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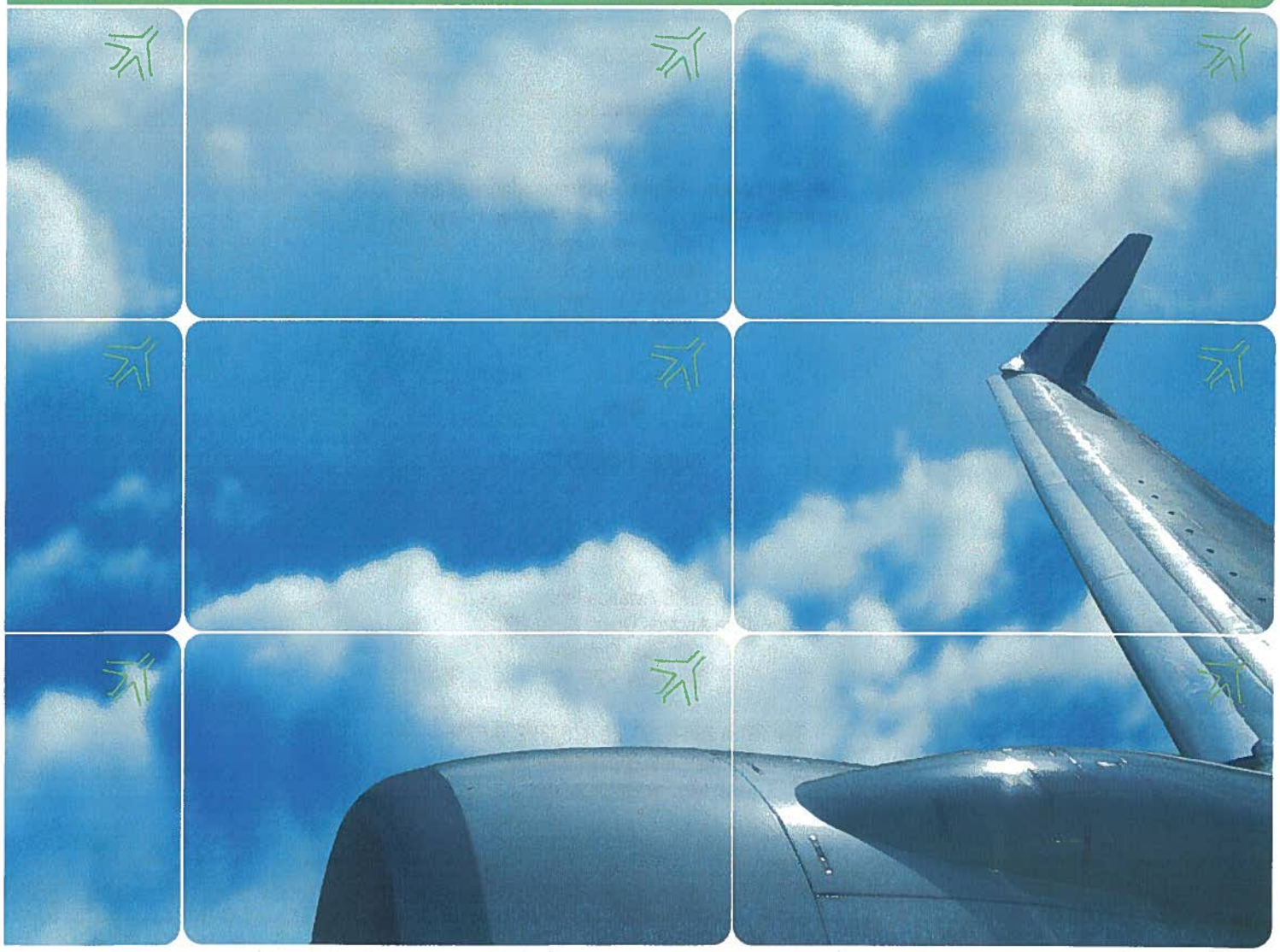
Airport Assessment and Gap Report
Peace River Airport



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Airport Assessment and Gap Report
Peace River

Prepared for:

Mr. Neil Larsen, Aviation Contracts Manager and
Mr. Trevor Wannop, Commercial Advisor, Heavy Oil
Shell Canada Limited
400-4th Avenue S.W.
P.O. Box 100, Station M
Calgary, AB T2P 2H5

Date

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Submitted by:

LPS Aviation Inc.
One Antares Drive, Suite 250
Ottawa, Ontario
CANADA K2E 8C4

Tel: (613) 226-6050 Fax: (613) 226-5236
e-mail: info@lpsaviation.ca
Web site: www.lpsaviation.ca

Executive Summary

Approval was recently given for expansion of the Carmon Creek bitumen extraction project located approximately 40 km northeast of the Town of Peace River, Alberta. The project will create demand for additional scheduled charter air services with larger aircraft at the Peace River Airport, which is owned and operated by the Town of Peace River.

The Airport Assessment and Gap Report projects additional traffic levels, and related facilities and infrastructure improvements needed to sustain the higher levels of air travel arising from project activity. The study provides an inventory of existing airport facilities and services, provides passenger traffic and aircraft growth projections, and assesses the ability of the airport to serve these higher levels with the existing infrastructure.

The study determined that the airport will be able to accommodate the increased traffic and aircraft size provided a series of investments are undertaken. While the airport was originally well-constructed by Transport Canada, the infrastructure is now aged and in need of refurbishment and renewal. By restoring and upgrading elements of the airport to meet local and industry needs, the Town of Peace River will become the owner of a modernized and more capable facility requiring relatively little additional cost to operate in the future.

