the increase in movements in 2010 was the start of service by Porter Airlines in late 2009, although this was factored into the 2010 forecasts. The other major contributor was a surge in operations by Air Canada Jazz starting in 2010, which was not anticipated in the forecasts. Much of the increased Jazz operations were due to a re-balancing of capacity between mainline Air Canada and Jazz, whereby Air Canada's overall domestic seat capacity at YYT increased slightly but more of it was operated by Air Canada Jazz. Due to the smaller aircraft operated by Jazz, this resulted in an increase in aircraft movements.

The fact that passenger volumes are close to forecast, while aircraft movements are above forecasts, means that the average aircraft size (passengers per movement) has declined to an extent not anticipated in the 2010 forecasts, due in large part to the increased Air Canada Jazz operations.

2.2 Economic Developments

This section provides a brief update of recent provincial and regional economic developments.

2.2.1 Gross Domestic Product

Figure 2-1 shows real (inflation adjusted) GDP growth rates for Newfoundland and Labrador and Canada. Looking at the last three years, provincial GDP grew beyond the national level in 2010 and 2011 but then dropped significantly by -4.4% in 2012, due in large part to reduced production and capital spending by the oil and gas industry. By comparison, national GDP increased by 1.7% in 2012. Historically, GDP growth rates for Newfoundland and Labrador have been strongly affected by activity levels in the oil and gas industry. The mining and oil extraction industry is the largest contributor to provincial GDP, accounting for 30% of Newfoundland and Labrador's total GDP in 2012 (up from 26% in 2009).[4]

According to Newfoundland and Labrador's Department of Finance, the province's GDP is estimated to have grown again in 2013 by an estimated 5.8% in real terms due to high levels of investment, consumption, and exports.[5]

Based on forecasts by commercial banks, the Canadian economy is forecast to grow at between 2.2% and 2.7% per annum over the next 2-4 years, while Newfoundland and Labrador is forecast to grow at 1.5% to 2.0% per annum (see **Appendix A**). Longer term (5-20 years ahead), Canadian GDP is projected to grow at around 2.0-2.5% per annum in real terms (sources accessed: *IMF World Economic Outlook 2013* and *IHS Global Insight World Economic Outlook 2014*). These updated economic projections are in line with the projections utilised in the 2010 air traffic forecasts.

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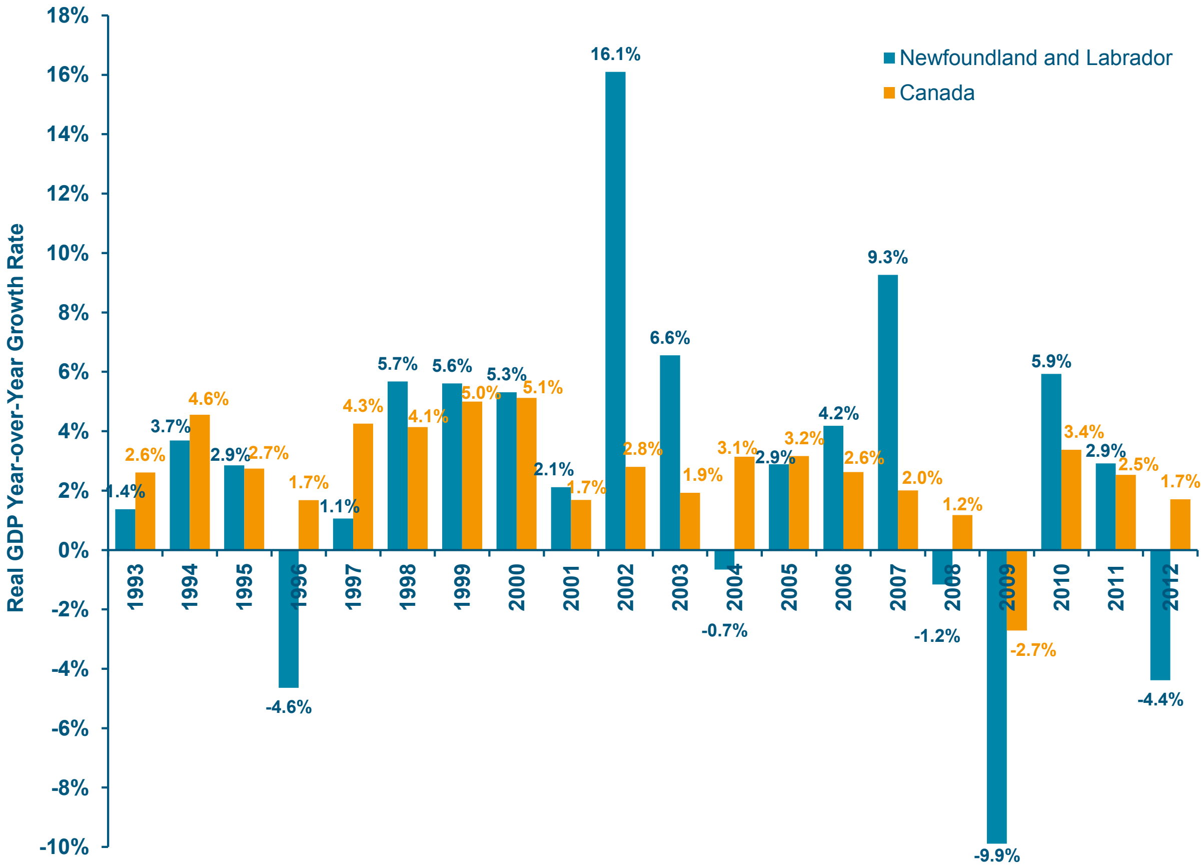
[4] Source: Statistics Canada. Table 379-0030 - Provincial Economic Accounts.

[5] Economic Research & Analysis Division, Department of Finance.

Figure 2-4: Newfoundland and Labrador and Canada Real Annual GDP Growth Rates, 1993-2012



Source: Statistics Canada Table 384-0038 - Gross domestic product, expenditure-based, provincial and territorial.

2.2.2 Oil and Gas Industry

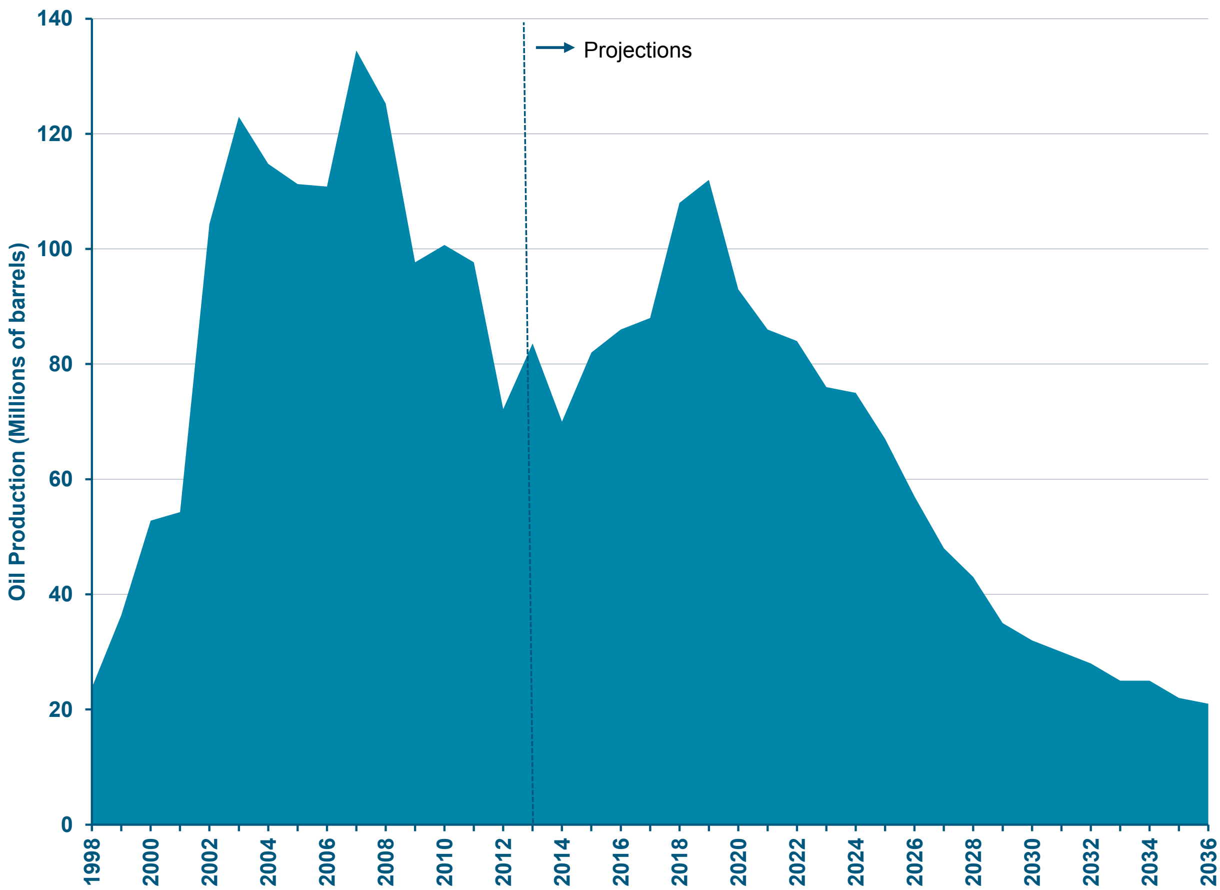
Figure 2-5 shows offshore oil production for Newfoundland and Labrador. In line with GDP growth, oil production in the province experienced a decline in 2012 (-26% compared to 2011). However, oil production picked up again in 2013 — 84 Million barrels of oil were produced in Newfoundland and Labrador. Overall, oil production is predicted to increase in the short term and then to decline over the long term. However, oil production is projected to be quite a bit higher than previously predicted. For example, in 2010 it was predicted that about 20 Million barrels of oil will be produced in 2030, the updated forecast expects about 32 Million barrel of oil by 2030. Furthermore, a number of major oil and gas projects are expected to boost the local economy:

- Hebron Offshore Oil Development – main operator ExxonMobil ($14 Billion);
- Hibernia Southern Extension Unit – operated by ExxonMobil ($1.7 Billion);

- White Rose Expansion – operated by Husky Energy ($1.2 Billion);
- Terra Nova – operated by Suncor ($0.3 Billion).[6]

Even as oil production declines, it is anticipated that activity levels associated with the oil and gas industry will remain elevated, due to activities associated with well decommissioning and the potential for the further development of natural gas.

Figure 2-5: Newfoundland and Labrador Oil Production, 1997-2036



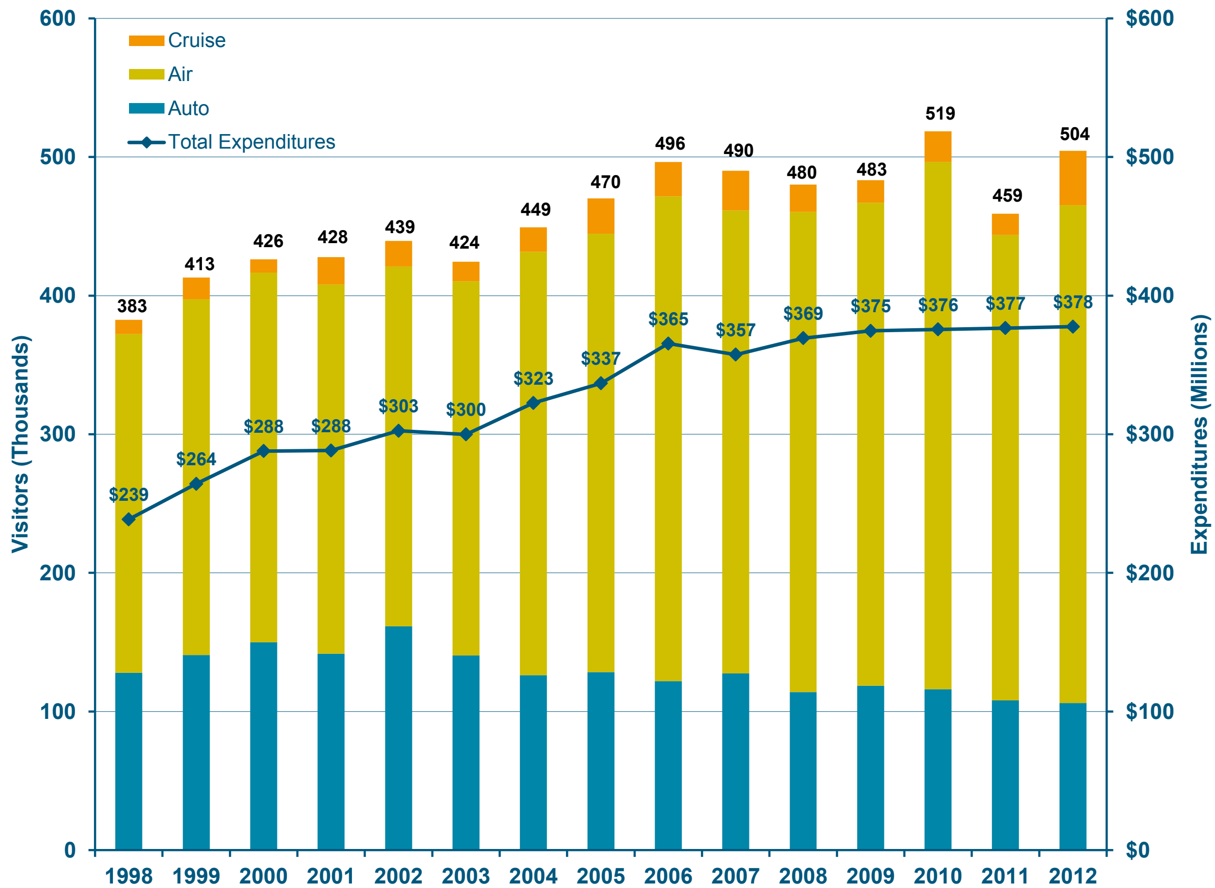
Source: 1998-2013: Economics and Statistics Branch (Newfoundland & Labrador Statistics Agency); 2014-2036: Estimates from St. John's State of the Economy.

[6] Source: St. John's State of the Economy.

2.2.3 Tourism

Figure 2-6 shows non-resident visitors to Newfoundland and Labrador and visitor expenditures. In 2012, a total of 504,000 non-resident visitors came to the province spending $378 Million. This represents an increase of almost 10% in terms of total visitors and an increase of 7.6% in terms of expenditures compared to the previous year 2011. In 2012, 71% of all non-resident visitors arrived by air, 21% by car, and 8% by cruise ship.

Figure 2-6: Historical Non-Resident Visitors to Newfoundland and Labrador by Mode and Total Visitor Expenditures, 1998-2012



Source: Tourism Statistics, Department of Tourism, Culture and Recreation.
Note: Due to a change in methodology and the implementation of the 2011 Exit Survey Program, there is a break in the historical series (from 2011 onwards)

2.3 Air Service Development

One of the inputs to the 2010 air traffic forecasts was an air service scenario based on an air service development strategy developed for YYT by Inter*VISTAS* in a separate study. This scenario considered the possible growth in existing services and the development of new routes likely to occur over the next 5-10 years for the domestic, transborder, and international sectors.

The assumptions and the projected routes in the 2010 scenario were re-examined to determine whether changes are required in light of the current outlook, and particularly the European air service development strategy being developed for YYT by Inter*VISTAS*.

While the outlook for air service development in the domestic and transborder sectors was assessed to be largely unchanged, it was viewed that there was a case for adjusting the outlook for international air services.

Air Canada's success on the YYT-LHR route and the subsequent growth in capacity has contributed to increased international passenger traffic in recent years. Additionally, the start of WestJet's service to Dublin in 2014 is expected to result in considerable international passenger traffic, even allowing for the fact some passengers may be transiting YYT on the way to/from Toronto.[7] WestJet has also indicated that it may consider using YYT as a hub for additional services to Europe:

> "*Chris Avery, WestJet vice-president of network planning, alliances, and corporate development, said the airline is looking at four or five other European cities as possible destinations and potentially developing St. John's into an East Coast hub for connections to Europe*." Financial Post, November 15, 2013.[8]

Furthermore, Inter*VISTAS*' air service development analysis has identified a number of other European destinations for potential new service, such as Paris, Aberdeen, Oslo, and Reykjavik. These could be operated by Air Canada, WestJet, and/or new entrant carriers.

Therefore, it was decided to increase the forecasts for international traffic to reflect the new Dublin service and the positive outlook for additional international services at YYT. Details of the revised forecast are provided in **Chapter 3**.

---

[7] WestJet will operate daily service to/from Dublin from June 15, 2014 to October 5, 2014. The service will continue onwards to/from Toronto.

[8] http://business.financialpost.com/2013/11/15/westjet-airlines-ltd-announces-first-solo-flights-to-europe/

3 Conclusions and Update to the Forecast

Based on the review described in Chapter 2, the adjustments to the forecasts are provided in the section below.

3.1 Air Passengers

The review of passenger traffic found that:

- Traffic over the last three years was closely in line with the air traffic forecasts produced in 2010. The forecasts anticipated fairly strong passenger growth, particularly in the transborder and international sectors, and this growth has been realised.
- The long term economic outlook in Newfoundland and Labrador and Canada is fundamentally unchanged from 2010.
- Based on the new WestJet service and recent air service development research, there is the potential for higher growth in international passenger traffic, particularly in the short to medium term, than previously forecast in the Most Likely forecast.

Therefore, the forecasts for international passenger traffic have been increased upwards to reflect this greater potential for international service development. In addition, the domestic forecasts have been upgraded marginally to reflect the fact that domestic traffic growth has been slightly higher than forecast and that the new international services increase the opportunity for passengers to connect at YYT between domestic and international services.

The updated Most Likely forecasts for YYT are provided in **Figure 3-1**. The forecast for transborder passengers is unchanged (the 2010 forecasts are provide in Appendix B). The forecast for international passengers has been increased by as much as 26,000 E/D passengers relative to the 2010 forecasts, and the domestic forecasts have been increased by as much as 18,000 E/D passengers. These changes have a modest impact on total forecast passengers, which is 2.3% higher in 2020 compared with the original forecasts (in other years the percentage difference is smaller). The changes are relatively small because the original forecasts incorporated many of the traffic developments that have taken place.

Figure 3-1: Updated Forecasts of E/D Passengers at YYT by Market (Most Likely Forecast)

Year	Domestic	Transborder	International	Total
2010	1,234,793	35,520	48,400	1,318,713
2015	1,438,000	79,800	104,200	1,622,000
2020	1,607,600	136,900	155,500	1,900,000
2025	1,780,200	176,400	195,400	2,152,000
2030	1,953,400	204,500	227,100	2,385,000
Forecast Annual Growth Rates				
2010-2015	3.1%	17.6%	16.6%	4.1%
2015-2020	2.3%	11.4%	8.3%	3.2%
2020-2025	2.1%	5.2%	4.7%	2.5%
2025-2030	1.9%	3.0%	3.1%	2.1%
2010-2030	2.3%	9.1%	8.0%	3.0%

3.2 Aircraft Movements

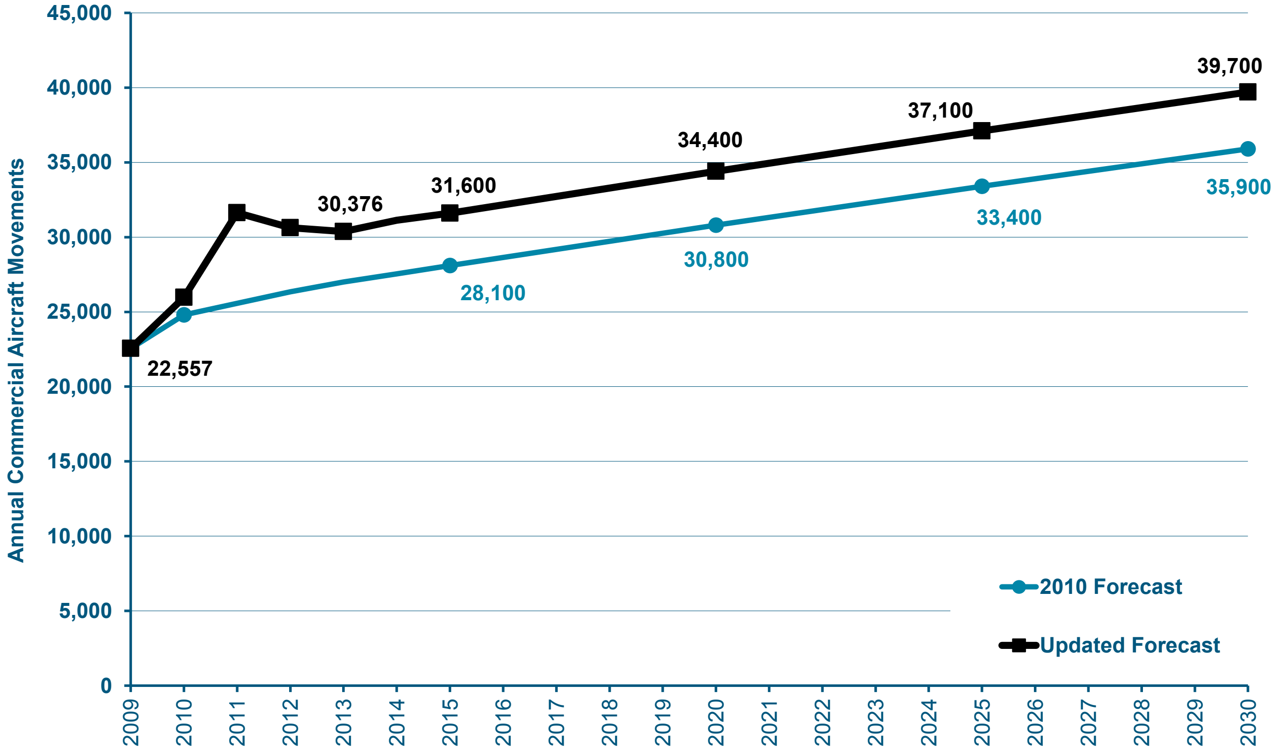
As described in Section 2.1.2, commercial passenger aircraft movements are higher than forecast due in large part to Air Canada shifting capacity between its mainline and Jazz operations. Schedule data for 2014 indicates that Air Canada will shift yet more capacity to the Jazz operations, resulting in a greater number of aircraft operations providing roughly the same seat capacity as 2013. Combined with increased operations by WestJet, commercial aircraft operations are expected to increase in 2014.

This capacity shifting is a one-off event and is expected to end once the carrier re-balances its operations. Longer term, commercial passenger aircraft movements are projected to grow in line with passenger traffic, but at a slower rate as the average aircraft size increases. The updated forecasts of commercial passenger aircraft are provided in **Figures 3-2** and **3-3**.

Figure 3-2: Updated Forecasts of Commercial Passenger Aircraft (Level I-III) at YYT (Most Likely Forecast)

Year	Total Movements
2010	25,975
2013	30,376
2015	31,600
2020	34,400
2025	37,200
2030	39,700
Forecast Annual Growth Rates	
2010-15	4.0%
2015-20	1.8%
2020-25	1.5%
2025-30	1.4%
2010-2030	2.1%

Figure 3-3: Original and Updated Forecasts of Commercial Passenger Aircraft (Level I-III) at YYT (Most Likely Forecast)



Appendix A: Real GDP Forecasts

Canada

Year	RBC	IMF Economic Outlook	Bank of Montreal	CIBC	TD Bank
	December 2013	October 2013	March 2014	February 2014	January 2014
2013	1.7%	1.6%	2.0%	1.8%	1.7%
2014	2.6%	2.2%	2.3%	2.3%	2.3%
2015	2.7%	2.4%	2.5%	2.3%	2.4%
2016		2.5%			
2017		2.4%			

Newfoundland and Labrador

Year	RBC	Bank of Montreal	CIBC	TD Bank
	December 2013	March 2014	October 2013	January 2014
2013	6.0%	5.5%	5.5%	5.1%
2014	1.5%	1.5%	1.5%	1.5%
2015	1.7%	2.0%		1.5%
2016				
2017				

Appendix B: Summary of the Air Traffic Forecasts Produced in 2010

Forecasts of E/D Passengers at YYT by Market (Most Likely Forecast)

Year	Domestic	Transborder	International	Total
2009 (Actual)	1,161,515	35,407	27,022	1,223,944
2010	1,233,600	34,400	46,700	1,314,700
2015	1,428,000	79,800	86,200	1,594,000
2020	1,589,600	136,900	130,500	1,857,000
2025	1,761,200	176,400	175,400	2,113,000
2030	1,938,400	204,500	208,100	2,351,000
Forecast Annual Growth Rates				
2009-2010	6.2%	-2.8%	72.8%	37.4%
2010-2015	3.0%	18.3%	13.0%	3.9%
2015-2020	2.2%	11.4%	8.6%	3.1%
2020-2025	2.1%	5.2%	6.1%	2.6%
2025-2030	1.9%	3.0%	3.5%	2.2%
2010-2030	2.3%	9.3%	7.8%	2.9%

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Forecasts of Commercial Passenger Aircraft (Level I-III) at YYT (Most Likely Forecast)

Year	Most Likely
2009 (Actual)	22,522
2010	24,800
2015	28,100
2020	30,800
2025	33,400
2030	35,900
Forecast Annual Growth Rates	
2009-10	10.1%
2010-15	2.5%
2015-20	1.9%
2020-25	1.6%
2025-30	1.5%
2010-2030	1.9%

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ST JOHN'S INTERNATIONAL AIRPORT

Air Traffic Forecasts

Draft Report

strategic
transportation
& tourism
solutions

Prepared for
St. John's International Airport Authority

Prepared by
Inter*VISTAS* Consulting Inc.

19 November 2010

Table of Contents

Glossary of Terms

Average Aircraft Size (AAS): The average number of seats per aircraft flown.

CNLOPB: Canada-Newfoundland and Labrador Offshore Petroleum Board.

CMA: Census Metropolitan Area

Enplaned/Deplaned Passenger (E/D Passenger): A market passenger that enplanes or deplanes an aircraft. In market, a passenger is counted only once as long as he/she remains on the same flight number. The U.S. Bureau of Transportation Statistics generally uses market data for passenger totals.

Federal Aviation Administration (FAA): Agency responsible for regulating and overseeing civil aviation in the United States.

Gross Domestic Product (GDP): A measure of the money value of final goods and services produced as a result of economic activity in the nation. This measure is net of the value of intermediate goods and services used up to produce the final goods and services.

International Monetary Fund (IMF): International organization that oversees the global financial system.

Official Airline Guide (OAG): A global flight information and data solutions company, known for its airline schedules database.

Movements: in the context of aircraft operations, movements refers to the landings and take-offs of aircraft.

Origin/Destination Passenger (O/D passenger): A passenger that begins or ends his/her trip in a particular market. O/D traffic ignores connections made by passengers.

Real Gross Domestic Product (Real GDP): Nominal (current year) GDP (see above) adjusted for inflation to account for price level changes. Real GDP allows for a fair comparison of production levels across time periods.

RJ: Regional Jet.

1. Introduction

1.1 Background

St John’s International Airport (YYT) is located approximately 6kms from the city centre of St John’s, the provincial capital of Newfoundland and Labrador. The airport is largest in the province, in terms of passenger volumes, handling over 1.2 million passengers in 2009. The airport has scheduled services to points in Canada, the U.S., to St. Pierre (a dependent territory of France), seasonal service to London (UK), and charter services to sunspots in Mexico and the Caribbean.

As an input to it strategic and master planning process, St. John's International Airport Authority has commissioned Inter*VISTAS* Consulting Inc. (Inter*VISTAS*) to produce air traffic forecasts for the airport.

1.2 Project Scope

In regards to the air traffic forecast deliverables, the following core outputs are provided in this report:

- Unconstrained forecasts of annual passenger for the period up to 2030 with annual (calendar year) forecasts for the following years: 2010, 2015, 2020, 2025 and 2030.
- In addition, the passenger forecasts are broken down into domestic and international markets.
- Unconstrained forecasts of annual commercial passenger aircraft movements for the forecast period up to 2030.
- Unconstrained annual air cargo forecasts for the period up to 2030.

1.3 Report Structure

This report presents the air traffic forecasts produced by Inter*VISTAS*, as well as documentation of the methodology and assumptions underlying the forecasts.

The report is structured as follows:

- Chapter 2 describes the current and historical aviation activity at the airport and background on the local economy.
- Chapter 3 presents the air traffic forecast methodology and assumptions.
- Chapter 4 provides a detailed air service development scenario for route and traffic development at YYT.
- Chapter 5 presents the forecasts of passengers, aircraft movements and air cargo.
- The appendices provide additional information of the forecasting methodology and assumptions.

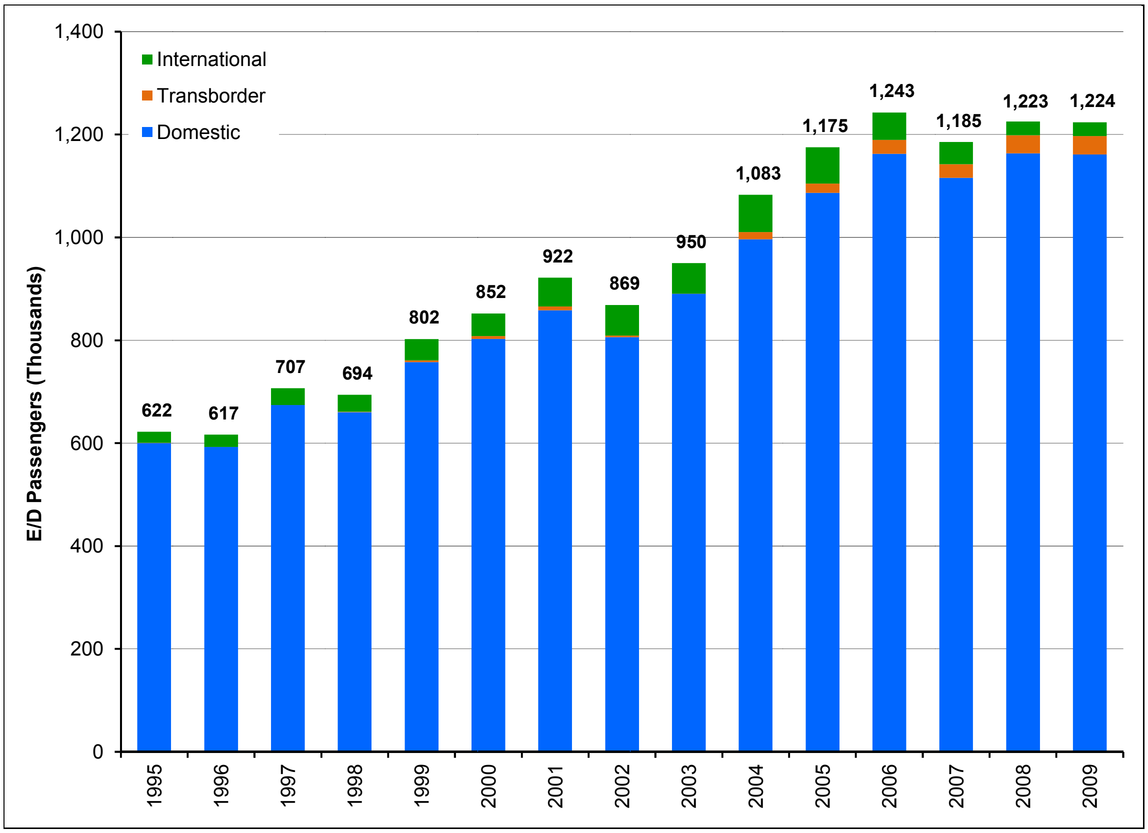
2. St John's International Airport Historical Market

2.1 Air Passenger Traffic

Figure 2-1 shows enplaned and deplaned (E/D) passenger traffic at YYT from 1995 to 2009 by market. Total passenger traffic at YYT grew by an average of 6.8% per annum between 1995 and 2001, due in part to increased activity in the offshore oil industry. Traffic declined by 5.7% in 2002 as a result of the September 11th attacks and an economic downturn. Passenger volumes then grew rapidly between 2002 and 2006, averaging 9.4% per annum, a major contributor to which was the entry of WestJet in 2003. Traffic declined 4.6% in 2007 partially as a result of the exit of CanJet from scheduled services. Since 2007, passenger traffic has been fairly robust in the face of the 2008-2009 global recession, increasing 3.3% between 2007 and 2009.

Domestic traffic is the dominant traffic segment at YYT, accounting for 93-96% of all traffic since 1995. Transborder and international traffic have made up a small proportion of traffic: in 2009, transborder accounted for 2.9% of traffic while international accounted for 2.2%. Further details of domestic, transborder and international services are provided in Section 2.3.

Figure 2-1: Historical E/D Passenger Traffic by Market at YYT, 1995-2010

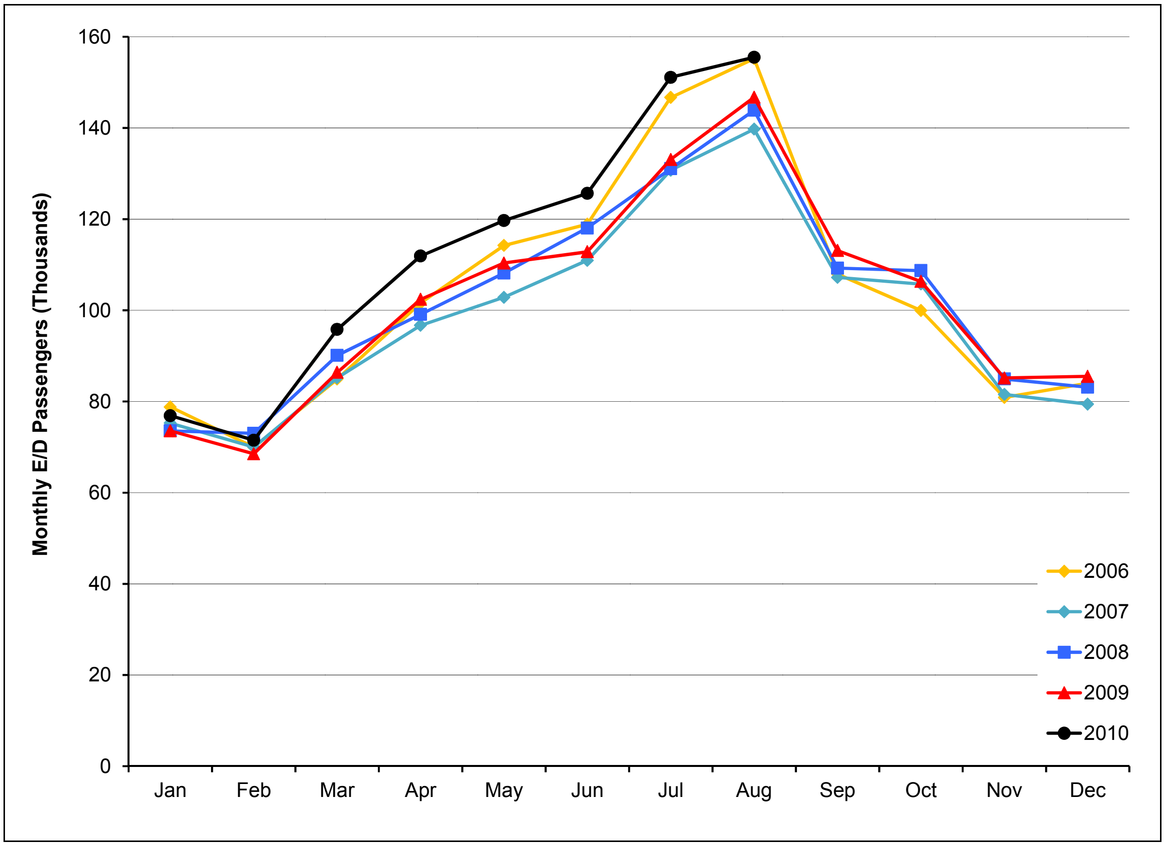


Source: Source: St. John's International Airport Authority and Transport Canada.
Passenger traffic by geographic market estimated based on carrier traffic figures provided by St. John's Airport Authority and traffic split data from Transport Canada and OAG

Figure 2-2 presents the monthly traffic levels from January 2006 to August 2010. Historically, YYT experiences its highest traffic levels in the summer months, particularly July and August, and its lowest traffic levels in the winter (November to February).

Year-to-date data for 2010 show traffic volumes exceeding levels experienced in the last few years. This is due in large part to the start of service to Halifax by Porter Airlines (service started in October 2009). Further information on the projected traffic in 2010 is provided in Chapter 5.

Figure 2-2: Monthly Historical Passenger Traffic at YYT, January 2006 – August 2010



Source: St. John's International Airport Authority.

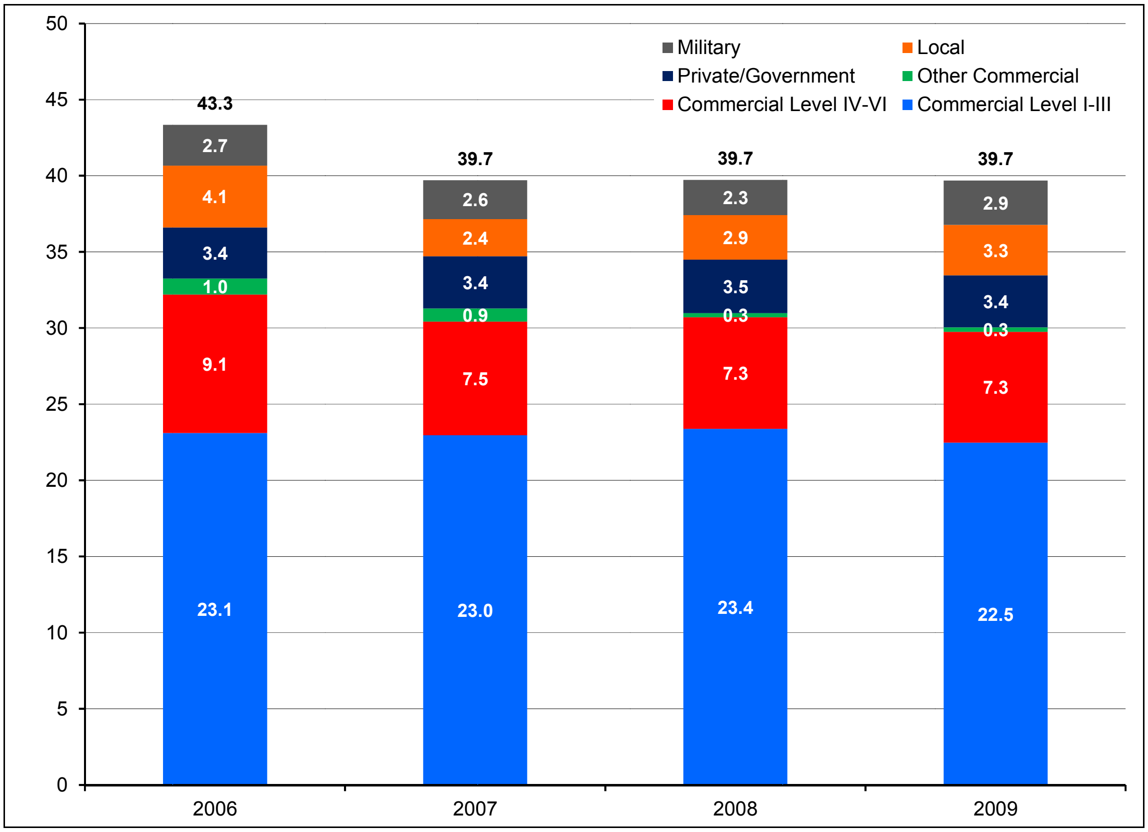
2.2 Aircraft Movements

Aircraft activity at YYT is made up of four main categories of aircraft operations:

1. Commercial air carriers – scheduled and charter passenger operations, as well as freighter aircraft and some helicopter operations. Transport Canada sub-categorizes these movements in three types:
   - Level I-III: Canadian air carriers that realized annual gross revenues of $1,000,000 or more in each of the two proceeding calendar years, plus also foreign air carriers.
   - Level IV-VI: Canadian air carriers that realized annual gross revenues of less than $1,000,000 in each of the two proceeding calendar years.
   - Other commercial - flights performed by commercial aircraft operators not included in the Air carrier categories. For example, flying schools, agricultural sprayers, water-bombers, aerial photography and survey, etc.
2. Private/Government – other civil aviation operations such as business aviation, private aircraft, specialized air charters, flight training, air ambulance, etc.
3. Military – military aircraft operations, both local and itinerant.
4. Local – civil aircraft operations in which the aircraft remains in the close proximity of the airport, normally landing and taking off at the same airport. Local operations are often carried out during training flights (touch-and-go), equipment tests etc.

Figure 2-3 shows historical aircraft movements at YYT from 2006 to 2009, broken down into the categories listed above. In 2009, YYT handled a total of 36,690 aircraft movements. Between 2006 and 2009, total aircraft movements declined by 8.4% (2.9% per annum, on average). The largest component of aircraft movements is Level I-III commercial air carriers, which accounted for 57% of total movements in 2009.

Figure 2-3: YYT Aircraft Movements, 2006-2009



Source: Statistics Canada, Aircraft Movement Statistics: NAV CANADA Towers and Flight Service Stations (TP 141 and TP 577).

2.3 Scheduled Airline Services

Figure 2-4 shows the scheduled routes served from YYT in the last three years. As of 2010, the airport has scheduled service to nine domestic destinations, one transborder destination and two international destinations. In addition, a number of winter sunspot charters to Varadero, Punta Cana and Cancun also operate.

Halifax and Toronto have the highest service frequency levels, offering connecting opportunities at both these hub airports. The only transborder service is to Newark operated by Continental Airlines (largely with RJs, although B737-700s are used in some instances), which again offers connecting opportunities at the airline's New York hub.

In 2010, Air Canada operated a daily service to London Heathrow between late May and late September using an A319 aircraft (120 seats). The other international service is to St. Pierre, part of Saint Pierre and Miquelon, a dependent territory of France located as closed as 10km south of Newfoundland and Labrador.

Figure 2-4: Scheduled Destinations Served from YYT (Average Weekly Outbound Frequency)

Destination	Weekly Outbound Frequency			Comments
	2008	2009	2010	
Domestic				
Calgary (YYC)	1.6	1.7	1.6	Seasonal daily service by WestJet
Deer Lake (YDF)	49.2	41.6	35.5	Served by Air Canada and Provincial Airlines (Air Labrador terminated service in 2009)
Gander (YQX)	21.3	21.3	21.5	Served by Air Canada
Goose Bay (YYR)	0.8	-	8.7	Served by Air Canada and Provincial Airlines
Halifax (YHZ)	44.3	51.8	72.0	Served by Air Canada, WestJet and Porter Airlines (the latter started in October 2009)
Montreal (YUL)	10.1	10.0	10.4	Served by Air Canada
Ottawa (YOW)	5.5	4.4	6.1	Served by Air Canada
St Anthony (YAY)	10.9	10.0	8.7	Served by Provincial Airlines
Toronto (YYZ)	43.8	43.8	43.4	Served by Air Canada and WestJet
Transborder				
New York (EWR)	6.6	7.1	7.0	Served by Continental Airlines
International				
London (LHR)	-	-	2.3	Seasonal daily service by Air Canada started in 2010.
St. Pierre (FSP)	3.0	3.0	3.0	Served Air Saint-Pierre
Total	**197.1**	**194.7**	**220.2**	

Source: OAG Airlines Schedule Data.
All services are year round unless indicated otherwise.
Excludes winter sunspot charters to Varadero, Punta Cana and Cancun.

The seat market share of the scheduled carriers is shown in **Figure 2-5**. Air Canada is the largest carrier at YYT with 58% of all seats, with WestJet the second largest carrier. The third largest carrier is Porter Airlines, following the introduction of its 3x daily Halifax service in October 2009.

Figure 2-5: Airline Seat Market Share at YYT, 2010

Airline	Inbound and Outbound Seats (Thousands)	Seat Share
Air Canada	1,017	58%
WestJet	362	21%
Porter Airlines Inc.	173	10%
Provincial Airlines	136	8%
Continental Airlines	46	3%
Air Saint-Pierre	13	1%
Sunwing Airlines Inc.	8	0%
Total	1,755	100%

Source: OAG Airlines Schedule Data.

2.4 Air Cargo

A recently commissioned air cargo study conducted by Jacobs Consulting Canada on behalf of St John's International Airport Authority estimated that YYT handled a total of 10,850 tonnes of air cargo in 2009.[1]

The Jacob's study also estimated that all-cargo carriers and integrated carriers carried about 84% of all cargo at YYT, while the remaining cargo was carried in passenger aircraft bellyhold. The study also calculated that 82% of the total cargo was inbound cargo, while only 18% was outbound cargo. The study found that the busiest air cargo traffic occurs at the end of the year, in November and December.

[1] *Air Cargo Study: St John's International Airport*, Jacobs Consulting Canada, September 24, 2010.

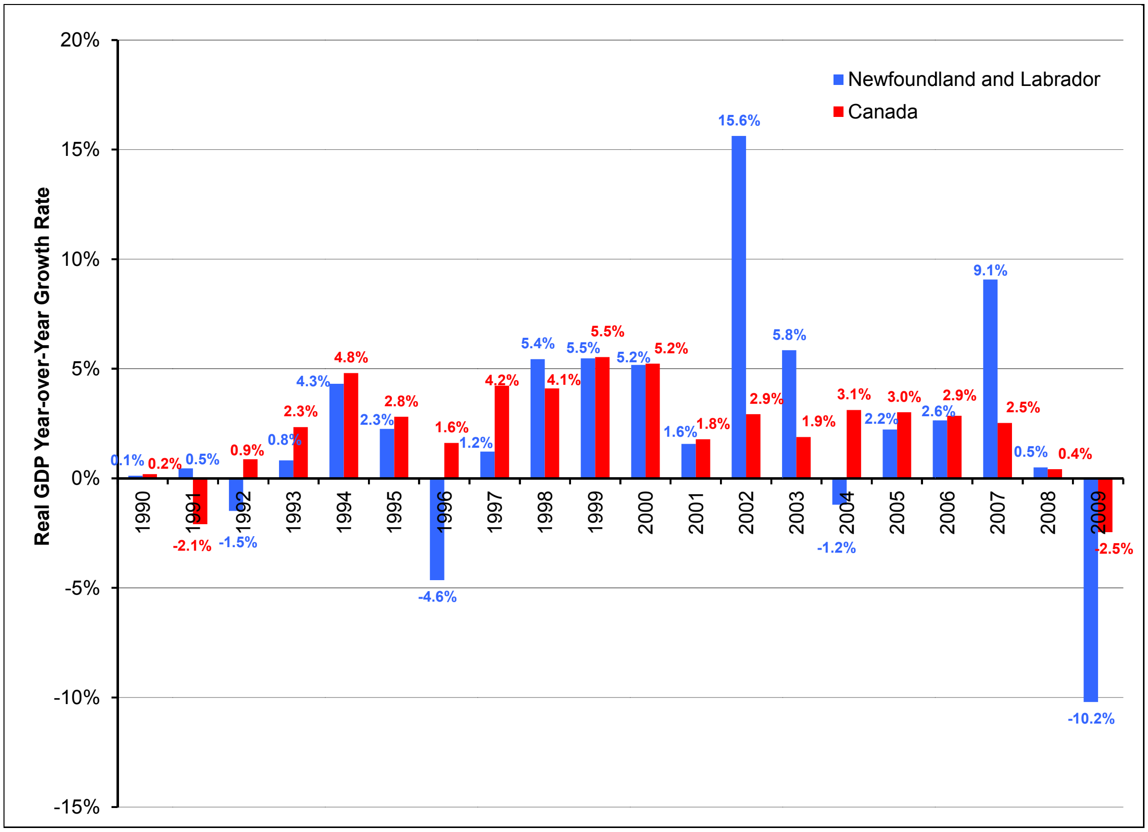
2.5 Economy

This section provides an overview of the regional economy around St. John's.

2.5.1 Gross Domestic Product

In 2009, the Gross Domestic Product (GDP) of Newfound and Labrador was approximately $25 Billion in total, or $49,140 per capita which was above the national average of $45,290 per capita. **Figure 2-6** shows the growth rate in real (inflation adjusted) GDP for Canada and for Newfoundland and Labrador. In general, provincial GDP growth shows far greater volatility than national growth (i.e., larger increases and declines). In part, this is due to varying activity levels in the offshore oil and gas industry.

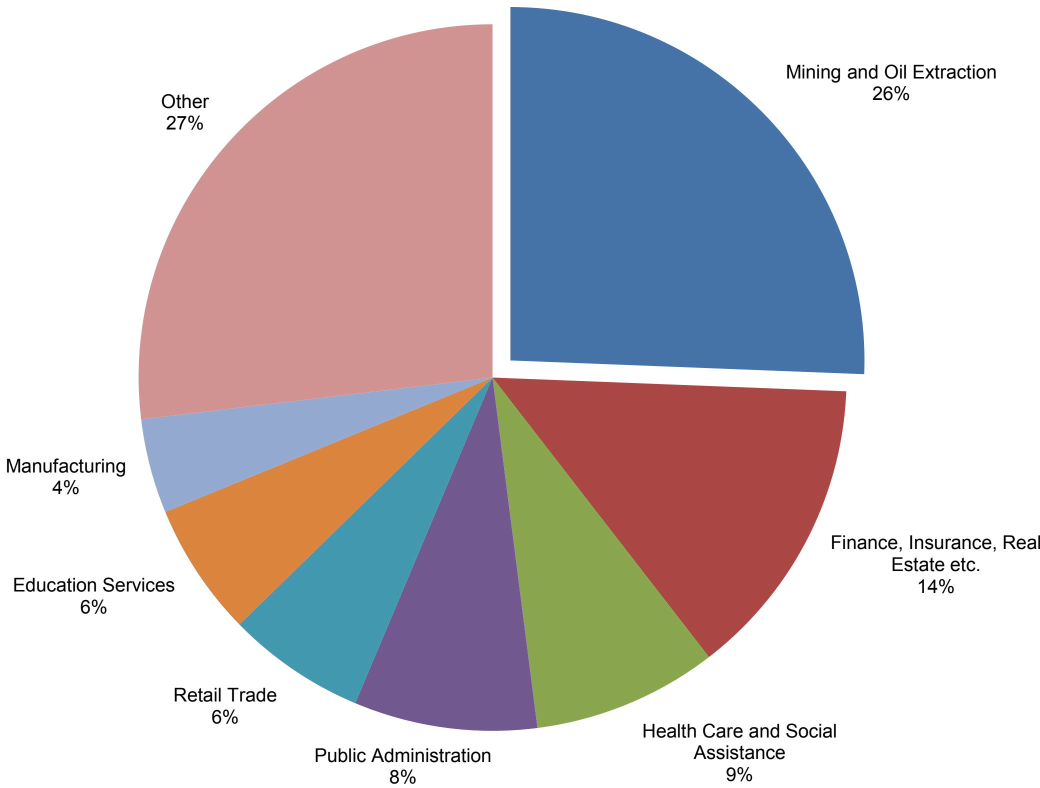
Figure 2-6: Newfoundland and Labrador and Canada Real Annual GDP Growth Rates, 1990-2009



Source: Newfoundland & Labrador Statistics Agency, Economics and Statistics Branch and Newfoundland & Labrador, Economics Research and Analysis, Department of Finance

Figure 2-7 shows GDP by industry in Newfoundland and Labrador in 2009. As can be seen, the oil extraction industry is the largest single contributor to provincial GDP. The concentration of this industry in the St John's region is reflected in the regional GDP breakdown: St John's CMA account for 50% of provincial GDP even though it accounts for only 37% of the province's population.[2]

Figure 2-7: Gross Domestic Product by Industry in Newfoundland and Labrador, 2009



Source: Newfoundland and Labrador Statistics Agency, Economics and Statistics Branch.

2.5.2 The Oil and Gas Industry

Most of Newfoundland and Labrador's oil and gas industry activities are located in the St. John's area. Oil and gas companies such as ExxonMobil, Chevron, Husky Energy, Suncor Energy and Statoil are located in St. John's. In 2009, Newfoundland and Labrador produced approximately 35% of Canada's light crude oil (Source: Economics Research and Analysis, Department of Finance).

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[2] Source: State of the Economy, St. John's Metro: http://www.stjohns.ca/cityservices/economic/state_of_the_economy.pdf.

There are currently three major offshore oil developments off the coast of St. John's: Hibernia, Terra Nova and White Rose. In addition, Hebron, a new development, is projected to produce oil by 2017 (Source: CNLOPB).

Hibernia is the largest oil field development offshore of Canada's east coast and is operated by ExxonMobil. The total oil field production is estimated at 704 million barrels and total oil in place is estimated to be 1,395 million barrels. Hibernia produced 46 million barrels of oil in 2009 (a decrease of 9.6% compared to the previous year). In the beginning of 2010, the decision was made to develop Hibernia Southern Extension and extend production of Hibernia by five to ten years. (Source: Economics Research and Analysis, Department of Finance).

Terra Nova, the second largest oil field development off Canada's east coast, is operated by Suncor Energy; its estimated oil in place is 406 million barrels. In 2009, Terra Nova produced 29 million barrels of oil, a decline of 22.7% compared to the previous year (Source: Economics Research and Analysis, Department of Finance).

White Rose, operated by Husky Energy, contains an estimated 440 million barrels of oil. White Rose produced 23 million barrels in 2009 (a decline of 38.3% compared to the previous year) (Source: Economics Research and Analysis, Department of Finance).

In 2008, the Government of Newfoundland and Labrador and the Hebron consortium agreed to develop the Hebron oil field. The Hebron field is estimated to contain 581 million barrels of recoverable oil. A Development Plan Application is expected to be submitted in late 2010. Construction start of the development is expected in 2012 and first oil production is expected in 2017. ExxonMobil will be the primary operator of Hebron (Source: Economics Research and Analysis, Department of Finance).

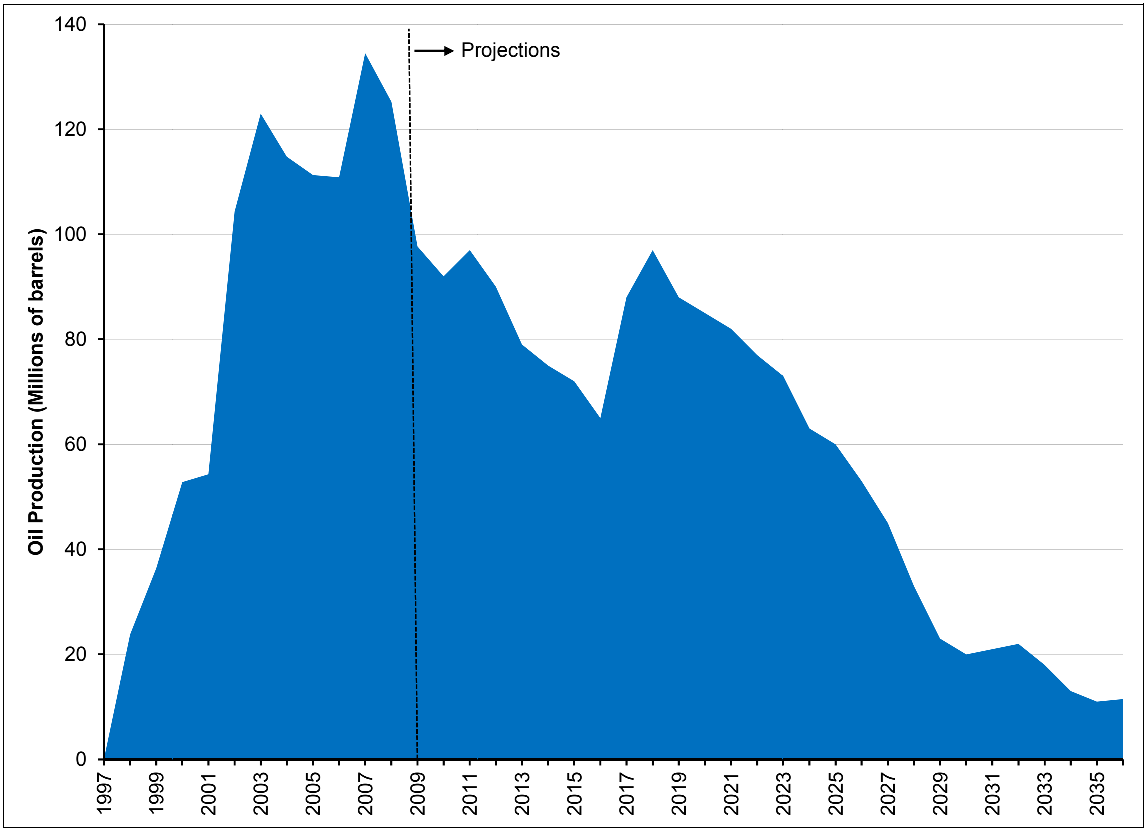
Figure 2-9 shows offshore oil production for the province of Newfoundland and Labrador from 1997 to 2009, and an estimate of oil production from 2010 to 2036. Offshore oil production increased dramatically in the decade between 1997 and 2007, but has declined 27% in the last two years due to the economic downturn and declining oil prices. The most recent projections for oil production in the region indicate relatively high but declining production levels over the next 25 years.

Although production levels are projected to decline over the long term, it is anticipated that activity levels associated with the oil and gas industry will remain elevated, due to activities associated with well decommissioning and the potential for development of natural gas. However, both the province of Newfoundland and Labrador and the City of St John's recognize the need to diversify the economy and have taken step to facilitate this, such as the province's Economic Diversification and Growth Enterprises (EDGE) Program,[3] and the City's Strategic Economic Roadmap.[4]

[3] http://www.intrd.gov.nl.ca/intrd/programs/edge_page.html.

[4] http://www.stjohns.ca/cityservices/economic/roadmap.jsp.

Figure 2-8: Newfoundland and Labrador Oil Production, 1997-2036



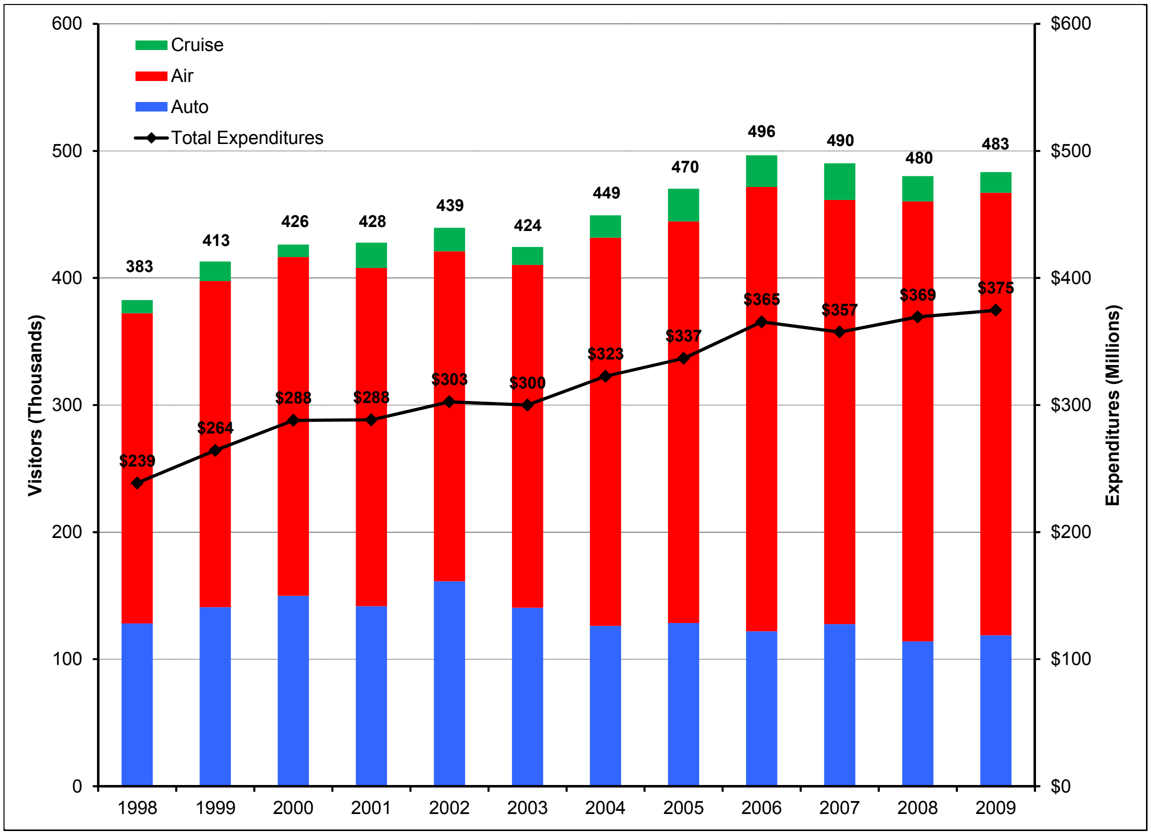
Sources: 1998-2009: Economics and Statistics Branch (Newfoundland & Labrador Statistics Agency); 2010-2036: Estimates from Canada-Newfoundland and Labrador Offshore Petroleum Board (CNLOPB).

2.6 Tourism

Figure 2-9 shows visitors to Newfoundland and Labrador by mode and total expenditures from 1998 to 2009. In 2009, the total number of non-resident visitors to the province reached 483,200. Total visitors have increased at an average rate of 2.1% per annum since 1998. The majority of tourists arrive by air: in 2009, 72% of visitors arrived by air and accounted for 80% of total spending. By comparison, in 2009, 25% of visitors arrived by car and accounted for 20% of expenditures, and 3% arrived by cruise ship accounting for 0.3% of total expenditures.

Visitors arriving by air have increased by an average annual rate of 3.3% from 1998 to 2009, which is exceeded only by cruise passengers which increased at 4.2% per annum. Visitors by car declined by 8% between 1998 and 2009 (an average decline of 0.7% per annum).

Figure 2-9: Historical Non-Resident Visitors to Newfoundland and Labrador by Mode, and Total Visitor Expenditures, 1998-2009



Sources: Tourism Statistics, Department of Tourism, Culture and Recreation

3. Forecast Methodology

Air travel is a derived demand. Demand for air transportation between origin and destination markets is derived from the socio-economic interactions between these markets, shaped by carriers' networks and available airlift capacity. Generally, business/trade activity, tourism/visitor activity as well as visiting friends and relatives (VFR) constitute the primary components of air travel at an airport.

Dependable forecasting practice requires awareness of the uncertainties surrounding the forecasts. Considerable effort by the project team has gone into analyzing the factors affecting traffic activity at YYT. However, as with any forecasts, there are uncertainties regarding these factors, such as the outlook for the local and world economies and the structure of the airline industry. A pragmatic and yet systematic approach has been used to produce a set of unbiased aviation activity forecasts for YYT.

As described in the rest of this chapter, forecasts have been produced for the following:

- Enplaned and deplaned passenger traffic;
- Aircraft operations;
- Air cargo.

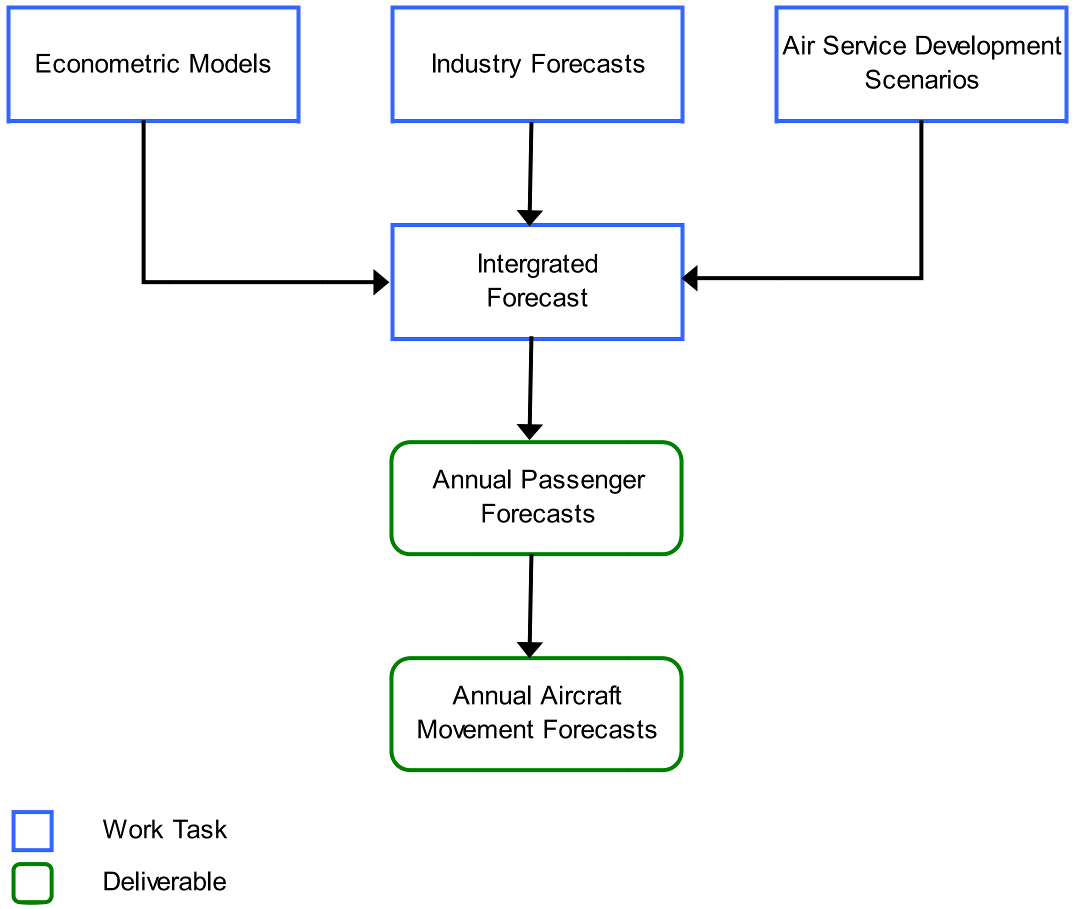
3.1 Forecasts are Unconstrained by Airport Capacity

It should be noted that the forecasts represent unconstrained forecasts - they have been developed without consideration of the ability of the current airport facilities to handle the forecast traffic.

3.2 Air Passenger Forecast Methodology

Figure 3-1 provides an overview of the forecasting methodology for YYT, highlighting key components which are discussed in more detail below. In essence, air passenger forecasts were generated using three alternative approaches and then compared and reconciled into a single set of forecasts. The benefit of this approach is that it allowed the forecast team to utilize data-driven econometric analysis while integrating internal and external expert judgment. The three forecasting approaches are discussed in the following sub-sections.

Figure 3-1: YYT Air Traffic Forecasting Methodology



3.2.1 Industry Forecasts

This approach involved the use of published forecasts by reputable sources to project traffic growth at YYT, namely:

- Boeing, Current Market Outlook, 2010-2028, published June 2010.
- Airbus, Global Market Forecasts, 2009-2028, published November 2009.
- Transport Canada, Aviation Forecasts 2008-2022, published September 2009 (forecasts for Atlantic Canada).
- FAA, Aerospace Forecasts FY 2010-2030, published March 8, 2010 (for transborder traffic only).

In some cases, the forecast is provided in terms of revenue-passenger-miles, which were converted to an E/D passenger basis. Some of the published forecasts provide projections for specific country markets (e.g., Canada Domestic, U.S.-Canada, etc.), while others are at the continental level (e.g., North America-Europe, North America-Asia, etc.). The appropriate forecast growth rates provided in these publications were applied to the 2010 estimated traffic volumes at YYT for each individual market (domestic, transborder, and international).

Details of the growth rates of the published sources are provided in **Appendix A**.

3.2.2 Air Service Development Scenario

The air service development scenario considered at a detailed level the traffic growth on existing routes and development of new domestic, transborder and international routes. The scenario draws on the Air Service Development Strategy developed in a separate study by Inter*VISTAS.* The analysis examined individual markets and assessed the potential for increased (or decreased) service on existing routes, new carriers on existing routes, and new routes that could be operated. The aim of this approach was twofold:

1) Provide an alternative forecast, using an industry knowledge approach to compare against the more quantitative industry forecast and econometric approaches used in the rest of the study.
2) Illustrate the general type of route development opportunities that underpin the air traffic forecasts.

The details of the approach used and results produced are provided in **Chapter 4**. It should be noted that the scenario is designed to illustrate the development potential of YYT and is not a forecast of the exact routes and carriers that will eventually operate at YYT, nor is it designed to function as an air service development strategy (separate documentation produced by Inter*VISTAS* should be referenced for information on the air service development strategy).

3.2.3 Econometric Model

The econometric modeling approach used regression analysis relating historical passenger traffic at YYT to various socio-economic and industry factors, such as economic growth, incomes, population, etc. Using projections of these factors, it was then possible to produce forecasts of air traffic at YYT through the econometric model.

The econometric analysis related total passenger traffic at YYT to a range of a wide range of explanatory variables to produce the final model.[5] The models were estimated using annual data from 1995 to 2009. The explanatory variables explored were:

- Real Gross Domestic Product (Newfound and Labrador, and Canada), sourced from the Statistics Canada;
- Personal Disposable Income (St John's, Newfound and Labrador, and Canada), sourced from the Statistic Canada and the Newfoundland and Labrador Statistics Agency;
- Population (St John's, and Newfound and Labrador), sourced from the Newfoundland and Labrador Statistics Agency;
- Total employment (St John's, and Newfound and Labrador), sourced from the Newfoundland and Labrador Statistics Agency;

[5] Econometric analysis was also conducted using domestic traffic as the dependent variable, but was found to have a lower statistical fit. Due to low and fluctuating transborder and international traffic levels and difficulties obtaining appropriate explanatory variables, it was not possible to conduct this analysis on transborder and international traffic.

- Offshore oil production in Newfound and Labrador, sourced from the Newfoundland and Labrador Statistics Agency;
- Offshore Area Historical Program Expenditures, sourced from the Canada-Newfoundland and Labrador Offshore Petroleum Board.

Numerous model estimations were conducted using various reasonable combinations of the above variables. Many of the variables were rejected on the basis of poor statistical fit, implausible parameters or high correlation with other explanatory variables.

The final model, selected on the basis of statistical fit, parameter robustness and the plausibility of the parameter estimates, is summarized below:

$Ln(TotalPaxTraffic) = Constant + a_1 \times Ln(CanadaRealGDP) + a_2 \times Ln(StJohnsPopulation)$

Where:

Ln is the natural log of the variable;

TotalPaxTraffic is total passenger traffic at YYT;

CanadaRealGDP is Gross Domestic Product (GDP) of Canada adjusted for inflation;

StJohnsPopulation is the population of the St John's CMA;

Constant, a_1 and a_2 are the estimated model parameters capturing the impact of the various factors on traffic growth at YYT.

Details of the regression results are provided in **Appendix B**. To generate total traffic forecasts for YYT, the estimated econometric model was applied to projections of the key explanatory variables in the models:

- For the GDP of Canada, the projections in the short term (up to 2013), were based on an average of the forecast GDP growth rates produced by the Bank of Canada, the IMF, the Conference Board of Canada, Transport Canada, Bank of Montreal, CIBC, TD Bank and Scotia Bank. The projections beyond 2013 were based on forecast GDP growth rates produced by Transport Canada as part of its aviation forecasts. These projections are provided in **Appendix C**. All of these projections provided the most recent outlook on the current economic situation and the expected timing and strength of the recovery, as well as the long term outlook.
- The projection of St John's population were taken from Newfound and Labrador Department of Finance forecasts (Medium Scenario), produced April 2010.

3.2.4 Integrated Forecast

The projections produced from the three approaches (industry, air service development scenario and econometric) were averaged to produce the *Most Likely* forecast (also known as the Base or Medium forecast). This forecast was split into domestic, transborder and international traffic based on the results from the industry and air service development scenarios.

In addition to the Most Likely forecast, Low and High forecasts were also produced which assumed lower or higher levels of economic growth, population and air service development.

3.3 Aircraft Movements

Passenger carrier aircraft movements are generally a function of passenger traffic demand and air service development, shaped by carriers' networks and average aircraft size. Forecasts of future aircraft movements are derived forecasts, taking into consideration passenger traffic demand, potential service improvement/expansion, change of average aircraft size, and load factor.

Forecasts of annual commercial aircraft movements were based on forecast passenger traffic demand. Passenger aircraft movements depend on the average aircraft size and average load factor (i.e. average passenger per flight), as represented by the formula below:

$$\text{Aircraft Movements} = \frac{\text{E/D Passenger Forecasts}}{\text{Average Aircraft Size x Average Load Factor}}$$

Where:
Average Aircraft Size x Average Load factor = Average Passengers per Aircraft Operation

Forecasts of average aircraft size and flight load factors were prepared and applied. The changes in future fleet mix and load factors reflect:

- Current airline and fleet mix;
- Market development and new air services;
- Carrier fleet replacement plans and improved aircraft utilization.

3.4 Air Cargo

Due to lack of reliable historical data on air cargo, it was not possible to conduct econometric analysis on cargo volumes. Instead, an approach was used which developed forecasts from a combination of the following approaches:

- Elasticity approach - air cargo GDP elasticities for air cargo traffic obtained from an Inter*VISTAS* air travel demand elasticity study were applied to GDP forecasts to derive air cargo forecasts.[6]
- Development of a scenario based on an air cargo study commissioned by St John's International Airport Authority.[7] The study report contains a review of the potential demand that could be achieved at YYT through recovery of leakage to other airports, new seafood exports and stimulation of latent demand (page V-10 of the report). The scenario assumes that these potential cargo volumes will be achieved within the next 5-10 years. Where the report provided a range estimate, the mid-point has been used.
- Industry forecasts - Industrial air cargo forecasts were derived by applying growth rates for air cargo traffic forecasts published by major aviation industries using the same sources as for the passenger industry forecasts, namely Boeing, Current Market Outlook, 2010-2028, Airbus, Global Market Forecasts, 2009-2028, and Transport Canada, Aviation Forecasts 2008-2022.

Finally, the three set of projections were averaged to develop the Most Likely air cargo forecast.

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[6] *Estimating Air Travel Demand Elasticities*, Inter*VISTAS* report for IATA, December 2007.

[7] *Air Cargo Study: St John's International Airport*, Jacobs Consulting Canada, September 24, 2010.

4. Air Service Development Scenario

As part of the forecasting process, an air service development scenario was generated to provide an alternative to the analytical approaches used and to illustrate the type of route development opportunities that underpin the air traffic forecasts. This chapter provides a detailed description of this scenario.

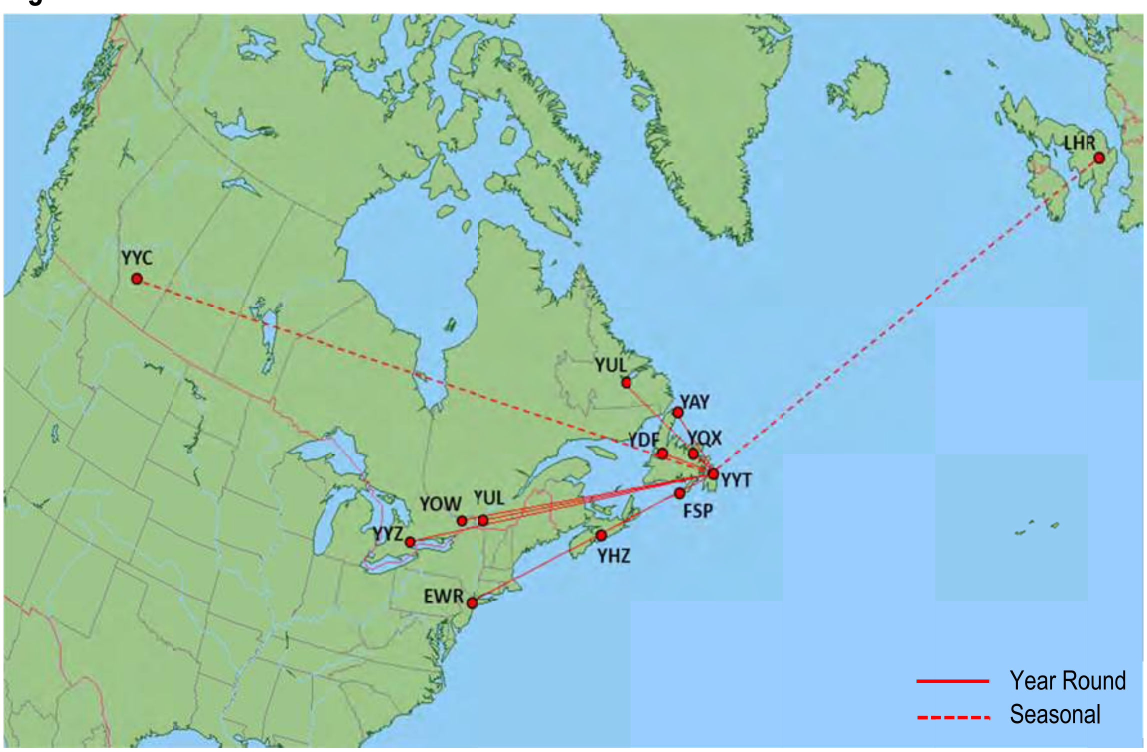
This chapter examines individual markets and assesses the potential for increased (or decreased) service on existing routes, new carriers on existing routes, and new routes which could be operated. The scenario draws on the Air Service Development Strategy developed in a separate study by Inter*VISTAS*. It should be noted that the scenario is designed to illustrate the development potential of YYT and is not a forecast of the exact routes and carriers that will eventually operate at YYT. In practice, some of the identified route opportunities will be realized, some will not, and a few opportunities not identified here will be realized.

This chapter begins with a general discussion of the market situation for YYT, followed by an analysis of market opportunities on specific routes.

4.1 Market Situation

As illustrated in **Figure 4-1**, YYT has scheduled services on nine domestic routes, one transborder route (Newark) and two international routes (London and St. Pierre). In addition to these scheduled services, YYT also has charter services to sunspots such as Varadero, Punta Cana and Cancun.

Figure 4-1: Schedule Routes from YYT



Source: OAG Schedule Data, July 2010 and February 2011.
Excludes winter sunspot charters to Varadero, Punta Cana and Cancun.

YYT is the largest airport serving Newfoundland and Labrador in terms of passenger volumes but faces competition from four other commercial airports on Newfoundland island (see **Figure 4-2**). Market research conducted by InterVISTAS as part of the Air Service Development Strategy found that 22% of air passengers to/from Newfoundland and Labrador used an airport other than St John's. The leakage was highest in the domestic market, at 24%, while leakage in the transborder and international markets was 11% and 14% respectively.

Figure 4-2: Commercial Airports in Newfoundland and Labrador

4.2 Market Potential and Opportunity

The analysis of market potential and opportunity is based on the Air Service Development Strategy, particularly the market research conducted as part of that study. This market research is summarized in Figures **4-3** to **4-5**. The tables show the estimated volume of O/D traffic to/from YYT and other Newfoundland and Labrador airports (Other NL) by market. The tables also indicate where direct service is operated from YYT.

Overall, based on the total traffic figures, 37% of passengers travelling to/from Newfoundland and Labrador were not served by a direct service between YYT and their final origin or destination (i.e., they are required to connect at Halifax, Toronto or elsewhere). The same figure for passengers to/from YYT is 36%.

The lack of direct service is particularly pronounced for the transborder market, where only 9% of O/D passengers to/from Newfoundland and Labrador could use direct service to/from YYT (the Newark service). The international market also lack direct services, with 49% for international O/D traffic having a corresponding direct service to/from YYT. The same figure for domestic traffic is 71%.

Figure 4-3: Major Domestic O/D Markets to/from YYT

Market	Direct Service	YYT Traffic	Other NL Traffic	Total Traffic
Domestic Market				
Halifax	■	176,820	48,170	224,990
Toronto	■	157,580	51,830	209,410
Montreal	■	42,550	31,290	73,840
Ottawa	■	51,000	15,840	66,840
Edmonton		30,320	17,420	47,740
Calgary	☐	31,780	5,730	37,510
Gander	■	36,880	0	36,880
Fort McMurray		26,580	9,620	36,200
Deer Lake	■	26,300	0	26,300
Goose Bay	■	25,930	0	25,930
Other		148,740	60,340	209,080
Total Domestic		**754,480**	**240,240**	**994,720**

Source: InterVISTAS market research, 2008.
"Other NL" figures likely understated due to under-representation in GDS datasets.
■ = Year Round Service; ☐ = Seasonal Service; ⊡ = Charter Service.

Figure 4-4: Major Transborder O/D Markets to/from YYT

Market	Direct Service	YYT Traffic	Other NL Traffic	Total Traffic
Transborder Market				
Orlando		176,820	48,170	224,990
Tampa		157,580	51,830	209,410
New York*	■	42,550	31,290	73,840
Houston		51,000	15,840	66,840
Boston		30,320	17,420	47,740
Fort Lauderdale		31,780	5,730	37,510
New Orleans		36,880	0	36,880
Washington**		26,580	9,620	36,200
Las Vegas		26,300	0	26,300
Miami		25,930	0	25,930
Other		148,740	60,340	209,080
Total Transborder		**754,480**	**240,240**	**994,720**

Source: InterVISTAS market research, 2008.
"Other NL" figures likely understated due to under-representation in GDS datasets.
■ = Year Round Service; ☐ = Seasonal Service; ⊡ = Charter Service.

Figure 4-5: Major international O/D Markets to/from YYT

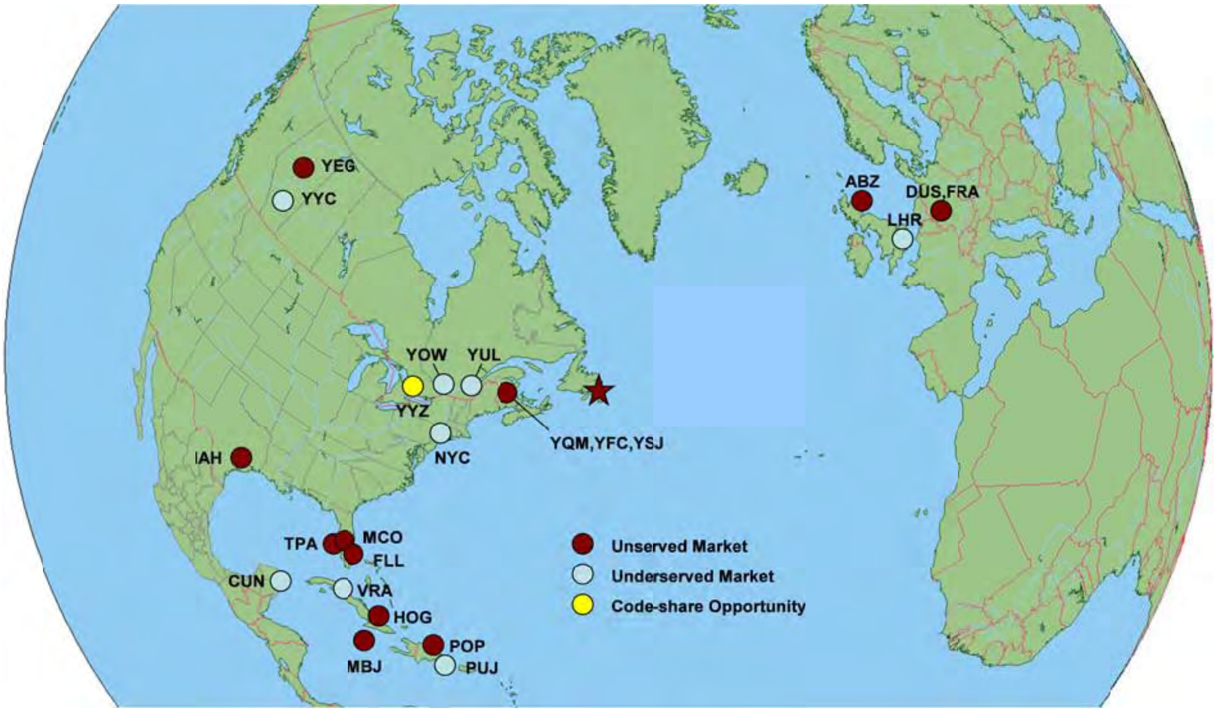
Market	Direct Service	YYT Traffic	Other NL Traffic	Total Traffic
International Market				
London, UK	☐	22,180	4,830	27,010
Paris		3,470	5,610	9,080
St Pierre	■	7,650	0	7,650
Punta Cana	⊡	7,600	10	7,610
Varadero	⊡	6,700	30	6,730
Puerto Plata	⊡	5,560	10	5,570
Aberdeen, UK		3,250	440	3,690
Dublin		2,360	140	2,500
Amsterdam		1,770	260	2,030
Beijing		1,950	40	1,990
Frankfurt		1,450	270	1,720
Rome		1,020	150	1,170
Doha		980	140	1,120
Shanghai		970	20	990
Oslo		900	60	960
Other		27,240	4,740	31,980
Total International		**754,480**	**240,240**	**994,720**

Source: InterVISTAS market research, 2008.
"Other NL" figures likely understated due to under-representation in GDS datasets.
■ = Year Round Service; ☐ = Seasonal Service; ⊡ = Charter Service.

Based on this market analysis and other industry and market factors, a number of unserved and underserved markets were identified in Air Service Development Strategy as summarised in **Figure 4-6**. These are markets which offer significant potential for development of new (or additional) direct service in the short, medium and long term.

These unserved/underserved markets are described in more detail in **Figure 4-7**. As well as the market listed, there is also the potential to benefit from recent code-sharing agreements signed by WestJet. WestJet has announced an interlining agreement with KLM/Air France, and a codesharing agreement with Cathay Pacific. These agreements will provide competitive travel alternatives for international travellers outside of Canadian gateway cities.

Figure 4-6: Unserved and Underserved Markets from YYT



Source: Air Service Development Strategy, Inter*VISTAS*.

Figure 4-7: Details of the Unserved/Underserved Markets

Sector	Underserved Markets	Unserved Markets
Domestic	**Montreal/Ottawa** 1st and 2nd largest markets served by only a single carrier. Business/government connections offer high yields but low stimulation potential.	**Edmonton** Largest unserved market from YYT (47,740 passengers). Gateway to Athabasca oil sands and can carry Fort McMurray traffic (another unserved market) **Moncton** Largest unserved market in Eastern Canada (19,110 passengers). Best placed to attract traffic to/from New Brunswick and Prince Edward Island.
Transborder	**New York JFK** Provide competitive service to EWR. Opportunity for a non-Star Alliance carrier (e.g., Delta or American).	**Florida** Top two O/D markets are in Florida. Potential for leisure traffic stimulation (although low yield). Can be served with fairly low frequencies. **Houston** Largest unserved transborder market outside of Florida. Obvious oil industry connections (high yield).

Sector	Underserved Markets	Unserved Markets
		Boston Largest unserved market in the Northeast and offers good onward connectivity. However, low priority as it has been discontinued from other Canadian airports.
Sunspot	**Varadero, Punta Cana, Cancun** All three markets offered in Winter 2010. Could support additional service, perhaps from multiple carriers.	**Puerto Plata** Previously served from YYT. Historical demand suggest service could be supported. **Holguin, Montego Bay** Holguin has been served in the past. WestJet has expanded aggressively in Montego Bay.
Other International	**London, UK** Currently has seasonal daily service. Potential to secure a longer summer season and eventually year-round service.	**Aberdeen** Largest transatlantic market after London and Paris. Like Houston, obvious oil industry ties. **Germany** Germans are independent travelers who value wilderness, but market size is currently small. There is also a strong, competitive Germany-Canada charter market.

Source: Air Service Development Strategy, Inter*VISTAS*.

4.3 Air Service Development Scenario

Based on the analysis described in the previous section, an air service development scenario was produced which projected frequency increases on a city-pair specific basis, for both existing and new markets. Projections were produced for 2015 and 2020 based on the current schedule.

The air service scenario is provided in **Figure 4-8**, which shows the current frequency and the expected frequency in 2015 and 2020. Comments on each route are also provided. As stated previously, it should be noted that the scenario is designed to illustrate the development potential of YYT and is not a forecast of the exact routes and carriers that will eventually operate at YYT.

The frequencies listed in this table were converted into an annual passenger forecast based on reasoned assumptions regarding aircraft size and load factors to provide a comparison with the industry and econometric model forecasts.

Figure 4-8: New and Additional St John's International Airport Air Services

Market	Average Weekly Outbound Frequency			Notes
	Current	2015	2020	
Aberdeen	-	-	2.0	Long term potential for twice weekly year-round service.
Boston	-	-	7.0	Long term potential for daily RJ service by a U.S. carrier.
Calgary	1.6	7.0	7.0	Current seasonal service converts to year-round within five years.
Deer Lake	35.5	40.0	45.0	Continued but modest market growth.
Edmonton	-	6.0	7.0	Service eventually builds up to year-round daily (likely operator: WestJet).
Frankfurt	-	-	0.5	Seasonal once weekly service, likely charter.
Gander	21.5	26.6	28.6	Continued but modest market growth.
Goose Bay	8.7	10.0	13.0	Continued but modest market growth.
Halifax	72.0	76.7	81.7	Continued but slow market growth. Growth moderated by new direct services slowing the growth of connecting traffic.
Houston	-	-	5.0	Long term potential for weekday service by a U.S. carrier.
London, UK	2.3	4.7	7.0	Service build-up to year-round daily.
Moncton	-	14.0	14.0	RJ service, possible carriers: Air Canada or Porter.
Montreal	10.4	14.0	16.5	Service develops as new carriers enter the market.
New York	7.0	19.0	21.0	Frequency build up to JFK/EWR by new and incumbent carriers.
Orlando/Tampa/ Fort Lauderdale		0.8	1.2	Seasonal service building up in frequencies and destinations.
Ottawa	6.1	7.0	10.5	Service develops as new carriers enter the market.
Punta Cana/ Puerto Plata/ Cancun	0.6	0.8	0.8	Gradual expansion of charter frequencies (seasonal).
Punta Cana/ Varadero	0.3	0.5	0.7	Gradual expansion of charter frequencies (seasonal).
St Anthony	8.7	10.0	10.0	Continued but modest market growth.
St Pierre	3.0	4.0	5.0	Continued but modest market growth.

Market	Average Weekly Outbound Frequency			Notes
	Current	2015	2020	
Toronto	43.5	49.2	51.2	Continued but modest market growth. WestJet code sharing generates additional traffic, somewhat offset by development of new direct service.
Other Sunspot	0.5	1.6	1.7	Additional destinations and frequencies.
Total	**221.7**	**291.9**	**336.4**	

5. Air Traffic Forecasts

The following sections describe the air traffic forecasts for St John's International Airport. These forecasts have been developed using the methodology described in Chapter 3. Total E/D passenger forecasts are provided, along with breakdowns into domestic, transborder and international traffic. In addition, forecasts of commercial passenger aircraft movements and air cargo are also provided.

As noted previously, these forecasts represent unconstrained forecasts - they have been developed without consideration of the ability of the current airport facilities to handle the forecast traffic.