The study identifies deficiencies and requirements with respect to accommodating local and additional project traffic, and provides a graphical Development Plan which addresses and scopes the necessary Airside, Air Terminal and Groundside improvements.

Rough Order-of-Magnitude (ROM) costs are provided to support increased scheduled air services using Boeing 737-400 and Dash 8-400 aircraft types. In addition, an Aviation Climatology Study is included which demonstrates that high levels of airport availability, and air service reliability can be achieved using the airport's existing suite of electronic and visual approach and landing aids.

While the existing runway has sufficient length to accommodate the Dash 8-400, extending the runway from 5,000' to 5,900' in length is necessary to accommodate the B737-400 design aircraft. To support regular operations by either aircraft, a full-length asphalt removal and restoration program is required to restore the main runway.

The existing apron can accommodate increased traffic by larger aircraft, however Taxiways A and B will require restoration. Major investments in new airfield electrical systems were made in 2006. Additional electrical lighting and relocation of visual approach aids will be required for B737-400 operations. The cost of airside improvements is estimated at $14.1 million for B737-400 operations, and $9.3 million for Dash 8-400 operations.

The air terminal building is in good condition and adequate in size to accommodate the increased traffic, although at slightly lower levels of service and comfort. Modest internal reconfiguration of a portion of the ground floor area should provide a terminal capable of handling the peak design volume of 140 passengers at an estimated cost of $650,000.

Groundside investments needed to accommodate the increased project-related traffic principally include the restoration of the existing long term parking lot to its former capability of 145 paved parking stalls. The cost of groundside improvements to accommodate additional traffic is estimated to be $980,000.

Net construction costs for all improvements are estimated to total $15.8 million to support Boeing 737-400 operations, and $10.9 million to support Dash 8-400 operations. Both estimates include a design and pricing allowance of 2.5%, an escalation allowance of 5%, professional service and project management fees of 15%, a project contingency of 10%, and a ground support equipment allowance. A total upgrade investment of $21.4 million will be required to support regular Boeing 737-400 services and approximately $15.1 million to support regular scheduled and charter services by aircraft up to DHC8-400 in size.

Table of Contents

List of Figures

List of Tables

1 Background

1.1 Introduction

Approval has been received from the Energy Resources Conservation Board for the Carmon Creek Project to proceed. This project is located approximately 40 km northeast of the Town of Peace River, Alberta.

The project will increase production from Peace River leases from 12,500 barrels per day (bpd), up to 80,000 bpd using vertical steam drive thermal enhanced recovery methods.

Site preparation and construction is expected to commence following a final investment decision for the project. Site preparation activities could begin in early 2014 with Phase 1 construction completed by the end of 2016, and Phase 2 in 2020.

Following construction, operations are expected to occur for in excess of 30 years.

The project is expected to generate high demand for labour in the area, and subsequent high demand for personnel transportation to and from the Peace River area, especially by air.

An assessment of the Peace River Airport is required to determine if the current infrastructure has the capability and capacity to support significantly increased scheduled charter air service to the area, utilizing narrow body turbofan aircraft types. This requirement is driven by the need to provide personnel to support the Carmon Creek Project as well as natural growth in the local travel market.

Peace River Airport is owned and operated by the Town of Peace River. Investment is required at the airport in order to provide the desired capacity and capability to support increased industry activity in the area.

1.2 Study Objectives

To date, industry has operated charter air services to the airport on an ad-hoc basis. Once construction commences the Carmon Creek Project is expected to generate 250 enplaned and 250 deplaned scheduled charter passengers over a 6 hour daily period, and throughout a three-day cycle.

Aircraft types proposed for charter or operation by industry have been identified as the Boeing 737-400 (B737-400) and the Dash 8-400 (DHC8-400), and smaller aircraft types.

In order to support industry's passenger transportation requirements various infrastructure upgrades will be required to accommodate larger aircraft types at the Peace River Airport and accompanying passenger volumes.

The Airport Assessment and Gap Report first undertakes a review and inventory of current airport services, infrastructure and traffic levels. Based on projected expansion in traffic levels and aircraft operations the study then identifies the required airport improvements and associated Rough Order-of-Magnitude (ROM) development costs to support industry and local transportation requirements.

2 Airport Profile

2.1 Designation

Peace River Airport is certified in accordance with the requirements of Transport Canada document TP312, 4th Edition – Aerodrome Standards and Recommended Practices. The Airport Certificate acknowledges that the airport meets all regulatory and operational requirements of the Canadian Aviation Regulations (CARs), and essentially enables the airport to accept scheduled air services.

Peace River Airport is locally owned and operated by the Town of Peace River and is not classified under Transport Canada's National Airport System.

2.2 Design Aircraft

2.2.1 Background

An airport facility is designed to permit regular operation of aircraft up to and including certain size and performance capabilities. This aircraft is known as the design aircraft.

The design aircraft is normally the most operationally and/or physically demanding aircraft to make substantial use of the airport facility. The design or critical aircraft forms the basis on which protection zones, clearances, etc. are determined. It should be noted that the aircraft that is the most demanding in terms of size or pavement loading, may not necessarily be the same as the most performance limited aircraft.

2.2.2 Current Design Aircraft

The Airport Operations Manual (AOM) identifies the Boeing 737 (reference Code 3C) as the design aircraft for the airport. There are many different variations of the Boeing 737 model type aircraft and an AOM would normally describe the performance characteristics of a particular model.

2.3 Current Infrastructure

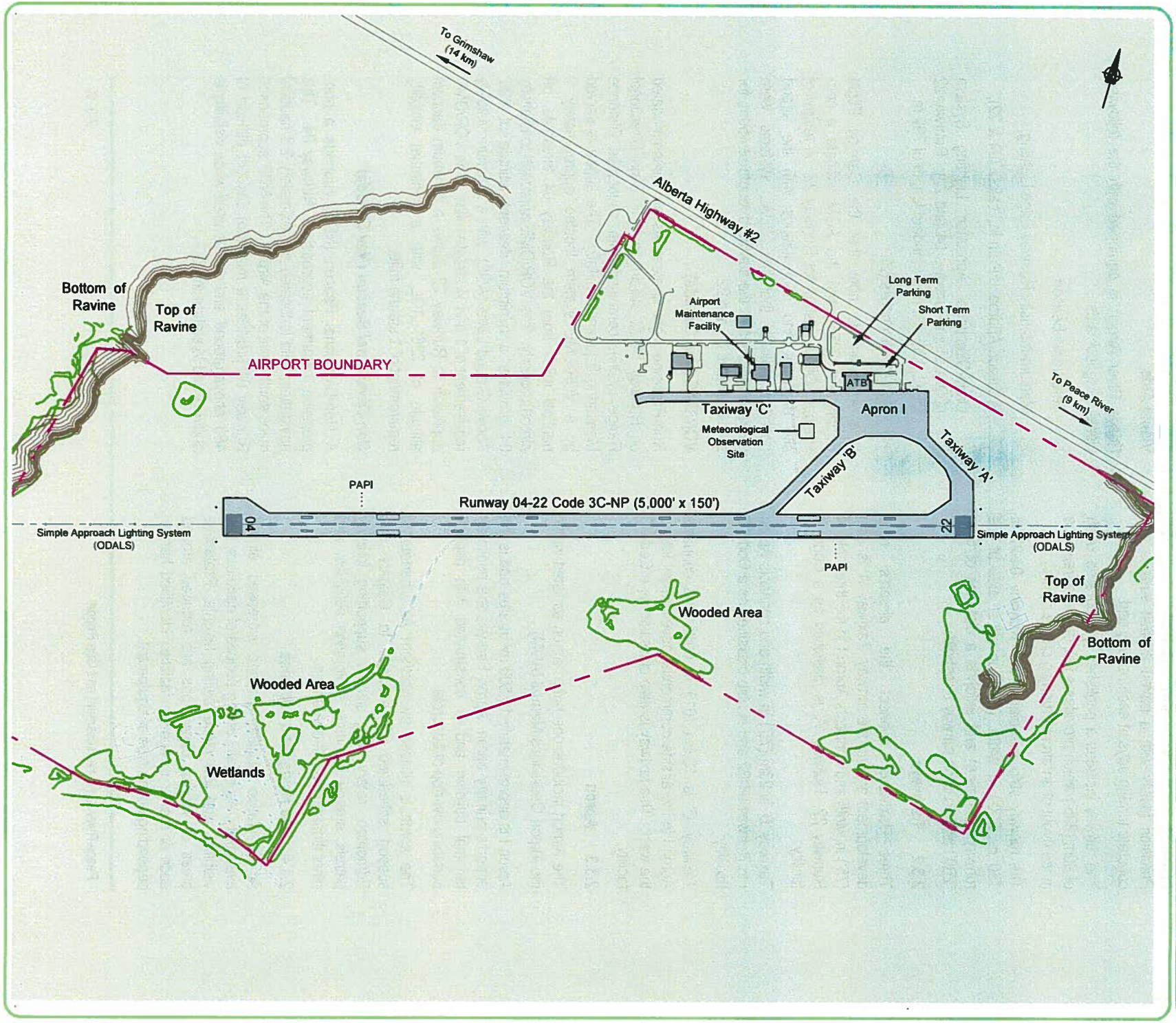
Peace River Airport includes one runway, three taxiways and a public apron. The core development area is located in the northeast quadrant of the airport property. The airport site is illustrated in Figure 2-1.

Airport information has been derived from various aeronautical references including the Airport Operations Manual (AOM), Canada Flight Supplement (CFS), and the Canada Air Pilot (CAP).

Table 2-1 shows key data specific to the Peace River Airport. This data is generally used for aviation operations and airport planning purposes.

Table 2-1 – Aerodrome Data

Reference Point (coordinates)	N 56° 13' 38.8" W 117° 27' 03.1"
Reference Point Elevation	568.0 m ASL
Aerodrome Elevation	568.5 m ASL
Aerodrome Magnetic Variation	20°E



LPS AVIA CONSULTING
One Antares Drive,
Suite 250, Ottawa, ON,
Canada K2E 8C4
www.lpsaviation.ca

Client

Shell Canada
Carmon Creek Project

Title

Peace River Airport

Airport Assessment and Gap Report

Site Plan

Notes

1. Preliminary
2. All dimensions approximate

Figure No.	2-1
Drawn By	EDH
Approved By	EGL
Date	AUGUST 2, 2013
Scale	1:10,000
Filename	LPS PR Airport.dwg

2.3.1 Runway 04-22

Runway 04-22 has dimensions of 1,524.0m x 45.72m (5,000' x 150'). The runway is a Code 3C – Non-Precision facility with a paved asphalt surface and concrete turning bays at each runway end.