5.1 Passenger Traffic

5.1.1 Total Passengers

The Most Likely, Low and High forecasts for total air passengers at YYT are provided in **Figure 5-1** and **Figure 5-2**. Highlights of the **Most Likely** forecast:

- The traffic volumes for 2010 were projected using data from the first eight months of the year and analysis of historical seasonality and schedule data for the remainder of 2010. Strong growth of 7.4% is projected for 2010 due in large part to the introduction of service to Halifax by Porter Airlines in October 2009.[8]
- Traffic growth is projected to be strongest in the first five years of the forecast period (3.9% per annum average growth between 2010 and 2015), due to a number of factors:
    1. "Bounce back" from the economic recession of 2008-2009, with above-average economic growth as projected by all of the current short term economic forecasts (see **Appendix C**).[9]
    2. Development of new air services in the domestic, transborder and international markets as identified in the Air Service Development Strategy.
    3. Relatively high projected population growth in St John's, averaging 1.5% per annum over the next five years.
    4. High activity levels in the oil and gas sector.
    5. Strong growth in local personal incomes.
- After 2015, growth is projected to attenuate due to market maturity, slowing population growth (averaging 0.6% per annum between 2015 and 2030) and declining oil production levels.

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[8] Passenger traffic in the first eight months of 2010 was 9.0% higher than the same period in 2009.

[9] Forecast GDP growth for 2010-15 is 2.7% per annum, compared with the long-term average of 2.2% per annum over the entire forecast period.

Figure 5-1: Historical and Forecast E/D Passengers at YYT, 1995-2030

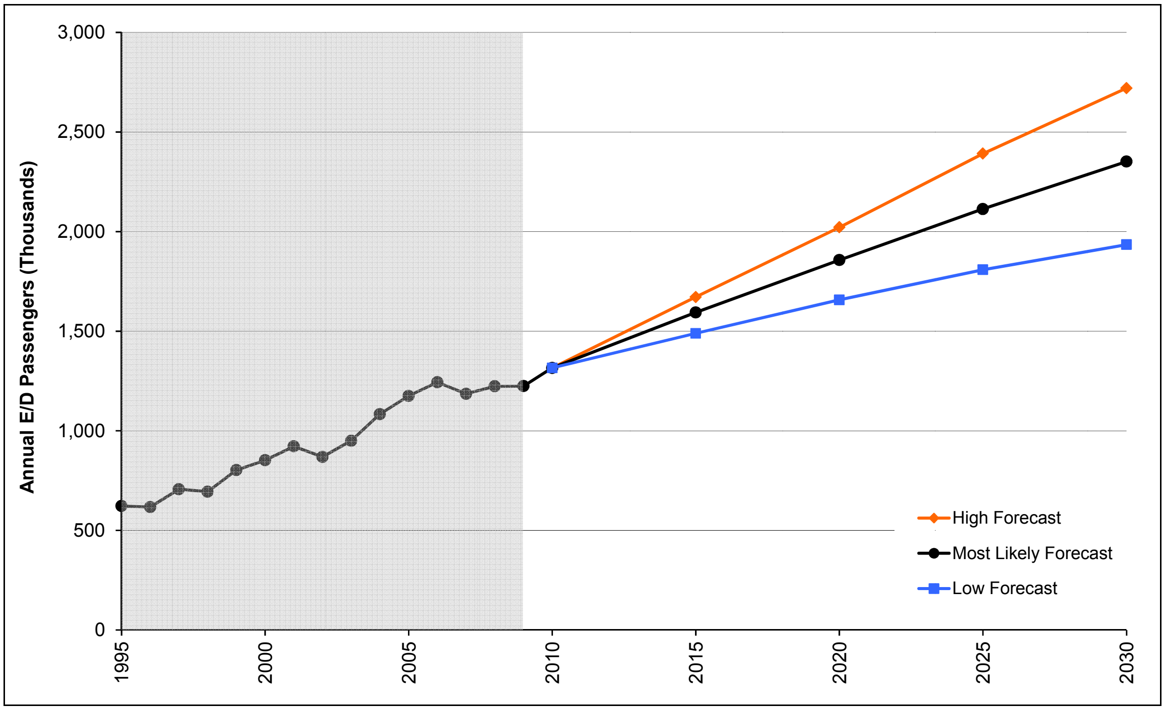

Figure 5-2: Forecasts of E/D Passengers at YYT, 2009-2030

Year	Low	Most Likely	High
2009 (Actual)		1,223,944	
2010	1,315,000	1,315,000	1,315,000
2015	1,489,000	1,594,000	1,671,000
2020	1,657,000	1,857,000	2,021,000
2025	1,808,000	2,113,000	2,391,000
2030	1,934,000	2,351,000	2,720,000
Annual Average Growth Rate			
2009-10	7.4%	7.4%	7.4%
2010-15	2.5%	3.9%	4.9%
2015-20	2.2%	3.1%	3.9%
2020-25	1.8%	2.6%	3.4%
2025-30	1.4%	2.2%	2.6%
2010-2030	1.9%	2.9%	3.7%

- Over the entire forecast period (2010-30), total passenger traffic is forecast to average 2.9% per annum. This is lower than the 4.9% per annum average growth achieved between 1995 and 2009 or the 4.1% per annum growth achieved between 2000 and 2009. This reflects the relative maturity of the YYT market as well as the difficulty in achieving the same level of percentage growth on a higher traffic base.[10]

In addition to the Most Likely forecast, Low and High forecasts were also produced:

Low Forecast
The Low forecast assumes a lower levels of economic and population growth than the Most Likely forecast. In the Low forecast, GDP growth between 2010 and 2030 averages 1.7% per annum compared with 2.2% per annum in the Most Likely Forecast. Population growth averages 0.5% per annum compared with 0.8% in the Most Likely forecast. Air service development is projected to be slower than the scenario set out in Chapter 4, with only around two thirds of the new services being achieved.

The average growth rate for total passenger traffic in the Low forecast is 1.9% per annum compared with 2.9% in the Most Likely forecast.

High Forecast
The High forecast assumes higher economic and population growth – 2.6% per annum GDP growth and 1.0% per annum population growth (compared with 2.2% and 0.8%, respectively, in the Most Likely forecast). Air service development is projected to exceed the scenario in Chapter 4.

The average growth rate for passenger traffic in the High forecast is 3.7% per annum.

5.1.2 Passenger Forecasts by Market

The Most Likely forecast broken down in domestic, transborder and international passengers is presented in **Figure 5-3**.

The projections for 2010 show domestic traffic growing by 6.2%, relative to 2009, due to the Porter Airlines service to Halifax. Transborder traffic is forecast to decline slightly (by 2.9%) due to lower loads on the Newark service. International traffic is up nearly 73% as a result of the seasonal service to London (UK) started in 2010 by Air Canada.

In the long term, the domestic market is forecast have the lowest growth rates, averaging 2.3% per annum over the forecast period, due to its relative maturity and overall size. The highest growth is forecast for the transborder market (9.3% per annum on average), as the airport currently has only one service to the U.S. (Newark). Strong growth is also forecast in the international market (averaging 7.8% per annum), as new service and increased service to sunspot and European destinations develop.

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[10] The reason for this is twofold: firstly, as the potential of the airport is realized, the easier opportunities are exploited meaning that growth has to come from less mature markets; the second reason is numerical - higher traffic increases are required to achieve the same growth rate, e.g., a 5% increase on a base of 2 million passengers requires twice as much traffic as 5% growth on a base of 1 million passengers.

Figure 5-3: Forecasts of E/D Passengers at YYT by Market (Most Likely Forecast)

Year	Domestic	Transborder	International	Total
2009 (Actual)	1,161,515	35,407	27,022	1,223,944
2010	1,233,600	34,400	46,700	1,314,700
2015	1,428,000	79,800	86,200	1,594,000
2020	1,589,600	136,900	130,500	1,857,000
2025	1,761,200	176,400	175,400	2,113,000
2030	1,938,400	204,500	208,100	2,351,000
Forecast Annual Growth Rates				
2009-2010	6.2%	-2.8%	72.8%	37.4%
2010-2015	3.0%	18.3%	13.0%	3.9%
2015-2020	2.2%	11.4%	8.6%	3.1%
2020-2025	2.1%	5.2%	6.1%	2.6%
2025-2030	1.9%	3.0%	3.5%	2.2%
2010-2030	2.3%	9.3%	7.8%	2.9%

The high growth rates for transborder and international are also a function of their current low traffic levels. As a result, relatively small increases in air service produce large percentage increases in traffic. For example, a Dash 8-400 (Q400) aircraft operating daily on a year round basis at a 70% load factor would generate 35,700 annual E/D passengers. In the transborder market, the addition of this service would more than double the current level of traffic (34,400 in 2010). By comparison the same service added to the domestic market would increase traffic by only 2.9%.

Although, the domestic market is forecast to grow at the smallest rate, it will still remain the dominant market segment, accounting for 82% of all passenger traffic in 2030 (compared with 95% in 2009).

5.2 Commercial Passenger Aircraft Movements

As discussed in Chapter 3, passenger carrier aircraft movements are generally a function of passenger traffic demand, shaped by carriers' network and the average aircraft size. Forecasts of future aircraft movements are derived forecasts, taking into consideration passenger traffic demand, potential service improvement/expansion, change of average aircraft size, and load factor.

Therefore, forecast passenger demands have been related to projected passengers-per-aircraft to generate the forecasts of passenger-carrier operations.

The projections of average passengers per aircraft growth for the Most Likely forecast are as follows:

- **Domestic Traffic**: the average number of passengers per aircraft in 2009 was 54. Based in part on the scenario analysis in Chapter 4, this average is expected to gradually rise as more long haul services are introduced (e.g., Calgary year round and Edmonton) and as upgrading occurs on other routes (e.g., from turboprop to RJ, or RJ to B737/A320 aircraft, etc.).[11] Therefore, the average passengers-per-aircraft is projected to increase by 0.7% per annum, reaching 61 by 2030.
- **Transborder**: the Newark service is largely operated with 50-seater RJs, although B737-700s are used in some instances. As a result, the average passengers-per-aircraft in 2009 was 43. Passengers-per-aircraft are expected to grow fairly strongly as potential routes such as Orlando/Tampa or Houston would likely be served by B737/A320 aircraft. The average passenger-per-aircraft is projected to rise by 2.9% per annum, reaching 76 by 2030.
- **International Traffic**: the average number of passengers per aircraft in 2009 was 36 as the only scheduled international route was to/from St. Pierre, which is operated with turboprop aircraft (a small number of charter flights to sunspot destinations also operated). In 2010, this average is estimated to rise to 53 with the introduction of Air Canada's seasonal service to London (operated with A319s). Similar to transborder, passengers-per-aircraft is expected to increase strongly as more long haul services are introduced (sunspot and Europe). Therefore, passengers-per-aircraft is projected to grow by 5.2% per annum to reach 109 passengers by 2030.

In the Low forecast, the average number of passengers per aircraft was assumed to grow at a lower rate than in the Most Likely forecast – with the slower growth in new and existing services, there is a reduced entry of larger, long haul aircraft and less pressure to upguage. Similarly, the High forecast assumes higher growth in passengers-per-aircraft (than the Most Likely Forecasts), as higher traffic growth leads to new long haul services and upguaging.

The resulting aircraft movement forecasts are presented in **Figure 5-4** and **Figure 5-5**. In the Most Likely forecast, commercial passenger aircraft movements are projected to grow by an average of 1.9% per annum. This is considerably below the passenger forecast of 2.9% per annum average growth due to the projected increase in average passengers-per-aircraft. In the Low forecast, aircraft movements are forecast to grow by 1.4% per annum while they are forecast to grow by 2.3% per annum in the High forecast.

[11] Average load factors are expected to increase marginally as well.

Figure 5-4: Forecast Commercial Passenger Aircraft (Level I-III) at YYT, 2009-2030

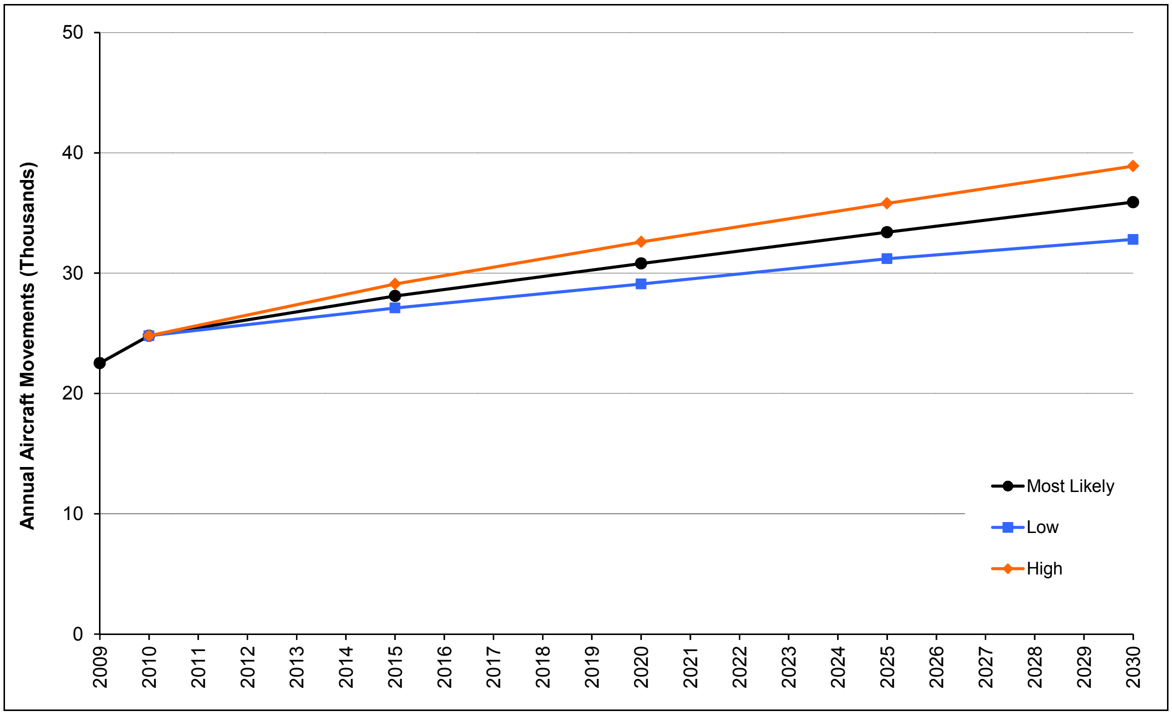

Figure 5-5: Forecasts of Commercial Passenger Aircraft (Level I-III) at YYT, 2009-2030

Year	Low	Most Likely	High
2009 (Actual)		22,522	
2010	24,800	24,800	24,800
2015	27,100	28,100	29,100
2020	29,100	30,800	32,600
2025	31,200	33,400	35,800
2030	32,800	35,900	38,900
Annual Average Growth Rate			
2009-10	10.1%	10.1%	10.1%
2010-15	1.8%	2.5%	3.2%
2015-20	1.4%	1.9%	2.3%
2020-25	1.4%	1.6%	1.9%
2025-30	1.0%	1.5%	1.7%
2010-2030	1.4%	1.9%	2.3%

5.3 Air Cargo

As described in Section 3.4, the Most Likely air cargo forecast was based on an average of three forecasting approaches – an elasticity approach, a scenario approach and industry forecast approach. The Low forecast was taken from the lowest forecast from the three approaches – the industry forecast, while the High forecast was based on the highest of the three – the scenario approach.

The air cargo forecasts are provided in **Figure 5-6**. In the Most Likely forecast, growth in cargo tonnage is forecast to average 3.2% per annum, while in the Low forecast growth is 1.7% per annum and in the High forecast, 4.3% per annum.

Figure 5-6: Forecasts of Air Cargo (Tonnes) at YYT, 2009-2030

Year	Low (Tonnes)	Most Likely (Tonnes)	High (Tonnes)
2009 (Actual)		11,000	
2010	11,000	11,000	11,000
2015	11,900	13,200	14,900
2020	13,000	15,500	18,500
2025	14,100	17,900	22,000
2030	15,300	20,500	25,600
Annual Average Growth Rate			
2009-10	1.4%	1.4%	1.4%
2010-15	1.6%	3.7%	6.3%
2015-20	1.8%	3.3%	4.4%
2020-25	1.6%	2.9%	3.5%
2025-30	1.6%	2.7%	3.1%
2010-2030	1.7%	3.2%	4.3%

Appendix A: Industry Forecasts

The following table identifies various external industry forecasts that were used as part of the air traffic forecast methodology.

Figure A-1: External Forecasts of Passenger Traffic

Source	Traffic Market	Average Annual Growth Rate
Boeing[12]	Within North America Europe to and from North America North America to and from Central America	2.5% 4.3% 4.1%
Airbus[13]	Domestic Canada Canada-U.S. Canada-Western Europe Canada- Caribbean	2.9% 4.3% 4.3% 3.3%
FAA[14]	U.S.-Canada	2.5%
Transport Canada[15]	Domestic Canada Transborder International	1.8% 2.5% 2.9%

[12] Boeing, Current Market Outlook, 2010-2028, published June 2010.

[13] Airbus, Global Market Forecasts, 2009-2028, published November 2009.

[14] FAA, Aerospace Forecasts FY 2010-2030, published March 11, 2009.

[15] Transport Canada, Aviation Forecasts 2008-2022, published September 2009.

Appendix B: Regression Results

The total passenger econometric model was specified as follows:

Ln(TotalPaxTraffic) = Constant + a_1 *x Ln(CanadaRealGDP) +* a_2 *x Ln(StJohnsPopulation)*

Where:

Ln is the natural log of the variable;

TotalPaxTraffic is total passenger traffic at YYT;

CanadaRealGDP is Gross Domestic Product (GDP) of Canada adjusted for inflation;

StJohnsPopulation is the population of the St John's CMA;

Constant, a_1 and a_2 are the estimated model parameters capturing the impact of the various factors on traffic growth at YYT.

Regression Output - Model

Adjusted R-Squared
0.96

	Coefficient Estimate	T-Statistic
Constant	-11.67	2.03
LN (CanadaRealGDP) – a_1	1.30	16.7
LN (StJohnsPopulation) – a_2	0.61	2.4

Appendix C: Real GDP Forecasts

Short Term Forecasts

Year	Bank of Canada	IMF Economic Outlook	Bank of Montreal	CIBC	TD Bank	Transport Canada
	October 2010	October 2010	October 2010	Sept 2010	Sept 2010	Dec 2009
2010	3.0%	3.1%	3.0%	3.0%	3.0%	2.6%
2011	2.3%	2.7%	2.7%	1.9%	2.1%	3.5%
2012	2.6%	3.5%	3.1%	2.8%	2.8%	4.1%
2013		2.8%			2.4%	3.3%
2014					2.4%	

Long Term Forecasts

Period	Transport Canada
	Dec 2010
2009-13	2.2%
2014-19	2.2%
2019-24	2.0%
2024-29	2.0%

InterVISTAS

Air Cargo Study

St. John's International Airport

Submitted to:
St. John's International Airport Authority

Submitted by:
Jacobs Consultancy Canada Inc.
220 Laurier Ave. West, Suite 500
Ottawa, Ontario K1P 5Z9

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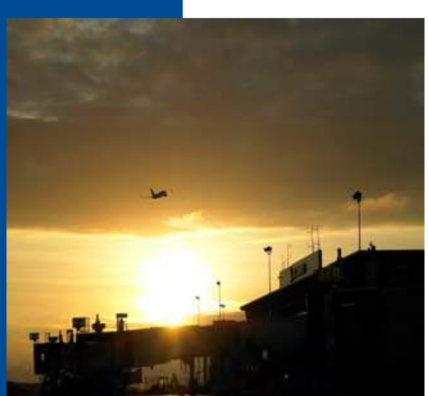

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LIST OF APPENDICES

I. INTRODUCTION

St. John's International Airport (YYT) is one of the 26 airports in the National Airports System (NAS) in Canada and is the primary air gateway to Newfoundland & Labrador. The airport has scheduled air freighter service to Gander, Moncton and Halifax with onward flights to Montreal and Toronto. Cargo is also carried on passenger flights and YYT has scheduled passenger services to five communities in Newfoundland & Labrador and major cities in Canada, the US (New Jersey) and to the French islands of St Pierre and Miquelon. Air Canada operates scheduled service to London during the summer and there are seasonal charter services to the Caribbean. Domestic cargo travelling to Western Canada connects via major airports located in Quebec, Ontario or Nova Scotia. International cargo connects via Toronto, Montreal, Halifax or the US.

St. John's is the eleventh largest cargo airport in Canada. Most cargo is carried on domestic flights. YYT has an 11% share of the Atlantic Canada international trade by air mode (by weight), but most does not fly on international flights to/from YYT. For example, cargo bound for St. John's may be flown from Europe to Toronto then transferred onto a domestic flight to YYT.

The availability of air cargo services is critical for major industries in Newfoundland & Labrador. The Oil and Gas industry, for example, depend on air service to deliver urgent replacement parts and delays causing downtime can cost millions of dollars per day. Not having air cargo services would be a major disincentive for companies to locate in Newfoundland. Furthermore, the lack of direct air service to Europe, other than during the summer, is also a disincentive for businesses to operate in Newfoundland & Labrador.

The St. John's International Airport Authority (SJIAA) commissioned this study to provide a comprehensive report on the cargo opportunities that may be available at YYT and to determine an action plan for the SJIAA to promote air cargo development at the airport.

Objectives of Study

The objectives of the study were to:

- Determine the potential for growth in the air cargo market at St. John's International Airport;
- Assess the benefits of increased capacity and improved service to the community and to the SJIAA;
- Determine if the market is worth pursuing; and
- Provide recommendations and an action plan to further develop this market.

Methodology

The following steps were undertaken to meet these objectives:

- Examine current trends within the air cargo industry, both globally and within Canada;
- Examine existing cargo volumes;
- Interview freight forwarders and air cargo service providers (list provided in Appendix A);
- Interview industry and government stakeholder groups (list provided in Appendix A);
- Determine existing & potential air cargo demand;

- Examine competitive position of YYT;
- Undertake a SWOT analysis;
- Undertake a gap analysis;
- Examine the benefits and costs; and
- Develop recommendations & action plan.

II. OVERVIEW OF AIR CARGO TRANSPORTATION

Global Overview

On a global basis, air cargo represents 35% of the value of all international cargo, although typically only 1% by weight. Analysis of historical trends indicates that air cargo has grown on average almost 5% a year over the 20 year period from 1988 to 2008, although growth was lower in the last 10 years averaging 3.7% per year[1].

Air cargo was severely affected by the recent global recession and declined by 8% in 2009, but is rebounding and has grown by 4.7% in the first four months of 2010[2]. Short term challenges that resulted in negative growth in 2009 are likely the exception to a longer term upward trend. They were precipitated for a number of reasons including:

- Volatile aviation fuel prices;
- Spill over of economic problems in the US to the global economy; and
- Modal shift of some international air cargo shipments to lower cost ocean transport.

Prospectively, air cargo is forecast to show positive growth over the long term for a number of structural reasons.

From the earliest European settlements, Canada's economy has been based on the ability to trade goods. In the 21st Century, the rapid movement of goods and people will be a necessary pre-condition for Canada to benefit from the search for new streams of natural resources, globalization of manufacturing and just-in-time supply.

There are many international trends creating air mode opportunities for Canada, as well as many local, national and trans-national issues that have to be resolved for Canada to achieve its International Gateway potential, including:

- Global economic interdependence;
- Investment in secure infrastructure and capacity;
- International production and sales of goods and services;
- Global sourcing of consumer perishables, such as fresh fruit and flowers;
- Increased reliance on inventory management concepts such as "Just-in-Time" and "Zero" stocks;
- The development of high value and limited life goods such as fashion apparel in non-consuming markets;
- More open borders, both in terms of access and security;
- Less restrictive national and more open multinational trade agreements; and

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1 Boeing World Air Cargo Forecast 2008/09: An Overview, Nov 13, 2008 for 1987-2007 values; and ACI for 2008 values.

2 ACI Monthly World Traffic report, June 2010.

- More liberalized air service agreements.

It is more than simply infrastructure, important though that is. It is also these key issues, how they are addressed and resolved, that will impact how that infrastructure is utilized.

Current Global Air Cargo Industry Framework

A breakdown of the air cargo industry by carrier type is presented in Exhibit II-1.

Exhibit II-1. Air Cargo Carrier Types and Their Business Characteristics

Air Cargo Carrier Types	Characteristics	Illustrative Carriers	Customers	Desired Airport Characteristics
Belly	Baggage holds of passenger aircraft	WestJet, Air Canada, United, American, BA	Wholesale, mail, retail	Passenger airport
Mixed	Baggage holds of passenger aircraft and main decks of all-cargo aircraft	Cathay Pacific, Northwest, Lufthansa, Air France	Wholesale, mail, retail	Passenger airport
Integrated	Main decks of all-cargo aircraft	FedEx, UPS, DHL	Retail	Airport near population
All-cargo	Main decks of all-cargo aircraft	CargoJet, Kelowna Flightcraft, Challenge Air Cargo, Cargolux, Evergreen	Wholesale	Airport near population or more remote airport

In Canada it is estimated[3] that integrated carriers account for 20% to 25% of the market, all cargo carriers 30% to 35%, and belly and mixed cargo carriers approximately 45% of the market (the types of cargo carriers are defined above).

In recent years, air cargo yields (an airline's revenue per kilo of freight) have been under pressure. Overall, air freight yield fell over 5 percent per year since 1985. As with passenger services, airlines are looking to improve their air cargo yields through cooperation with their alliance partners. The high cost of fuel has pushed up the airlines' costs, but it has also allowed them more recently to adjust their rates upward to solidify yields to some extent.

The industry is currently in an important transition period with new security regulations, significant consolidation and reorganization among the cargo airlines and freight forwarders, new model airlines (sometimes called Low-Cost Carriers) and shifts in traditional demand patterns as logistics providers are seeking a more efficient, less costly operating environment.

The integrated carriers (DHL, FedEx, Purolator, and UPS) - typically using their own aircraft fleets - and the freight forwarders are the primary drivers of the air cargo industry and the ultimate routing of air cargo volumes and use of airport gateways. These carriers have been rapidly increasing their domestic and international market share over the past decade through their highly developed transportation networks and multiple service offerings. However, while delivery speed and reliability

3 Jacobs Consultancy analysis of national trends in air cargo (unpublished).

— two qualities that air express possesses in abundance — are prized by business and consumers more than ever before, other modes of transport are increasingly providing similar services at a cost below what is compensatory for pure air networks.

The savings from surface transportation can be substantial, in some instances 10 to 12 times cheaper than air transportation. For this reason, every major integrated carrier has also invested heavily in the development of time-definite regional and transcontinental surface distribution networks.

As the integrated carriers continue to expand their service offerings, their facility planning is increasingly focused on identifying airports that can accommodate long-term facility development that are geographically well positioned with good access to multiple transportation modes.

Freight forwarders are still responsible for over three-quarters of the world's international freight shipments and are strongly attracted to the cargo capacity in the belly space of wide-body passenger aircraft on routes at airports that serve international gateway cities.

Carriers that concentrate aircraft capacity at large gateways often negotiate competitively priced guaranteed cargo space contracts with the freight forwarding companies and thereby attract large volumes of cargo from across the country. This manifests itself in diversion of air cargo to these cargo hub facilities. In previous studies focused on Atlantic Canada, Jacobs Consultancy has found specific examples of these diversions, for instance, Canadian lobster being trucked to airports in the US Northeast for air shipment to Europe and Asia.

Increased cargo security requirements on passenger airlines, particularly in the US, are contributing to a shift in shippers' preference towards dedicated freighter service and both Boeing and Airbus forecast that pure freighters will increase to almost 50% of the industry's future cargo capacity requirements. Transport Canada has not yet issued a definitive regulation concerning air cargo security screening, particularly that being carried in passenger aircraft, but has been working on the issue for some years. It has, however, indicated that it will move to harmonize its regulation with those currently in force in the United States. Currently, they do not see any changes generating a need for significant additional infrastructure at airports, preferring to push the security perimeter back from the airfield boundary.

International Air Service Agreements

While other sectors of the economy have generally benefited from a multilateral trading regime initiated by the General Agreement on Tariffs and Trade (GATT), and continued under the World Trade Organization (WTO) framework, air transport services have not followed the pattern, particularly with respect to "Most Favoured Nation" provisions. Countries still maintain the sovereignty of the airspace over their territory and access to agreed routes has been largely limited to national carriers of the two countries that negotiate certain bilateral rights of (air) access. Strict regulation remains the norm in international scheduled air service issues.

Given the recognition that air transport is a direct economic contributor and a leading trade facilitator, the globalization and integration/regionalization of international economies, and fundamental changes in the airline industry, there is a growing international momentum for greater liberalization of air services. Many options have been identified, many of which will facilitate the growth of Canada's Gateway Airports, including:

- The negotiation of specific clauses within the bilateral framework for open route exchanges;

- Multilateral agreements, whereby it is possible for an airline of a signatory country to compete for passengers and cargo regardless of its nationality;
- A lead sector approach, whereby specific markets such as cargo services are liberalized first;
- Reduction of limits on foreign investment in airlines;
- Effective Special Trade Zones legislation and regulation;
- A general reduction in taxes and Customs impediments which increase shipping and travel costs and reduce mobility; and
- Reduction of infrastructure access constraints.

Since the mid-1990's Canada has pursued the gradual and incremental liberalization of its bilateral air transport agreements. In 2004, Transport Canada identified a number of key issues and strategies related to air liberalization, many of which still need to be addressed[4], and followed up in 2006 by launching its "*Blue Skies"* policy.

Canada has successfully concluded a number of Open-Skies type agreements and concluded new or expanded air services agreements with a number of other countries. With significant growth seen in emerging markets – many of which are key trading partners currently or prospectively – there is an opportunity to influence the route structure of the emerging cargo carriers to include Canada in their air transportation logistics planning.

Recently, Canada achieved a significant breakthrough with an Open Skies Agreement with the EU, creating the potential to increase the flow of passengers and cargo between all 27 EU States and Canada. However, many of the more interesting changes included in this agreement are contingent on other air policy changes – for instance, many of the announced benefits do not come into effect until Canada raises the airline foreign ownership limit to 49% and currently there is no publicly released timetable to implement this policy change.

Canada has updated its US Air Service Agreement and now air carriers of both countries are allowed not only to pick up all-cargo traffic in the other nation's territory and carry it to a third country as part of a service to or from their home territory, but also to operate stand-alone all-cargo services between the other nation's territory and third countries. However, a carrier based, owned and controlled in one country is still not allowed to transport cargo within the other, i.e. cabotage is still not allowed. Indeed, it is generally accepted that cabotage will not be on the agenda for the foreseeable future.

While air liberalization has been a key facilitator in the growth of air cargo, governments still primarily focus their efforts on passenger traffic. Generally, insufficient recognition has been accorded to the importance of air cargo liberalization to business competitiveness, world trade and economic growth and development.

[4] TC submission to the Standing Committee on Transport (SCOT) entitled "Air Liberalization: A Review of Canada's Economic Regulatory Regime as it affects the Canadian Air Industry", November 2004.

Special Trade and Enterprise Zones (SEZ)

Another important element in developing International Gateway opportunities is the availability of efficient special trade and enterprise or economic zones (SEZ) structures (which includes Foreign Trade Zones (FTZ), something that is generally seen as lacking in Canada.

Over the past twenty years, a range of designated SEZ has been created internationally with the aim of promoting economic development, although the specifics vary greatly across jurisdictions.

These zones tend to be quite wide ranging in terms of general economic activity and some have a transportation element connected to them. Examples include:

- The People's Republic of China has a number of Special Economic Zones which are targeted at foreign capital and economic activity which is predominantly export-oriented. These zones often have special administrative rights including separate planning and financial planning.
- India passed legislation enabling special trade areas in 2005 and to date some 300 zones have been developed. India has a much larger number of smaller SEZs than China, which has not provided the same critical mass which the Chinese SEZs have achieved.
- Enterprise Zones exist in a number of forms in the United States, at both the federal and state level, generally in economically depressed areas. The growth of FTZ has been substantial – from 50 in 1980 to more than 225 in 2005. Near the border, Plattsburg has positioned itself as Montréal's FTZ and has been successful in attracting numerous Canadian customers[5].
- An Enterprise Zone program was launched by the **U.K.** government in the early 1980's in order to promote and encourage private sector industrial and commercial activity through financial incentives and relaxation of some statutory and administrative controls.

International experience also suggests that there are certain factors that greatly increase the likelihood of success for these zones. These include a combination of quality infrastructure, supportive government and lighter regulation, a strong export focus, tax and customs exemptions and large storage and logistics capacities.

However, it is noted that WTO obligations place a limit on country competition for Tax and Customs Duty Free Zones (or more generically FTZ). Subsidies to particular businesses or industries are discouraged and may be subject to challenge by other WTO countries.

International Air Cargo Transshipment Program

Canadian airports have the potential to be transshipment points for air cargo travelling between North America and both Asia and Europe. The air route distances are shorter to European and Asian markets than competing US airports. While non-stops to Europe have been common for many years, with new, longer-range aircraft many new Asian routes are, or will soon be, possible from many parts of Canada. The industry is already implementing non-stop passenger flights to Asian markets from Central Canada.

Canada's International Air Cargo Transshipment Program allows Canadian and foreign carriers to carry international cargo transshipments coming from, or destined to, points outside Canada via approved Canadian airports. Established in 1982 at Mirabel Airport this program was initially

[5] AdM Presentation (undated): First Canadian Foreign Trade Zone – AdM-Mirabel.

intended to promote the use of small and underutilized airports, and at the time, was not available to larger airports. The Transshipment Program:

- Allows Canadian and foreign carriers to carry international cargo transshipments coming from, and destined to, points outside Canada via approved Canadian airports even if the rights are not provided in Canada's bilateral air transport agreements (such as with India);
- Allows in-transit cargo to be stored in bond until it is transported to its final destination by air or another mode; and
- Has been extended to a number of Canadian airports beyond Mirabel to include: Hamilton, Windsor, Gander, Winnipeg, Edmonton, Calgary, Vancouver, Moncton, Abbotsford, and most recently Halifax, Prince George and Toronto-Pearson.

The perceived lack of an effective Duty and Tax Free Zone regime allowing transshipped goods into Canada, the ability to add significant value to them, and border issues, has meant that Canada has not, to date, generally been viewed as an attractive location for logistics centres, in spite of its geographical advantages. This has contributed to Canada's International Air Cargo Transshipment Program not achieving the success it promised.

Until very recently, no carriers had asked to use the provisions of the Transshipment Program. In March 2009, three foreign carriers had applied to the Canadian Transportation Agency (CTA) for the following authorizations[6]:

1. Cargolux Airlines International, S.A. - for Montréal-Mirabel and Calgary airports only;
2. Cargo Air Ltd. - for the 13 designated airports; and
3. Atlantic Airlines Limited - for the 13 designated airports.

The applications for these 3 carriers are still pending; the CTA indicated they are waiting for a new Minister's direction on this program.[7]

Before the Transshipment program was in place, three foreign carriers were granted authorizations from the Canadian Transportation Agency (CTA) to carry bonded international cargo at Canadian airports[8]:

1. Cargolux Airlines International, S.A. - for Montréal-Mirabel and Calgary airports only;
2. Varig Brazilian Airlines African International Airways and Vega Airlines Ltd. - for Montréal-Mirabel and Hamilton airports only – granted December 28, 2005; and
3. Atlantic Airlines Limited - for the 13 designated airports – granted December 20, 2006.

African International Airways and Vega Airlines Ltd. had previously been granted authorizations to carry bonded international cargo at transshipment airports, but the authorizations were rescinded.

6 Jacobs Consultancy Telephone conversation with CTA, March 2009.
7 Communication with CTA June 30, 2010
8 CTA web site, June 2010.

Canadian Air Cargo Data

There is a multiplicity of air cargo data sources which are used studying developing air cargo analyses, including:

- Airport Reported Data;
- Statistics Canada: Traffic at Canadian Airports Report (Cat. 51-203-X);
- ECATS Cargo Data;
- Export/Import and Domestic Trade Flow Data:
    - Air Exports Cleared, Central Canada;
    - Air Exports Origin, Central Canada:
        - Air Imports Cleared, Central Canada;
        - TC Domestic Trade Flow Data;
    - TC Forecasts:
        - Airport International-US Export-Import Detailed Forecasts; and
        - TC Domestic Flows Forecast (Air mode).

Many issues are encountered in arriving at meaningful air cargo information, including but not limited to:

- Data not complete or not collected by an airport;
- Airlines reporting different cargo figures to different agencies;
- Reporting of value of goods, but not weight, in trade data;
- Lack of information on commodity types;
- Lack of data by sector of flight and/or origin or final destination of cargo;
- Cargo transferred between flights (e.g., at cargo hub airport) being counted twice (once in "unloaded" and again in "loaded" column); and
- Truck only cargo also using airport cargo distribution centres and some sources including this cargo in air mode statistics.

Overall, a lack of comprehensive and correct air cargo information is an impediment to Canadian enterprises wanting to identify the domestic and international air cargo opportunities that exist and for planning the transport infrastructure requirements.

III. AIRPORT AND CARGO FACILITIES

Airport Characteristics

The St. John's International Airport (YYT) is located 12 km north of the downtown section of the City of St. John's on Highway 40, one km north of the junction with the Trans-Canada Highway 1.

The airport has three runways. The primary and secondary runways are both capable of handling wide-body jet aircraft. The primary (11-29) is equipped with a Category II ILS on Runway 29 and a Category I ILS on Runway 11. The secondary Runway, 16, has a Category I ILS. Air navigation is provided by a Nav Canada tower located at the airport.

The air terminal building is 16,300 m^2 (175,000 sq. ft.) and was designed to handle 1,130 total E/D passengers during the peak hour.

The airport does not have a modern, dedicated cargo terminal. The Air Canada Cargo building is very old and will be removed in the next few years. Purolator, Cargojet and WestJet use part of the Provincial Airlines hangar for processing their cargo, but the space is tight and Provincial is pressuring Cargojet to move to another location. Provincial Airlines processes their cargo in their hangar.

A new ramp services building is being constructed to accommodate the existing operations conducted in the Air Canada cargo/maintenance and Air Labrador buildings. Construction is expected to commence in late 2010. These facilities are being removed to facilitate ATB ramp expansion that will accommodate additional overnight parking of commercial aircraft. The ramp associated with this new building will provide storage of equipment that is presently parked on the ATB ramp. The ramp services building will have limited space available to support some additional cargo operations, such as those by WestJet. However, the space is not sufficient to support a larger cargo operator. Any new entrant air cargo operators or significant expansion of existing cargo operations by incumbents will require a new cargo facility to address future growth.

Ground handling services are available from three service providers, one of which is equipped with a main deck loader for loading cargo into large jet aircraft.

A full range of services is available at the airport including jet and avgas fuel and aircraft hangar facilities. Freight forwarder services are available within the City of St. John's.

Operational Issues, Challenges and Opportunities

The St. John's International Airport's primary service area is the Avalon Peninsula. Its coastal position leads to service interruptions in inclement weather conditions, particularly fog. Upgrading to a Category III ILS would greatly improve the ability of airlines to maintain flight schedules.

Planned Investments in Infrastructure & Operations

The SJIAA currently has a $20 Million development plan for the Passenger Terminal Building Phase I Expansion. The full implementation of its total capital plan out to 2013 will cost approximately $85 to $100 Million. Improving the operational capability of the ground based navigational aids is important to securing the airport's future status as the gateway to the region. The SJIAA plans to invest in upgrades to the airfield lighting systems and has applications with NavCanada to upgrade to the ILS system to improve airport accessibility. The SJIAA is seeking funding partnerships with the provincial and federal governments to share in the $26 million capital costs associated with improving the accessibility of the Airport. This project, if approved, will include an upgrade to the airfield lighting systems and an upgrade to the ILS system. It will significantly improve the accessibility of the airport under low-visibility conditions and will place St. John's International Airport on par with the other Top 8 Airports in Canada.

IV. AIR CARGO SERVICE PROVIDERS

Scheduled air freighter service is provided by:

- Cargojet;
- Prince Edward Air (regional affiliate of Cargojet); and
- Purolator (operated by Kelowna Flightcraft).

The services are summarized in Exhibit IV-1. All freighter services from YYT are domestic, with jet service to either Moncton or Halifax/Hamilton and turboprop service to Gander. Much of the cargo to Moncton is transferred to freighter aircraft for transport to Montreal, Toronto and beyond.

Exhibit IV-1. Air Freighter Services at YYT, May 2010

Airline	Aircraft	Max. Payload (Tonnes)	Days per Week		Direction	Routing
Cargojet	B727-200F	27.2	4	Tue-Fri	Arrive	YHM-YQM-YHZ-YYT
					Depart	YYT-YHM
Purolator	B737-200F	21.4	5	Tue-Sat	Arrive	YQM-YYT
				Mon-Fri	Depart	YYT-YQM
Prince Edward	BE1900	2.27	10	Mon-Fri	Arrive	YQX-YYT
Air*					Depart	YYT-YQX

Source: OAG, Airline web sites, Flight Tracker

* Prince Edward Air is a subsidiary of Cargojet

Airport designators: YHM Hamilton; YQM Moncton; YHZ Halifax, YYT St. John's; YQX Gander

Purolator and Cargojet/Prince Edward Air operate from the Provincial Airlines hangar.

Purolator also operated flights from YYT to Montreal-Trudeau Airport via Moncton for 8-10 weeks in the fall of 2009 to transport approximately 5 tonnes of seafood each day to Europe.

The passenger airlines operating at YYT all carry cargo in addition to passengers. This includes:

- Air Canada;
- WestJet;
- Provincial; and
- Air St. Pierre.

The volume carried by these airlines, particularly the regional carriers, is limited by the small amount of belly space available on the aircraft for cargo.

Charter carriers also play an important role in moving air cargo both from YYT to offshore oil platforms and regional communities, and occasionally transport larger items to St. John's, primarily for oil and gas companies. Cougar Helicopters operates extensively to offshore drilling installations for crew changes and transporting freight.

There are two courier companies that presently have off-site facilities that have expressed interest in establishing their sorting and maintenance facilities at the Airport. The feedback from these companies is that, compared to other locations in the City of St. John's, the Airport is mid-range on cost but logistically an ideal location as it results in greater efficiencies in its operations. At present, FedEx and UPS have sorting facilities off-airport and use flights operated by other airlines, including Purolator, for transporting their cargo.

V. AIR CARGO DEMAND

Current Air Cargo Volumes

The total volume of air cargo handled at YYT in 2009 is estimated to be 10,850 tonnes based on information provided by the carriers. Statistics Canada reported 9,839 tonnes at YYT for 2009. During the first 6 months of 2010, cargo volumes were 1% higher than in the same period in 2009. Most cargo (84%) is carried by all cargo / integrated carriers, while 14% is carried in the belly of aircraft on passenger service.

Most cargo at YYT is inbound, as shown in Exhibit V-1, although the small amount of intra-provincial cargo is mostly outbound. The directional imbalance is high for interprovincial cargo – for every tonne of outbound cargo there are almost 6 tonnes of inbound cargo. This directional imbalance is much greater at YYT than at either Halifax or Moncton.

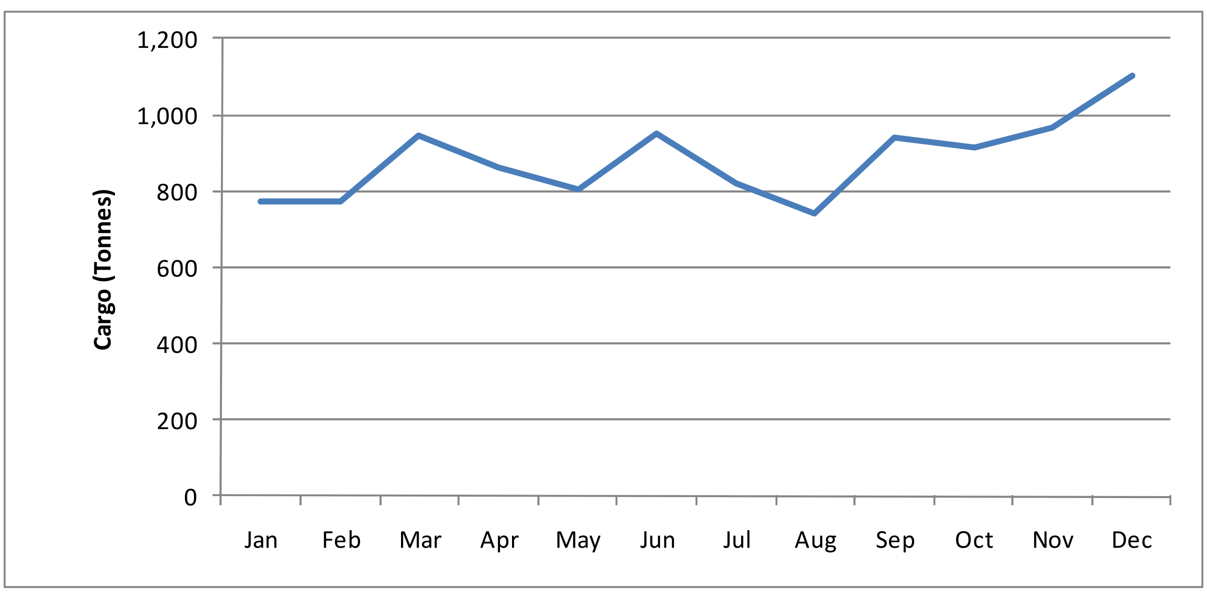
Exhibit V-1. Air Cargo Tonnages at YYT by Direction and Region

	Inbound	Outbound	Total	Inbound %	In/Out	Out/In
All Cargo	8,878	1,974	10,851	82%	4.5	0.22
Interprovincial	8,689	1,460	10,149	86%	5.9	0.17
Intra-provincial^	189	513	702	27%	0.4	2.7

^ Includes St. Pierre

Air cargo volumes vary significantly by month, as shown in Exhibit V-2, with November-December being the busiest period.