The runway includes a published graded area width of 90m (295') which provides a flat, obstacle free area in the event of an aircraft running off the runway.

The runway strip associated with Runway 04-22 is 150 m (500') in width, (75m on either side of the runway centreline) and extends a distance of 60m (200') prior to each runway threshold.

2.3.2 Taxiways

Three taxiways connect the airport's core development area to the runway. Taxiway 'A' is 23m (75') in width and connects Apron I to the threshold of Runway 22. Taxiway 'A' is classified as a Code C facility.

Taxiway 'B' is 23m (75') in width and connects Apron I to Runway 04-22 and is also classified as a Code C taxiway.

Taxiway 'C' is 18.5m (61') in width and connects Apron I to the airside commercial development lots to the west. This taxiway is also classified as a Code C facility.

2.3.3 Apron

The Airport includes one public apron as listed within the Airport Operations Manual (AOM).

Apron I is approximately 16,500 m² in area and is the airport's primary apron. Apron I serves the public air terminal building and is constructed with asphalt surfacing overtop of concrete.

The apron is utilized by Northern Air Charters to support scheduled air services to Calgary and Edmonton, rotary wing aircraft supporting forestry patrols, energy resource exploration activities, and other itinerant aircraft operations.

2.3.4 Air Navigation Facilities

Air navigation facilities provide increased airport availability, especially during periods of darkness, low visibility, and low cloud ceiling heights. Protective areas of varying dimensions are required around each of the air navigation facilities identified herein, depending on the type of equipment.

Future development must consider these protective requirements. Descriptions of the air navigation facilities installed at the Peace River Airport follow.

Visual Aids

Peace River Airport is equipped with the following visual navigation aids:

- Aerodrome Beacon
- Medium-Intensity Runway Edge Lighting;
- Precision Approach Path Indicators (04 & 22);
- Omni-Directional Approach Lighting System (ODALS) for Runways 04 and 22). Runway 22 ODALS have a non-standard length of 792 m.
- Lighted Windsocks (2).

It is important to note that the Canada Flight Supplement (CFS) and the AOM indicate a non-standard ODAL system for Runway 22. A review of site drawings and consultations with the airport operator indicate that the ODAL systems were upgraded in 2005 to the standard length of 450m, for both Runways 04 and 22.

VOR/DME (Nav Canada)

Non-Precision flight approaches are accommodated on Runway 04-22 utilizing a VHF Omni-Directional Range (VOR), combined with co-located Distance Measuring Equipment (DME). The airport is served by a VOR/DME system located approximately 2 nautical miles from the Runway 04 threshold, off airport property. The VOR/DME approach to Runway 04 provides a minimum descent altitude of 428' Above Ground Level (AGL), with a minimum visibility requirement of 1 and ¼ statute miles. The VOR/DME approach to Runway 22 allows a minimum descent altitude of 336' AGL, with a minimum visibility requirement of 1 statute mile.

Non-Directional Beacon (Nav Canada)

A Non-Directional Beacon (NDB) supports a non-precision instrument approach to Runway 04. This navigational aid is located approximately 2.8 nautical miles south west of the Airport. The NDB approach to Runway 04 provides a minimum descent altitude of 488' above ground, and can be used when visibility is above 1 and ½ statute miles.

2.3.5 Aviation Services Facilities

Air Traffic Control

Nav Canada does not provide ATC services on, or in the immediate vicinity of the Peace River Airport. The airport is not provided with Air Traffic Control (ATC) facilities. ATC services are provided remotely from Nav Canada's Area Control Centre (ACC) in Edmonton for high-level en-route aircraft.

Flight Services

Nav Canada Flight Service Stations (FSS) provide resources for flight planning, access to briefings on weather, NOTAMs, aeronautical information, en-route and airport advisory services, vehicle control services, monitoring of navigational aids, VHF/DF assistance and alerting of Search and Rescue centres for overdue aircraft.

Peace River Airport is equipped with a dedicated Flight Service Station (FSS) located at the third level of the Air Terminal Building.

The Peace River FSS also provides remote aerodrome advisory services to Dawson Creek Airport users between the hours of 1330-530 Z and Fort McMurray users between the hours of 0545-1315Z.

Aviation Weather

Weather observations are performed at Peace River Airport by Nav Canada's Flight Service Station personnel. Weather instrumentation located within the airport property measure wind speed and direction, barometric pressure, ceiling height, temperature, and other atmospheric conditions.

Current weather conditions are reported through Nav Canada's regular channels (i.e. Flight Service Specialists and the Internet).

Aviation Fuelling

Aircraft fuel services are provided at the Peace River Airport. Both 100 Low-Lead (Avgas), and Jet A fuel sales (with high pressure refueling capability) are available on-site and are provided by Northern Air Charters. Consultations with the fuel provider indicate that 45,000 L of Jet A fuel storage is available on-site, with additional bowser capacity of approximately 10,000 L.

Aviation Support Facilities

Several aviation support facilities are available at the Peace River Airport. The following facilities are available as published in the Canada Flight Supplement (CFS):

- Aircraft Storage;
- Servicing/Minor Repairs;
- Major Repairs;
- Parking (Extended term)
- Tie-down facilities; and
- Plug-in facilities.

Aircraft de-icing is provided by Northern Air Charters utilizing type IV de-icing agents. De-icing services are provided using a tractor-towed wagon for aircraft types up to B1900D in size. A scissor lift has previously been provided on a rental basis for de-icing the Dornier 328, and similar aircraft types.

2.3.6 Passenger Facilities

Peace River Airport has a public Air Terminal Building (ATB), with an approximate ground floor area of 998 m^2. This facility was constructed in 1982 and is comprised of two stories plus control tower cab, with a traditional brick and stucco finish.

The ATB accommodates passenger and air carrier operations at the Airport, including the scheduled air service operated to Calgary and Edmonton by Northern Air Charters.

In addition, the ATB provides operational space for rental car agencies on the first floor, with airport administration, Nav Canada offices, and a restaurant (currently closed) located on the second floor.

A breakdown of the ATB's functional areas (main floor only) is provided in Table 2-2, and a layout of the ATB's main floor is provided in Figure 2-2.

The air terminal building was found to be in generally good operating condition during a recent inspection with significant areas underused. Surplus space was observed for example on the ground floor in the airline check-in area, baggage make-up area and pubic waiting areas.

Table 2-2 – Air Terminal Functional Areas

Element	Current Areas (m^2)
Public Areas	
Ticketing	51
General Waiting	31
Holdroom	72.5
Baggage Claim Area	65
Baggage Claim Device	21
Outgoing Baggage	116
Security	0
Washrooms	26
Air Carrier	
Airline Operations Area	66
Air Carrier Support	49.5
Concessions and Passenger Services	
Car Rentals	23
Vending	12
Storage/Office	80
Building Services & Equip.	39
Circulation & Structure	346
Gross Main Floor Area	**998**

2.3.7 Airport Maintenance Facilities

All airport maintenance is undertaken by staff employed by the Town of Peace River. Airport maintenance activities include, but are not limited to the following tasks:

- Snow clearing;
- Safety inspections;
- Fence maintenance
- Grass cutting
- Groundside and airside pavement maintenance;
- Maintenance of airfield electrical systems and visual aids; and
- Wildlife management.

Peace River Airport operates an airport maintenance facility located to the west of the Air Terminal Building. This facility was originally constructed by Transport Canada and houses maintenance vehicles, shops, offices and extensive support amenities. The facility and equipment contained therein are in good operating condition.

The Town of Peace River employs three full-time staff who perform airport maintenance activities at the Peace River Airport. The Field Electrical Centre (FEC) houses all electrical equipment to support airfield lighting systems, and is located directly to the north of the airport maintenance facility. This facility was also found to be in good operating condition.

2.3.8 Access Roads and Parking

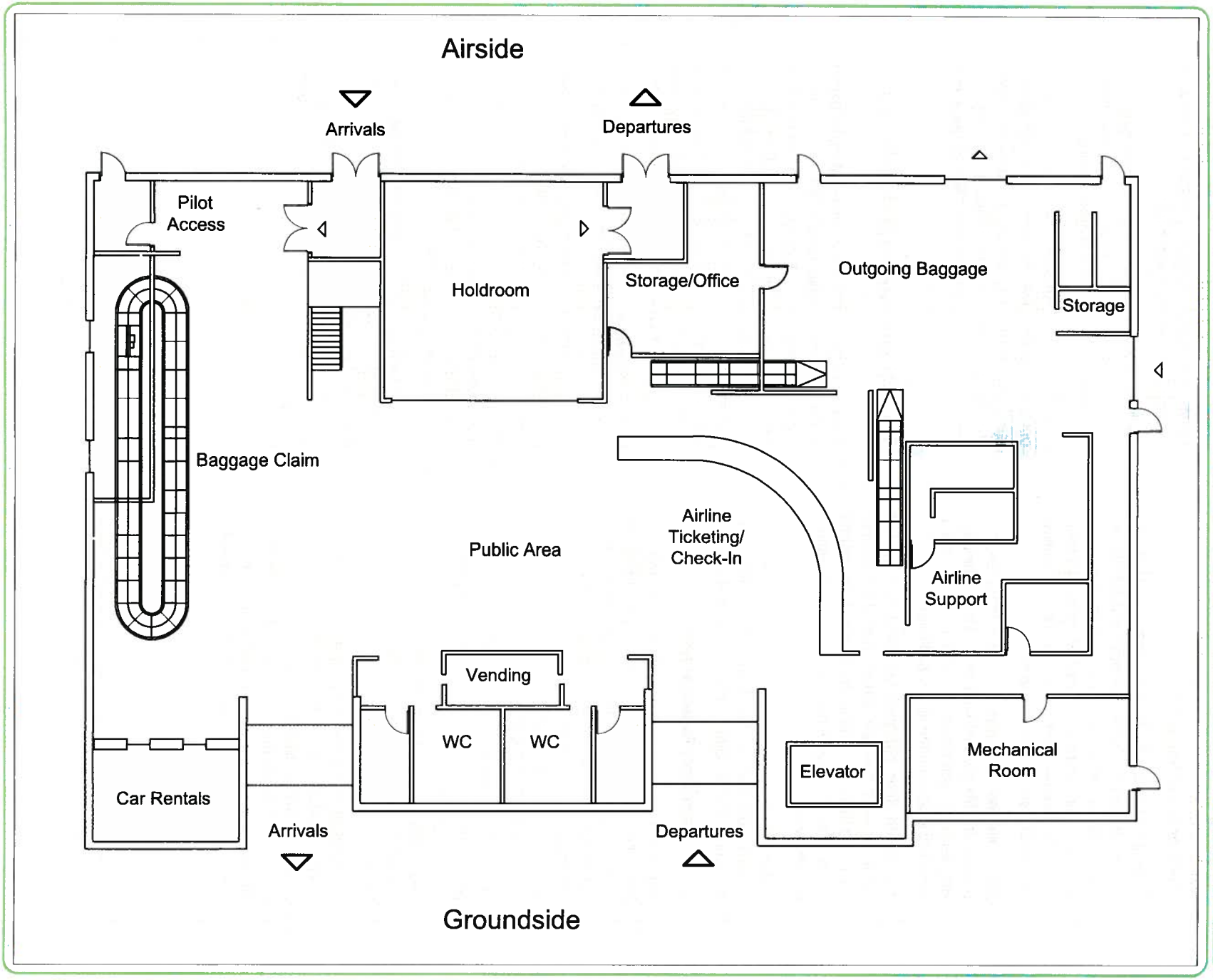
The primary access to the Peace River Airport is from Alberta Highway 2, via the Main Access Road. The Main Access Road connects to a terminal frontage road with curbside drop-off, and a through-lane to access short-term vehicle parking. All vehicle parking in the vicinity of the Air Terminal Building is based on a self-pay system using a payment kiosk located in the ATB.