Exhibit V-2. Air Cargo Tonnages at YYT by Month in 2009



Air Cargo Flows

Almost all cargo at YYT is handled on domestic flights. Statistics Canada reported the following breakdown for 2009:

✈ Domestic	9,704 tonnes	98.6%
✈ Transborder	26 tonnes	0.3%
✈ International	109 tonnes	1.1%
✈ Total	9,839 tonnes	100.0%

However, based on trade data for air mode in 2007, approximately 1,400 tonnes of cargo on domestic flights at YYT is transferred to/from transborder or international flights at either Toronto, Halifax or Montreal. A breakdown of the value and estimated tonnages of air cargo exported and imported by air from YYT in 2007 is given in Exhibit V-3.

Exhibit V-3. Value and Estimated Tonnage of Exports and Imports from YYT^ in 2007

Country	Outbound/Exports		Inbound/Imports**	
	Value ($M)	Tonnes*	Value ($M)	Tonnes*
US	$12.36	175	$27.54	153
Other International	$64.84	367	$31.11	769
Total	$77.20	543	$58.65	922

Source: Canadian Trade Data, TC 2008
^ Most of the cargo is flown domestically to Toronto, Halifax or Montreal to be loaded on international flights
* Estimated based on value and average value per kilogram from US Trade Database
** Includes only imports where YYT is the arrival port to Canada (excludes imports arriving at Halifax, Toronto or other Canadian airports)

It should be noted that exports as reported here are based on the province of origin and truly reflect the current demand for air exports from Newfoundland & Labrador. However, imports are based on the province of the port of entry, not the province of the final destination of the imports. Thus, if imports bound for Newfoundland & Labrador arrive in Halifax at Toronto airports and then either flown or trucked to St. John's, they will not be recorded as an import to Newfoundland & Labrador. Since Newfoundland & Labrador has little cargo capacity on international flights, the volume of air imports is likely significantly under-represented in terms of the volume of imports to Newfoundland & Labrador traveling by air for all or most of the journey.

Interviews with cargo carriers indicated that most of the interprovincial air cargo at YYT originates from, or is bound to, Ontario or the US.

Exhibit V-4 presents the values and estimated tonnage of exports from and imports to Newfoundland & Labrador by world region in 2007. The volumes are significantly greater than the volumes processed at YYT as much of Newfoundland & Labrador's international trade by air mode does not use YYT. Some is flown from Gander and Goose Bay (military equipment) and most is flown from Toronto, Montreal and Halifax. Europe is the largest market – in total, approximately 256 tonnes is exported via air from Newfoundland & Labrador to Europe and 790 tonnes imported via air from Europe. The directional imbalance for Europe is about 3:1 with imports exceeding exports, although the imbalance is likely much larger as the imports exclude items coming via an airport in another province. The US is the second largest market with 165 tonnes exported from Newfoundland & Labrador and 335 tonnes imported to Newfoundland & Labrador airports. Asia is the largest export market via air mode, but there are few imports where Newfoundland & Labrador is the port of entry as the air imports from Asia come via Toronto or Vancouver airports.

Exhibit V-4. Values and Estimated Tonnage* of Exports from and Imports to Newfoundland & Labrador by Region in 2007

World Region	Exports from NFLD		Imports to NFLD^		Exports + Imports	
	Value $M	Estimated Tonnes	Value $M	Estimated Tonnes	Value $M	Estimated Tonnes
Africa	$0.49	6	$0.13	3	$0.62	9
Asia	$6.99	257	$0.93	19	$7.92	275
Central America & Islands	$1.60	22	$0.00	1	$1.60	23
Eastern Europe	$18.56	52	$0.03	0	$18.59	52
Mexico	$0.46	3	$0.06	3	$0.51	6
Middle East	$2.12	22	$0.00	0	$2.12	22
Oceania (Pacific Islands)	$0.67	5	$0.04	1	$0.71	6
Other North America	$0.06	3	$0.00		$0.06	3
South America	$2.15	29	$0.16	27	$2.31	56
United States	$28.88	165	$33.09	169	$61.97	335
Western Europe	$25.62	204	$39.60	791	$65.23	995
Total	$87.61	769	$74.04	1,015	$161.65	1,784

Source: Canadian Trade Data, TC 2008
* Estimated tonnage based on value and average value per kilogram from US Trade Database
^ Includes only imports where the arrival port to Canada is in Newfoundland (excludes imports arriving at Halifax, Toronto, etc.)

In 2005 when St. John's had wide-body passenger air service to London Heathrow with significant cargo capacity, outbound cargo was averaging over 14 tonnes per week, mostly fresh fish to London.

The values of exports from and imports to Newfoundland & Labrador to/from major European trading partners by air mode by country in 2008 are presented in Exhibit V-5. The largest share of trade by air to/from Newfoundland & Labrador in 2008 was with the U.K. (39%), followed by Germany (21%) and France (13%).

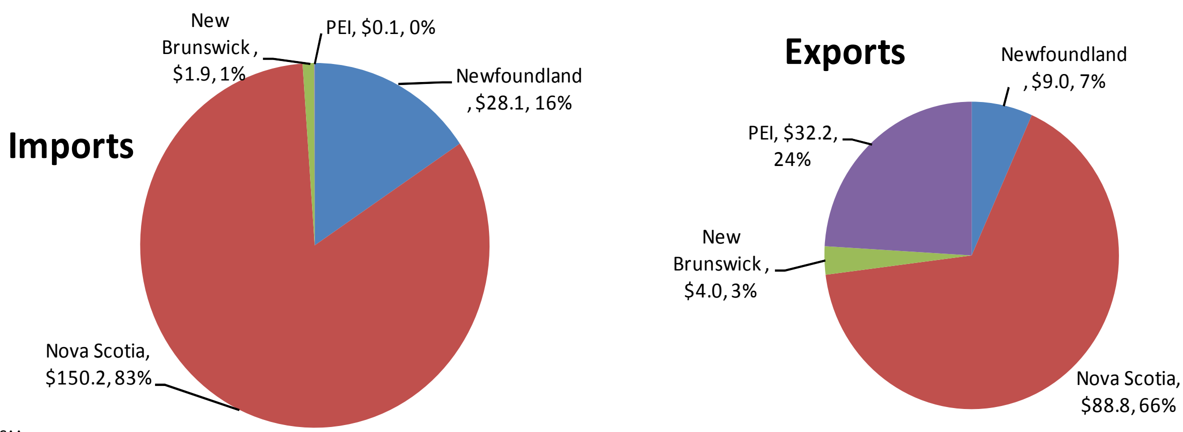
Exhibit V-5. Value ($ Million) of Exports from and Imports to Newfoundland & Labrador to/from Major European Trading Partners by Air Mode by Country in 2008

Country	Imports to NFLD			Exports from NFLD			Exp.+Imp. by Air	
	Air	All Modes	% Air	Air	All Modes	% Air	Value	% of Total
U.K.	$12.4	$39.6	31.3%	$2.0	$172.3	1.2%	$14.4	39%
Germany	$3.8	$11.7	32.7%	$3.8	$11.7	32.7%	$7.7	21%
France	$4.6	$13.9	33.3%	$0.2	$317.8	0.1%	$4.9	13%
Italy	$0.8	$3.5	22.5%	$0.6	$107.9	0.6%	$1.4	4%
Switzerland	$4.0	$4.0	100.0%	$0.0	$1.7	2.3%	$4.0	11%
Belgium	$0.2	$20.3	0.8%	$0.2	$0.5	43.5%	$0.4	1%
Total (above)	$28.1	$98.9	28.4%	$9.0	$702.7	1.3%	$37.0	100%

Source: ACCA 2010

The values of exports from and imports to Atlantic Canada provinces to/from major European trading partners (U.K., Germany, France, Italy, The Netherlands, Switzerland and Belgium) by air mode in 2008 are shown in Exhibit V-6. Most of the imports (83% by value) were to Nova Scotia with Newfoundland & Labrador a distant second with 16% of the total. The large majority of the exports were also from Nova Scotia (66%), with PEI accounting for almost a quarter followed by Newfoundland & Labrador with 7%. The considerably larger volume of trade using air transportation via Nova Scotia is a strong incentive for carriers to operate air freighter services from Halifax.

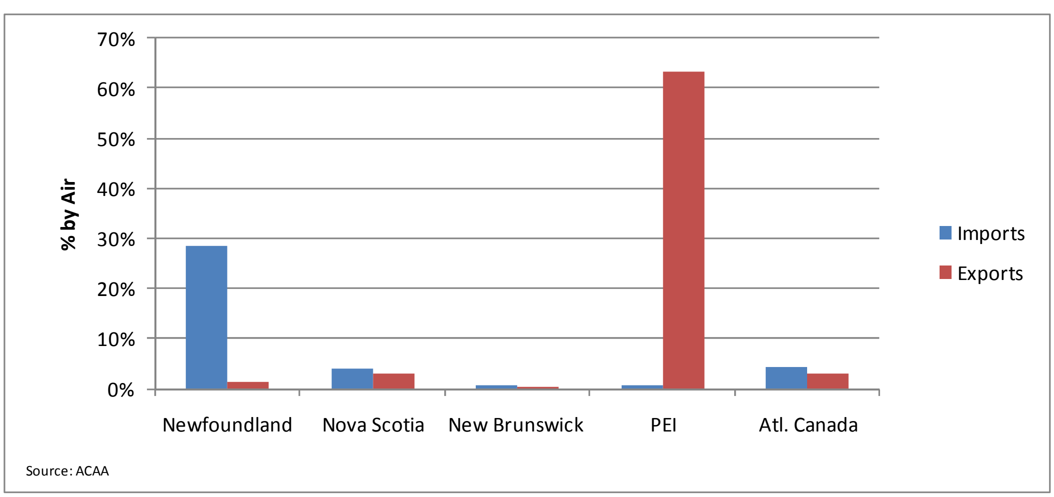
Exhibit V-6. Value ($ Million) of Exports from and Imports to Atlantic Canada Provinces to/from Major European Trading Partners by Air Mode in 2008



Source: ACAA

The percentage of total imports (by value) by air mode to Newfoundland & Labrador from the major European trading partners is relatively high at 28%, much greater than for Nova Scotia and New Brunswick (see Exhibit V-7). However, the percentage of exports by air mode is low, just 1%. This compares with averages of 4% and 3% for imports and exports to Atlantic Canada provinces as a whole. PEI has a very high percentage of exports by air mode (63%). Newfoundland & Labrador and PEI are more dependent of air mode for their trade with Europe than the other Atlantic Canada provinces, but their volumes of trade are relatively low.

Exhibit V-7. Percentage by Exports from and Imports to Atlantic Canada Provinces (by Value) to/from Major European Trading Partners by Air Mode in 2008



The values of exports and imports for Newfoundland and other Atlantic Canada Provinces to/from their major European trading partners, both total and by air mode, in 2008 are presented in Exhibit V-8. The U.K. is by far the largest trading partner for Newfoundland and the other Atlantic Canada provinces by air mode, while Germany is the largest in total value of exports and imports by all modes. Imports from the U.K. to Newfoundland exceed exports by a factor of six to one. It should be noted, however, that the volume of goods to a particular country exported and imported by air mode is greatly influenced by the airlift capacity to that country. Most of the air cargo capacity is available in the belly of passenger flights to the U.K. Germany and France are the next two largest European trading partners by air mode for Newfoundland followed by The Netherlands and Switzerland. Newfoundland accounts for just 10% of the exports and imports by air mode between Atlantic Canada and Europe.

Exhibit V-8. Value ($ Million) of Exports and Imports for Atlantic Canada Provinces to/from Major European Trading Partners, Total and by Air Mode in 2008

Country	Province	Imports to NFLD			Exports from NFLD			Exp+Imp by Air	
		Air	Total	% Air	Air	Total	% Air	Value	% of Total
U.K.	**Newfoundland**	**$12.4**	**$39.6**	**31.3%**	**$2.0**	**$172.3**	**1.2%**	**$14.4**	**40.1%**
	Nova Scotia	$81.7	$789.6	10.4%	$28.9	$166.4	17.4%	$110.7	46.1%
	New Brunswick	$0.9	$185.1	0.5%	$2.2	$17.9	12.0%	$3.0	54.4%
	PEI	$0.1	$16.8	0.5%	$24.0	$28.1	85.6%	$24.1	59.1%
	Atl. Canada	$95.1	$1,031.1	9.2%	$57.1	$384.6	14.8%	$152.2	47.2%
	% Nfld	**13.0%**	**3.8%**		**3.5%**	**44.8%**			
Germany	**Newfoundland**	**$3.8**	**$11.7**	**32.7%**	**$2.7**	**$1,010.1**	**0.3%**	**$6.6**	**18.2%**
	Nova Scotia	$13.3	$2,523.9	0.5%	$14.2	$62.7	22.6%	$27.5	11.5%
	New Brunswick	$0.6	$26.6	2.2%	$0.3	$12.7	2.0%	$0.8	15.2%
	PEI	$0.0	$0.0	100.0%	$8.5	$12.3	69.3%	$8.5	20.9%
	Atl. Canada	$17.7	$2,562.2	0.7%	$25.7	$1,097.9	2.3%	$43.4	13.5%
	% Nfld	**21.6%**	**0.5%**		**10.6%**	**92.0%**			
France	**Newfoundland**	**$4.6**	**$13.9**	**33.3%**	**$0.2**	**$317.8**	**0.1%**	**$4.9**	**13.5%**
	Nova Scotia	$11.1	$100.1	11.1%	$14.2	$96.6	14.7%	$25.3	10.5%
	New Brunswick	$0.1	$6.8	0.8%	$0.6	$12.3	5.0%	$0.7	12.1%
	PEI	$0.0	$0.0	100.0%	$3.0	$9.2	32.6%	$3.0	7.4%
	Atl. Canada	$15.8	$120.8	13.1%	$18.0	$436.0	4.1%	$33.8	10.5%
	% Nfld	**29.4%**	**11.5%**		**1.2%**	**72.9%**			
Italy	**Newfoundland**	**$0.8**	**$3.5**	**22.5%**	**$0.6**	**$107.9**	**0.6%**	**$1.4**	**4.0%**
	Nova Scotia	$32.9	$166.5	19.8%	$5.9	$21.9	26.8%	$38.8	16.2%
	New Brunswick	$0.0	$3.3	0.7%	$0.0	$11.6	0.3%	$0.1	1.0%
	PEI	$0.0	$0.0	100.0%	$0.1	$3.3	4.0%	$0.2	0.4%
	Atl. Canada	$33.8	$173.3	19.5%	$6.7	$144.7	4.6%	$40.4	12.5%
	% Nfld	**2.3%**	**2.0%**		**9.7%**	**74.6%**			
The Netherlands	**Newfoundland**	**$2.3**	**$5.9**	**38.8%**	**$2.0**	**$90.8**	**2.2%**	**$4.3**	**12.0%**
	Nova Scotia	$8.3	$40.5	20.4%	$9.6	$44.7	21.4%	$17.8	7.4%
	New Brunswick	$0.1	$29.1	0.2%	$0.3	$541.8	0.1%	$0.4	6.9%
	PEI	$0.0	$0.0		$3.8	$4.7	82.1%	$3.8	9.4%
	Atl. Canada	$10.6	$75.5	14.1%	$15.7	$682.0	2.3%	$26.3	8.2%
	% Nfld	**21.6%**	**7.8%**		**12.9%**	**13.3%**			
Switzerland	**Newfoundland**	**$4.0**	**$4.0**	**100.0%**	**$0.0**	**$1.7**	**2.3%**	**$4.0**	**11.2%**
	Nova Scotia	$1.3	$15.5	8.4%	$0.5	$3.5	15.1%	$1.8	0.8%
	New Brunswick	$0.3	$0.3	100.0%	$0.0	$2.2	0.2%	$0.3	5.0%
	PEI	$0.0	$0.0		$1.0	$1.0	100.0%	$1.0	2.5%
	Atl. Canada	$5.6	$19.8	28.1%	$1.6	$8.5	19.0%	$7.2	2.2%
	% Nfld	**71.6%**	**20.1%**		**2.4%**	**19.8%**			
Belgium	**Newfoundland**	**$0.2**	**$20.3**	**0.8%**	**$0.2**	**$0.5**	**43.5%**	**$0.4**	**1.0%**
	Nova Scotia	$1.6	$243.7	0.7%	$16.5	$45.3	36.5%	$18.2	7.6%
	New Brunswick	$0.0	$0.0	100.0%	$0.3	$245.4	0.1%	$0.3	5.5%
	PEI	$0.0	$0.0		$0.1	$4.5	3.2%	$0.1	0.4%
	Atl. Canada	$1.8	$264.0	0.7%	$17.1	$295.6	5.8%	$19.0	5.9%
	% Nfld	**9.0%**	**7.7%**		**1.2%**	**0.2%**			
Total (above)	Newfoundland	$28.1	$98.9	**28.4%**	$7.9	$1,701.0	**0.5%**	$35.9	**100.0%**
	Nova Scotia	$150.2	$3,879.9	3.9%	$89.8	$441.1	20.4%	$240.0	100.0%
	New Brunswick	$1.9	$251.2	0.8%	$3.7	$843.9	0.4%	$5.6	100.0%
	PEI	$0.1	$16.8	0.7%	$40.7	$63.2	64.5%	$40.9	100.0%
	Atl. Canada	$180.3	$4,246.7	4.2%	$142.0	$3,049.2	4.7%	$322.4	100.0%
	% Nfld	**15.6%**	**2.3%**		**5.5%**	**55.8%**			

Source: ACCA 2010

Air Cargo Profile

A detailed breakdown of cargo on domestic flights by commodity type is not available. However, based on interviews with air cargo providers, the most common types of cargo are:

- Machine parts;
- Small packages;
- Tools;
- Oil field/drilling/refining equipment; and
- Product samples.

Much of the cargo on domestic flights is similar to international cargo as it is flown to/from Halifax, Toronto or Montreal where it is transferred to/from international flights.

The most common types of products exported and imported by air from YYT are summarized in Exhibit V-9. The most common exports by air mode are vehicle and machinery parts and live/fresh seafood. The most common air imports are machinery parts.

Exhibit V-9. Top Export and Import Products by Value Cleared at YYT in 2007

Exports	Value	Tonnes*	Imports	Value	Tonnes*
Vehicles, Except Railway or Tramway, and Parts etc	$3,471,486	108.7	Nuclear Reactors, Boilers, Machinery etc.; Parts	$20,294,120	502.5
Nuclear Reactors, Boilers, Machinery etc.; Parts	$13,518,597	98.1	Articles of Iron or Steel	$2,252,189	139.7
Fish, Crustaceans & Aquatic Invertebrates	$925,522	94.4	Electric Machinery etc; Sound Equip; TV Equip; Parts	$4,149,255	40.9
Aircraft, Spacecraft, and Parts Thereof	$44,990,502	80.7	Optic, Photo etc, Medic or Surgical Instruments etc	$6,073,321	39.0
Tools, Cutlery etc. of Base Metal & Parts Thereof	$1,608,349	38.7	Live Trees, Plants, Bulbs etc.; Cut Flowers etc.	$174,409	33.0
Electric Machinery etc; Sound Equip; TV Equip; Parts	$4,686,260	24.7	Beverages, Spirits and Vinegar	$170,486	29.1
Optic, Photo etc, Medic or Surgical Instruments etc	$4,529,295	20.9	Tools, Cutlery etc. of Base Metal & Parts Thereof	$1,581,441	21.3
Articles of Iron or Steel	$306,252	19.9	Aircraft, Spacecraft, and Parts Thereof	$21,871,114	16.3
Miscellaneous Articles of Base Metal	$235,097	14.8	Rubber and Articles Thereof	$375,896	15.3
Furskins and Artificial Fur; Manufactures Thereof	$1,703,903	12.8	Plastics and Articles Thereof	$226,721	11.6

Source: Canadian Trade Database, TC 2008
* Estimated tonnage based on value and average value per kilogram from US Trade Database

Major Generators of Inbound and Outbound Cargo Traffic

YYT is the major airport for air cargo in Newfoundland & Labrador and as such, a portion of the inbound and outbound cargo is generated at other airports and is only transferred between flights at YYT. A significant portion of the cargo is small packages generated by businesses throughout Newfoundland & Labrador.

The Oil and Gas industry is a major generator of air cargo at YYT, almost all of which is inbound. Machine parts make up a significant portion of the air cargo due to the urgency of delivery for the Oil and Gas industry and are often flown on special charter flights. Air cargo demand is more strongly related to exploration for oil and gas than production as it is easier to plan in advance during the production phase and have items shipped by cheaper modes of transportation. Rigs used in exploration cost $0.5-1.0 million dollars a day to operate and given the unpredictable nature of the operating environment there is often an urgent need for replacement parts. Much of the off-shore industry is built around U.K./European specifications and technology and most of the parts therefore come from either Aberdeen (Scotland) or Stavanger (Norway). Efficient service to the US, particularly Houston, is also desirable and next day delivery is required if possible.

The geographical distribution of air cargo demand associated with the Oil and Gas industry is estimated to be approximately:

- 50% U.K./Europe;
- 25% Western Canada; and
- 25% the US.

There is expected to be an increase in exploration for oil and gas around Newfoundland & Labrador in the next 5 to 8 years which should result in an increase in air cargo demand. Expenditures on exploration of $1-2 billion are expected over the next 5 years. Construction on the Hebron off-shore platform is underway and is expected to cost $4-6 billion. In addition, the $1.5 billion Vale Inco mine concentrator in Voisey's Bay, Labrador, is under construction as well as a new processor located at Long Harbour (Newfoundland). These construction projects will further stimulate air cargo demand in the province to some degree.

Oil refining and ship building are also important industries in Newfoundland & Labrador, but they create little demand for air cargo. Other manufacturing industries are small and don't use air cargo. The retail industry does not generate air cargo at YYT as the main distribution centres for air cargo are at Toronto, Montreal and Vancouver, and retail products are shipped by surface mode from those airports to Newfoundland.

The high tech industry has grown strongly and is an important industry in St. John's, but again does not create significant air cargo demand. Much of the output is software which can be transported electronically. Other items such as radio frequency identification devices which are of very high value per unit weight are so light that millions of devises weight less than a tonne. The Defence and Aerospace industries are also important industries in Newfoundland & Labrador, but the air cargo volumes that are generated from these sectors are small and little growth in cargo is expected in the short-term.

The Seafood industry is one of the largest contributors to exports by air mode. The amounts exported by air are much lower than in the past and there is potential for a huge increase. In 2007 air exports of fish, crustaceans & aquatic invertebrates was less than 2 tonnes per week, while the amount was closer to 14 tonnes per week in 2005 when the B767 operated to London U.K. Dedicated trans-Atlantic cargo flights or wide-body passenger aircraft on the London-Heathrow route are required to carry the quantities of fresh seafood generated in Newfoundland & Labrador to Europe.

Demand in the Seafood industry is currently depressed due to the current weak economy, particularly in Europe, Newfoundland & Labrador's largest market. There has also been a long-term decline due to depletion of some fish stocks. The industry freezes most of its products making it less time sensitive to transport and easier to match supply with demand, and has invested significant capital in this process. Most fish products, particularly shrimp, are trucked frozen to Halifax or Montreal and placed on ships destined for Europe, the Far East and China. However, consumers prefer fresh fish and demand has risen, but the industry, particularly in Newfoundland & Labrador, has been slow to react. This is compounded by the lack of quick, cheap, reliable air service to major markets, particularly Europe. The directional imbalance in air cargo between Europe and Newfoundland, and North America in general, would allow seafood exports to Europe to be flown at reasonable prices as much of the capacity is currently under-utilized.

New Opportunities

A significant opportunity identified for the Seafood industry is exporting mussels to Europe. Holland has been a major supplier of mussels to Europe, but it is restricting production due to environmental concerns. Mussels are very popular in Europe, particularly when served fresh. France, for example, imported 37,880 tonnes of live mussels in 2008 and 17,080 tonnes of processed mussels. Most of these mussels were imported from the Netherlands and Spain. Exports of live mussels to France from The Netherlands have declined from 15,000 tonnes in 2003 to 10,410 tonnes in 2008. Chile is one of the major suppliers of mussels in the world with total exports of 38,572 tonnes in 2009, but almost all of these were exported frozen (92.5%) or canned (7.5%).

Direct airlift to Europe will be important for this opportunity to be realized. Prince Edward Island is the major exporter of mussels from Canada as shown in Exhibit V-10, with 241 tonnes, most of which is to Europe. Chile, Spain, Greece and Ireland are the major competitors for replacing the mussels previously produced in the Netherlands. With a new freighter service, Newfoundland & Labrador would have a distinct advantage over Chile in terms of air transportation, both in terms of cost and shipping time, but sufficient volumes would be required to make the service viable. The current large imbalance in directional flows of air cargo should lead to good rates for seafood exports on the flights back to Europe. Potential export volumes from Newfoundland of 500 to 1,000 tonnes could be realized, and potentially as high as several thousand tonnes if 20% of the Netherlands market is captured.

Exhibit V-10. Value and Estimated Tonnes of Live/Fresh Mussels from Atlantic Canada in 2007

World Region	Value			Weight (Tonnes)		
	Nova Scotia	Prince Edward Is.	Total	Nova Scotia	Prince Edward Is.	Total
Asia		$135,900	$135,900		38.7	38.7
Western Europe	$49,373	$709,770	$759,143	14.1	202.1	216.2
Total	$49,373	$845,670	$895,043	14.1	240.8	254.9

Source: Canadian Trade Database, TC 2008
* Estimated tonnage based on value and average value per kilogram from US Trade Database

A company, Fly-Fresh-Freight, has operated sporadically specializing in flying fresh fish from Newfoundland & Labrador to Europe. The company used Icelandair to ship cargo from Gander to Reykjavik and on to Liege (Belgium). The flights were operated from Gander as the airport fees are low and the majority of the fish to be shipped came from north-east Newfoundland & Labrador. Reliability of supply of cod fish to ship was an issue and there was insufficient volume for the service to be viable.

The provincial government is undertaking an initiative to market Newfoundland & Labrador seafood to Europe. This initiative has the potential to increase demand for fresh seafood from the province and would require airlift to transport the seafood to the European market.

Purolator recently introduced a seafood commodity rate as an incentive for the Seafood industry to make use of underutilized capacity on flights departing from St. John's.

Leakage to Other Airports

A significant portion of the air cargo travelling to/from the St. John's area does not use YYT, but is trucked (with part of the trip using a ferry) to/from Toronto, Halifax or Montreal and flown on international flights at those airports. Based on information provided by the freight forwarders interviewed, 15-20% of the area air cargo demand is leaked to these airports. This equates to approximately 2,000 tonnes of air freight annually. Almost all this cargo is destined for international markets, the large majority of it being to Europe, and most is inbound. A new service using wide-body passenger or freighter aircraft to Europe could potentially capture a significant portion of this traffic, dependent on the frequency of service, reliability and rates.

Latent Air Cargo Demand

There are currently a number of factors which make it undesirable for companies to ship goods by air from YYT. These include:

- International air services are only provided on small aircraft (the Air Canada service to London during the summer uses an A319 aircraft and the Continental service to Newark uses a regional jet) which results in restrictions, delays and higher costs. Air Canada does not take items weighing over 75 kg. Shippers have to transport goods via Halifax, Toronto or Montreal and to speed up delivery often have to ship goods on different waybills/carriers which makes it very expensive. Lack of interlining agreements is also a problem. Shippers sometimes end up transporting urgent goods from Halifax by truck and ferry as is it can be quicker than by air. Cargojet and Air Canada did interline for a short time to try and address the issues with respect to delays and the high costs of shipping from Newfoundland & Labrador, but it is understood that interlining is no longer available.

- Use of domestic flights is too expensive and service is inconsistent. One freight forwarder indicated that it can be very difficult to get inbound cargo from Halifax to St. John's.

- The most economical method of shipping cargo internationally is to truck the cargo from/to Toronto. However, cargo shipped to Europe using this method typically takes 6 to 7 days to reach its final destination which is too long for shipping most live/fresh seafood. A non-stop flight to Europe would reduce the shipping time to one to two days and open up new markets which currently freeze or preserve the seafood and ship by marine mode from Montreal or Halifax.

New air cargo services which are efficient, reliable and affordable will stimulate significant new air cargo demand in the province.

Potential for Increased Connecting and Diverted Air Cargo to St. John's

YYT currently acts as a regional hub for air cargo for Newfoundland and Labrador. Air cargo arriving at YYT is either loaded into trucks or onto flights and transported throughout the province.

The potential for increasing YYT's role as a hub airport for cargo is limited. YYT's geographical location does not favour it becoming a hub for domestic cargo in Atlantic Canada – Moncton has that role currently, despite its much lower O/D air cargo market than Halifax. Also, little traffic would divert from other Atlantic Canada airports to YYT due to the longer shipping times and high costs resulting from the use of the ferry to access Newfoundland.

St. John's geographical location makes it an ideal airport for the role of a hub or transshipment point for cargo travelling between North America and Europe. However, the relatively small volume of local O/D air cargo and the lack of wide-body service to Europe are significant obstacles to YYT assuming this role. Gander has tried to promote itself as a transshipment point, but with very little success. Halifax has been more successful obtaining twice weekly service to Europe, but both flights operate only on the east-bound direction and cargo travelling from Europe to Halifax goes in the belly of passenger flights on the London-Halifax service, or through either a US hub, Toronto or Montreal. Halifax has been able to attract these freighter flights as, unlike most airports in North America, it has much greater outbound cargo to Europe than inbound. Currently St. John's has much greater inbound cargo from Europe and this does not favour a similar arrangement. New sources of outbound air cargo to Europe would greatly strengthen its attractiveness for European flights.

Potential Air Cargo Demand

The potential cargo demand at YYT was determined by considering the current tonnages at YYT and potential new cargo through recovery of leakage, new seafood exports and stimulating latent demand as discussed above. The total potential air cargo demand for YYT is estimated to be of the order of 15,000 to 20,000 tonnes annually. This is comprised of:

- Existing air cargo at YYT of 11,000 tonnes.
- Air cargo currently leaked to Toronto, Halifax, Montreal and airports in the US of 2,000 tonnes.
- Export of live mussels to Europe – the likely potential volume is estimated to be between 500 and 1,000 tonnes, although volumes could be over 2,000 tonnes if the cultivation and marketing of mussels is successful and the Netherlands production declines significantly.
- Seafood previously shipped by air on the YYT-London-Heathrow flight which was discontinued in 2005. At that time approximately 14 tonnes per week was being shipped or 700 tonnes annually.
- Other latent demand, including other seafood exports, which could be stimulated with introduction of a new international service is unknown but is potentially between 10% and 50% of the current air cargo at YYT, or 1,100 to 5,500 tonnes.

With these components of demand inbound cargo will still exceed outbound cargo by a margin of 60% to 40%. European cargo would be approximately 7,500 tonnes, accounting for 40-45% of the total air cargo demand, and the flow would be approximately equal in each direction. With the higher volumes of potential live mussel exports (2,000 tonnes), the total potential air cargo destined for Europe increases to 8,700 tonnes with 55% being outbound.

Lift Capacity to Meet Potential Air Cargo Demand

A weekly freighter service using a B767F aircraft would typically transport approximately 1,700 tonnes annually in each direction (given 45.6 t capacity and 70-75% load factor). If the flight stops over at YYT en route to/from another Canadian or US city, and only half the load is attributable to St. John's, the annual tonnage reduces to 1,000 tonnes per year in each direction. This represents about 42% of the current inbound tonnage to YYT from Europe, but is over double the current outbound tonnage to Europe. Even on the outbound leg a weekly flight would not capture a 42% share of the existing market. Thus, a weekly B767F stop-over flight is clearly not feasible at current cargo levels for Europe.

With a potential demand to Europe of approximately 7,500 tonnes with an even split inbound and outbound as discussed above, the weekly stop-over flight would require a 26% market share which would be feasible. A twice weekly stop-over flight would require a 54% market share which again should be feasible. With the less optimistic values for live mussel exports (500 tonnes) and attracting latent demand (10% of existing), demand to Europe would be only 6,000 tonnes, with 60% inbound and market shares of 28% for inbound and 40% for outbound would be required. This should still be achievable with a weekly flight given the time advantage over shipping via Toronto or Halifax.

The potential demand to Europe would also be sufficient to substantially fill the cargo capacity available in the belly of a B767 passenger aircraft on daily service to Europe. With a cargo capacity of 14 tonnes, the annual capacity each way is 5,000 tonnes. The potential demand to Europe would account for 73% of this capacity if the flight was able to capture a 100% market share. In practice this is unlikely as the European cargo will be coming from, or going to, a range of places throughout Europe and for some of these a routing via another North American city may be more economical. This level of demand would be ideal for a daily B767 passenger service which stopped en-route at YYT and only 50-60% of the cargo is loaded/unloaded at YYT. As before, the volumes loaded and unloaded on the European leg would be similar.

If the export of mussels to Europe was highly successful with over 2,000 tonnes shipped annually, this would make a twice week B767F freighter stop-over service more feasible, or enable high **cargo** load factors on a daily B767 passenger service to Europe. It should be noted, however, that for many years Halifax had substantially higher air cargo demand for Europe than the potential volumes identified for YYT and until recently was not able to attract a stop-over flight, and currently only has stop-over flights in the westward direction to Europe. Other factors such as consistent and reliable volumes of shipments and location of export and import markets in Europe are very important. A stop-over flight between Houston and the U.K. or Norway would be optimal for the Oil and Gas industry needs as oil and gas companies frequently have urgent shipments between these locations and the flight distances are long enough to provide some benefits for stopping over and refueling. Much of the live/fresh seafood, however, would need to be transported to the major markets in continental Europe (France, Germany, Italy and Switzerland) and an airport in that area (e.g., Belgium) would be better for seafood exports. Loads between Houston and YYT would be lower, reducing the profitability of this service.

Another potential role for YYT is to be a hub airport for air cargo in Newfoundland and Labrador. YYT already plays this role to some extent being the only airport in the province with regular schedule cargo services using jet aircraft. However, both Deer Lake and Gander have feeder services on Prince Edward Air to Cargojet's Atlantic hub in Moncton and to Halifax. The Gander service is via Deer Lake and continues on the YYT. Thus, western Newfoundland's air cargo requirements are served efficiently via Moncton and Halifax, rather than YYT, except for large items requiring jet freighter aircraft. There is currently limited capability for transporting cargo by air between YYT and other parts of the province. Provincial Airlines carries a small volume of cargo on its commuter passenger flights, but these aircraft are only suitable for carrying small packages and the cargo constitutes a very small portion of total cargo at YYT. Prince Edward Air provides daily service to Gander using a Beech 1900 aircraft and Cougar Helicopters also carries some cargo between YYT and the off-shore oil and gas platforms. Many of the larger items to the remote project sites are brought in on charter flights bypassing YYT. Most intra-provincial cargo at YYT is carried by truck to/from its final destination/origin. The volumes are unknown but are likely to be relatively small.

Trucking times across Newfoundland can be over 10 hours and airlift or marine services are required for shipments to/from Labrador. To effectively act as a hub airport for the province, YYT would require a feeder air cargo service linking YYT with other parts of the province. Given the relatively low demand levels and flight distances involved, a turboprop aircraft such as a Beech 1900, Cessna Caravan (C208) or possibly a DHC8 combi aircraft would provide the service. The new service would concentrate on services to northern Newfoundland and Labrador as the eastern portion of Newfoundland is well served by Prince Edward Air and space on passenger flights to Deer Lake. However, demand to northern Newfoundland and Labrador is low and variable and the potential to transport fairly large items (1-5 tonne) on an infrequent as-required basis would be important. This type of demand would be better served by a charter service, rather than a regular scheduled service. The demand for such a feeder service could not be quantified, but given the remote locations of the mining and oil and gas projects in the northeastern parts of the province, the demand could be significant.

VI. COMPETITIVE ANALYSIS

The main airports which compete with St. John's for air cargo services, particularly to the US and Europe, are Halifax, Gander, and Moncton. An overview of the airports and air cargo facilities and services at these airports is provided in Exhibit VI-1 and summarized for each airport below.

In terms of runway length, YYT at 8,500 ft is slightly shorter than Halifax airport (8,800 ft) and much shorter than Gander (10,200 ft). YYT has a Category II ILS, as does Halifax airport, while Gander and Moncton have Category I ILS's. However, the frequent low visibility conditions at YYT put YYT at a disadvantage relative to the other airports, even with a Category II ILS (see Exhibit VI-2). As Exhibit VI-3 illustrates, the current usability[9] of YYT is far below that of other major airports in Canada. The visibility varies by season and in April and May each year, usability of YYT drops below 90%. When low visibility conditions preclude landings or departures, the result is delays, flight cancellations or the diversions of inbound flights to alternative airports which can be very costly for carriers.

The cargo facilities at YYT are very small compared to Halifax and Moncton airports, especially given the amount of cargo processed at the airports. YYT has 1.3 sq. ft. of space for every tonne of cargo, while Halifax has 5.5 sq. ft. and Moncton has 4.6 sq. ft. for every tonne of cargo. This is consistent with the fact that much of the air cargo is processed off-airport (cargo processed by the integrators). There is potential for increasing the size cargo facilities at YYT to allow the integrators to process their cargo at the airport.

Domestic cargo services are a little less than Halifax and Moncton airports which both act to some extent as cargo hubs, but YYT has no international services while Halifax has twice weekly service to Europe. None of the Atlantic Canada airports have transborder air cargo services except for Halifax's three inbound flights from New York-JFK stopping over on their way to Europe. All outbound air cargo to the US and most inbound air cargo from the US is either trucked to a US airport or flown to Toronto, Hamilton or Montreal and transferred to transborder flights.

Exhibit VI-4 provides a summary of airport fees and charges at selected airports and a comparison of fees charged for a range of freighter aircraft. Landing fees for freighter aircraft are higher at YYT than at Halifax and Gander, but less than at Moncton.

Gander

The airport has three runways, the primary runway capable of handling large wide-body jet aircraft such (e.g., B747) and has a Category I ILS. Air navigation is provided by a tower located at the airport.

The airport has a 484 m^2 (5,200 sq. ft.) climate controlled cargo facility with 172 m^3 (6,400 cu.ft.) freezer capacity. A main deck loader with a dual platform system designed to transfer containers and pallets weighing up to 7 tonnes is available at the airport.

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9 Usability is the percentage of the time that the combination of wind conditions, visibility and ceiling enable the airport to be used.

Exhibit VI-1.. Comparison of Airport Facilities and Services at Competing Airports

		St. John's		Halifax		Moncton		Gander	
Runway/ILS	Primary ft.	8,502	ILS Cat. II & I	8,800	ILS Cat. II	6,150	ILS Cat. I	10,200	ILS Cat. I
	Secondary ft.	7,005		7,700		8,000		8,900	
Airport Useability		93.9%		98.0%		n.a.		n.a.	
Sched. Cargo Flights		4/wk B737F Dom.	Cargojet	4/wk B727F Domestic	Cargojet	8/wk B727F Domestic	Cargojet	10/wk	
per week		10/wk BE1900 Dom.	Prince Edward Air	5/wk B727F Domestic	FedEx	2/day B727F Domestic	FedEx	BE1900 Dom.	Prince Edward Air
		5/wk B737F Dom.	Purolator	5/wk B737F Domestic	Purolator	4/day B737F Domestic	Purolator		
				2/wk B767F US-YHZ-Europe	ABX Air	5/day BE1900 Dom.	Prince Edward Air		
				1/wk B747F US-YHZ-Europe	Asiana Airlines				
				10/wk BE1900 Domestic	Prince Edward Air				
Widebody pax flights	Avg/week	1/wk	in summer	14-21/wk		0		0	
Cargo Apron		n.a.		16,300 m2 (175,000 sq. ft.)	new (planned)	n.a.		n.a.	
Cargo terminals		4,000 s.f.	Provincial Airlines	9,300 m2 (100,000 sq. ft.)	Air Canada, old facility	100,000 s.f.	Purolator	5,200 s.ft.	Cargo facility
		7,500 s.f.	Warehouse (AC)	off-site handling	Purolator (ass. 10,000 sq.ft.)	20,000 s.f.	FedEx	800 s..ft.	Prince Edward Air
		2,000 s.f.	Office space	off-site handling	FedEx (ass. 10,000 sq.ft.)	9,000 s.f.	Prince Edward Air		multi-use hangar
				3,250 m2 (35,000 sq. ft.)	Multi-user (open 2010)				
	Total sq. ft	13,900	sq.ft.	155,000	sq.ft.	129,000	sq.ft.	6,000	sq.ft.
Critical component		Warehouse (current	AC very old)	Warehouse		Warehouse		Warehouse	
		Nav aids		Runway length - need extension to 10,500 ft		Runway length/Nav aid (ILS is on short runway)			
Current cargo tonnage		10,846	tonnes (2009)	27,947	tonnes (2009)	28,312	tonnes (2007)*	1,896	tonnes (2007)*

Source: Canada Flight Supplement, Airport Web sites, OAG, FlightTracker, Nav Canada

* 2009 values from TC available but do not include tonnages from all carriers and under-represent the total cargo at the airport.

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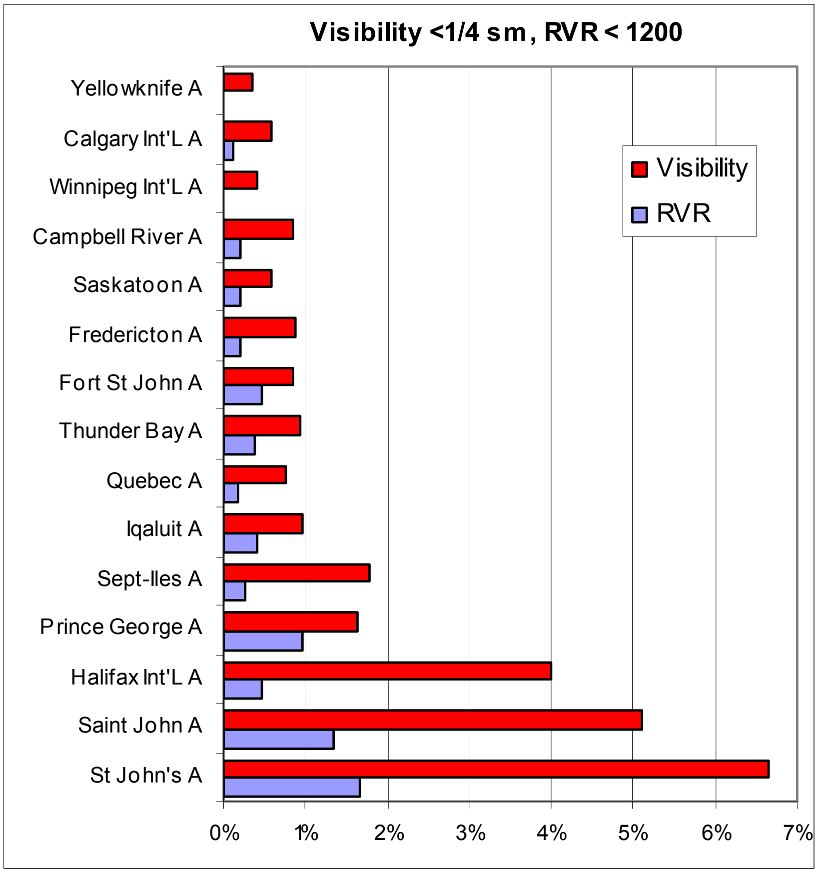
Exhibit VI-2. Comparison of the Percentage of Annual Time that Visibility and Runway Visual Range are Below ¼ Statute Mile or RVR 1200



Source- Visibility from Environment Canada, RVR from Nav Canada)

Exhibit VI-3. Usability (% of Year) for Selected Canadian Airports

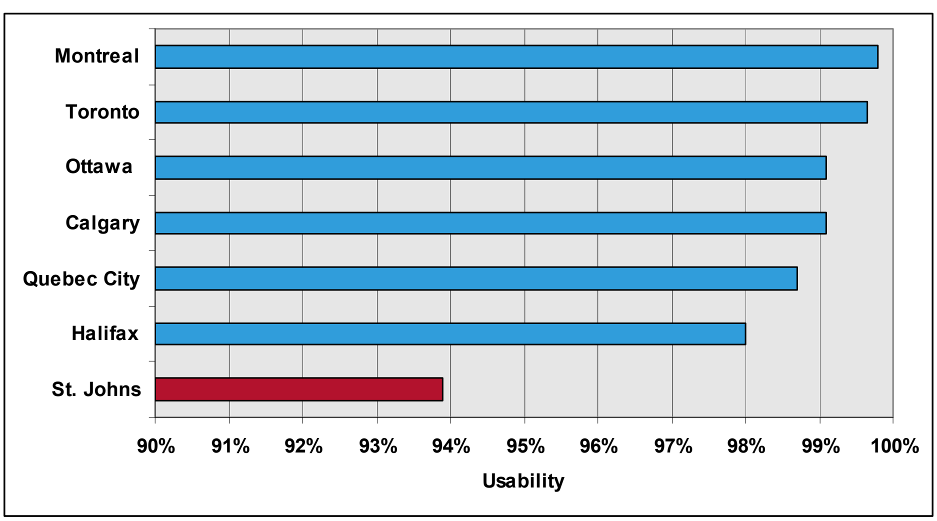


Exhibit VI-4. Comparison of Airport Fees and Charges with Competing Airports

	Airport Code	St. John's YYT		Gander YQX		Halifax YHZ		Moncton YQM	
Landing Fee Rate Table									
Fee per tonne	Domestic	0 - 21 t	$6.17	0 - 21 t	$4.93	0 - 21 t	$4.59	0 - 21 t	$7.18
		21 - 45 t	$7.77	21 - 45 t	$6.23	21 - 45 t	$5.80	21 - 45 t	$9.05
		> 45 t	$9.28	> 45 t	$7.40	> 45 t	$6.92	> 45 t	$10.77
	International	0 - 31 t	$6.23	0 - 31 t	$7.46	0 - 21 t	$4.59	0 - 21 t	$7.18
		30 - 70 t	$7.69	30 - 70 t	$7.46	21 - 45 t	$5.80	21 - 45 t	$9.05
		>70 t	$10.62	>70 t	$9.18	> 45 t	$6.92	> 45 t	$10.77
Parking Fee Rate Table									
Fees	Free for 1st:		6 hr		6 hr		6 hr		6 hr
	Daily rate	5.1 - 10 t	$10.51		$10.11		$10.11		$24.16
		10.1 - 30 t	$19.74		$18.98		$18.98		$44.70
		30.1 - 60 t	$30.76		$29.58		$29.58		$69.22
		60.1 - 100 t	$46.18		$44.40		$44.40		$104.49
		100.1 - 200 t	$76.99		$74.03		$74.03		$174.69
		200.1 - 300 t	$107.80		$103.65		$103.65		$244.07
		> 300 t	$138.62		$133.29		$133.29		$314.99
Landing Fee by Aircraft Type									
Aircraft	MTOW (t)								
B737F	54	Domestic	$501		$400		$374		$582
		International	$415		$403		$374		$582
B727F	89	Domestic	$826		$659		$616		$959
		International	$945		$817		$616		$959
B757F	113.6	Domestic	$1,054		$841		$786		$1,223
		International	$1,206		$1,043		$786		$1,223
B767F	159	Domestic	$1,476		$1,177		$1,100		$1,712
		International	$1,689		$1,460		$1,100		$1,712

Source: IATA Fees and Charges Manual, Airport Web sites, June 2010.