Vehicle parking supporting the air terminal building is comprised of the following:

- 145 long-term stalls;
- 32 short-stay stalls;
- 32 rental car stalls; and
- 13 staff/operational parking positions.

Parking areas were observed to be in generally poor condition, although the Terminal Frontage road was recently rehabilitated in the summer of 2013.

The Terminal Frontage Road has recently been rehabilitated.



LPS AVIA CONSULTING
One Antares Drive, Suite 250, Ottawa, ON, Canada K2E 8C4
www.lpsaviation.ca

Client
Shell Canada
Carmon Creek Project

Title
Peace River
Airport Assessment and Gap Report
Air Terminal Ground Floor Plan

Notes
1. Preliminary
2. All dimensions approximate

Figure No.	2-2
Drawn By	EDH
Approved By	RAM
Date	AUGUST 2, 2013
Scale	NTS
Filename	PR Terminal

2.3.9 Security and Access Control

Peace River Airport currently incorporates access control and security measures in accordance with standards for certified airports.

Chain-link fencing with an approximate height of 1.8m acts as a security barrier between groundside and airside areas within the core development area. Several secure gates are placed at various locations within the core development area to provide vehicles and pedestrians with airside access.

Paige wire fencing is provided in low traffic areas to prevent unauthorized persons and wildlife. The paige wire fence is approximately 1.2m in height and is generally located on the airport perimeter.

The airport does not have dedicated security staff located on-site; however, airport staff and personnel employed by airport tenants are on-site during normal operational hours and are expected to maintain a security watch.

Passenger security screening services are not currently provided at the Peace River Airport for scheduled, charter, and scheduled charter flights.

2.3.10 Emergency Response Services

Airport emergency response services are provided by the Town of Peace River's Fire Department, the Peace Regional EMS Unit, and the Peace River detachment of the RCMP. In the case of an emergency at the airport Flight Services would call 911 and they would dispatch police, fire, and/or medical services to the airport.

The Town of Peace River's fire hall is the primary point of dispatch for rescue and firefighting services. The fire hall is located within the centre of the Town of Peace River. Consultations with the Fire Department suggest that the emergency response time to the Peace River Airport is approximately 10 minutes.

The Town of Peace River's Fire Department operates 3 pumper trucks, each with 1,893 L (500 gal) water capacities, with a dispensing rate of 5,678 L (1,500 gal/min.). One fire truck has the capacity for 303 L (80 gal) of Class 'B' foam, with the capability to add a second truck with Class 'B' foam capability. Consultations with the Town of Peace River indicate that a new fire hall is being planned on the western side of the town, and closer to the airport. Once constructed, airport emergency response time would be reduced to approximately 5 minutes.

The Peace Regional EMS Unit occupies facilities on the airport site, with an expedient response time to the Air Terminal Building and airside facilities.

Airport Emergency Response Services (ERS) are not published within the Canada Flight Supplement (CFS), and are not required by the Canadian Aviation Regulations (CARs) at the Peace River Airport as passenger volumes are less than 180,000 per annum.

2.4 Environmental Conditions

Environmental concerns are similar at many airports in Canada and in other parts of the world. Aircraft operations combined with adverse weather conditions require the use of chemicals as anti-icing/de-icing agents for both aircraft and airport movement and manoeuvring areas. Other environmental impacts can be associated with commercial and industrial facilities located at an airport, especially those requiring use of chemicals in their business activities.

Special consideration needs to be given to airport activities that can adversely affect the environment.

A review of airport documentation and consultations with the airport operator suggest that an Environmental Review of the entire airport site has not been conducted in recent years, aside from a report prepared by Golder and Associates in June of 2010, related to the excavation of a former fuelling facility operated by Imperial Oil.

In the absence of an Environmental Review Report for the entire airport property, key environmental issues at the Peace River Airport described herein are limited to visual observations made during a recent site visit, and consultations with the airport operator.

2.4.1 Aircraft De-icing

Glycol is a non-flammable petroleum product used for aircraft de-icing, similar to those used in automotive cooling systems. Since glycol has very good de-icing properties, it is usually mixed with warm water and applied to aircraft surfaces to remove ice, snow or frost using hand-held sprayers or a 'cherry picker', or a similar lift device.

Aircraft de-icing for private and commercial aircraft operators is undertaken by Northern Air Charters at the Peace River Airport. Due to the low volume of glycol currently dispensed at the Peace River Airport, the chemical does not appear to be collected after use, and therefore mixes with snow and other precipitation to become a diluted run-off.

2.4.2 Pavement De-icing and Anti-icing

Urea is used as an airport surface de-icing and anti-icing agent at the Peace River Airport. Urea normally comes in pellet form and is applied to airport pavement surfaces using a spreader. Urea is considered to be effective of -10°C to above freezing; however, the substance has two major drawbacks.

Because its major application is an agricultural fertilizer, it can end up in local streams, rivers or lakes due to natural runoff and encourage the growth of oxygen algae, lowering oxygen levels within the water. It can also elevate the nitrate levels in ground water and other water courses, creating a potential hazard for human consumption.

The increased airport activity to support industry expansion is not expected to substantially increase the amount of pavement de-icing and anti-icing activities at the Peace River Airport.

2.4.3 Fuel Storage and Dispensing Procedures

A field visit and subsequent consultations reveal that there are several privately operated fuel tanks and dispensers located on the airport property. Northern Air Charters is the main commercial fuel provider, and no environmental concerns related to the fuel tanks or dispensers were identified during consultations.

Although a detailed review of fuelling procedures was not conducted as part of this study, no known concerns with the fuelling provider's Standard Operating Procedures and equipment were identified.

2.4.4 On-Airport Environmentally Sensitive Conditions

A wetland area is located in the southwest quadrant of the airport. Although a detailed survey of species at risk and animals was not conducted in this area, consultations with the airport operator suggest that beavers, deer, and the occasional moose have been previously spotted in this area.

Several deer have also been identified within the airport perimeter fence, as noted within the airport's Safety Management System (SMS) Hazard Log.

Although the presence of a wetland within the airport boundary can be considered as an environmentally sensitive area, these areas are not expected to be impacted by development recommendations presented within this Gap Report. Nonetheless, it is recommended that an environmental review be conducted prior to construction.

2.4.5 Off-Airport Environmentally Sensitive Conditions

There are two ravines beyond the airport property boundary, on the extended centreline of both Runway 04 and Runway 22. These ravines are estimated to be over 30 m (100') in depth, and provide habitat for many plants and animal species.

Runway 04-22 expansion is limited by major physical constraints at both ends.

The runway extension options presented within this Airport Assessment and Gap Report do not encroach into the existing ravines; however, an environmental review should be conducted prior to extending the runway to examine future drainage impacts, and potential species at risk.

2.4.6 Species at Risk

A detailed survey for species at risk was not conducted during the field visit. However, the areas recommended for development to meet the increased traffic (generally beyond the existing runway ends) are not expected to contain species at risk, and should not adversely impact construction. Nonetheless, it is recommended that an Environmental Review Study be commissioned prior to construction, to confirm the absence of any species at risk in the development areas.

2.5 Airport Availability

An airport's availability is a measure of the amount of time the site is available for aircraft operations based on historical and expected weather conditions and the approach aids provided. Generally speaking, the higher the level of instrumentation provided at the airport, the greater the airport availability.

An Airport Climatology Study (Appendix B) was prepared for the Peace River Airport which assessed historical aviation weather on an hourly basis for the last 30 years:

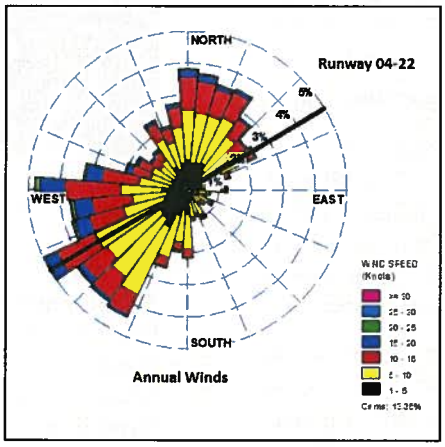
- to determine prevailing weather conditions;
- to assess airport availability in accordance with various categories of ceilings and visibilities (below VFR, below Non-Precision approach limits, and below IFR), and;
- to identify additional infrastructure or navaid requirements (if any) to provide an acceptable level of airport availability to support scheduled charter flight operations.

Key findings of the Airport Climatology Study include the following points:

1. Generally, the aviation weather regime at the Peace River Airport is excellent, averaging 94% VFR conditions or better on a year round basis.
2. Below Non-Precision approach weather averages 3% year round.
3. Below IFR ceilings and visibilities average 1% on an annual basis.
4. The wind regime is fairly light, with only 0.1% of the winds 25 knots or above.
5. There were no statistically significant reports of crosswinds 25 knots or more in the thirty years of analysis.
6. There were 376 occurrences of freezing precipitation in the thirty year period. This averages to approximately 12 hours per year, with most occurrences in November.

The annual wind rose for the airport is illustrated in Figure 2-3.

Figure 2-3 – Peace River Wind Rose Analysis (Annual)



3 Activity and Forecasts

3.1 Current Use

Peace River Airport is a public use facility that supports the transportation of passengers and cargo to the Peace Region.