A full range of services is available at the airport including jet and avgas fuel, Fixed Base Operator (FBO), ground handling services and maintenance services for a range of aircraft including wide-bodies. Freight forwarder services are available at the airport. A Foreign Trade Zone is located at the airport and is a designated airport in Canada's International Air Cargo Transshipment Program[10].

Gander Airport is at a strategic location between North America and Europe and has frequent stopovers of freighter aircraft travelling between the two continents, but has no scheduled international cargo service[11]. A feeder air cargo service is operated from the airport using a small turboprop aircraft.

[10] No bilateral designation is required at Gander for transshipment. Any licensed foreign carrier can transship foreign bound freight at Gander. Transshipment is allowed between a carrier's own aircraft, another carrier's aircraft, and trucks. This includes transfer between your aircraft and trucks (a true intermodal opportunity). This allows lower cost operations and/or rapid network expansion.

[11] Icelandair provided freighter service in 2007 but the service has ceased.

Halifax

The airport has two runways capable of handling wide-body jet aircraft (e.g., B767-300ER, A330 and B747) and has a Category II ILS. Air navigation is provided by a tower located at the airport.

The air terminal building is 65,256 m^2 (702,405 sq. ft.) and has 32 aircraft gates with 12 loading bridges. The airport has a large cargo facility operated by Air Canada including a 9,300 m^2 (100,000 sq. ft.) cargo terminal with a loading dock. Purolator and FedEx both have small facilities but the cargo is mostly loaded and unloaded from the air shipping containers off-airport. A new 3,250 m^2 (35,000 sq. ft.) air cargo facility opened in spring of 2010. A main deck loader for loading cargo into large jet aircraft is available at the airport. Currently there are no stands for cargo aircraft and they must share the apron with other aircraft. However, a new 16,300 m^2 (175,000 sq. ft.) apron is planned which will cater to cargo aircraft.

Halifax has a twice weekly international freighter service to Liege (Belgium) operated by ABX Air using a B767F (routing JFK-YHZ-LGG), and a weekly service to Brussels operated by Asiana Airlines using a B747F (routing JFK-YHZ-BRU-ICN). Both flights originate from JFK – there is no non-stop service to Halifax from Europe.

For domestic and transborder cargo, Halifax has daily flights operated by Cargojet, Purolator and FedEx (Morningstar). These flights have Moncton as an intermediate stop and originate from, and are destined to, Montreal, Hamilton or Toronto. In addition, Prince Edward Air operates turboprop air cargo services to Saint John-Fredericton-Moncton and to Charlottetown, Deer Lake-Gander and Moncton. Halifax is a designated airport under Canada's International Air Cargo Transshipment Program.

Moncton

The airport has two runways capable of handling small wide-body jet aircraft (up to B767 size) and has a Category I ILS, although the ILS is on the shorter runway. Air navigation is provided by a control tower services located at the airport. The airport has a large cargo facility including apron space, cargo terminal and a main deck loader for loading cargo into large jet aircraft.

Moncton airport is a cargo hub and much of the cargo, particularly that carried by Prince Edward Air, is transferred to/from jet freighter aircraft for transport to Montreal, Toronto and beyond. Based on the tonnages reported by the different airlines, it is estimated that 40% of the E/D cargo is transferred between flights. In addition to the estimated 28,300 tonnes of E/D cargo, approximately 12,000 tonnes of cargo transits through Moncton without being unloaded or loaded.

VII. STRENGTHS WEAKNESSES OPPORTUNITIES AND THREATS (SWOT) ANALYSIS

Overview

A SWOT analyses can be used to aid in developing an overall strategy such as a cargo strategy for YYT. Specifically this analysis can be used as a framework to guide systematic allocation of the airport's resources based on the alternatives available to the airport. In addition, the SWOT analyses can be used as a strategic framework for matching the airport's opportunities and threats with its strengths and weaknesses.

A SWOT analysis is an acronym for the strengths and weaknesses of an organization and the environmental opportunities and threats that an organization faces. The analysis is based on the assumption that an effective strategy evolves from a sound fit between the organization's internal resources and the organization's external realities, or situation.

YYT Air Cargo SWOT Analysis

A review of the information, collected primarily from various airport stakeholders, was used to generate the following SWOT analysis of air cargo operations:

***Strengths** - a strength is an advantage relative to its position or situation and the needs of the community and region it serves.*

1. Most easterly airport in North America and is strategically positioned to be a connecting point with Europe.

2. The airport is the major airport serving Newfoundland & Labrador and Labrador and more than 60% of the province's total population lives in the City of St. John's.

3. The Oil and Gas industry has significant demand for air cargo, particularly during the exploration phase, as the industry has grown rapidly over the past decade and further growth is expected.

4. YYT serves a diverse set of cargo clients, ranging from Integrator operators to dedicated cargo operators such as Cargojet, and a variety of other service providers. The 8 incumbent cargo service providers provide the necessary critical mass to build and support enhanced cargo operations.

5. Passenger traffic growth has increased more than 80% over the past decade. This has led to increased regular passenger service by airlines, increasing the capacity to carry cargo in the belly of passenger aircraft of the six incumbent carriers.

6. Shipping times and costs by surface modes increased due to use of a ferry – improves competitive position of air cargo relative to other modes.

7. The airport is classified as an Airport Point of Entry and is staffed by the Canada Border Services Agency (CBSA) operating 16 hours daily.

8. Two of the runways have sufficient length (8,502 and 7,005 feet) to accommodate wide body aircraft. Aircraft the size of an Antonov 124 aircraft can operate at the airport.

9. The airport operates with no noise restrictions that would permit late night cargo operations if required.

10. Ground handling services are available from three service providers, one of which is equipped with a main deck loader for loading cargo into large gauge aircraft.

11. The airport is conveniently located less than 10 km from the Port of St. John's and 1 km from the main highway that connects to the rest of the province and Canada.

12. The airport has over 300 acres of prime developable land both airside and groundside to accommodate new cargo facilities and operations.

Weaknesses *- a weakness is a limitation or deficiency in one or more of the organization's situation that impedes it full potential or effectiveness.*

1. The local air cargo market is relatively small and consolidation of cargo from throughout the Atlantic Canada region is made more costly due to the requirement to use a ferry or air mode for cargo from other provinces to access YYT.

2. In recent years, most of the YYT cargo tenants have experienced a downturn in business, which is strongly related to the national and world economies. Activities associated with the fishing industry, a potential driver of air cargo, has also declined somewhat in the last few years.

3. YYT is located in an area often affected by low visibility and is not serviced by adequate navigational aides that would allow operations in such conditions. Specifically, a Category 3 Instrumentation Landing System (CAT 3 ILS) is required on the primary runway.

4. Airport fees and charges, particularly with respect to landing fees, are higher than competing airports in the market area. This potentially makes the airport less attractive for cargo operators and services to be located at the airport.

5. The airport does not have a modern dedicated cargo terminal with x-ray screening equipment.

6. The cargo capacity of passenger airlines operating at YYT, particularly the regional carriers, is limited by the small amount of space available for cargo. The lack of wide-body passenger service to Europe is a major impediment.

7. The directional imbalance in cargo destined for Europe is about 3:1 with imports exceeding exports. The direction of the imbalance is the same as most North American airports and does not give YYT a competitive advantage.

8. The costs of shipping by air are very high and require urgent and/or high value products that warrant the premium charges. In addition, the use of domestic flights to connect cargo to international flights from other airports is very expensive and service is inconsistent.

Opportunities *- an opportunity is a major favorable reality in the organization's environment.*

1. YYT has a master plan and capital program which outlines a schedule for airfield improvements in support of aviation users, industry, and the community.

2. YYT has strong cargo partners (forwards, carriers, etc.) and could institute a cargo stakeholder outreach program. A roundtable could be set up to support the airport in the promotion of air cargo business at the airport.

3. Cargo demand generated by offshore oil and gas exploration activities can be a major driver of future cargo growth for the airport.

4. A new opportunity associated with the Seafood industry, exporting high value mussels to Europe, could reduce the directional imbalance and stimulate international air cargo service.

5. The world-wide trend is for air cargo to grow at a faster pace than passenger traffic in the future.

6. The airport could attract 'tech stops' by freighter aircraft to Europe which may provide some opportunity/capacity to 'top up' the loads with locally produced cargo such as seafood.

***Threats** - a threat is a major unfavorable reality in an organization's environment. Threats are impediments to the organization's desired position.*

1. Continued dominance of Toronto with respect to the consolidation and movement of international air cargo and the addition of new dedicated cargo facilities and freighter services at Halifax.

2. Slow recovery of the global economy could result in inadequate cargo demand to support enhanced air cargo operations and capital investments in new infrastructure in the short term. Any recession in the economy continues to be a threat to YYT.

3. Increased transborder and international security policies and regulations and associated constraints.

4. Offshore drilling restrictions or curtailment resulting from the recent situation in the Gulf of Mexico.

5. Aviation fuel price increases in the future may reduce the volume of air cargo due to high costs to move goods by air, although higher fuel prices make tech-stops at YYT on long flights more attractive.

VIII. GAP ANALYSIS

Air carriers, freight forwarders and businesses shipping air cargo, were contacted regarding their current use of cargo facilities at YYT and what improvements they would like to see. Their responses are summarized below.

- Three airlines indicated that a cargo warehouse facility will be required in the future: Cargojet (one of the largest cargo carriers at the airport), WestJet and Air Saint Pierre. All three currently use the Provincial Airlines hangar. However, both Cargojet and WestJet indicated that at the present time they have no interest in relocating to a common use facility.
- Purolator presently has facilities off-airport, but are examining options for possibly establishing a sorting and maintenance facility at the airport. They currently use Provincial Airlines hangar for their on-airport requirements.
- Air Canada did not provide any information, but they have a cargo building which is very old and currently used primarily for other purposes and will be demolished in the next year. Air Canada will have space to process their cargo in the new ramp services building.
- FedEx and UPS have sorting facilities off-airport and use flights operated by other airlines.
- Provincial Airlines processes a small amount of cargo in their hangar. Provincial has expressed a desire for WestJet and/or Cargojet to move their cargo processing elsewhere to free-up space in the building.
- Other improvements noted were requirements for additional apron space and cargo screening capability.
- Apart from the above facility issues, the main problems indicated were related to the weather. A new Cat. III ILS would greatly reduce the impacts of poor visibility.

SJIAA should strongly encourage Purolator to build a sorting and processing facility at the airport. The airport will need to provide serviced land, an apron and taxiway.

A modern dedicated common use cargo facility will likely be required in the future to accommodate growth in air cargo and other operations at the airport. Increasing demands for ramp services vehicles should ideally be accommodated in the new ramp services building. Space in the building could be freed up by relocating the Air Canada cargo operations to another facility. The timing for developing the new common use cargo facility will be dependent on many factors but could be triggered by the need for more space in the ramp services building, the need for Cargojet to move its processing operations to a new location, or the introduction of a new European freighter service. Optimally, FedEx, UPS, Cargojet, WestJet, Air Canada, Air Saint Pierre, the operator of a new European freighter service and other air cargo providers such as freight forwarders would co-locate in the facility. Purolator will likely have constructed their own facility, either at the airport or elsewhere in St. John's, by that time. If not, they could also move into the facility.

The size of the facility would depend on which carriers located their processing and sorting operations in the facility. The most common owner-operator arrangement for new cargo terminals is for a private operator to have a long-term lease of airside land from SJIAA, build the facility then lease the space to airline and freight forwarder tenants. A dedicated cargo apron would be required adjoining the facility with space for one turboprop and one B737 size aircraft (two B737s if Purolator is a tenant in the new facility).

The level of investment required by the airport is dependent on many factors. The cargo facility would be financed by a third party owner-operator and would only require serviced airside land with an apron and access to the taxiways. Serviced land with road and taxiway/runway access is not currently available at the airport and a new cargo apron will be required. To handle approximately 5,000 tonnes of cargo annually, the building will likely need to be approximately 5,000 sq. m. costing $5-6 million and will require roughly 12,000 sq. m. of land allowing for vehicle parking and truck docks. This excludes the likely additional cargo due to a European freighter service. With Purolator as a tenant, the building size and land area will approximately double.

The new facility would free up space in the Provincial Airlines hangar and would provide sufficient area to handle any small increase in cargo that would be associated with new intra-provincial services.

The additional potential demand identified in Section V is dependent on a number of factors, many of which are not directly influenced by the SJIAA. Factors which can be directly influenced by SJIAA relate to the cargo facilities, the level of fees and services provided by the airport and, to a lesser extent, the air navigation facilities at the airport.

The most likely additional demand would be related to a weekly freighter service between North America and Europe stopping over at YYT. The additional cargo that would be handled at YYT was estimated to be approximately 2,000 tonnes per year. The following infrastructure and services would be required to cater to this potential new demand:

- Common use cargo warehouse and office space – the common use cargo facility may need to be expanded to handle the additional cargo demand.
- Refrigeration facilities required for storing live/fresh seafood – the refrigeration facilities could be built as part of the expansion of the cargo facility.
- Cargo apron – depending on the scheduling of the new Europe flight, additional space for a B767 may be required for the expanded service.
- Main deck loader for B737 and B767 aircraft – one of the existing ground handlers at the airport already operates a suitable main deck loader.
- CBSA to provide customs services as required – currently CBSA services provided 16 hours per day coverage which should be sufficient although additional staff may be required to meet the substantial increase in work load.
- X-ray screening equipment to efficiently meet the new air cargo security screening requirements.

In addition to the above, it would be very advantageous if a Cat. III ILS was provided at YYT to improve the reliability of service. This is important to carriers to minimize the costs of delays, missed opportunities and additional costs associated with using an alternate stop-over airport or eliminating the flight. For shippers, the delays could result in missed deadlines, spoiled goods, lost markets and higher costs.

An overview of the key factors that need to be considered with respect to procurement options for developing the new cargo facilities at YYT is provided in Appendix B.

The level of investment required to cater for the additional demand is dependent on a number of factors and only ball-park estimates can be given. For facilities requiring improvement, the approximate ball-park cost and the group best suited to own and operate the facility is as follows:

- Expanded common use cargo warehouse and office space – $2.3 million given a 770 sq. m. expansion to handle the 2,000 additional tonnes of air cargo. A private operator would own and finance the facility, but the airport would need to provide serviced land with both landside and airside access.
- Refrigeration facilities – $0.4 million given a 300 sq. m. refrigeration unit located in the cargo warehouse. An interim option is to use refrigerated truck trailers parked at the airport until the air service catering to the seafood exports is well established and the refrigeration facility is built. The refrigeration facility would be owned and operated by the private third party operator of the new cargo building.
- Cargo apron – additional space of 2,700 sq. m. for a B767, if required, would cost approximately $0.9 million. Cost would be borne by the SJIAA and possibly supported by economic development government grants.
- Services to land and road and taxiway access – the costs will be dependent on the exact location of the land to be serviced and could not be determined at this time.
- X-ray screening equipment - cost unknown and could be covered by CATSA/Transport Canada.
- Cat. III ILS – cost would be of the order of $24 million ($22.6 million attributed to the airport), but it would benefit all flights at YYT and the cost should be recovered by Nav Canada from users.

The timing of the development of these expanded facilities is dependent on developments in the Seafood industry and **should only be developed once it is clear that at least a large portion of this demand will be realized**. It may take, for example, several years for the mussel industry in Newfoundland to develop and be able to export significant quantities of live mussels to Europe. It will also take time to line-up the major stakeholders in the production of live/fresh seafood, an air carrier to transport the product, and markets in Europe that are willing to purchase the seafood. Markets in Europe are currently depressed due to the recession and the debt crisis and it may take several years to recover.

A new freighter service to Europe would strengthen YYT's position for being an air cargo transshipment point for flights between North America and Europe. The SJIAA should apply to become a designated airport in Canada's International Air Cargo Transshipment Program. This would allow Canadian and foreign carriers to carry international cargo transshipments coming from, and destined to, points outside Canada via YYT even if the rights are not provided in Canada's bilateral air transport agreements. It would also allow in-transit cargo to be stored in bond until it is transported to its final destination by air or another mode. While a number of airports have obtained this status in the transshipment program (including Gander and Halifax), few have obtained any new services resulting from the program. Being a designated airport in the transshipment program however provides an indication to carriers that YYT is looking for and will welcome transshipment opportunities, and would allow carriers the flexibility and opportunities afforded by the program. The development of a transshipment centre should not be considered until a carrier has firm commitments for serving YYT and transshipping significant cargo through the airport at volumes that could not be handled in the expanded common use terminal.

While a number of trigger points have been described which could lead to enhanced service, it is vital that any new common use facility be master planned to enable the final scale and scope to realized at some later date.

IX. BENEFIT-COST ANALYSIS

Benefits and Costs to the St. John's International Airport

The main benefits to the SJIAA of the expanded cargo services and facilities will be the additional landing fees and land lease rental fees for the common use cargo facility. A private operator could build and finance the facility and receive the rent from the tenants in return for the capital investment.

The new common use cargo facility would benefit the airport primarily by providing land lease revenues. The facility will also improve efficiency for cargo operators at the airport resulting in reduced costs and delays to shippers which in turn will stimulate new air cargo demand. Most of this new stimulated demand will likely be carried on existing flights and there would be minimal increase in landing fee revenues. However, if the increased demand resulted in an additional B737 flight per week (for example Cargojet increasing its frequency from 4 to 5 per week), the additional revenue to the airport would be $32,000 per year. The revenue for leasing the land will be approximately $31,000 per year (assuming 12,500 sq. m. of land is required at a rate of $2.50 per sq. m.

Costs to the airport for the common use cargo facility are associated with providing serviced land and a dedicated apron for cargo aircraft. Serviced airside land is not available currently at the airport. The additional cost is dependent on many factors and could not be determined at this time. An apron of 1,500 sq.m. required for one B737 aircraft would cost in the order of $0.5 million. Annualized costs, assuming a 5% p.a. interest rate and 20-year payback period, would be $40,000 per year for a $0.5 million loan, somewhat greater than the revenues from the land lease, but much less than the revenues if the facility stimulates an additional weekly B737 freight flight. With an economic development grant or loan, the cost of capital could be significantly reduced.

The revenues and costs associated with Purolator developing a cargo sorting and handling facility at the airport would be similar to that of the common use facility given above, although there would not likely be any additional B737 movements associated with the new facility.

A single weekly B767F stop-over flight would land at YYT 104 times per year, 52 when stopping over from the North American origin city on the way to Europe, and another 52 on the flight from Europe. The service would generate between $158,000 and $200,000 annually, depending on the model of B767F used. Revenues may be less in the first year depending on the incentive package offered for the new service. The incremental lease fees on land for the additional 400 sq. m. common use cargo facility is expected to be in the order of $2,500 annually. Thus, the total additional annual revenue would be approximately $160,000 to $200,000.

The additional costs to the airport would be capital cost associated with expanding the apron for the B767F, any road and utilities work required for the expanded terminal, and possibly a contribution towards the installation of a Cat. III ILS. The capital cost of the apron is projected to be approximately $900,000 and the Cat. III ILS approximately $22.6 million. The cost of any road/utility work is unknown. If 5% of the cost of the Cat. III ILS is attributed to cargo flights at the airport, the pro-rated cost is around $1.13 million. Assuming payments are spread over a 20-year period with a 5% p.a. interest rate, the annualized costs would be:

Apron	$72,000
Cat. III ILS	$91,000
Total	$163,000

The total annualized costs are similar to the new revenues to the airport and costs, but may be greater depending on the costs of any road/sewer/power works that is required.

Benefits and Costs to the St. John's International Area

The benefits and costs to St. John's and the surrounding areas are outlined below.

Benefits include:

- The new common use cargo building would improve the efficiency and accommodate future growth of the air cargo operations at YYT, and result in reduced delays and costs to companies requiring air transport of items to and from Newfoundland, and St. John's in particular.
- New cargo services would open up new markets for live/fresh mussels and other seafood. A single weekly stop-over flight could transport 1,000 tonnes annually worth approximately $7 million. A twice weekly stop-over flight would double the value to approximately $14 million annually.
- Improved speed, reliability and cost for transporting items by air between Newfoundland and Europe. This will be especially important for the off-shore Oil and Gas industry where delays can cost $0.5-1.0 million dollars a day if operations are stalled waiting for a replacement part.
- The additional revenues to the airport will help in financing the much needed upgrade of air navigation facilities to a Cat. III ILS which will benefit all users of the airport, particularly the business community.
- Increased size of aircraft for bringing in urgent parts for the off-shore Oil and Gas industry. Currently Air Canada has a maximum weight restriction of 75 kg and larger parts must come via Halifax or Toronto which takes two to five days longer.
- The additional cargo demand could be met with a new year-round wide-body passenger aircraft service to Europe. The cargo carried on the flight would significantly improve the viability of the service if passenger levels are marginal. Such a service would provide a much needed year-round link for people travelling between St. John's and Europe on business, and for personal or leisure activities and would stimulate tourism in Newfoundland.
- Additional jobs in the transportation, Seafood and Oil and Gas industries and indirect employment in other industries throughout Newfoundland.
- Increased taxation revenues.

Costs include:

- Increase in flights at YYT, some possibly at night, would slightly increase aircraft noise levels near the airport.
- Marketing and incentive program costs associated with the development and promotion of a European air cargo service.
- Capital improvement costs in terms of upgrading airport infrastructure.

X. CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Based on the findings of this study it is concluded that:

- There will likely be a need for a common use cargo facility at the airport in the future to accommodate existing demand and future growth in air cargo.
- SJIAA should not pursue a strategy for YYT to be a regional cargo hub for Atlantic Canada or for Newfoundland & Labrador, but should continue to work with air cargo transportation providers to improve the air cargo facilities and services at the airport.
- There are a number of factors which result in higher costs and delays in transporting air cargo to/from YYT. Better coordination and cooperation between the various air cargo providers should alleviate these issues.
- Currently there is insufficient air cargo to justify a weekly freighter service to Europe, even as a stop-over on a European-North America service. However, with additional live/fresh seafood exports to Europe it may be feasible for a weekly freighter service between Europe and North America to stop-over at YYT to top-up loads. The potential may not be realized for 2 to 3 years until production levels, markets and carrier uplift capacity are organized.

Recommendations

It is recommended that the SJIAA take the following actions:

- SJIAA Master Plan a long-term air cargo facility which will be developed in stages.
- SJIAA monitors the levels of air cargo and the needs of cargo carriers and ramp services vehicles for warehouse/hangar space at the airport to determine when would be an opportune time to develop a common use cargo facility. At that time, SJIAA should develop a business case for the provision of a new common-use cargo facility at YTT, including interested tenants, required floor space, location, airside and groundside access, apron space, vehicle parking and truck dock demands, and approximate costs and revenues, and seek interested third parties to build and operate the facility.
- SJIAA institute a cargo stakeholder outreach program with freight forwarders, air carriers, Oil and Gas and Seafood industry representatives to assist the airport in identifying issues with air service in the St. John's area, discussing approaches to overcoming these issues, identify air cargo development opportunities and promoting air cargo business at the airport. This group could also discuss the need for, and assist in, developing improved intra-provincial cargo services at YYT.
- SJIAA monitor developments in the live/fresh seafood export industry in Newfoundland with a view to determining when there would be sufficient volumes to support direct weekly year round stop-over cargo services to Europe.
- SJIAA act as a point of contact between the Seafood industry and their freight forwarders (and possibly government), and airlines that could potentially provide air cargo services to their major markets in Europe, to share information and work towards matching the air cargo demand side and supply of airlift capacity.

- SJIAA obtain status as a designated airport in the Canada International Transshipment Program. Information on obtaining this status is provided in Appendix C.
- SJIAA develop a Cargo Forum for ongoing consultation with freight forwarders and airlines providing cargo services at YYT to investigate improvements in air cargo services at the airport. Topics covered could include changes in procedures and interlining agreements to improve the speed, reliability and cost of YYT cargo connecting at other Canadian airports, and of cargo at YYT connecting in intra-provincial flights.

APPENDIX A

LIST OF ORGANIZATIONS INTERVIEWED

LIST OF ORGANIZATIONS INTERVIEWED

Freight Forwarders

PF Collins International Trade Solutions

Eimskip Canada Inc.

Clarke Inc

Avalon Customs

Freightway International Ltd.

Oceanex

Stakeholder Groups

Government of Newfoundland

Newfoundland & Labrador Oil & Gas Industry Association

Canadian Manufacturers and Exporters, Newfoundland & Labrador Division

St. John's Board of Trade

Newfoundland & Labrador Business Coalition

Atlantis Aviation

Airlines

Cargojet & Prince Edward Air

WestJet

Provincial Airlines

Cougar Helicopters

Air Saint Pierre

Purolator

APPENDIX B
PROCUREMENT OPTIONS FOR DEVELOPING NEW CARGO FACILITIES

Procurement Options for Developing New Cargo Facilities

The following technical memorandum provides an overview of the key factors that need to be considered with respect to the development of new cargo facilities at the St. John's International Airport:

At many airports, a combination of direct negotiation, competitive proposal processes, and partnership with a master developer is used to achieve the development of airport facilities such as a cargo building. Often times the procurement method selected is a result of the unique attributes of the airport property, the skill set and availability of airport staff and the amount of airport funding available for infrastructure.

Direct Negotiation

Direct negotiation can be effectively utilized by airports provided that certain protocols, policies and procedures are in place to insure regulatory compliance, and to facilitate the development process. Sample components for inclusion in an airports land leasing policy include the following:

- ***Available land and Land Use Plan.*** It is important that the airport has identified the property suitable for cargo development and highest and best or preferred uses for the parcels.
- ***Rates and Charges Schedule.*** The airport should also have available a specific market based rates and charges schedule.
- ***Infrastructure Program.*** The airport should have identified the property locations with existing infrastructure suitable for cargo development and/or infrastructure funding options.
- ***Qualifications for Developer or User.*** Airport should establish the minimum qualifications for developer or user and require potential developers provide the airport with a business plan, site plan, financial plan, marketing plan (if development is speculative), references and experience, and other information that may be of particular interest to the airport, (jobs creation plan, or environmental plan).
- ***Marketing Program.*** The airport should have a transparent program and provide a fair opportunity for all qualified parties to participate in development cargo opportunities. A marketing or out reach program is effective in communicating to the community (including the development community) that the airport is "open for business" on a "first come first served" basis for desired uses and qualified developers.
- ***Commissions.*** The airport should determine in advance if the airport will pay brokerage fees/commissions.

Competitive Processes

Statements of Interest (SOI), Requests for Qualifications (RFQ), Requests for Bid (RFB), and Requests for Proposals (RFP). In some situations, in particular where airport property in general or certain types of airport property (ramp access) is in limited supply; where the airport has been approached by two or more interested third parties for the same development opportunity; where the political or legal environment makes direct negotiation problematic; or where an airport desires a specific development and would like to "test the market" for such development, airports often initiate a competitive process to secure the most qualified developer. Different methods in the competitive process can be used by airport sponsors, and certain methods are sometimes required by enabling legislation or airport policies. In each case however, the development opportunity will be advertised to the public, which for many airport sponsors achieves the desire for a fair opportunity for all interested parties. Some distinctions between the competitive processes include the following:

- ***Statements of Interest (SOI).*** An SOI is typically used in circumstances where a parcel of airport property is available for cargo development. The advertisement for SOIs allows any interested developer to propose a cargo facility development for the property. These SOIs are typically presented at a "concept level" by the developers and would not have the detail sufficient to determine the specific development program. Based on the response to the SOI, the airport can enter into direct negotiations with respondents to the SOI, or use the information presented in the SOIs for the development of RFQs or RFPs.

- ***Requests for Qualifications.*** An RFQ is typically used in circumstances where a parcel of airport property is available for cargo development and the airport has a highest and best preferred development use already determined. RFQs are advertised for this preferred cargo development use and include the specific criteria requested to determine a qualified proposer. The cost to the developer to prepare a statement of qualifications is much less than a full proposal required in a RFP process. Based on the response to the RFQ, the airport can enter into direct negotiations with respondents to the RFQ, or issue an RFP for the developers deemed to be qualified through the RFQ process.

- ***Requests for Bid and Requests for Proposals.*** As with a direct negotiation procurement approach, the competitive procurement process requires the airport to determine the minimum qualifications for the developer and user. Unlike the direct negotiation procurement approach however, the competitive procurement process requires the airport to determine the specific criteria upon which the selection of competing proposers will be based, and the ranking (or weights) of the various criteria to assist the airport in selecting the best proposal. Some airport sponsors are limited by legislation or governing policy to competitive processes based solely on cost to the airport or revenue generated for the airport from qualified proposers. In this case, the airport will advertise under a Request for Bid process, where (once the proposers are deemed to be qualified) the determining selection criteria will be cost/revenue. For those airport sponsors who are allowed to issue Requests for Proposals, the general factors comprising selection criteria often include but are not limited to:

    - The demonstrated quality of planned cargo development.
    - Compatibility with airport expectations for cargo services.
    - Degree of economic benefit returned to the Airport.
    - Financial feasibility of project pro forma.
    - Development team member's professional qualifications.
    - References for the Proposer.
    - Experience with similar types of cargo development, leasing and property management.
    - Demonstrated ability to access and obtains private equity and debt.
    - Presentation of confirmed commercial users/tenants and/or ability to market to local, regional and national commercial users/tenants.

- Demonstrated experience and financial strength to complete the project on budget and on schedule.
- The Proposer's proposed project approach.
- The level of comprehensiveness of the Proposer's submitted Proposal.

Each factor or criteria is given a weight based on the airport's goals for the project, or as required by governmental policy. The airport will either reject all proposals if desired, or will commence direct negotiations with the qualified Proposer with the highest score.

APPENDIX C

AIR CARGO TRANSSHIPMENT PROGRAM

AIR CARGO TRANSSHIPMENT PROGRAM OVERVIEW

As a complement to Canada's "Blue Sky" International Air Policy (2006), the Government of Canada extended the Air Cargo Transshipment Program to allow any airport to participate in the program, subject to its meeting current application requirements and approvals. The Air Cargo Transshipment Program was previously intended to promote the use of small and under-utilized airports.

The Air Cargo Transshipment Program allows foreign air carriers to be authorized by the Canadian Transportation Agency (CTA) to carry international cargo shipments via approved Canadian airports coming from and destined to points outside Canada, even if these rights are not provided in Canada's bilateral air transport agreements. In transit cargo may be stored in bond at the approved Canadian airports pending its transportation by air or other mode to its final destination. Where foreign carriers are permitted under bilateral air transport agreements or arrangements and authorized under a separate CTA license to carry Canadian origin or destined cargo, they may combine this activity on flights also involved in cargo transshipment activity. In addition, Canadian carriers are entitled to carry foreign-to-foreign cargo in bond separately or in combination with any existing authority to carry cargo to and from Canada.

Furthermore, any transportation between Canada and the United States (U.S.) may be operated by road-feeder service using an air waybill. In other words, an air carrier may choose to substitute truck transportation over a portion of the routing, for example, between Canada and the U.S. for goods being transported between the U.S. and Europe.

From a transportation perspective, the air carrier activity is only regulated to the extent that the air carriers must meet all safety and security requirements imposed by Transport Canada (TC), show evidence of insurance consistent with the CTA's Air Transportation Regulations and report to the CTA traffic carried under the program.

Obtaining Status as a Designated Airport

The application process is straightforward - normally the President of the relevant airport authority will write to the Minister of Transport requesting consideration of inclusion of the airport in question in the program. TC officials then consult with other government departments as required to determine whether there are any concerns in respect to the application. If there are no impediments raised and the Minister of Transport subsequently decides in favor of the application, a direction to the CTA would be issued which would give the CTA the authority to authorize air carriers to perform the cargo transshipment activity. A news release would also be issued. To advertise the program more broadly, the practice has also been for the Minister of Transport, Infrastructure and Communities to request the Minister of International Trade to have Canada's embassies disseminate the news release to foreign civil aviation authorities and their air carriers.

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ST. JOHN'S
International Airport Authority

St. John's (YYT) European Air Service Development Strategy

Prepared for
St. John's International Airport

Prepared by
Inter*VISTAS* Consulting Group

March 2014

DRAFT – as of March 11th, 2014

Contents

Project Objectives

As the primary driver of passenger traffic, available air services at St. John's International Airport (YYT) have a significant impact on the airport's revenue stream as well as the overall Newfoundland & Labrador economy. Of particular importance are international transatlantic services, as they provide strong potential to open up new markets and increase St. John's global profile.

To begin, this strategy seeks to provide context around the airline industry and network planning process. Using this knowledge of airline business models combined with market data, the primary objective of this project is to outline a clear set of goals and implementation methods that St. John's International Airport can use to achieve the following goals:

- Secure, sustainable and viable Europe air service, and
- Maximize destinations served for YYT (nonstop and connecting) for business and leisure travellers, and for the economic benefit of catchment area residents.

Additionally, the strategy is designed to provide rationale for pursuing specific air services, so that:

- Limited airport resources (financial and human) can be focused on those routes and airlines which offer the greatest potential for success, and
- Community expectations are managed and realistic.

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The Air Service Development Process

The Air Service Development Process

The Air Service Development (ASD) process involves several important steps:

Market Research

- Required to quantify the true market potential.

↓

Detailed Route Analysis

- Needed to understand expected viability of new flights, and impact on existing services.

↓

Presenting the New Route Business Case

- The market's qualitative and quantitative strengths must be clearly communicated to prospective air carriers.

↓

Risk Sharing Investment

- An appropriate tool, in certain circumstances, to help airlines commit to new air services.

A Compromise of Needs

Air service development efforts must take into account both market needs and airline objectives.

Cities and regions want easy access and price-competitive options for inbound visitors as well as for outbound residents.

Airlines require a positive and acceptable financial return from each service.

There are three types of carriers, each with their own strategies for achieving profitable results.

- Network carriers;
- Low cost carriers (LCC); and
- Charter carriers.

As a result, air service development strategies must be tailored for each carrier type.

Air Service Development (ASD)

ASD is a long term, strategic effort.

The majority of carriers focus on:

Short-term
Frequency and schedule adjustments

→

Medium-term
New routes

→

Long-term
New aircraft and strategy

Airlines operate with planning cycles - schedules are generally finalized three to six months in advance.

Air service development initiatives may take a variable amount of time, ranging from six months to several years.

- In some cases, a new air service may never be initiated.

Airline Planning Options

An airline's financial return is dependent upon flight load factor (sales) and average yield (average fare).

Aircraft are mobile assets worth $30 - $300 million. Airlines must generate a sufficient return on these investments.

Aircraft can be easily re-deployed to better performing routes.

Airlines may accept a lower load factor if they can charge higher average fares. Alternatively, if fares are depressed, airlines must achieve higher load factors to achieve the same results.

Airlines will always add new markets based on expected financial performance.

Air Service Development Strategy

Air service deficiency evaluation involves several steps:

Market Review

- Market size.
- Traffic flow potential.
- Current non-stop, direct and connecting air services.
- Services at similar or competing markets.

Focus on Viable Markets

- Which cities could support new non-stop air services?

Incorporate Airline Strategies

- Priorities and constraints vary from carrier to carrier.

Identify Route Opportunities

- Appropriate airline options and air service development priorities.

These components are examined in more detail in the following sections.

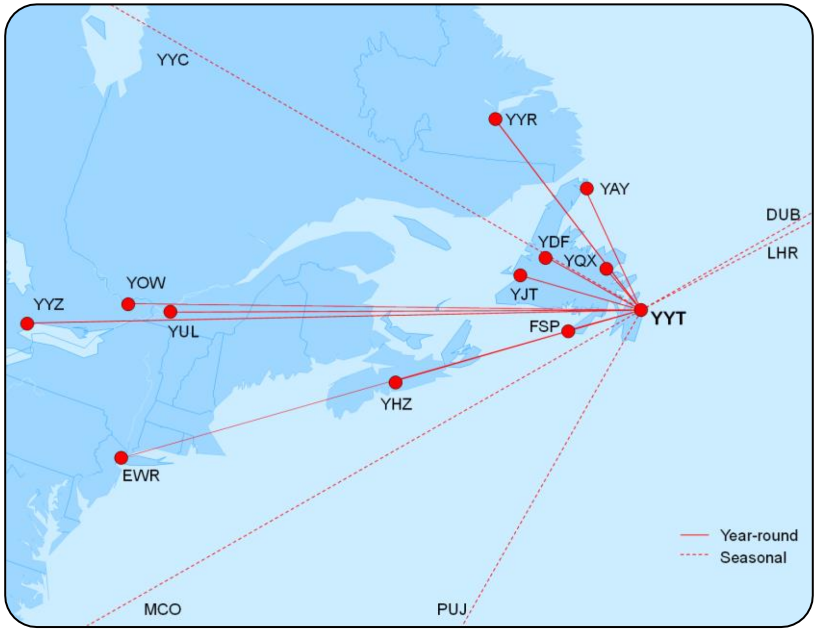
Review of Current Situation



Review of Current Situation

Current Air Services

- Current YYT-Europe air services provide **limited access (seasonal)** to the **large markets**.
- Even with the AC LHR service, **a large share (estimated at 54%) of the YYT-Europe traffic is back-hauling** over points in North America (mainly YYZ, EWR and YHZ).

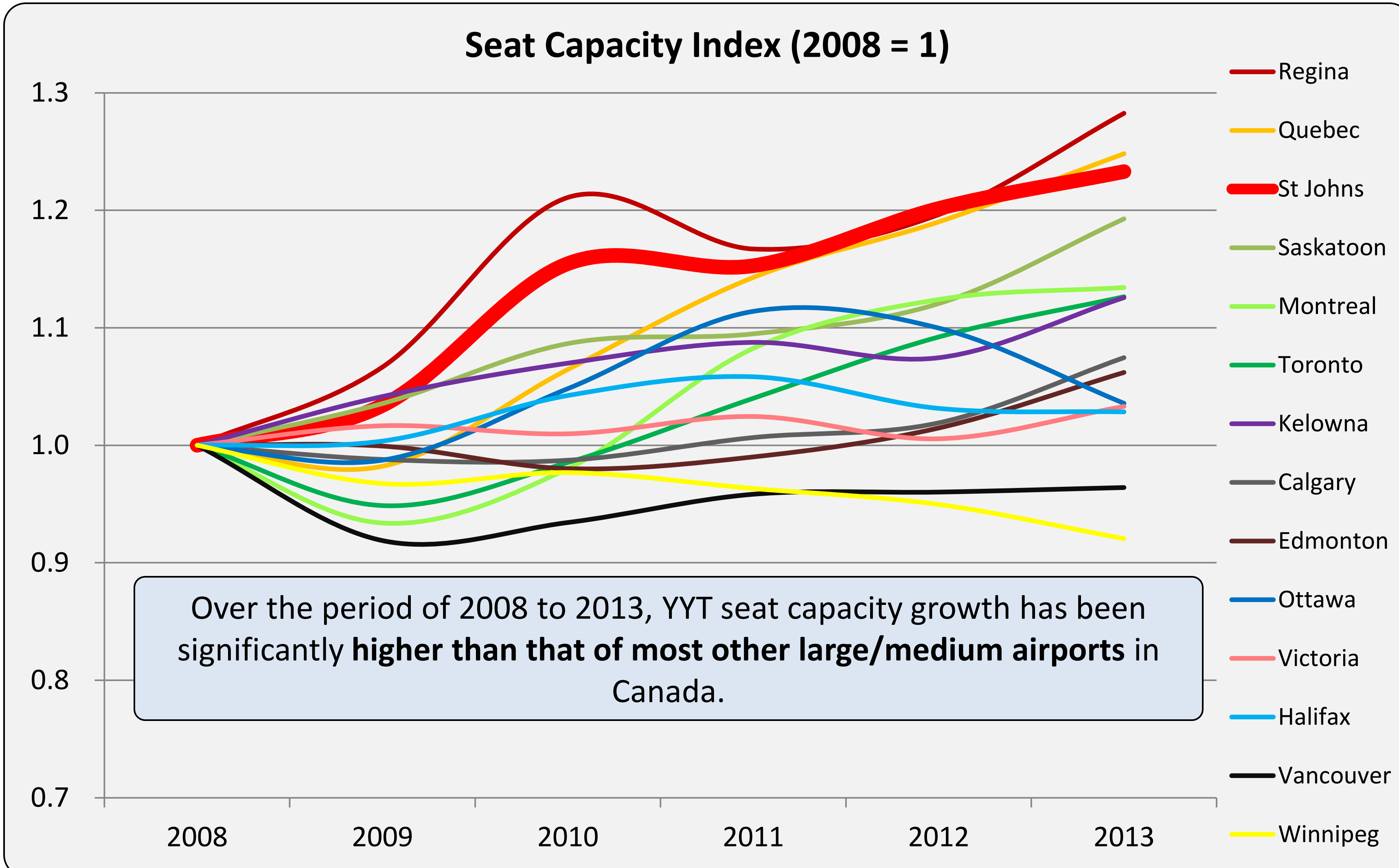


Market	Airline	Winter Weekly Outbound		Summer Weekly Outbound	
		Flights	Seats	Flights	Seats
Europe:					
London Heathrow	Air Canada	-	-	7	840
Dublin	WestJet	-	-	7	952
Canada/US Hubs/Caribbean:					
Calgary	WestJet	-	-	7	952
Halifax	Air Canada	34	2,822	42	3,304
	Porter	12	840	18	1,260
	WestJet	14	1,887	14	1,904
Montreal	Air Canada	6	582	14	1,358
NY Newark	United	7	350	7	798
Orlando	WestJet	1	136	-	-
Ottawa	Air Canada	6	450	7	679
	WestJet	-	-	7	952
Punta Cana	WestJet	1	136	-	-
Toronto	Air Canada	33	3,809	48	6,119
	WestJet	10	1,360	21	3,084
Regional:					
Deer Lake	Air Canada	20	360	21	378
	Provincial	19	646	19	646
Gander	Air Canada	21	378	28	504
Goose Bay	Air Canada	7	350	7	350
	Provincial	6	204	6	204
St. Anthony	Provincial	7	238	1	34
St. Pierre	Air St. Pierre	3	144	3	144
Stephenville	Provincial	5	170	5	170
Total		**212**	**14,862**	**289**	**24,632**

Sources: Innovata Schedules (via Diio), Feb 2014 and Jul 2014 and Diio FMg, year ended November 2013.

Review of Current Situation

Capacity Benchmarking



Source: Innovata Schedules (via Diio), outbound seats.

Review of Current Situation

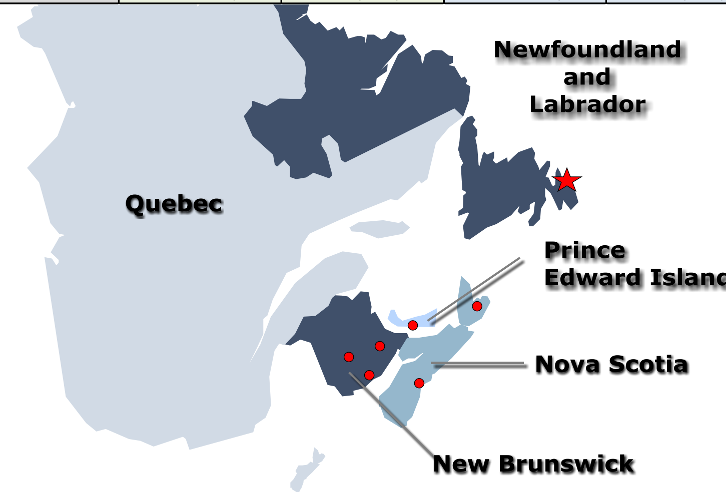
Competing Airports

All of the Atlantic provinces have the same transatlantic issues, namely having to fly westward to YUL or YYZ to catch eastbound European flights. YYT is well positioned to serve as a hub for access to Europe.

Currently, both YYT and YHZ have a similar level of service and as such they compete quite effectively.

- However, a unique European service at YYT would likely draw traffic from all of the Atlantic provinces, as YYT is not as circuitous for any of the other eastern cities.

Market Region	St. John's (YYT)		Halifax (YHZ)	
	2013 Flights	2013 Seats	2013 Flights	2013 Seats
Atlantic	16,733	925,701	19,741	1,131,767
Rest of Canada	6,496	803,451	32,835	2,720,619
USA	803	79,938	8,463	515,999
Europe	366	43,920	852	185,294
Latin/Caribbean	73	12,737	872	149,641
Grand Total	**24,471**	**1,865,747**	**62,763**	**4,703,320**

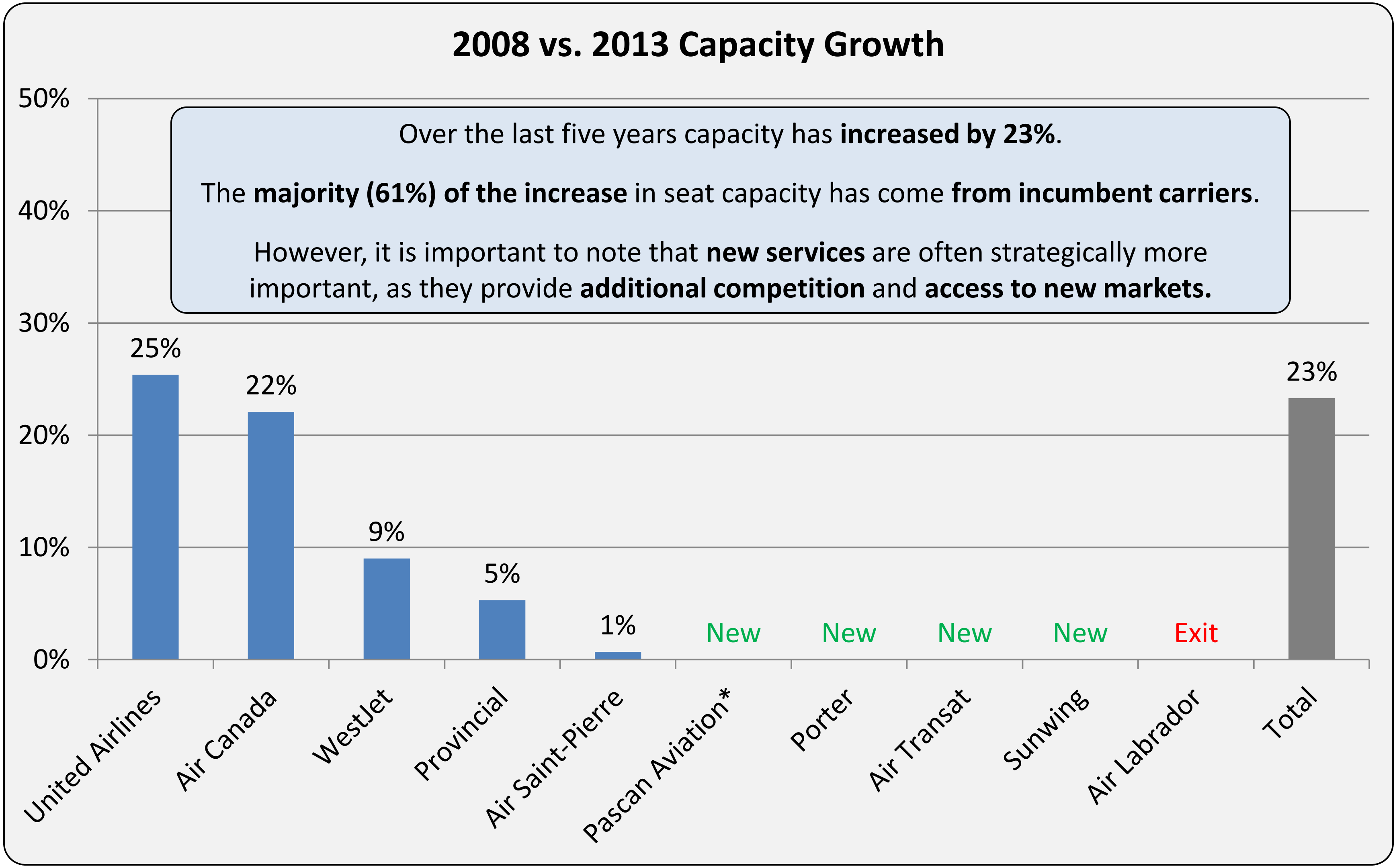


Airport	2012 E/D Passengers	Destinations Served				2013 Seat Capacity	Air Distance From YYT (mile)
		Domestic	Transborder	International	Total		
Halifax (YHZ)	3,606,000	19	13	15	47	4,703,320	548
Moncton (YQM)	615,000	9	2	3	14	778,656	574
Charlottetown (YYG)	297,000	4	1	0	5	370,454	499
Fredericton (YFC)	290,000	4	0	1	5	371,737	665
St. John (YSJ)	216,000	3	0	1	4	304,575	646
Sydney (YQY)	145,000	2	0	1	3	203,631	360
Total	**5,169,000**					**6,732,373**	

Note: Sydney (YQY) E/D data is estimated from 2005-2010 statistics. Saint-Pierre and Miquelon considered Atlantic.
Source: Airport websites; Innovata Schedules (via Diio); Great Circle Mapper.

Review of Current Situation

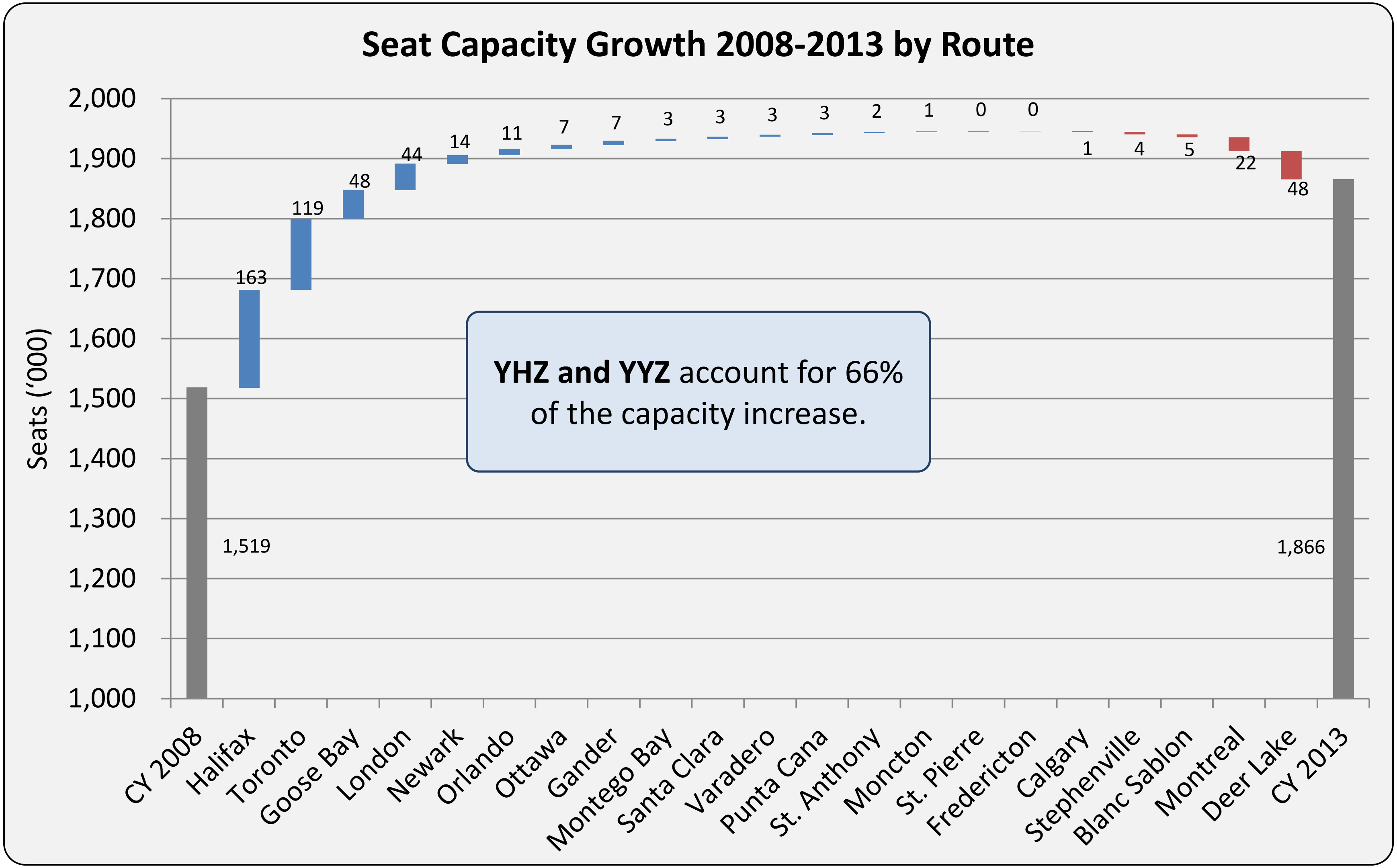
Capacity Growth



* Note: Pascan exited the market on December 13th, 2013.
Source: Innovata Schedules (via Diio), outbound seats.

Review of Current Situation

Seat Capacity Growth



Source: Innovata Schedules (via Diio).

Review of Current Situation

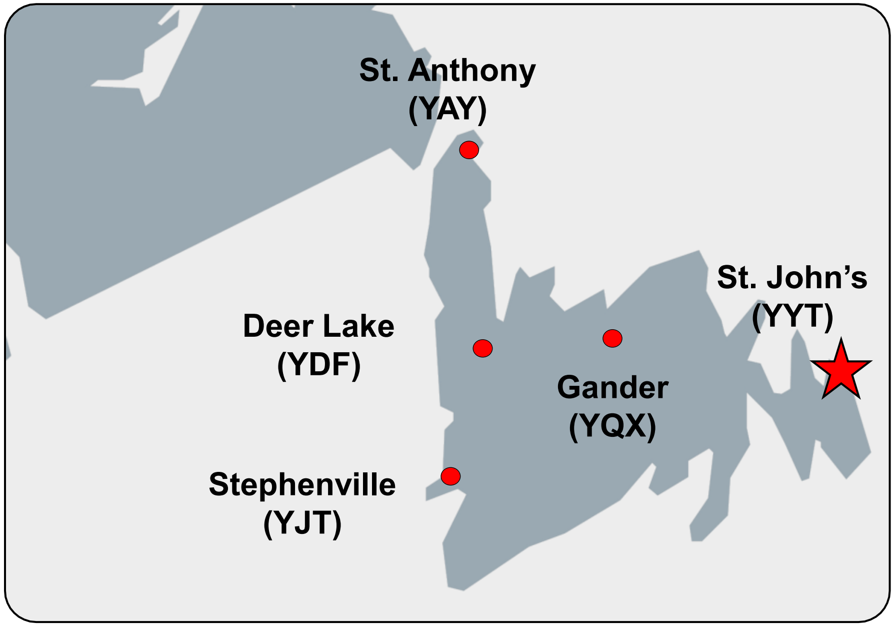
Catchment Area Definition & Populations

Depending on the air service and competition from surrounding airports, YYT will draw traffic from different catchment areas.

- The island of Newfoundland includes four other commercial airports and has a population of 485,000.
- In the case of a direct service to Europe, YYT would draw drive traffic from the entire island.
- As such the catchment area for Europe services is assumed to be the entire island.

Catchment Area	Population (est. 2012)
St. John's (Primary)	200,600
Rest of Newfoundland (Secondary)	284,400
Sub-total	**485,000**

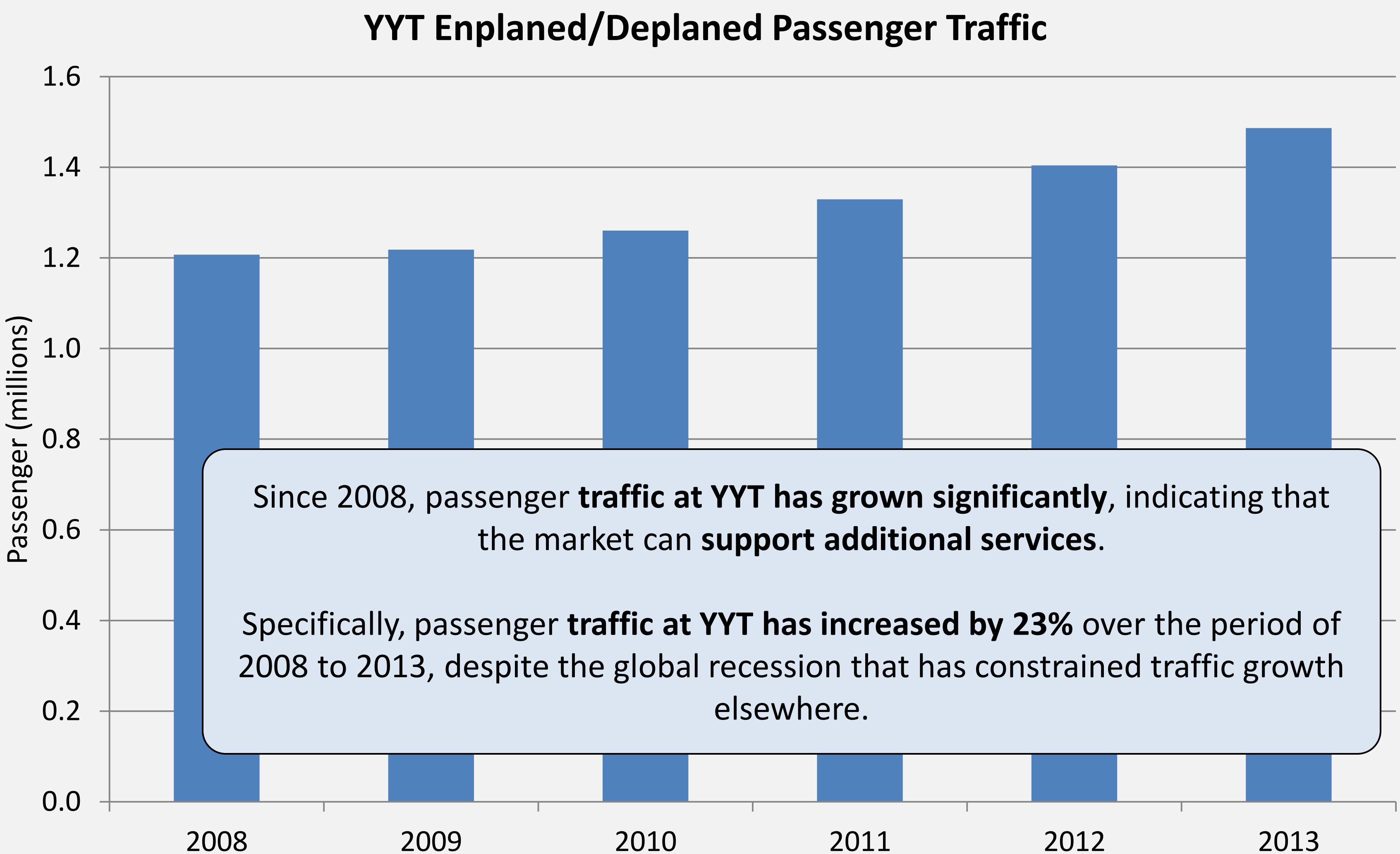
Community	Distance to YYT (km)	Drive Time to YYT
St. John's	-	-
Gander	337	3 h 28 min
Deer Lake	639	6 h 27 min
Stephenville	768	7 h 52 min
St. Anthony	1,051	11 h 53 min



Source: Statistics Canada, 2013 Census and projections and NewfoundlandLabrador.com; Drive times: Google Maps.

Review of Current Situation

Passenger Traffic



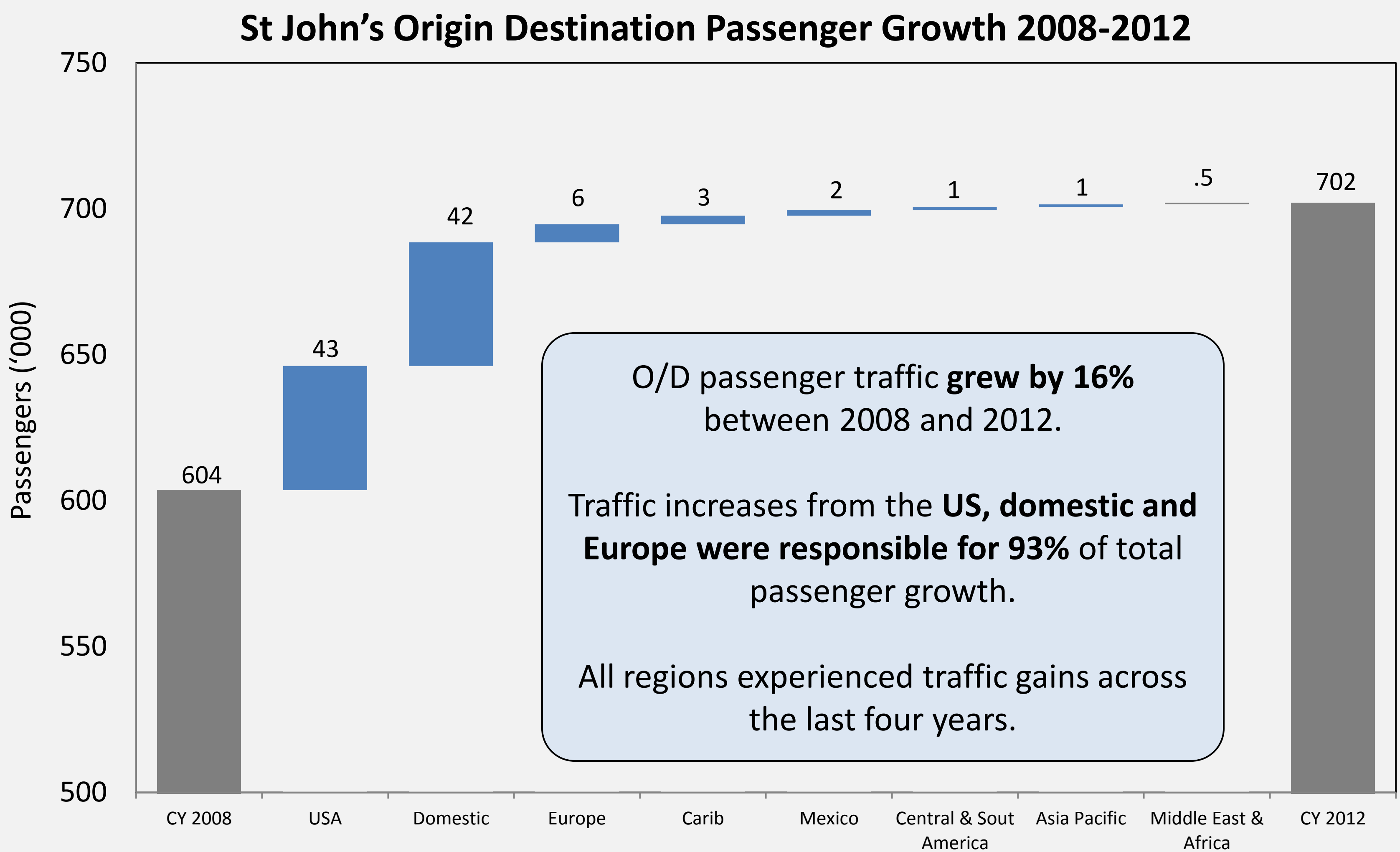
Since 2008, passenger **traffic at YYT has grown significantly**, indicating that the market can **support additional services**.

Specifically, passenger **traffic at YYT has increased by 23%** over the period of 2008 to 2013, despite the global recession that has constrained traffic growth elsewhere.

Source: YYT Airport.

Review of Current Situation

Passenger Traffic Growth



O/D passenger traffic **grew by 16%** between 2008 and 2012.

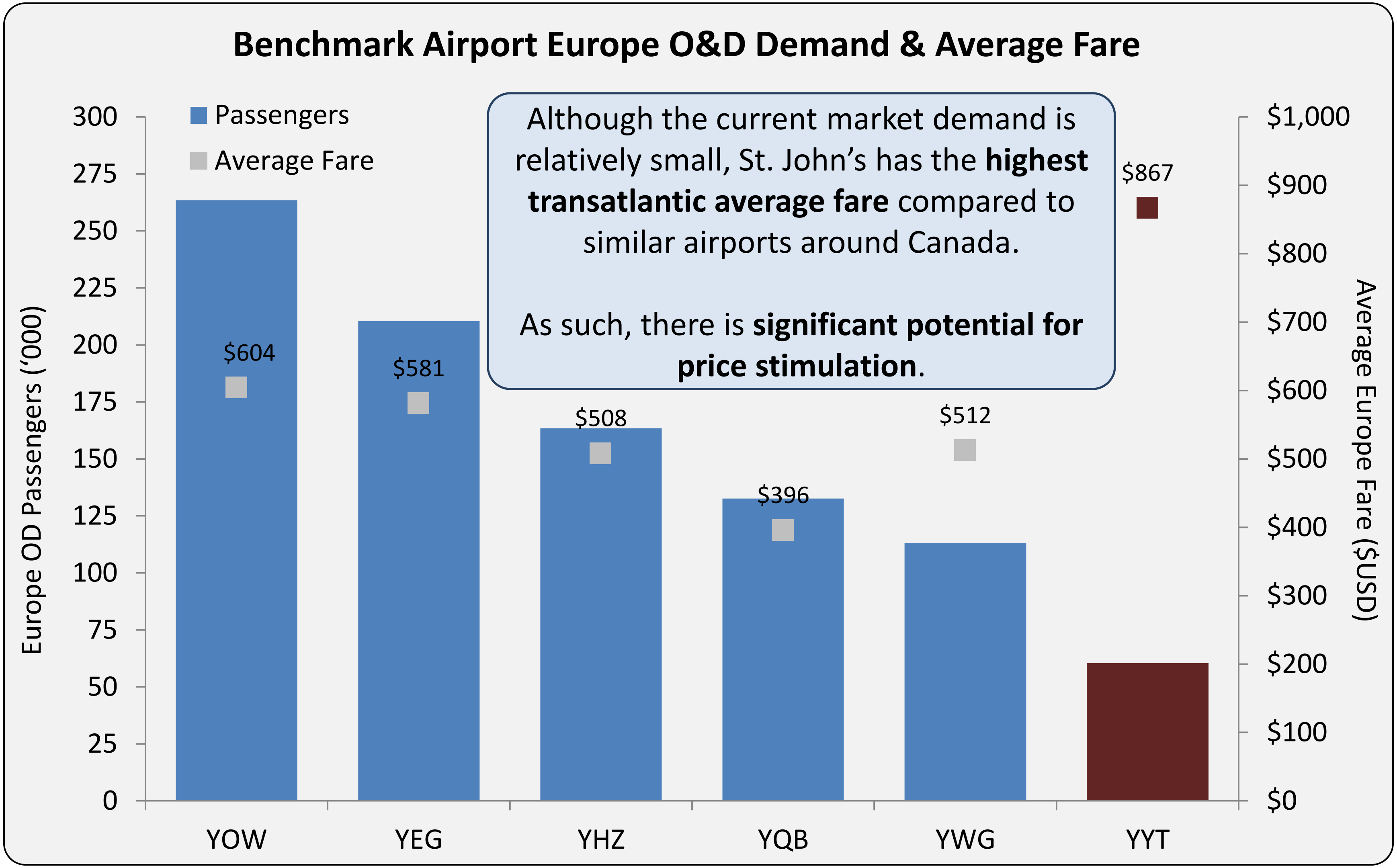
Traffic increases from the **US, domestic and Europe were responsible for 93%** of total passenger growth.

All regions experienced traffic gains across the last four years.

Note: Saint Pierre and Miquelon included in Domestic.
Source: Diio FMg.

Review of Current Situation

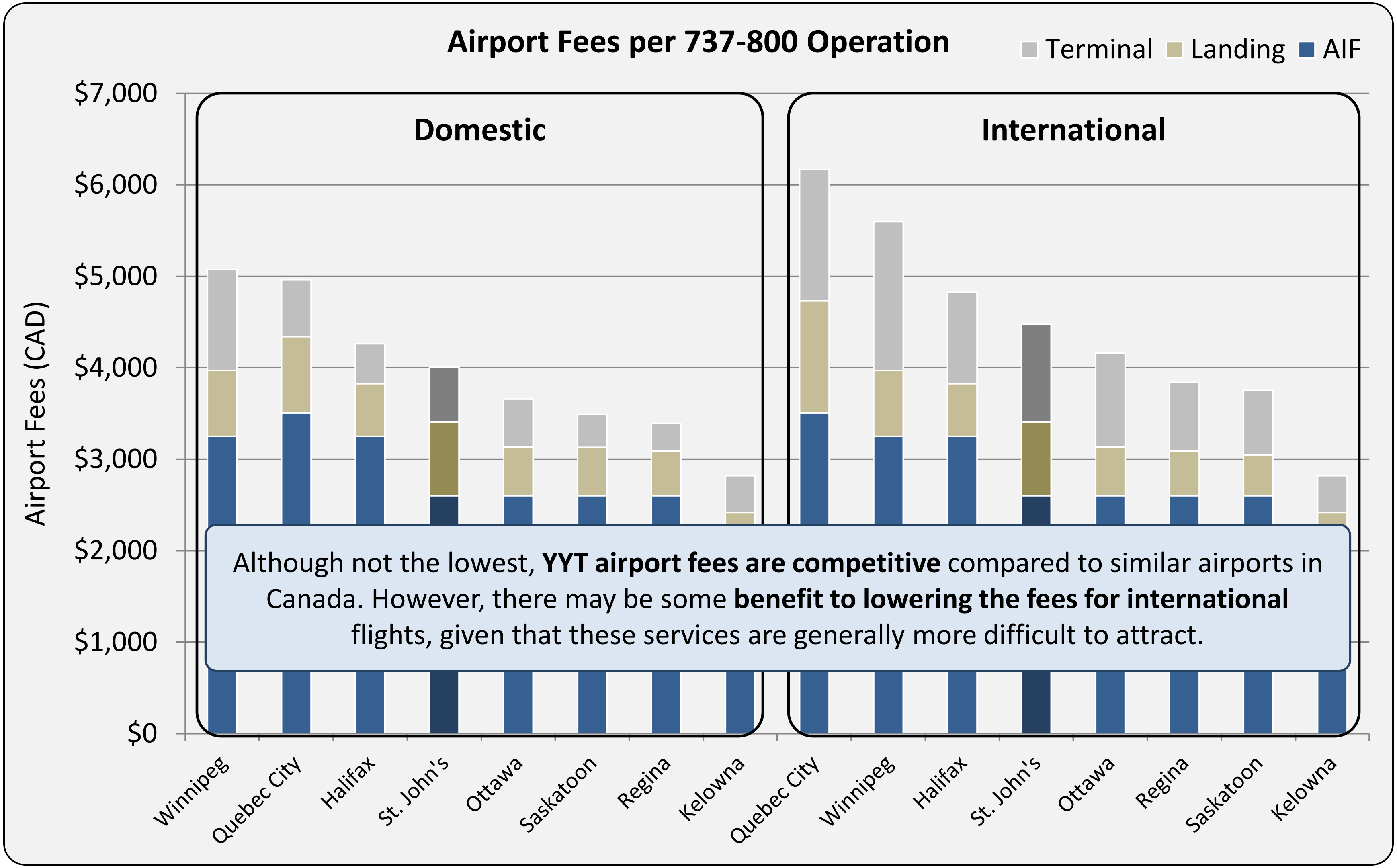
Benchmarking: European Demand & Average Fares



Source: Diio FMg, year ended November 2013.

Review of Current Situation

Benchmarking: Aeronautical Fees



Note: Based on a 737-800; MTOW: 80,000kg ; 162 seats and 130 onboards.
Source: Public airport fee schedules (2013).

Review of Current Situation

SWOT Analysis

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Strengths

- Economic boom, growing population and growing demand for air travel.
- Current air services are performing well and expanding, and airfares are higher than average.
- Most of Canada can feed YYT without circuity – especially in the case of Atlantic Canada.
- Proactive approach to air service development.
- Incentive support from the Province.
- Momentum from WS Dublin announcement.

Weaknesses

- Full regional connection potential is split with YHZ.
- Airport costs are not low enough to offer a significant competitive advantage.
- Relatively small population base and market sizes to Europe.
- Air Canada and other network carriers mostly happy to feed existing hubs rather than provide non-stop service.
- Lack of tourism marketing in Europe.

YYT

Opportunities

- New aircraft technology will allow for narrow-body YYT-Continental Europe operations.
- Additional capacity on existing routes (LHR & DUB) due to strong performance.
- Air services to unserved cities in Europe.
- Additional hub services to feed onward flights to Europe.
- New European leisure markets to diversify product offering.

Threats

- Growth of Europe air service at competing hubs (e.g. YHZ).
- Improvements in connecting processes at competing hubs (e.g. ITD being implemented at YYZ and YHZ).
- Evolving business model of LCCs – potential for LCCs to acquire long-haul aircraft and bypass YYT.
- New aircraft technology may allow for transatlantic flights from other points in Canada.

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International Airport Authority

Developments in Aircraft Technology



Increased Range for Narrow-bodies

With the exception of the larger Boeing 757 (approx. 175 to 225 seats), virtually all transatlantic services are operated with larger wide-body aircraft.

- In fact, the only transatlantic routes currently in operation with smaller narrow-body aircraft are YYT-LHR, JFK-LCY, YYT-DUB, and some Greenland flights.
- Although current narrow-body technology (Boeing 737 and Airbus A320 family) is capable of completing transatlantic operations, these operations push the aircraft to their range limits, making it commercially questionable (due to weight restrictions, diversions during strong winds etc.).

The introduction of new narrow-body aircraft technology (e.g. Boeing 737 MAX, Airbus A320neo and Bombardier CSeries) will extend the range of these aircraft by about 300 to 500 miles.

New technology will open up the possibilities for transatlantic service considerably, making operations from YYT to Continental Europe easily possible.

The Boing 737 MAX Family

C U R R E N T

- The Boeing 737 was first developed in the 1960s to initiate jet service between short distance cities.
- After many years and many iterations, the 737 has become a work horse for many airlines around the world because of its durability, flexibility, and economics.
- The continued development of the 737 has allowed the size of the aircraft and the range of the aircraft to grow far beyond the scope of its original intent.
- Current versions of the 737 seating between 125 to 185 passengers have a range of about 2,700 miles, which is adequate for most European missions including YYT-LHR, YYT-AMS, YYT-FRA, and/or YYT-CDG for example.

N E W

- The 737 MAX was developed as a result of the technology and lessons learned from Boeing's highly successful 787 program.
- With seat configurations similar to current models (-700, -800, and -900), the 737 MAX family combines better operating economics with longer ranges – estimated at around 3,000 miles, which is adequate for most of Europe.
- First delivery is scheduled for 2017. Transatlantic operators with confirmed orders include Air Canada, Icelandair, Norwegian, Thomson, and WestJet among others.

Note: Ranges based on 70% of manufactures stated maximum, as operators very rarely operate any closer to the stated maximums.

The A320neo Family

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CURRENT

- The Airbus A320 family was developed in the late 1980s to compete with Boeing's highly successful 737.
- Currently, Airbus effectively splits the global short-haul market with Boeing's 737.
- Over the years, Airbus has grown the size of the A320 to include the A321 (approx. 170 seats), and shrunk it, incorporating the A318/A319 (approx. 110 to 125 seats).
- Currently the A320 has relatively good range capability at around 2,800 miles (slightly further than the current Boeing 737's). This is adequate for many European operations. (Note: The smaller A318 has more range but is not operated by many carriers, nor is it anticipated to be offered in the neo.)

NEW

- Airbus developed the A320neo in response to wide-spread customer requests to update the 30-year old A320 family.
- Like the Boeing 737 MAX, the A320neo family will have seat configurations similar to current models (319, 320, and 321) and better operating economics with longer ranges – estimated at around 3,200 miles.
- First delivery is scheduled for 2015. Current and potential transatlantic operators with confirmed orders include easyJet and Norwegian.

easyJet norwegian.no

Note: Ranges based on 70% of manufactures stated maximum, as operators very rarely operate any closer to the stated maximums.

The CSeries Family

CURRENT

- Canada's Bombardier Aerospace has been wildly successful with its Canadair regional jets since its inception in 1991.
- Based upon the design for a corporate jet, the Bombardier CRJ has been stretched from about 50 passengers up to 100.
- Although the CRJ aircraft line have a good range of up to 1,600 miles, it doesn't provide for transatlantic operations.
- Bombardier's biggest issue with the current CRJ fleet types has become the economic burden imposed by rising fuel prices; current CRJ's are not especially fuel-efficient.

NEW

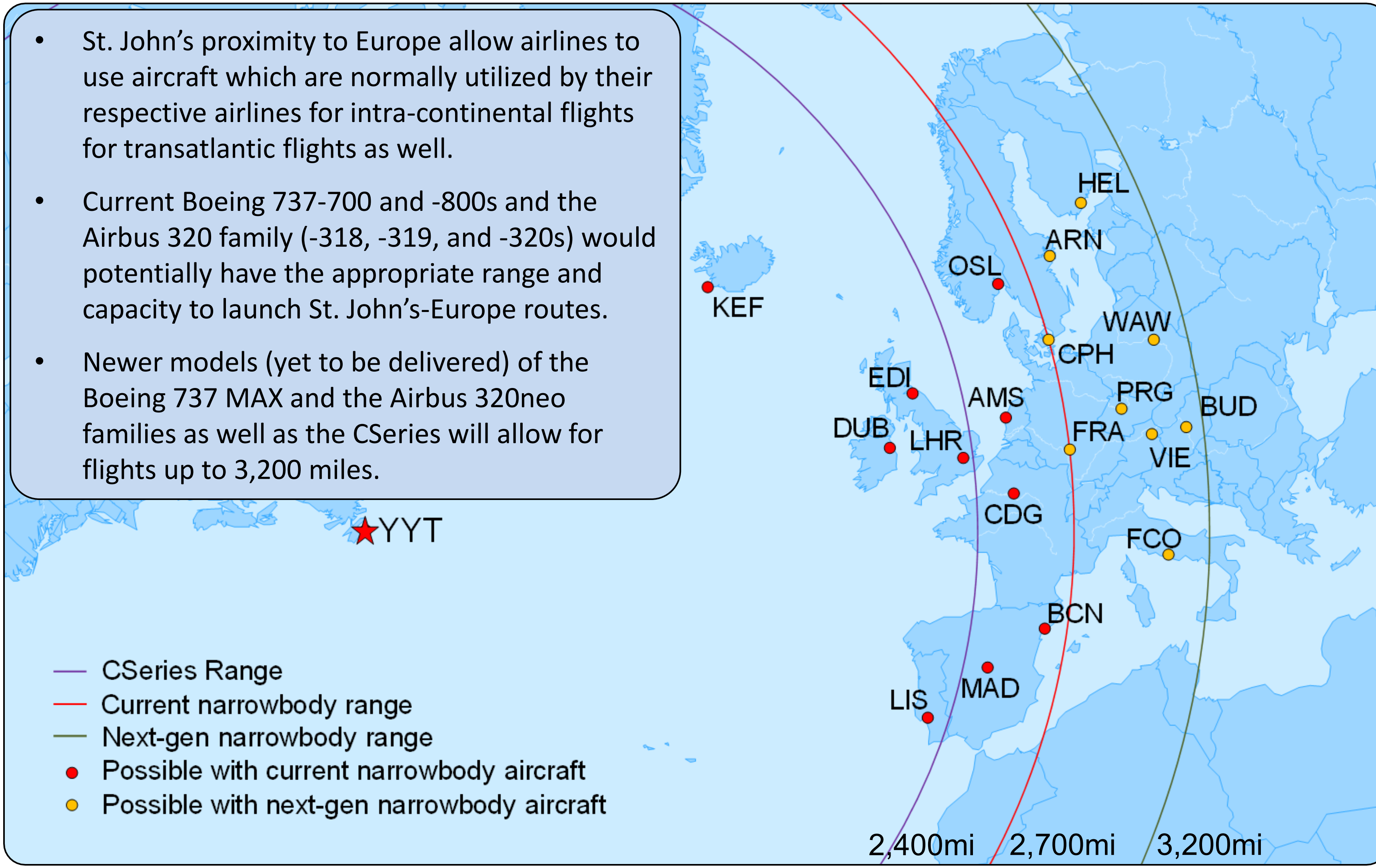
- In order to compete with Boeing and Airbus and in order to provide a state-of-the-art aircraft to its customers, Bombardier developed the CSeries in response to wide-spread customer requests for larger and more fuel-efficient aircraft.
- The CSeries is a whole new aircraft and comes in two versions, a 110-seat model and a 135-seat version.
- Estimated range for the new aircraft is 2,400 miles.
- First delivery is scheduled for late 2015. Current and potential transatlantic operators include Porter.

porter

Note: Ranges based on 70% of manufactures stated maximum, as operators very rarely operate any closer to the stated maximums.

Increased Range for Narrow-bodies

- St. John's proximity to Europe allow airlines to use aircraft which are normally utilized by their respective airlines for intra-continental flights for transatlantic flights as well.
- Current Boeing 737-700 and -800s and the Airbus 320 family (-318, -319, and -320s) would potentially have the appropriate range and capacity to launch St. John's-Europe routes.
- Newer models (yet to be delivered) of the Boeing 737 MAX and the Airbus 320neo families as well as the CSeries will allow for flights up to 3,200 miles.



Note: Ranges based on 70% of manufactures stated maximum, as operators very rarely operate any closer to the stated maximums.

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Incumbent Airline Update

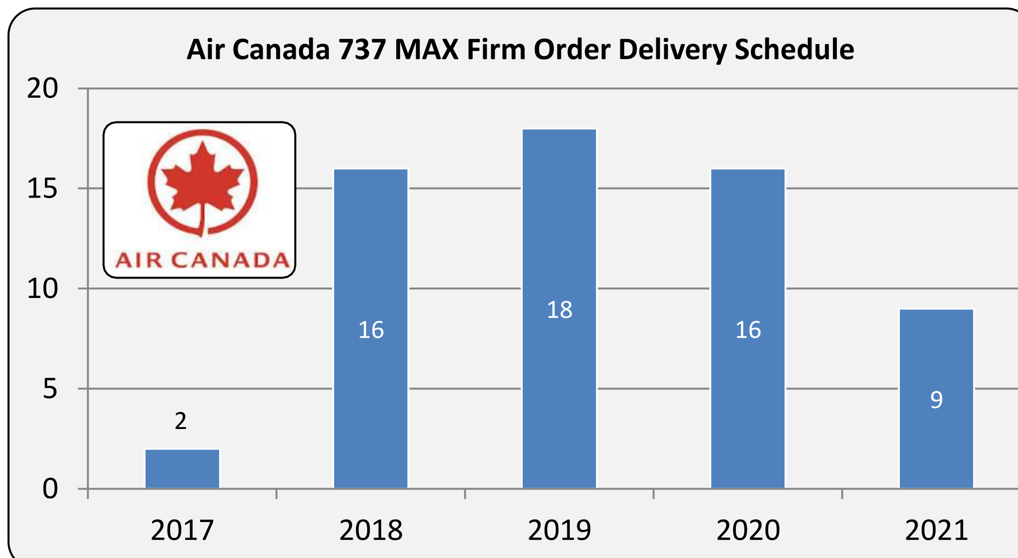


Airline Strategy Update

Air Canada (AC)

Air Canada is the largest airline at YYT with 59% seat share, 61% flight share, and service to eight cities.

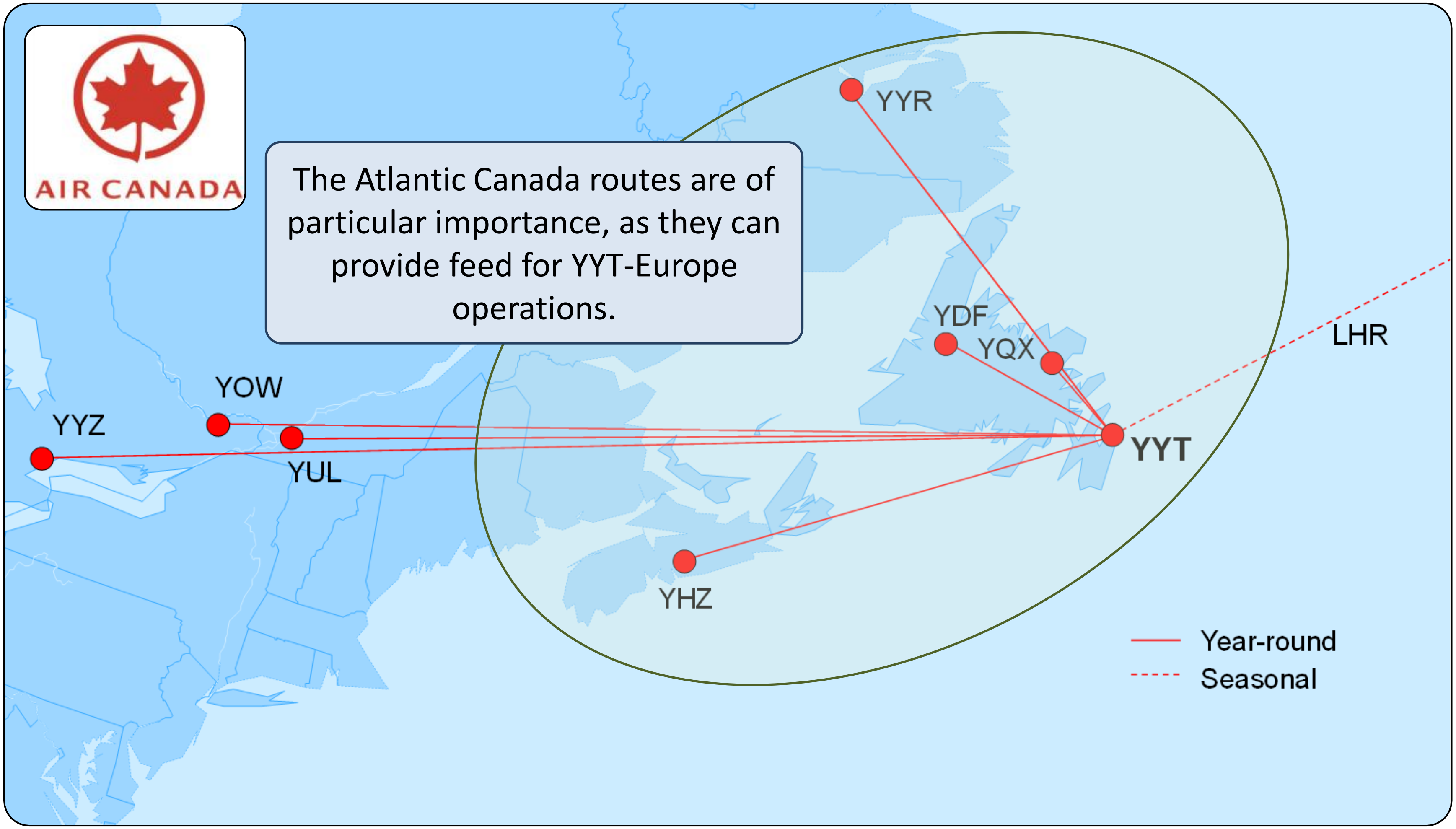
- For the full year 2013, Air Canada achieved record financial performance (adjusted net income of $340 million), which is encouraging as they will likely be inclined to expand.
- In the short-term, Air Canada's focus will be on its low cost Rouge product and international expansion.
- Internationally, five new high density 777s will be deployed on key long-haul routes such as YUL-CDG. AC has also ordered 37 787s to replace the aging 767s and to open up thinner international routes.
- Air Canada recently announced its narrow-body fleet replacement by ordering up to 109 737 MAXs.
  - This includes 61 firm orders, 18 options, and 30 purchase rights.
- Delivery of the 61 firm order 737 MAXs is expected to start in 2017 and continue through to 2021.



Source: Air Canada News Release, February 12, 2014; Air Canada Investor Update 2013; Air Canada 2013 Q2 Financial Report; Innovata Schedules (via Diio).

Air Canada YYT Network

Air Canada currently operates 7 year-round and 1 seasonal route at YYT.



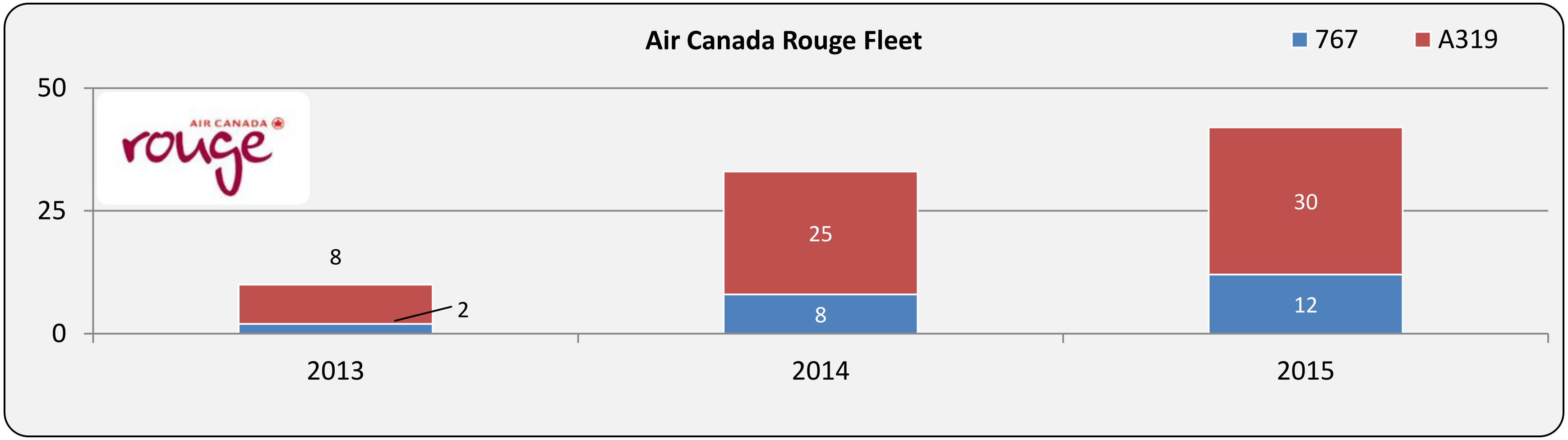
Source: Innovata Schedules (via Diio).

Airline Strategy Update

Air Canada (AC)

Air Canada Rouge is a wholly owned, low-cost subsidiary set up to compete with Air Transat, WestJet, and Sunwing on key leisure routes.

- Rouge will operate a two-aircraft type fleet consisting of high density Airbus A319s (142 seats) and Boeing 767s (264 seats) transferred and modified from Air Canada mainline. Rouge is estimated to deliver 21% and 29% CASM reductions to these aircraft respectively.
- Currently Rouge service is concentrated at YYZ and YUL; however preparations are underway for YVR and YYC expansion.
- With 42 aircraft by the end of 2015, secondary cities in Canada are likely to see Rouge service.
- Air Canada Rouge's lower operating costs and higher density service could be an ideal fit for YYT to compete with WestJet across the Atlantic as well as expand the transatlantic product offering



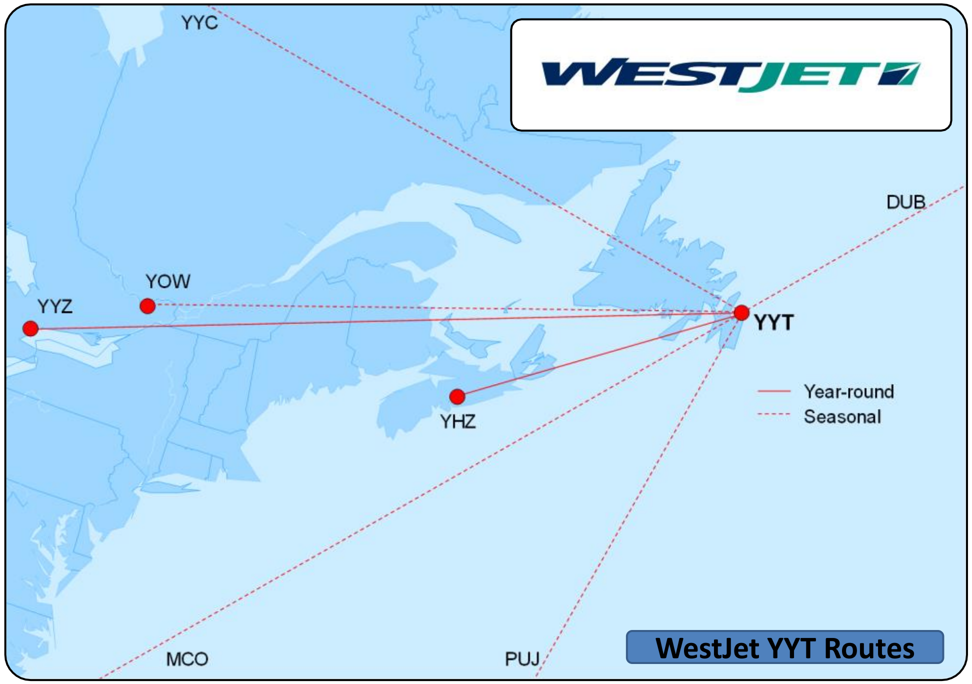
Source: Air Canada Investor Update 2013; Air Canada 2013 Q2 Financial Report; Air Canada 2012 Year Ended Financial Report.

Airline Strategy Update

WestJet (WS)

WestJet serves six markets from YYT and accounts for 22% of seat capacity and 12% of departures.

- WestJet continues to have strong financial performance (net earnings of $268.7M), and as such, they remain willing and able to expand (ASMs up 8.6% for 2013 vs. 2012).
- New transatlantic strategy focused at YYT using smaller narrow-body aircraft with lower fares.
- Similar to JetBlue, WestJet has a hybrid of offerings to attract more high yield business traffic.
  - WestJet Dollar program to incentivize and retain frequent flyers;
  - “Plus” fare class for greater flexibility.
- WestJet announced a 40 737 MAX 8 and 25 737 MAX 7 order. With lease renewals and options, its 737 fleet could be up to 162 aircraft by 2023.
- Additionally, the new Q400s should free up some existing 737s.



Source: WestJet Investor Updates 2013 and 2014; WestJet 2013 Q3 Financial Report; WestJet 2012 Year Ended Financial Report; Innovata Schedules (via Diio).

Airline Strategy Update
Porter (PD)

Porter Airlines is a regional operator based in Toronto's Billy Bishop Airport (YTZ) with Q400 operations throughout Central/Eastern Canada and the Northeastern US.

- Porter recently announced fleet plans to add up to 30 Bombardier CSeries jets to be delivered in the second half of 2015. These aircraft will have 110-135 seats and a range of approximately 2,400 miles – sufficient for operations to the UK and Ireland.
- However, regulation, runway length and slot constraints are some of the challenges facing Porter's jet expansion at its current YTZ hub.
  - The tri-partite agreement between the City of Toronto, Toronto Harbour Commission and the Government of Canada will need to be amended to allow for CSeries operations. Concern of noise pollution is seen as a major hurdle, and hearings have been postponed.
  - Current runway length is insufficient for CSeries operation; YTZ's runway will have to be increased by 550 ft. on each end to accommodate such aircraft.
  - Lastly, YTZ is a slot controlled airport. Geography and regulations limit further expansion.
- If Porter is unable to get permission to operate the CSeries at YTZ, it is very unlikely that they will go through with the purchase of these aircraft (current commitment is actually conditional on being able to operate at YTZ).

Note: Ranges based on 70% of manufactures stated maximum, as operators very rarely operate any closer to the stated maximums.

Airline Strategy Update

Transat/Canadian Affair (TS)

Air Transat is a charter airline with service to leisure markets in the Caribbean/Central and South America (winter focus) and Europe (summer focus).

- Transat has been going through capacity transitions to reign in losses; however, they appear to have turned the corner, with a $75M profit turnaround in 2013. As such, Air Transat is scheduled to grow ASK's by 6% overall in 2014.
- Of significant importance to YYT is Air Transat's transition of its narrow-body fleet from a CanJet contract to an in-house fleet of five Boeing 737s starting in Feb 2014. Additionally, Transat is leasing 737-800s from Transavia (owned by KLM-Air France). However, the lease agreement only covers the winter season.
- The new company-owned 189 seat 737-800s will enable Air Transat to operate at lower variable costs and thus provide flexibility to serve smaller markets in the US, Caribbean, and potentially Europe.
- Transat does not profit from their air operations. Profitability comes from the packages that are sold in conjunction to airfare. Transat already has an established network of tours and hotels in Europe, which should help reduce start-up risks.

Source: Transat Investor Update 2013; Transat 2013 Q2 Financial Report; Transat 2012 Year Ended Financial Report.

New Airline Opportunities



New Airline Opportunities

Although several types of narrow-body aircraft can perform nonstop transatlantic flights, very few airlines have taken advantage of their range.

- WestJet's announcement of YYT-DUB service might cause other non-traditional transatlantic carriers to re-evaluate the possibility of transatlantic flights and/or prompt existing transatlantic airlines to launch narrow-body operations.
- Europe has a number of carriers with large narrow-body fleets capable of flying between Europe and YYT. Some have done one-off charter trips but none have fully committed to regular, scheduled service.

Aer Lingus (Ireland)

Aer Lingus, the Irish flag carrier, has done a brilliant job of surviving against tough odds and competition and carving out a niche for itself in Europe and across the Atlantic.

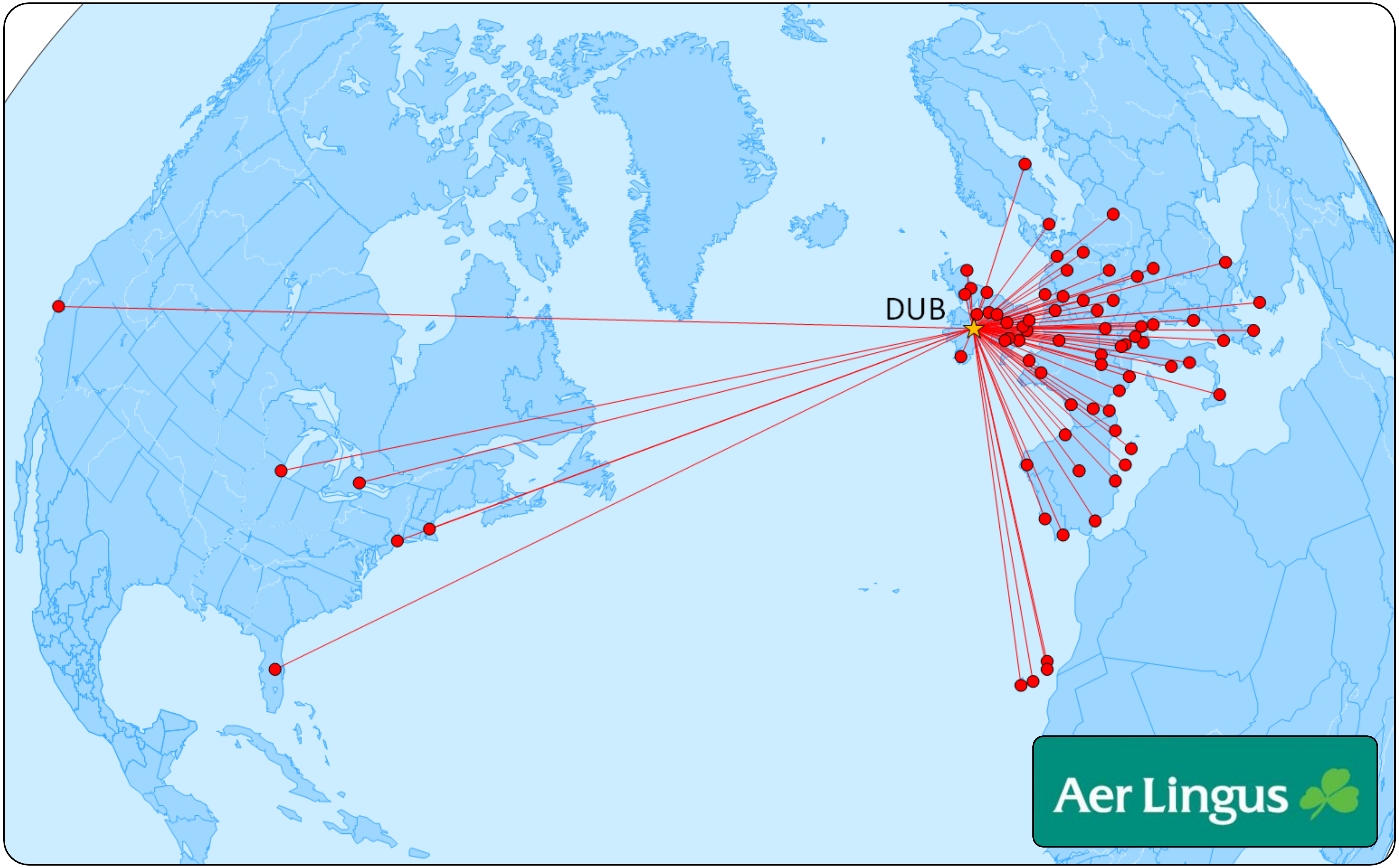
- Aer Lingus employs a hybrid model of service, with short-haul flights similar to LCC efforts, and long-haul using two-class, traditional transatlantic service standards.
- The airline has been comfortably profitable since 2010 and has 47 aircraft in its fleet, of which 33 are classic A319/320s.

They currently serve several cities in North America including Boston, Chicago, New York, Orlando, San Francisco, and Toronto from their Dublin and Shannon hubs (using A330 and Boeing 757 aircraft).

- Additional transatlantic destinations such as YYT would provide feed to support extensive eastbound services from DUB to the European continent (however the service would compete directly with WestJet for the local YYT-DUB market).

Source: Aer Lingus website; Innovata Schedules (via Diio).

Aer Lingus Network



Note: Station shown is based on priority for YYT.
Source: Innovata Schedules (via Diio) July 2014.

Condor (Germany)

Condor is a German leisure carrier, with a strong presence in North America.

- They currently serve a number of cities from Frankfurt in Canada including Toronto, Whitehorse, Calgary, Halifax, and Vancouver with their 767 fleet.

Originally, Lufthansa was instrumental in starting Condor for leisure routes to complement its business model.

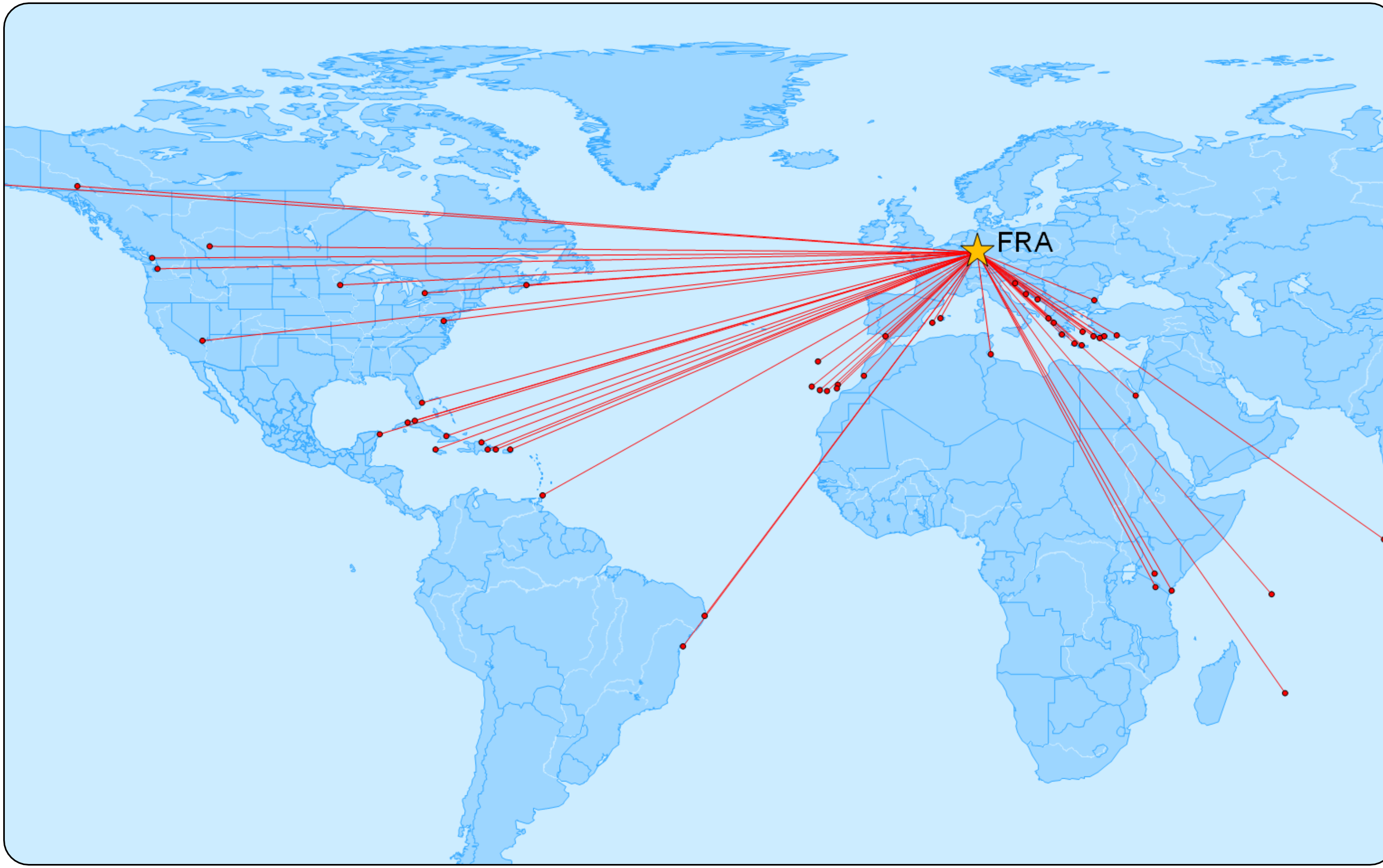
- Now owned by the British Thomas Cook charter group, Condor is the only one of Thomas Cook's airlines that is solely scheduled service.
- Condor's operation is similar to Air Transat; service is often only once or twice per week; onboard amenities and seating are geared towards vacationers. However, Condor does provide connecting itineraries (e.g. an estimated 44% of Condor's YHZ traffic is connecting at FRA).

Condor has 42 aircraft in its fleet, of which 13 are classic A320s.

Note: Condor's financials are not broken out separately from the Thomas Cook Group.

Source: Diio FMg, year ended November 2013.

Condor Network



Note: Stations shown are selected based on priority for YYT.
Source: Innovata Schedules (via Diio) July 2014.

EasyJet (UK)

Started in 1995 by a Greek-British shipping company magnate, the LCC has grown to be the largest airline in the UK, and one of the largest airlines in the world.

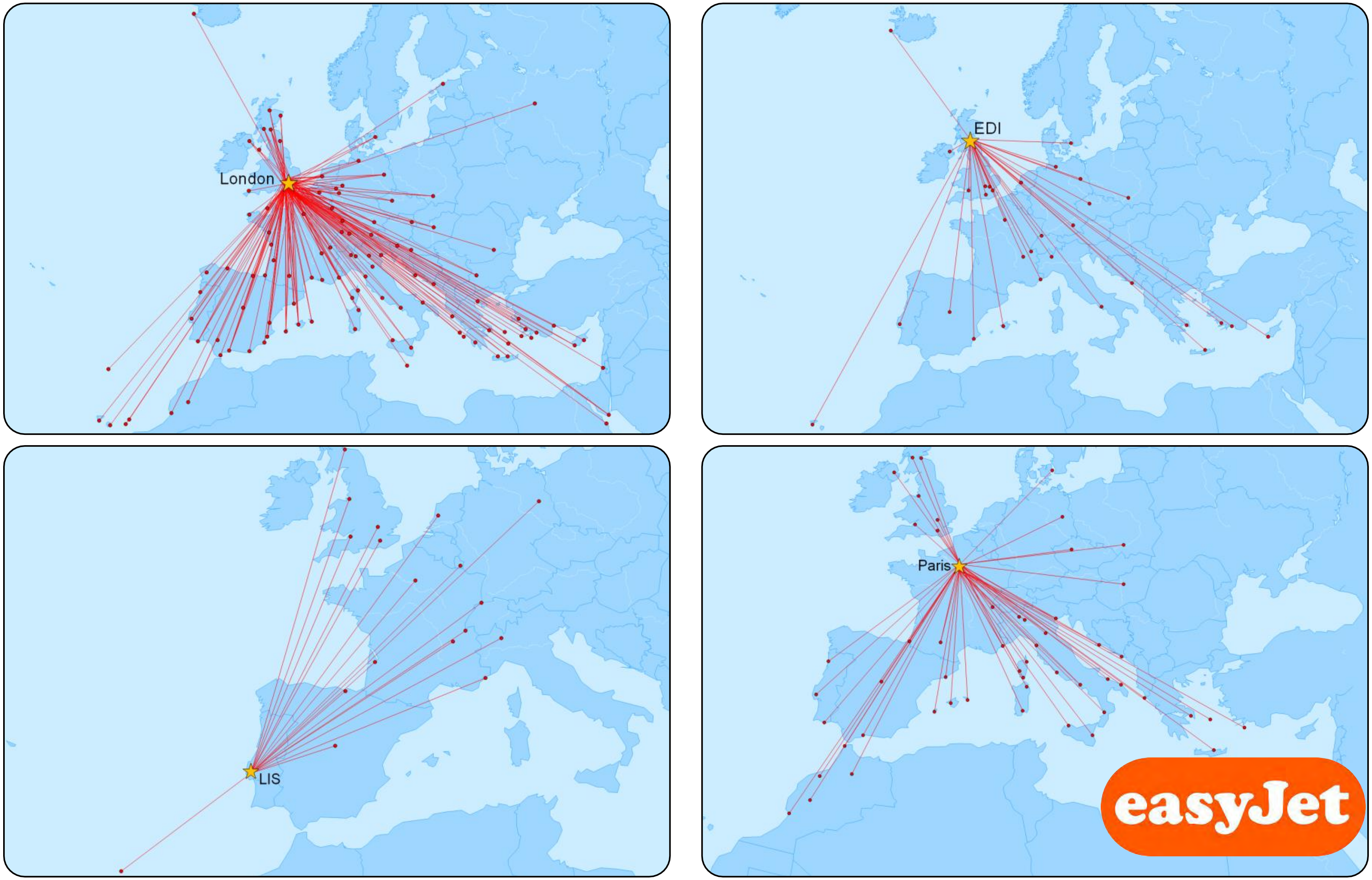
- EasyJet is a very profitable airline, with continual profits since at least 2000, and continues to perform very well financially (YE Sept 2013 profit up 50% over YE Sept 2012).
- EasyJet currently operates a fleet of 217 Airbus A319/320s with plans to grow the fleet to 300 by 2019 (with an order of 100 A320neos and an option for 35 more, placed in June, 2013).
- The airline operates 1,165 average daily flights to 138 destinations stretching from Ireland to Turkey.
- It is important to note that easyJet is extremely conscious of costs and will demand very low aeronautical fees as a condition of service (regardless of revenue potential).

Source: easyJet 2013 Q3 financial report; Innovata Schedules (via Diio).

EasyJet Network (illustrative hubs)

InterVISTAS
a company of Royal HaskoningDHV

ST. JOHN'S
International Airport Authority



Note: London includes: LGW, STN, SEN, LTN; Paris includes: CDG, ORY. Stations shown are based on priority for YYT.
Source: Innovata Schedules (via Diio) July 2014.

EasyJet Bases

Any proposed service would need to operate to/from **one of easyJet's bases**.

Furthermore, easyJet **will currently not overnight aircraft and crew at non-base stations**, so a YYT operation would likely need to be done as a **turn at YYT with the same crew**.

Icelandair and WOW (Iceland)

Icelandair traces its roots to 1937 and has flown as the national carrier since that time.

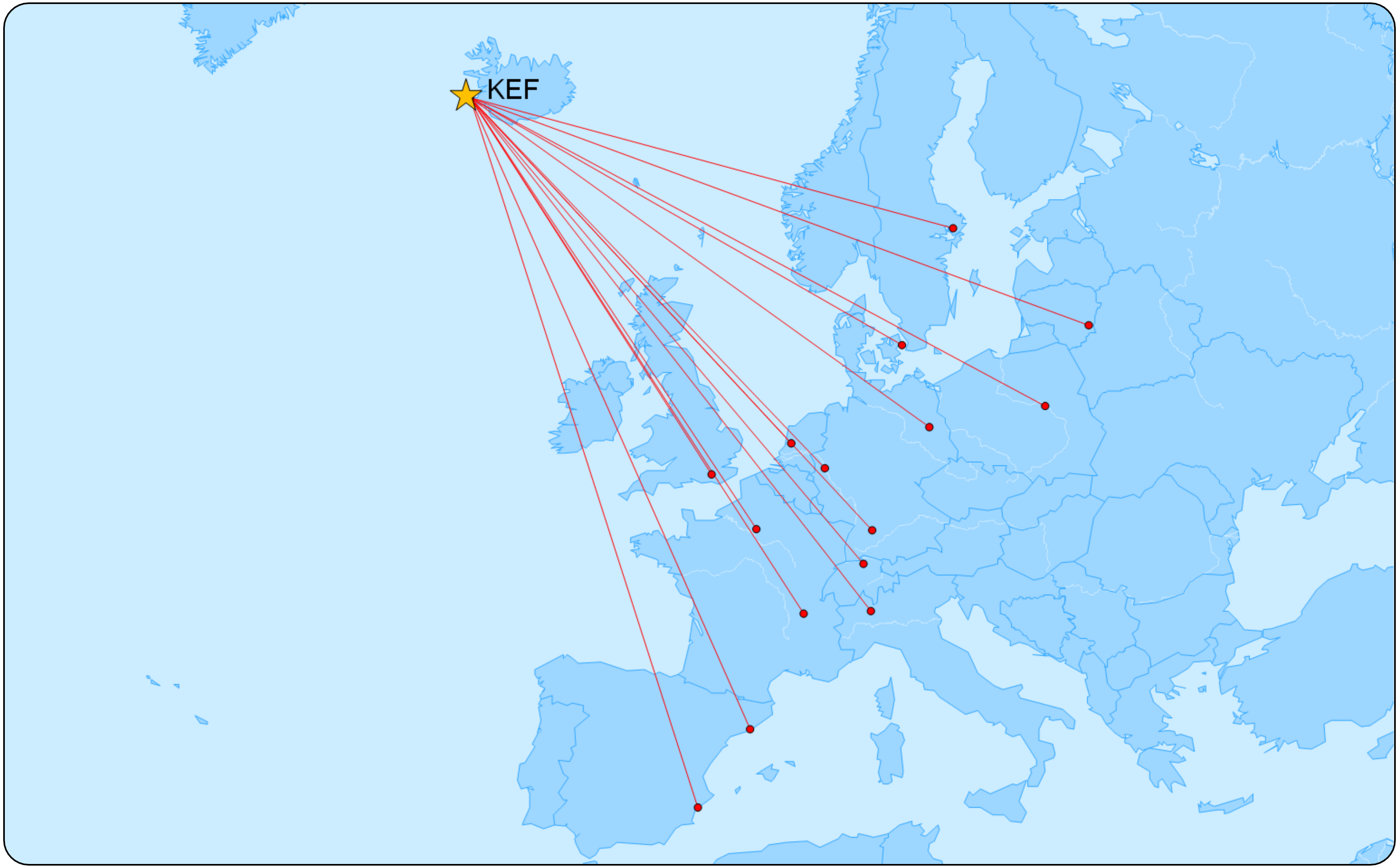
- The KEF hub provides excellent connectivity to Europe.
- Icelandair currently operates only 757's; however, they have ordered sixteen 737 Max's and anticipate delivery between 2018 and 2021.
- Additionally, they have expressed interest in purchasing ERJ-190s. These aircraft have under 100 seats and would have adequate range for YYT-KEF.

WOW began service in 2011 and bought many of Iceland Express' assets in 2012.

- WOW has a fleet of three A320s currently serving 16 destinations, with no aircraft orders on record.
- WOW is trying to initiate service to BOS for this coming summer.

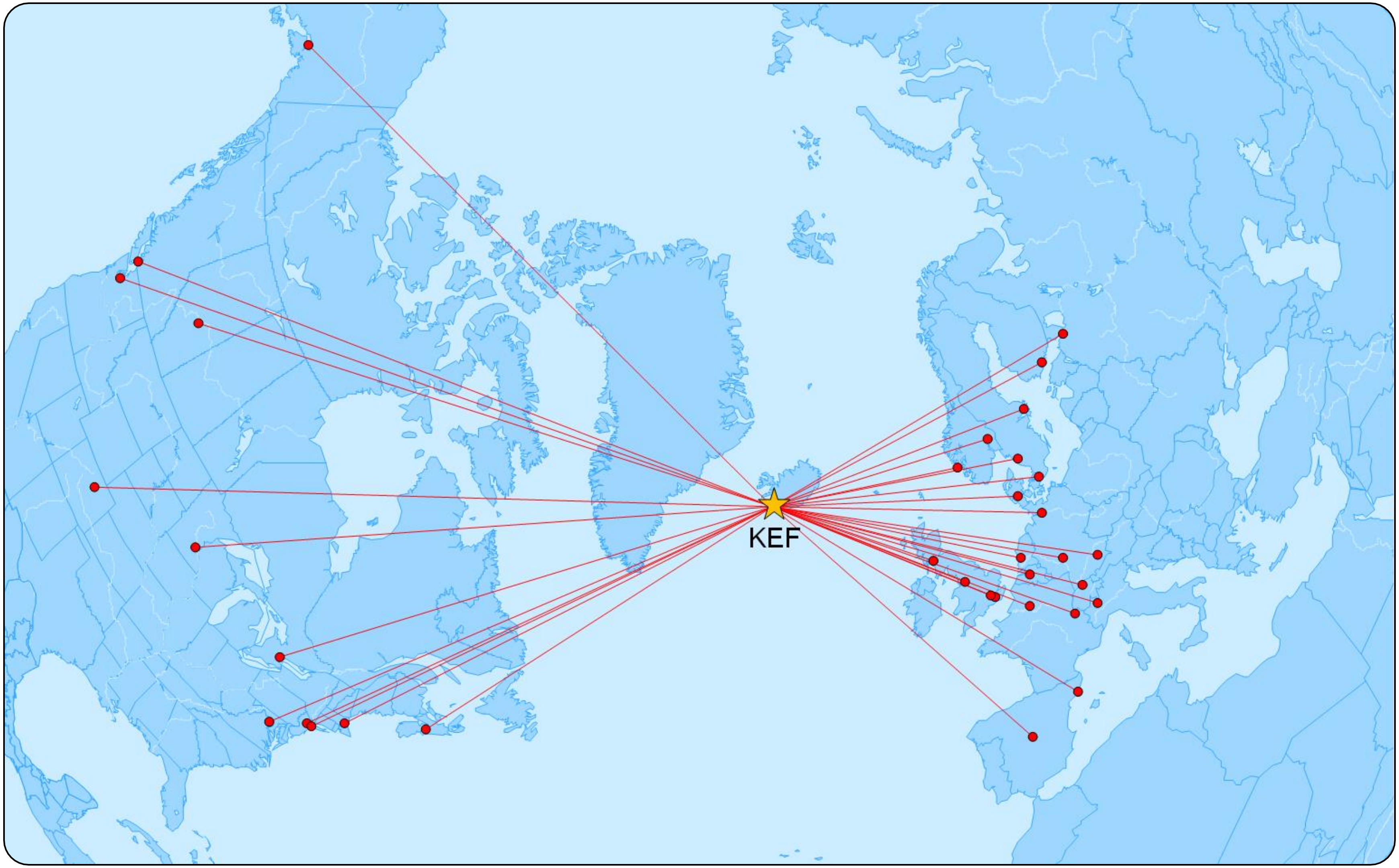
In 2012, Icelandair achieved a net profit of nearly $45M, while WOW's financials are not public.

WOW (Iceland) Network



Source: Innovata Schedules (via Diio) July 2014.

Icelandair Network



Source: Innovata Schedules (via Diio) July 2014.

Norwegian Air Shuttle (Norway)

Fast-growing LCC from Norway which evolved from its 1966 beginning as a small commuter airline in Norway.

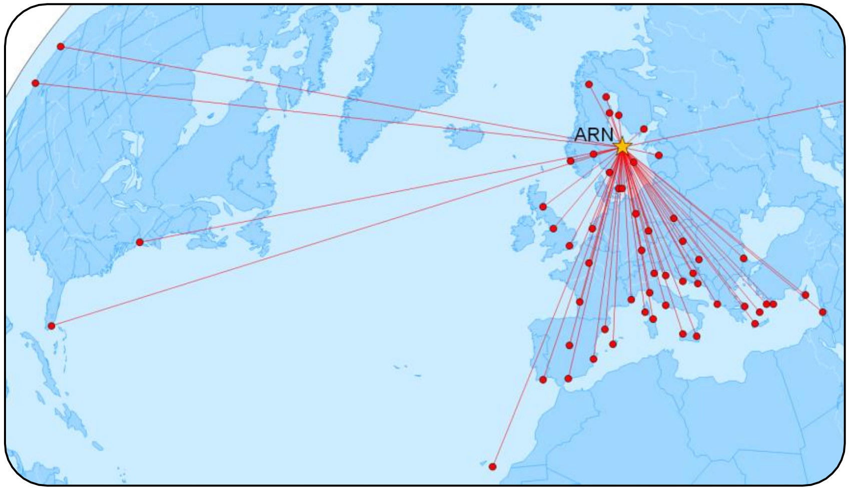
- Norwegian is now the third largest LCC in Europe with 86 Boeing 737s (mostly -800s) and 787s in the fleet at YE13, with plans to grow to 102 aircraft by YE15.
- In 2012, Norwegian ordered up to 150 Airbus 320neo's, with deliveries to begin in 2016; separately in 2012, Norwegian ordered up to 200 737 Max's, with deliveries set to start in 2017.

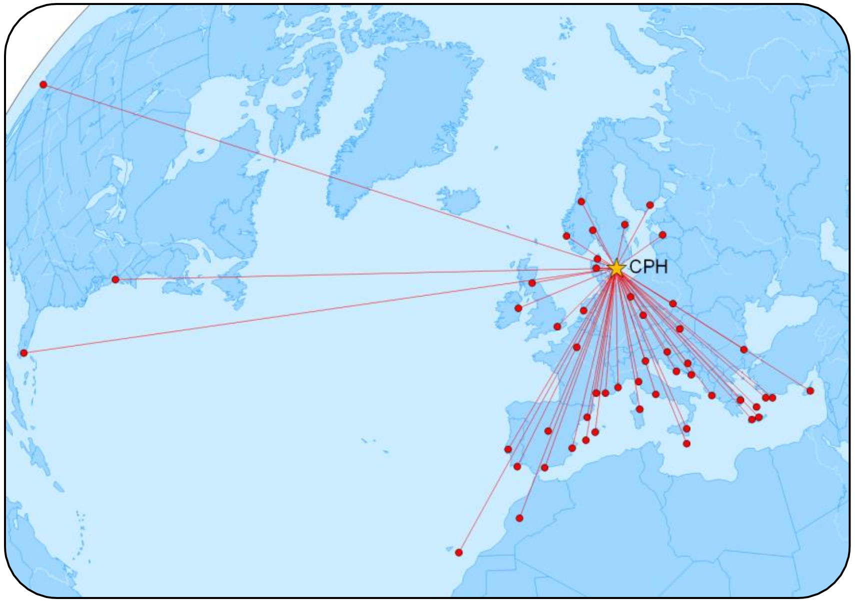
Recently launched wide-body, transatlantic service between Norway/UK and New York, California and Florida; however, they have not started any narrow-body operations across the Atlantic.

- It should be noted that their long-haul flying from LGW is done through a subsidiary with an operating certificate from Ireland. This is necessary to get around the bilaterals, as Norway is not part of the EU and therefore is not covered under the US-EU open skies agreement.

Norwegian has been profitable since 2007 and operates on average 430 daily flights system-wide to 126 destinations.

Norwegian Network





Note: Stations shown are selected based on priority for YYT.
Source: Innovata Schedules (via Diio) July 2014.

Norwegian Bases

Ryanair (Ireland)

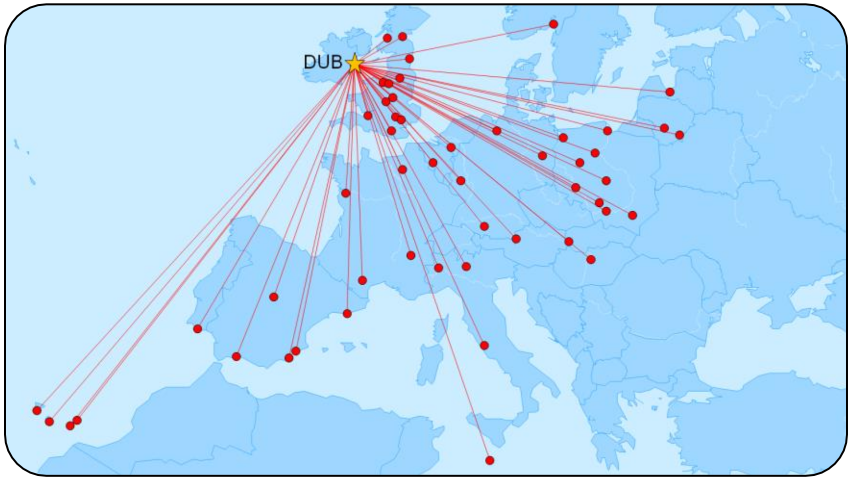
Original low-cost carrier in Europe, with its origins as a small commuter between Ireland and the UK in 1985.

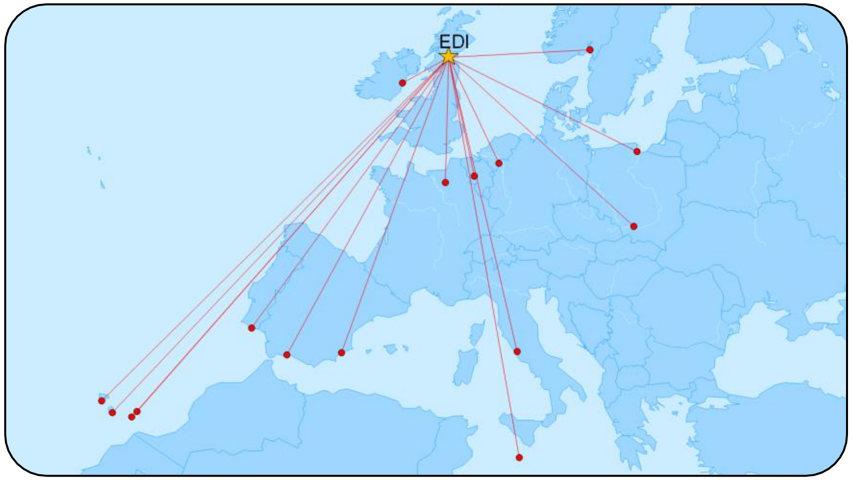
- Ryanair has reported profits as far back as 2001.
- Ryanair has evolved into one of the largest airlines in Europe and the world, with 303 737-800s in service across Europe, offering 1,700 peak daily flights from 58 bases.
- Ryanair signed a commitment in June, 2013 at the Paris Air Show to purchase 175 new 737-800s for delivery between 2015-2019, growing the fleet to 420 aircraft.

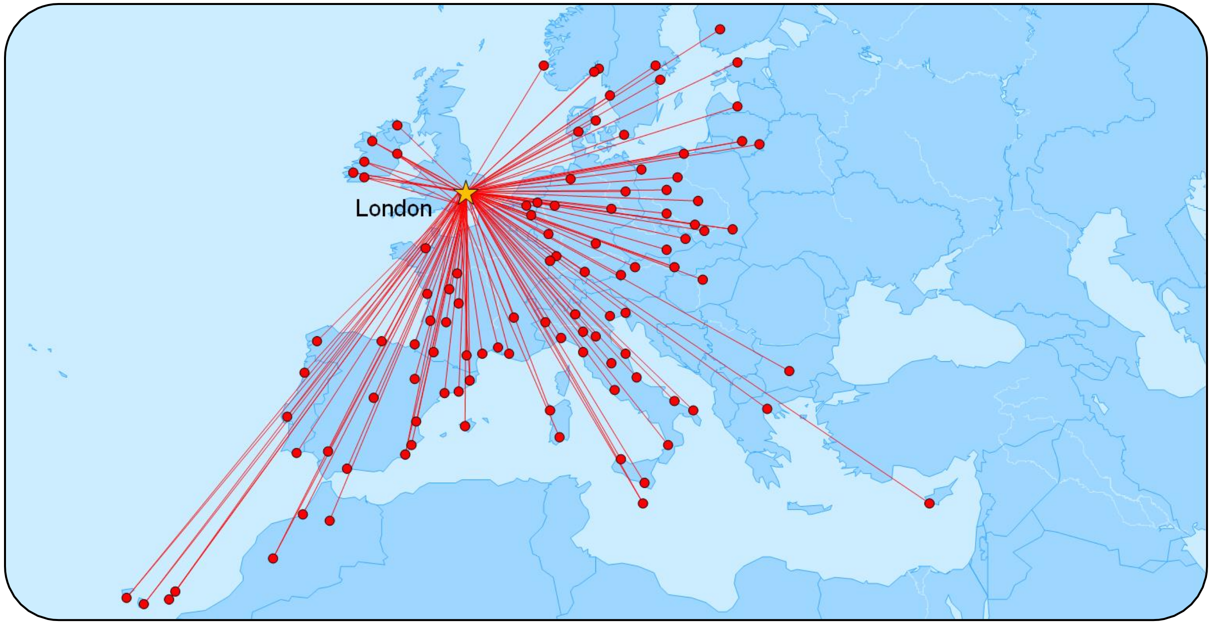
Michael O'Leary, Ryanair's CEO, was quoted in June of this year that he would like to initiate transatlantic flights with his fleet.

It is important to note that Ryanair is extremely conscious of costs and will demand very low aeronautical fees as a condition of service (regardless of revenue potential).

Ryanair Network (illustrative hubs)







Note: London includes: LGW, STN, LTN. Stations shown are selected based on priority for YYT.
Source: Innovata Schedules (via Diio) July 2014.

Ryanair Bases

Transavia (Netherlands & France)

Independent airline of the Air France/KLM Group with twin bases in Amsterdam and Paris Orly.

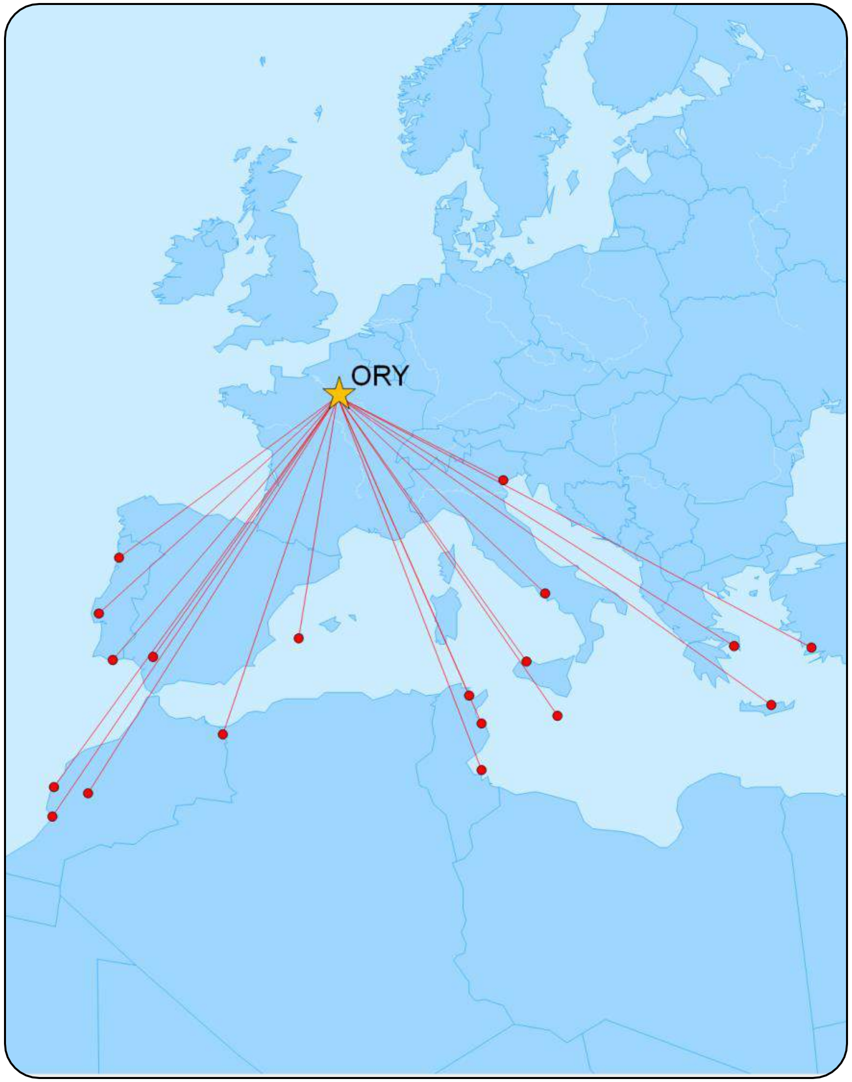
- Started service in 1966 as a Dutch leisure charter operator, but has evolved into a scheduled LCC.
- In 2006, AF/KL created a French affiliate of the LCC based at Paris' Orly airport, which is run separately from the Dutch branch.

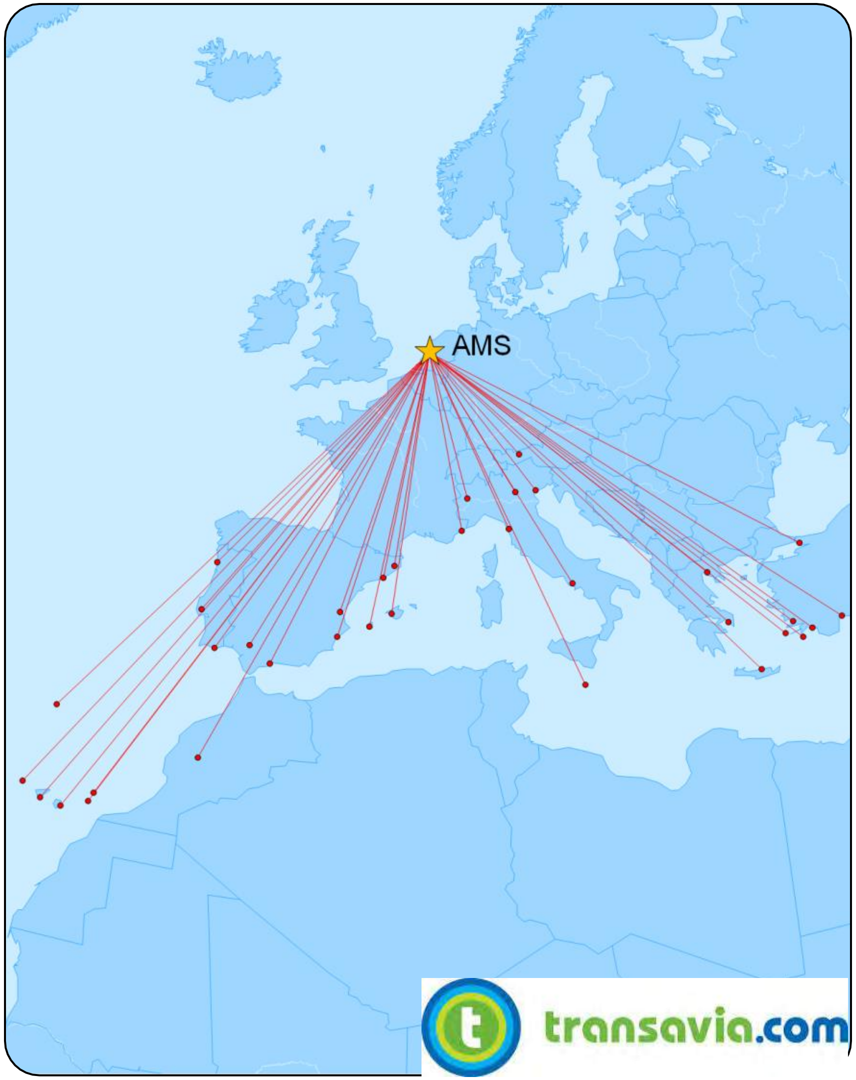
Airline results are not reported separately from Air France/KLM.

Transavia operates 30 all-Boeing aircraft, including 10 737-700s and 20 737-800s.

Source: Transavia website.

Transavia Network





Note: Stations shown are selected based on priority for YYT.
Source: Innovata Schedules (via Diio) July 2014.

Charter Carriers

The UK has a number of charter carries which offer regularly scheduled service to numerous destinations in North America. These include Monarch, Thomson, and Thomas Cook.

- Monarch has some A320s and is getting more.
- Thomson has a fleet of over 50 narrow-body Boeing 737-800s and 757-200s.
- Thomas Cook has a fleet of 71 aircraft and is harmonizing the fleet with A320s.
- Monarch and Thomas Cook offer scheduled departures, but Thomson is charters only.

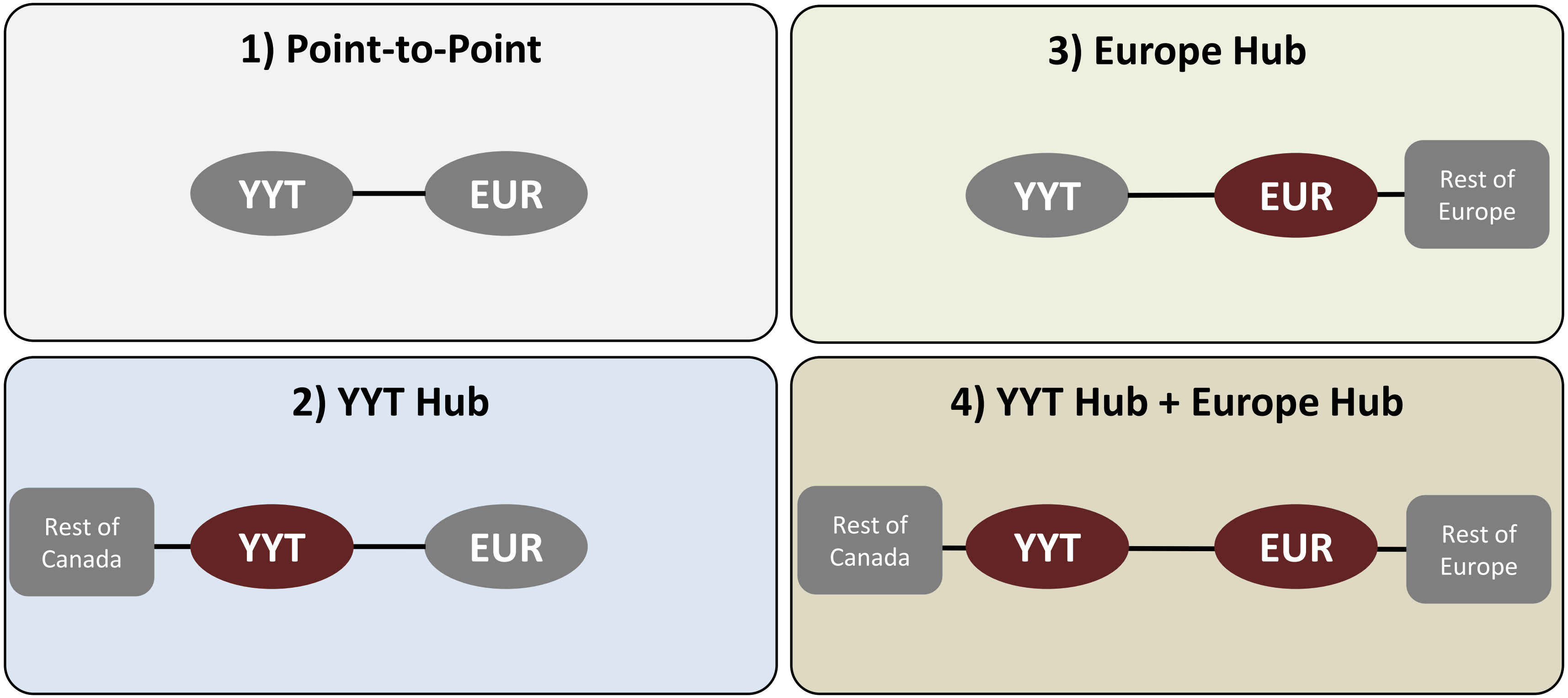
Opportunities for YYT-Europe Service



Opportunities for YYT-Europe Service

Types of Service

There are four broad types of service that could provide for YYT-Europe access:



Given that the suitable carriers and the criteria for evaluating these opportunities varies significantly, each of the above operation types have been examined separately in further detail.

Opportunities for YYT-Europe Service

Required Levels of Demand

To provide context for this section, the table below provides a general "rule of thumb" passenger volumes required to support service for a range of aircraft types.

Aircraft		Weekly Outbound Frequency	Annual Seats	Annual Passengers (assuming 80% load factor)	Passengers Per Day Each Way (assuming 80% load factor)
Type	Average Seat Configuration				
Small Narrow-body Jet	120	1	12,480	9,984	14
		3	37,440	29,952	41
		5	62,400	49,920	69
		7	87,360	69,888	96
Medium Narrow-body Jet	150	1	15,600	12,480	17
		3	46,800	37,440	51
		5	78,000	62,400	86
		7	109,200	87,360	120
Large Narrow-body Jet	180	1	18,720	14,976	21
		3	56,160	44,928	62
		5	93,600	74,880	103
		7	131,040	104,832	144
Wide-body Jet	250	1	26,000	20,800	29
		3	78,000	62,400	86
		5	130,000	104,000	143
		7	182,000	145,600	200

Opportunities for YYT-Europe Service

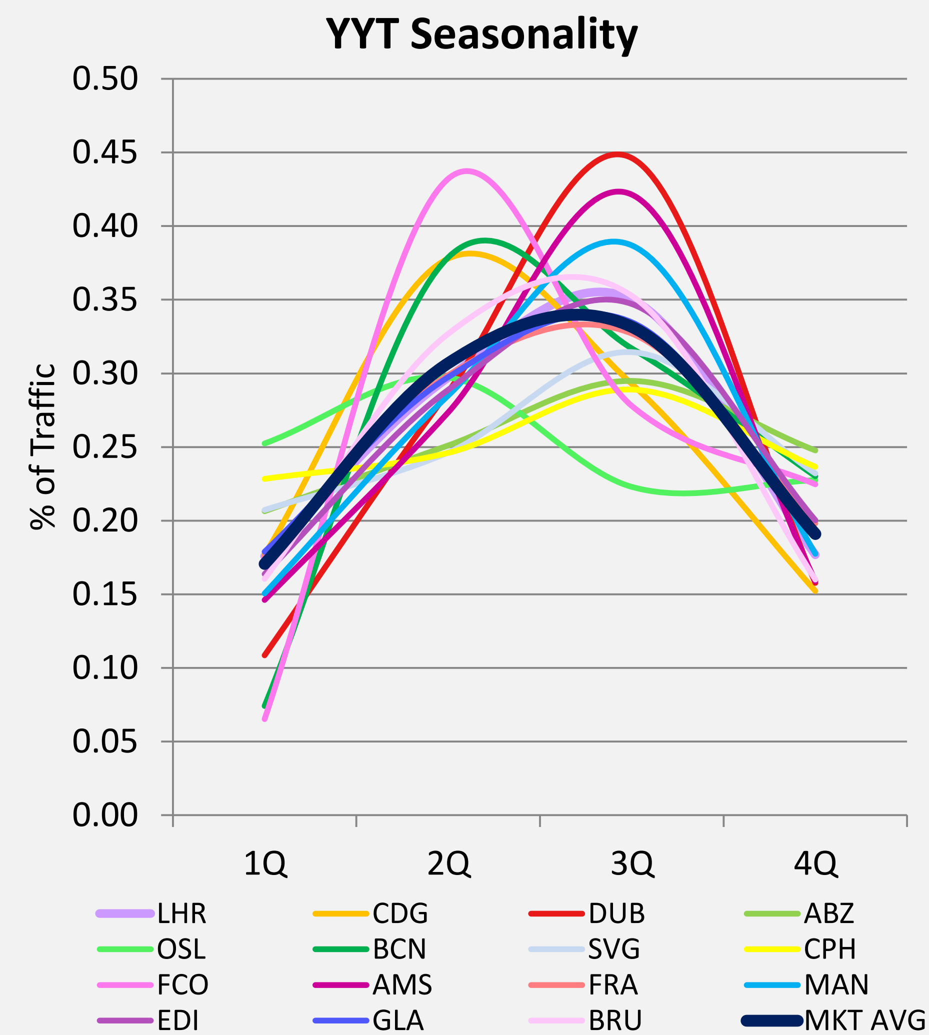
Seasonality

Some market sizes may look very small when averaged across the week or across an entire year.

- However, by flying a route only part of the year or only on certain days, the market sizes grow proportionally into sufficient sizes to support services viably.

Illustrative Example

- Paris' year-round market size is 5 PDEWs absent any stimulation. However given the peak in the demand for the summer demand increases to 7 PDEW.
- Since traffic is expressed as a figure Per Day Each Way, the same 7 PDEW extrapolates to 49 passengers each week.
- Hence, if an airline flew a route only on Saturdays during the summer, their demand could be 49 passengers on the travel day, before stimulation, and not 5.



Source: Diio FMg YE November 2013.

Point-to-Point Opportunities



Point-to-Point Opportunities

Overview

A point-to-point service is a flight that does not begin or end in an airline's hub.

- As such, the majority of the passengers on the flight are either from the origin (e.g., YYT) or the destination (e.g., MAN). The airline expects very little connecting traffic for a planned flight from "behind" the origin and very little traffic "beyond" the destination.
- For a point-to-point service to work there as to be a large local market or the potential for significant market stimulation.
  - Charter operators generally use larger aircraft and operate in large markets with proven demand.
  - However, most LCCs tend to use smaller planes and count on price elasticity to stimulate the market large enough to support the flight.
- Possible carriers for a YYT-Europe point-to-point service include:

easyJet, transavia.com, Monarch, RYANAIR, Air transat, Thomson, Thomas Cook

Point-to-Point Opportunities

Current Demand

Based on current demand, there are a limited number of point-to-point markets.

- Specifically, for a 1/week service with a narrow-body aircraft, approximately 17 PDEWs would be required (119 per week) – London is the only market that fits this criteria.

Rank	Market City	Market Demand (PDEWs)				Seasonality (Relative to Annual Average)			Average One-way Fare (USD)
		Summer Peak (Jun-Aug)	Summer Non-Peak (Apr, May, Sept, Oct)	Winter (Nov-Mar)	Annual	Summer Peak (Jun-Aug)	Summer Non-Peak (Apr, May, Sept, Oct)	Winter (Nov-Mar)	
1	London	32.9	28.0	15.5	24.1	36%	16%	-35%	769
2	Aberdeen	6.0	5.7	4.4	5.2	14%	9%	-16%	1,069
3	Paris	6.8	5.5	3.8	5.1	33%	7%	-26%	571
4	Oslo	5.3	4.6	4.1	4.6	16%	0%	-10%	1,815
5	Dublin	5.0	6.2	2.0	4.2	20%	50%	-53%	417
6	Stavanger	3.4	2.0	2.3	2.5	37%	-18%	-8%	1,740
7	Barcelona	2.3	3.1	0.9	2.0	17%	54%	-54%	487
8	Rome	2.0	3.5	0.7	1.9	2%	78%	-64%	443
9	Manchester	2.4	1.9	1.3	1.8	35%	8%	-28%	933
10	Edinburgh	2.9	1.7	1.0	1.7	69%	1%	-42%	867
11	Amsterdam	2.5	1.7	1.1	1.7	48%	3%	-32%	838
12	Copenhagen	1.7	1.6	1.7	1.7	1%	-2%	1%	828
13	Frankfurt	1.7	1.4	1.3	1.4	16%	-4%	-6%	643
14	Glasgow	1.5	1.4	1.0	1.3	21%	12%	-23%	856
15	Munich	1.0	2.3	0.3	1.2	-15%	99%	-71%	576
	Other	29.5	27.5	14.0	22.4	32%	23%	-38%	886
	Total	**106.9**	**98.3**	**55.5**	**82.7**	**29%**	**19%**	**-33%**	**867**

However, **price and service stimulation play a significant role** in the viability of new point-to-point services. As such, an assessment of the stimulation potential is provided on the following pages.

Source: Diio FMg data, 12 months ended November 2013.

Point-to-Point Opportunities

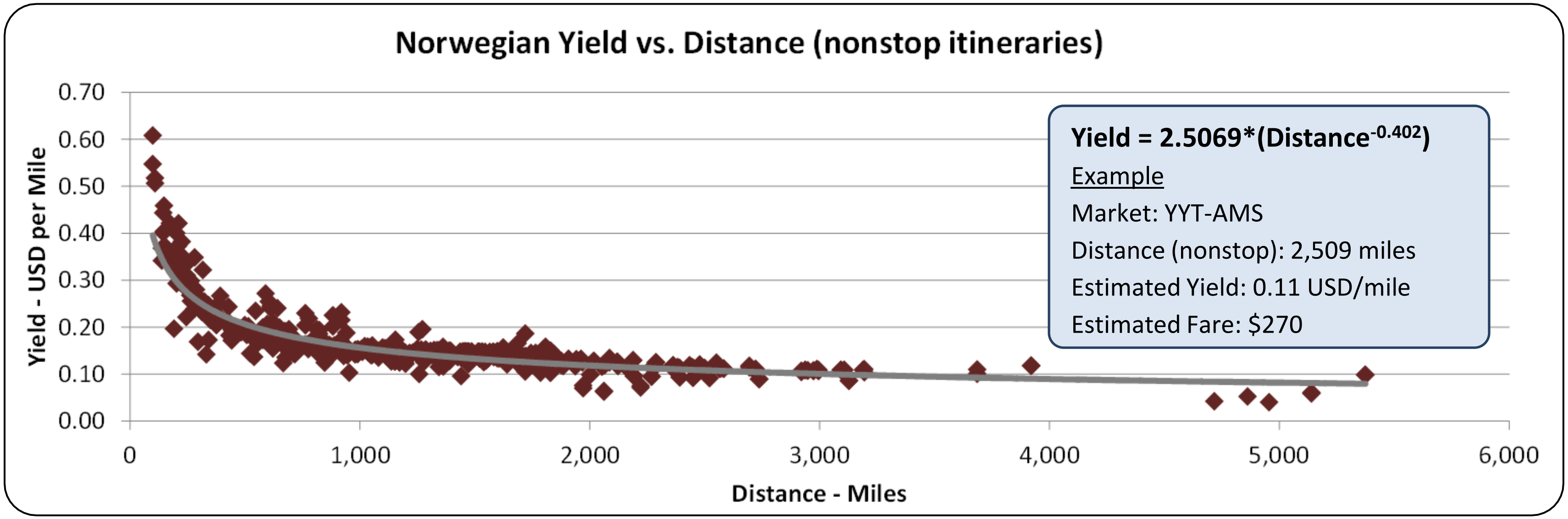
Price Stimulation

To estimate the potential fare after an LCC enters the market, a representative yield curve can be used.

- For our purposes, the yield curve for Norwegian has been used as a proxy (since they currently have long-haul operations).

Then using the yield curve based fares, stimulation rates are estimated using a price elasticity model.

- Elasticity of demand for the YYT market was assumed to be -1.25 (i.e. for a 10% decrease in fares the market size will increase by 12.5%).



Note: Yield curve constructed using Diio FMg data.

Point-to-Point Opportunities

Demand Potential With Stimulation

As shown in the table below, with reduced fares there is good potential for significant stimulation.

- With an estimate for stimulation included, Oslo, Stavanger, Aberdeen and Paris are above the threshold of 17 PDEWs.
  - In the case of Stavanger and Aberdeen these markets are probably not likely for an LCC point-to-point operation, given that they are mainly business markets.
  - However, Paris and Oslo are strong leisure markets and may be suitable for an LCC point-to-point operation.

		CURRENT					POTENTIAL (after stimulation)					
			Market Demand (PDEWs)						Market Demand (PDEWs)			
Rank*	Market City	Average One-way Fare (USD)	Summer Peak (Jun-Aug)	Summer Non-Peak (Apr, May, Sept, Oct)	Winter (Nov-Mar)	Annual	Average One-way Fare (USD)	Stimulation Rate	Summer Peak (Jun-Aug)	Summer Non-Peak (Apr, May, Sept, Oct)	Winter (Nov-Mar)	Annual
1	Oslo	1,815	5.3	4.6	4.1	4.6	278	2248%	124.2	107.6	96.9	107.4
2	London	769	32.9	28.0	15.5	24.1	257	331%	141.5	120.8	67.0	103.8
3	Stavanger	1,740	3.4	2.0	2.3	2.5	266	2242%	79.6	47.6	53.7	58.2
4	Aberdeen	1,069	6.0	5.7	4.4	5.2	248	705%	48.3	46.0	35.4	42.2
5	Paris	571	6.8	5.5	3.8	5.1	269	163%	18.0	14.4	10.0	13.5
6	Manchester	933	2.4	1.9	1.3	1.8	250	517%	14.9	11.9	8.0	11.0
7	Edinburgh	867	2.9	1.7	1.0	1.7	246	462%	16.4	9.8	5.6	9.7
8	Dublin	417	5.0	6.2	2.0	4.2	239	102%	10.1	12.6	4.0	8.4
9	Amsterdam	838	2.5	1.7	1.1	1.7	270	356%	11.3	7.9	5.2	7.6
10	Glasgow	856	1.5	1.4	1.0	1.3	243	460%	8.7	8.0	5.5	7.2
11	Copenhagen	828	1.7	1.6	1.7	1.7	285	312%	7.0	6.8	7.0	6.9
12	Frankfurt	643	1.7	1.4	1.3	1.4	283	188%	4.8	4.0	3.9	4.1
13	Barcelona	487	2.3	3.1	0.9	2.0	281	100%	4.7	6.2	1.8	4.0
14	Rome	443	2.0	3.5	0.7	1.9	308	58%	3.1	5.5	1.1	3.1
15	Munich	576	1.0	2.3	0.3	1.2	295	136%	2.3	5.4	0.8	2.7

* Rank based on stimulated annual market size.
Source: Diio FMg data, 12 months ended November 2013.

Potential Point-to-Point Routes

Assessment of Potential Target

Priority	Route	Comments
Medium	London	- At 24 PDEWs currently and further potential (stimulation) for demand of 100 PDEWS, the local market size is relatively large. - Very high yield for a route of this stage length. LCC's (easyJet, Ryanair, or Norwegian) or charters (Monarch or Thomas Cook) could take advantage of AC's high yields and stimulate the market with lower fares to get the market size that they would need to make point to point services viable. - Many LCCs and charter carriers have bases in London. Ryanair at Stansted and easyJet, Norwegian, Monarch, and Thomas Cook at Gatwick. - LCC's (easyJet, Ryanair, or Norwegian) or charters (Monarch or Thomas Cook) could take advantage of AC's high yields and stimulate the market with lower fares to get the market size that they would need to make point to point services viable. - However, the impact on Air Canada's operation would need to be considered prior to encouraging another carrier to start the route. If the entrance of an LCC caused Air Canada to exit the market, the net benefit for YYT would be negligible if not negative.
Medium	Paris	- With the third largest local market of 5 PDEWs, demand will need to be stimulated with lower fares to achieve an adequate market size for viable service. However, given the relatively high fares and strong leisure component, significant stimulation could be expected. - Paris is also a base for key LCC's and charter operators.

Potential Point-to-Point Routes

Assessment of Potential Targets (cont'd)

Priority	Route	Comments
Medium	Oslo	- The energy industry has created strong ties between Norway and Newfoundland and as a result the fares are very high. - Given the high fares, significant stimulation could be possible, however, the base market size is relatively small. - Oslo is a base for Norwegian, a LCC that has already entered the long-haul market.
Low	Dublin	- Very seasonal market, with high demand in the summer. - Will require an LCC to enter the market to stimulate demand with lower fares. - Aer Lingus has its largest base, and Ryanair has its second largest operation at Dublin. - Given that WestJet is entering the market, it is unlikely that another airline will enter the market until WestJet establishes itself or leaves the market.

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Hub Opportunities



Hub Opportunities

Overview

Given YYT's location, many cities in Eastern/Central Canada could feed European flights out of YYT. Additionally, service to a hub in Europe will provide access to all of Europe and, in some cases, regions beyond (i.e. Africa, Middle East and Asia).

- Airlines will plan on using the connecting traffic to augment smaller market sizes in the local market.
- Also, as an added bonus for YYT, airlines may add more domestic flights at YYT to maximize connectivity (e.g. WestJet adding additional YOW flight to feed DUB operation).

Possible hub carriers that may be suitable for a YYT operation include the following:

YYT Hub

WestJet, Air Canada, porter

Europe Hub

Icelandair, Aer Lingus, Air France, Norwegian.no, Lufthansa, KLM, Condor, British Airways, WOW air

YYT Hub + Europe Hub

Air Canada, WestJet

Hub Opportunities

Assessment of Potential Targets

When evaluating the potential hub routes some key characteristics to consider are as follows:

- **Large local market size** – Local traffic generally provides carriers with a yield premium, as travellers are often willing to pay a higher price for nonstop service.
- **High local market yield** – Allows carriers to meet their revenue targets even at lower load factors. As such, markets with a large business component are more likely to be viable, even at lower levels of demand.
- **Within range for a narrow-body aircraft** – Due to the smaller seat capacity (usually around 150 seats), it is much easier for carriers to fill a narrow-body aircraft as opposed to a wide-body aircraft (250+ seats) that is need for longer routes.
- **Minimal overlap with existing operations** – Network carriers are very hesitant to add new services if they believe they are already carrying the majority of the traffic via their existing hub services (i.e. a new service will cause dilution of existing services).
- **Good connectivity potential** – Allows carrier to support routes that are not viable or that are only viable at a limited frequency.

Hub Opportunities

Assessment of Potential Targets

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Based on the below evaluation criteria, the following markets have strong potential: London, Paris, Aberdeen, Oslo and Frankfurt.

		YYT + Newfoundland Market Demand		Other Canada Market Demand		Key Characteristics						
Rank*	Market City	PDEWs - Annual	Average One-way Fare (USD)	PDEWs - Annual	Average One-way Fare (USD)	Unserved	High Yield	Appropriate Stage Length for Narrow-body Aircraft	Minimal Overlap with Existing Operations	Strong Demand from "Other Canada"	Strong Connectivity Potential at Europe Side	Hub Carrier at Europe Side
1	London	26.5	760	1,935.4	672			✓		✓	✓	AC/Star, WS/BA
2	Paris	5.5	566	1,376.4	403	✓		✓	✓	✓	✓	WS/AF
3	Aberdeen	5.4	1,064	24.0	889	✓	✓	✓	✓			
4	Oslo	4.7	1,798	37.5	676	✓	✓	✓	✓		✓	DY
5	Dublin	4.6	417	240.0	428			✓			✓	EI
6	Stavanger	2.5	1,729	8.1	1,240	✓	✓	✓	✓			
7	Barcelona	2.2	499	285.7	467	✓		✓	✓			
8	Rome	2.1	436	484.0	402	✓			✓	✓		
9	Manchester	2.0	899	260.3	387	✓		✓	✓			
10	Amsterdam	1.9	796	453.3	503	✓		✓		✓	✓	WS/KL
11	Edinburgh	1.8	861	76.9	537	✓		✓	✓			
12	Copenhagen	1.8	824	132.7	531	✓		✓	✓			
13	Frankfurt	1.6	639	385.4	594	✓		✓		✓	✓	AC/LH/Star
14	Glasgow	1.4	839	148.5	393	✓		✓	✓			
15	Venice	1.3	396	173.1	434	✓			✓			

* Rank based YYT + Newfoundland current market size.
Source: Diio FMg data, 12 months ended November 2013.

Hub Opportunities

Assessment of Potential Targets

Priority	Route	Comments
High	London	- At 27 PDEWs the current local market size is relatively large. Furthermore, demand from the rest of Canada is very large at 1,935 PDEWs. - Strong demand from Canada and especially Atlantic Canada indicate that this route would be best served by a Canadian carrier. - London is a major hub and holds very good potential for AC/Star and WestJet/BA. At 93 PDEWs the YYT market to Europe, Asia, and Africa is substantial. However, in the case of WestJet, it would likely be costly to get slots at LHR, so they would probably operate at LGW which would diminish connectivity potential significantly. - Yield is very high for a route of this stage length. - Given the strong leisure component and potential for stimulation, this route could also be viable for an LCC or charter carrier.
High	Paris	- Although local market is still relatively small, Atlantic Canada demand of 33 PDEWs may be adequate for service. Additionally, when connectivity to big markets such as YUL and YYZ are included, demand is substantial. - Strong demand from Canada and especially Atlantic Canada indicate that this route would be best served by a Canadian carrier. - Paris is a major hub and holds very good potential for WestJet/Air France. - Unlike LHR, CDG has sufficient slots. - Given the strong leisure component and potential for stimulation, this route could be also be viable for an LCC or charter carrier.

Hub Opportunities

Assessment of Potential Targets (continued)

Priority	Route	Comments
Medium	Reykjavik	- Very small local market size; less than 1 PDEW. However, KEF is a good Europe hub. - Additionally, KEF has the advantage of being close to YYT and could easily be operated on any narrow-body aircraft. - With low fares, there is potential to stimulate the local and connecting markets. WOW would be best suited for this. - Icelandair has a stronger network and has shown interest in YYT. However, they may not be well suited for YYT, until they receive their smaller narrow-body/RJ aircraft.
Medium	Frankfurt	- Collectively, Atlantic Canada demand pushes this market up near the top of the list with 31 PDEWs. - Atlantic Canada feed dictates that a Canadian airline flies this route. - Given that Frankfurt is a major Star hub, Air Canada would be well suited to fly this route. However, Air Canada will likely have concerns about cannibalizing its LHR operation. That being said, slots are not an issue at FRA, so this route may be a good opportunity for Air Canada to grow its YYT-Europe product (rather than expanding at LHR where slots are expensive). - Alternatively Lufthansa, with its large fleet of narrow-body A320s and neos, might consider YYT as well. - The other possible operator for this route would be Condor. Condor has a strong presence in Canada and a fairly substantial network at FRA. However, Condor has a variety of aircraft and may be able to match the demand. Especially with stimulation, there may be enough demand to support a seasonal limited frequency service.

Hub Opportunities

Assessment of Potential Targets (continued)

Priority	Route	Comments
Medium	Amsterdam	- Although the market demand is smaller than other markets, Amsterdam is a major hub and is within range for narrow-body aircraft. - Strong demand from Canada indicate that this route would be best served by a Canadian carrier. - WestJet's partnership with KLM and its network in Canada make it the ideal carrier for this route. Additionally, WestJet would likely lower fares and stimulated demand. - Another option is KLM, however it is unlikely they will lower fares significantly or have enough feed at YYT to make the route work. - Current market size is too small for a charter carrier or LCC (there are better opportunities for LCC service to YYT).
Low	Oslo	-Although the market demand is adequate, the only suitable carrier for this route would be Norwegian. - Although OSL is not ideally located for connectivity to Europe, Norwegian has a strong network there. - Additionally, Norwegian has a history of lowering fares, so with stimulation the route could be viable.

Hub Opportunities

Assessment of Potential Targets (continued)

Priority	Route	Comments
Low	Dublin	-Very seasonal market, with high demand in the summer. - WestJet announced new service for the summer of 2014. - Atlantic Canada feed dictates that a Canadian airline flies this route. - No additional airline will enter the market until WestJet establishes itself.
Low	Aberdeen	- Strong demand from YYT, but overall demand from Canada is lacking (only 24 PDEWs from "other Canada"). - However, yields are very strong so may be of interest to niche carriers. - Additionally, WestJet may consider the route if there is an increase in YYT and Western Canada demand. - Another possible carrier is United, with the route being tied in with IAH. Under the current bilateral agreements, United could carry local YYT-ABZ passengers and connect passengers at YYT to Air Canada. Although this would not be a typical operation for United, the current IAH-ABZ market is large (59 PDEWs) and has high fares (average of $1,024), so there may be interest.

Summary of Opportunities & Implementation Plan

Summary of Targets Markets

While there are many possibilities for new or expanded European flying, London, Frankfurt, and possibly Paris represent the best short-term opportunities.

- London should be considered due to its existing AC service, large market size, geography, historical ethnic and commercial ties, and plethora of international connections.
- Frankfurt should also receive attention. The Star Alliance hub, with AC and Lufthansa as members, creates a number of connecting opportunities and is well within range for a flight.
- Canada’s large French community spread throughout eastern Canada might also provide sufficient behind traffic to support a YYT-Paris flight.
- Because of Newfoundland’s growing energy industry, trade links to Norway and Scotland might support flights to Oslo and Aberdeen respectively.
- Although the market size is small, Reykjavik has shown a great ability to stimulate demand and facilitate European connections to support transatlantic service.
- Until WestJet establishes itself in the Dublin market, it is likely that no other airline will look at entering this route.

Europe ASD Strategy – Target Markets

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Based on the preceding market assessments and airline strategy reviews, the following priority routes and airline targets are recommended for inclusion in YYT's Europe ASD strategy:

Priority Level	Route	Target Airlines
High	London*	Air Canada (year-round), WestJet, Norwegian**, easyJet, Ryanair, British Airways, charter operators
High	Paris	WestJet, Air France, Transavia, charter operators
Medium	Reykjavik	Icelandair, WOW
Medium	Frankfurt	Air Canada, Lufthansa
Medium	Amsterdam	WestJet, Transavia, KLM
Low	Oslo	Norwegian
Low	Aberdeen	WestJet
Low	Dublin	WestJet (year-round), Aer Lingus, Ryanair

* Approach to London will depend on Air Canada interest in expanding to year-round service.
** Dependant on Norwegian being able to get regulatory approval or move narrow-body aircraft to its Irish subsidiary.

2014/15 Implementation Plan

In terms of the actual implementation plan, it is recommended that resources be focused on the carriers that have the highest probability of launching a successful service. As such, it is recommend that the airline targets be pursed as follows (shown in order of highest priority to least priority):

Priority Rank	Airline Type	Specific Target Airlines
1	**Canadian Network Carriers.** Given the importance of the Canadian demand component (i.e. connections at YYT) the best suited carriers are the two main Canadian airlines.	**Air Canada** – Immediate opportunity for year-round London service. Also, near-term opportunity for Frankfurt service.
		WestJet – Immediate opportunity for expanded Dublin service (especially given the initial market reaction to the summer service). Also, near-term opportunity for Amsterdam, Paris, London (depending on the AC service) and possibly Aberdeen. In the medium-term, markets like Frankfurt, Rome, Manchester and Edinburgh could be viable with adequate traffic feed from Canada and market stimulation.
2	**High Potential European Network Carriers.**	**Icelandair** - Reykjavik
3	**European LCCs.** These carries have the ability to stimulate the market to a level sufficient for a viable service.	**WOW** - Reykjavik
		easyJet - London, Paris
		Norwegian - London, Oslo
		Ryanair - Dublin, London
4	**Charter operators.** For limited frequency package vacations.	**Condor** - Frankfurt
		Air Transat - Initial discussion focused on Europe potential in general.
		Thomas Cook - Initial discussion focused on Newfoundland inbound tourism potential.
5	**Other European Network Carriers.**	**KLM** - Amsterdam
		Air France - Paris
		Lufthansa - Frankfurt
		British Airways - London

Note: The above list of targets are interdependent and new services may change the priorities (e.g. If Air Canada goes year-round on London, priority given to other London carriers will decrease significantly).

2014/15 Implementation Plan

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The following air service development tactics are recommended for implementation in 2014/15:

Timeframe	Activity	Objective
October 2014	**World Routes Conference** (Chicago)	Introductory meetings with network planners, with emphasis on European carriers.

Additional Initiatives to be added once list of target routes/carriers is finalized

Evaluation Plan

Evaluation Plan

Air service development is a long term initiative, because airline planning cycles require 6-18 months lead time to initiate a new service.

The Europe ASD program at YYT should be evaluated by tracking each of the following on a regular basis:

- Passenger traffic
- Seat Capacity
- Number of markets served
- Quality of Service Indexing (to evaluate improvements in connectivity via hub airports)

Realistic goals can be set with regards to the above metrics.

Although this Europe ASD strategy covers a period of a few years, adjustments should be made if warranted based on the ongoing evaluation.

Next Steps



Next Steps

YYT sign off on proposed Europe ASD strategy and targets.

- Revisions as required.

Develop implementation plan for 2014/15 ASD tactics. Immediate initiatives to include:

- Development of an incentive program.
- Attending World Routes 2014.
- Beginning meeting arrangements for target airline headquarters visits.

Undertake airline headquarter meetings.

- Provide appropriate follow up, and adapt tactics as required based on carrier feedback.

Contact Information

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APPENDIX I

SUMMARY OF STAKEHOLDER CONSULTATIONS

MEMORANDUM

Date:	August 26, 2016
To:	Peter Avery, SJIAA
Copies:	Project File
From:	Joshua Horst, WSP
Project No.:	141-25347-00
Subject:	St. John's International Airport Master Plan Update 2015-2035 Stakeholder Consultations Summary

1.0 INTRODUCTION

This memo serves as a record of stakeholder consultations requested and completed during the development of the St. John's International Airport Master Plan Update 2015-2035 and Airport Land Use Plan Update 2015-2035.

2.0 BACKGROUND

WSP Canada Inc. was retained by St. John's International Airport Authority (SJIAA) in 2014 to prepare an update to the St. John's International Airport (SJIA) Master Plan that included an update to the official Airport Land Use Plan. The project was initiated in late January 2015 with a kick-off meeting hosted by SJIAA, and proceeded with Stakeholder consultation throughout the first half of 2015.

The list of stakeholders, to be approached for consultation in support of the update to the master plan included tenants and operators with a regular presence on at the Airport, on-site agencies, SJIAA board members, SJIAA ad hoc committees, and community stakeholders. For a complete list of stakeholders approached for comment refer to *Appendix 'A'*.

Throughout the master planning process the SJIAA was responsible for approaching stakeholders for comment and organizing on-site interviews with WSP staff. Where on-site interviews could not be arranged due to scheduling conflicts, the opportunity to provide comments to WSP was offered via conference call and online presentation.

The focus of the stakeholder consultations was to brief the stakeholders on the master planning process, WSP's project mandate, the main focus of the master plan update and to solicit comments pertaining to infrastructure and operational need. The focus of the master plan update was to refine SJIAA's Airport Land Use Plan to consider the long-term build-out of airside and landside infrastructure and facilities, while also ensuring that sufficient commercial development space was identified.

Stakeholder's who participated in the consultations were briefed on the previous Airport Land Use Plan, Terminal Area Master Plan and asked questions about their operations. Questions targeted the identification of operator/tenant needs and opportunities for growth and efficiency. SJIAA has acknowledged a need to focus on sustainability of operations and flexibility to accommodate varied growth.

Two rounds of stakeholder consultations were proposed and completed. However, several community stakeholder consultations were completed in Round 1 as opposed to Round 2.

3.0 ROUND 1 STAKEHOLDER CONSULTATIONS SUMMARY

Round 1 of the stakeholder consultations occurred in June of 2015. On-site interviews with stakeholders were conducted by WSP staff and the SJIAA in closed session at SJIAA's offices.

During the week of June 22nd 2015 stakeholder interviews were conducted with local and regional representatives from the following organizations. Key points from these interviews are also noted.

- E. W. Harvey Ground Servicing Company
    - Operations have scaled down since peak.
    - Current facilities offer sufficient area for continued operation into foreseeable future.
    - Access to apron needs to be efficiently maintained.
    - Ease of access to east side of airport of primary concern.
- Provincial Airlines
    - Availability of space for aircraft and future hangar expansion of primary concern.
    - Possibility to significantly increase size of MRO business exists in future.
- Woodwards
    - Current facility meets their requirements.
    - Future of fueling and storage operations of primary concern.
    - Access to both sides of the airport a growing issue.
- City of St. John's Planning Department staff
    - Changes to noise footprint the main concern.
    - Process for protection of airspace also an issue.
    - Pleased with improvements being made to level of service.
- Air Canada
    - On-time performance critical.
    - Infrastructure aimed at reducing delays is desirable.
    - Existing runway lengths are suitable.
    - Need for extension of primary runway (12-30) not identified.
- Swissport
    - No comment
- Inland Group (Roger Hussey)
    - Issues with drainage on and beside the de-icing facility noted.
    - Throughput limited due to lack of circular flow when all bays active.
    - Current alignment of bays works well.

- Town of Portugal Cove-St. Philips
  - Primary concern is noise.
  - Community is willing to work closely with airport to protect airspace around the airport.
  - Interested in developing more formal process.
- Town of Torbay
  - Community is willing to work closely with airport to protect airspace around the airport.
  - Interested in developing more formal process.
- NAV CANADA
  - Comments regarding protection of airspace and navigation aids. Agreed on need to protect airspace and navigational aids.
  - Comments regarding helicopter operations and noise related issues noted.
  - Recent changes to helicopter routing further discussed.
- Cargo Jet *
  - Demand for freight forwarding continues to grow.
  - Need beyond planned facility is likely limited.
  - Improved LOS is welcomed.
  - Deicing facility a concern if traffic significantly increases.

  * Interview conducted separately as part of WSP's ongoing work with Cargo Jet.

During the week of July 6th 2015 stakeholder interviews were conducted with local and regional representatives from the following organizations. Key points from these interviews are also noted.

- St. John's Board of Trade
  - Supports the level of service improvements.
  - Agrees that public transit connection to the Airport is important.
  - Emphasis placed on identification of a strong reliance on air travel to/from the Island.
  - High degree of travel connected to oil industry both out west and east.
- Enterprise Car Rental
  - Concerns raised over safe access to rental car parking lots.
  - Large queues for car rental and baggage claim often conflict.
  - No capacity issues foreseen.
- Avis Car Rental
  - Shared concerns over safe access to rental car parking lots.
  - No capacity issues foreseen.

During the week of August 17th stakeholder interviews were conducted with local and regional representatives from the following organizations. Key points from these interviews are also noted.

- Cougar Helicopters
    - Emphasis placed on minimizing delay on arrival and departure.
    - Planned routes would take aircraft to limits of mission range and result of very little ability to accept delays at St. John's.
    - Supports idea of exploring separate FATO locations from Runways.
    - Agrees that preserving ability for helicopters to approach and depart from 02-20 even after it is repurposed as a taxiway is important.
    - Agrees that likelihood of conflict between fixed wind and rotor wind aircraft will increase as a result of CAT IIIA availability
    - Number of Cougar operations could eventually double but timing is dependent on offshore oil production.
    - Operator is concerned about delays transiting CDF during peak periods.

Discussions and correspondence with a number of these stakeholders continued throughout the master planning process where additional information was requested or follow-up required.

4.0 ROUND 2 STAKEHOLDER CONSULTATIONS SUMMARY

Round 2 of Stakeholder Consultations occurred in November 2015 with follow-up correspondence to Air Canada, Cargo Jet and Cougar Helicopters. On-site interviews with stakeholders were conducted by WSP staff during the week of November 16th, 2015. Briefings to SJIAA Board Members and ad hoc committees were completed by Peter Avery, Director of Infrastructure and Planning.

During the week of November 16th 2015 stakeholder interviews were conducted with local and reginal representatives from the following organizations. Key points from these interviews are also noted.

- SJIAA Operations staff
    - Review of snow clearing operations and the decrease in runway throughput during snow and ice events.
    - A maintenance equipment hold area near threshold of Runway 12 is needed to reduce runway occupancy times and provide a safe exit location that does not conflict with the ILS.
    - Repurposing of 02-20 into taxiway wouldn't change priority level for snow-clearing as 02-20 is today mainly used as a connecting taxiway.
    - The cost of maintenance needs to be considered when proposing new infrastructure.
- NAV CANADA local staff
    - Improvements to infrastructure reviewed.
    - ATCT line of sight limitations noted.
    - Possibility to relocate ATCT in-field, north of Taxiway Kilo discussed.
    - Peak traffic mix discussed.

- o Helicopter operations discussed. Cougar facility relocation and operational impacts discussed.
- o Possibility to provide FATOs locations on taxiways separate from the runways discussed.
- o Airspace management discussed. No significant limitations.
- o No need for parallel runway.
- o Open to 02-20 closure if plan in place to manager helicopter traffic.
- o Emphasis placed on greater mixing of fixed wing and rotor wing in low visibility situations as a result of implementation of CAT IIIA for both Runway 11 and 29.
- o Reviewed ‘HOT’ spot and runway incursion issues.
- o Preference is for a full length taxiway, however NAV CANADA realizes the significant cost associated with provide the infrastructure.

Follow-up interviews from Round 2 included further briefings to Board members and ad hoc committee members by Peter Avery.

5.0 CONCLUSION

The development of the SJIA Master Plan Update 2015-2035 and Airport Land Use Plan Update 2015-2035 carefully considered the inputs from participating stakeholders. The Land Use Plan Update completed in December 2015 places an emphasis on flexibility to continue to accommodate growth in air travel demand and commercial development. The land use plan also considers impacts and opportunities arising from a phased implementation of TP 312 5th Edition at SJIA.

In so doing, the Airport now has a plan that provides flexibility to accommodate the expected infrastructure and facility needs of tenants, operators, agencies and the community for a planning horizon of 20 plus years. The most significant change from the previous Airport Land Use Plan is the recommendation to repurpose Runway 02-20 into a taxiway. Stakeholders who would be impacted by such a change were consulted in 2004. Those who chose to participate were again asked about the impact during the development of this latest master plan. Maintaining the runway surface or use as a taxiway was identified as essential to continued operations. However, the need for Runway 02-20 to continue to serve fixed wing arriving and departing aircraft was further discounted. The opportunities for expanded commercial development adjacent to the runway were the primary drivers in recommending it be repurposed from a runway to a taxiway.

Sincerely,

Joshua Horst

Joshua Horst, MAvnMgt, AvMP
Aviation Consultant

Enclosed: Appendix A – Primary YYT Stakeholders.

MEMORANDUM

APPENDIX A

Primary List of Stakeholders

Primary List of YYT Stakeholders

STAKEHOLDER CONSULTATIONS: ROUND 1

Tenants/Operators

- PAL
- Woodward Aviation
- Cougar Helicopters
- Canadian Helicopters
- Air Carriers (Air Canada/Air Canada Express, Westjet, Porter, Canadian North, PAL/Provincial Air, Sunwing, Air Transat, United Airlines,…)
- FBOs (Irving, Shell/Torbay Aero Services)
- Canadian Military/DND
- Canadian Coast Guard
- Local general aviation group
- Government of NL flight ops (air ambulance and water bombers)
- Fuel service providers (ASIG and proposed fuel consortium initiative led by Air Canada/Jazz (Paul Witty?), Shell and Woodward (Esso fuels).
- Ground handlers (Swissport/Service air, …)
- Catering firm (AW Harvey and Company Ltd.)
- Car Rental Companies (Avis, Budget, Enterprise, Hertz, National Car Rental, Thrifty
- Air cargo operators (Cargo Jet, Purolator, Fedex, Skylink Express, Kelowna Flightcraft) and handlers
- Deicing operators (likely the ground handlers) / environmental mitigation operator (Aeromag and Inland Technologies)
- Holiday Inn Express

Agencies

- NAV CANADA
- Transport Canada
- Canadian Coast Guard
- DND

STAKEHOLDER CONSULTATIONS: ROUND 2

SJIAA

- Board of Directors
- Ad hoc committees (development committee, frequent traveler/consumer satisfaction committee,…)

Community Stakeholders

- City of St. John's (dept. of Tourism/Economic Development or similar and dept. of Planning)
- Town of Torbay
- Town of Portugal Cove-St. Philips
- Department of Municipal and Intergovernmental Affairs
- Local chamber of commerce
- Economic development agencies
- Tourism agencies
- Board of trade