Northern Air Charters is currently the only air carrier operating scheduled services from the Peace River Airport to Edmonton and Calgary, utilizing a Beechcraft 1900D aircraft (B1900D). Ad-hoc charter flights to support energy resource transportation are also operated at the Peace River Airport. The airport also supports medevac flights, patrols by Alberta Forestry, and a small amount of General Aviation activity.

Limited air cargo traffic is currently experienced at the Peace River Airport. There are current ad-hoc charter shipments being carried out by Northern Air Charter. In addition, private charters may, on occasion, transport industrial supplies to the oil and gas industry. However, future demand for air cargo is seen as extremely limited due to the close proximity of a CN Rail line that runs through the Town of Peace River as well as a comprehensive road network with Edmonton approximately 486 km away.

3.2 Activity Forecasts

Airport activity forecasts impact the size, layout, capacity and the required capability of an airport's infrastructure.

3.1.1 Historical Movements

Regional activity forecasts for passenger volumes and aircraft movements were not available during the Airport Assessment and Gap Report. However, Peace River Airport provided historical passenger and aircraft movement data dating back to 1995.

These movements are summarized in Table 3-1.

Table 3-1 – Historical E/D Passengers and Aircraft Movements

Year	Enplaned/deplaned Passengers	Air Traffic Movements
1995	29,070	20,850
1996	27,501	17,620
1997	26,429	16,666
1998	24,097	15,874
1999	22,506	15,197
2000	20,969	16,637
2001	19,811	16,944
2002	15,409	16,235
2003	13,627	14,365
2004	11,033	12,737
2005	11,542	14,750
2006	12,312	14,954
2007	5,568	12,358
2008	4,794	10,452
2009	3,409	9,449
2010	3,398	8,573
2011	5,567	8,375
2012	6,855	9,466
2013	8,570	8,431

Airport activity has shown an overall decrease in passenger and aircraft operations, as shown in Figure 3-1.

From 1995 to 2010 passenger movements have declined from 29,070 to 3,398 while air traffic movements have dropped from 20,850 to 8,573.

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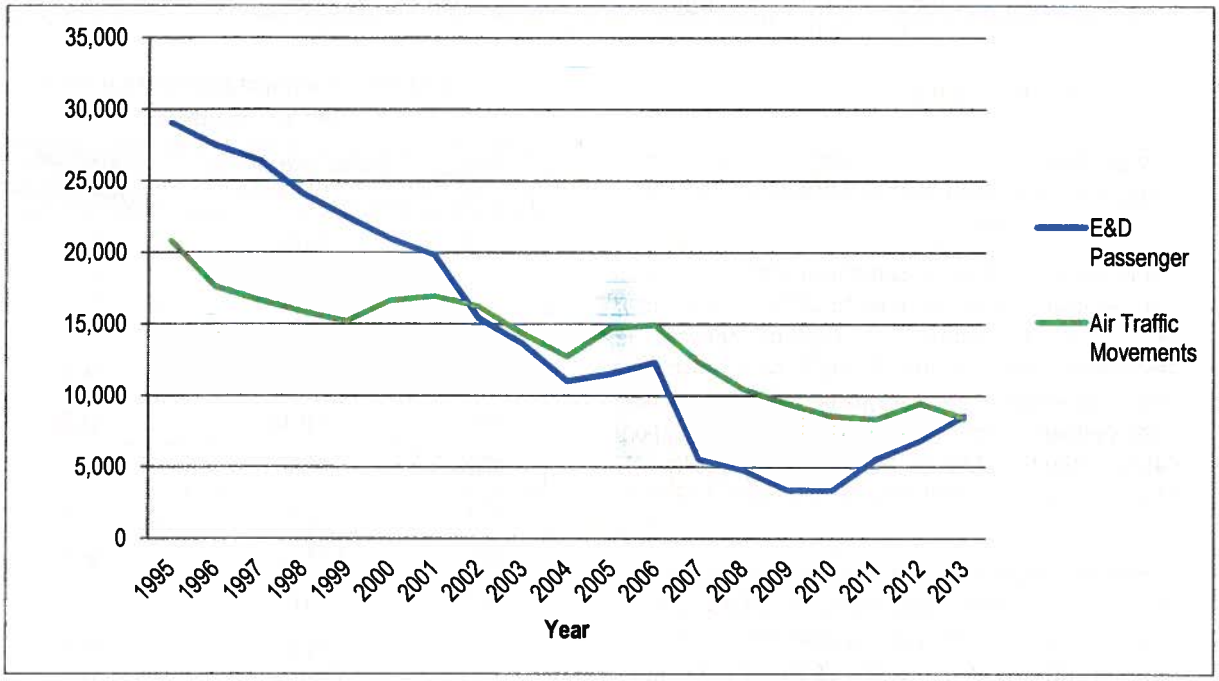
Figure 3-1 – Historical Passenger and Air Traffic Movements



3.1.2 Passenger and Air Traffic Projections

Passenger and Air Traffic projections for the Peace River Airport have been prepared as part of the Airport Assessment and Gap Report. The projections include the traffic associated with the Peace River Airport as well as the traffic that will be introduced to support industry expansion in the area.

Industry Traffic Growth Assumptions:

Activity associated with industry expansion will most likely follow one of the two passenger movement scenarios shown below:

- Over a three day period movement of up to 250 people in and 250 people out per day over a 6 hour period; **or**
- Over a five day period movement of up to 150 people in and 150 people out per day over a 6 hour period.

Public Traffic Growth Assumptions:

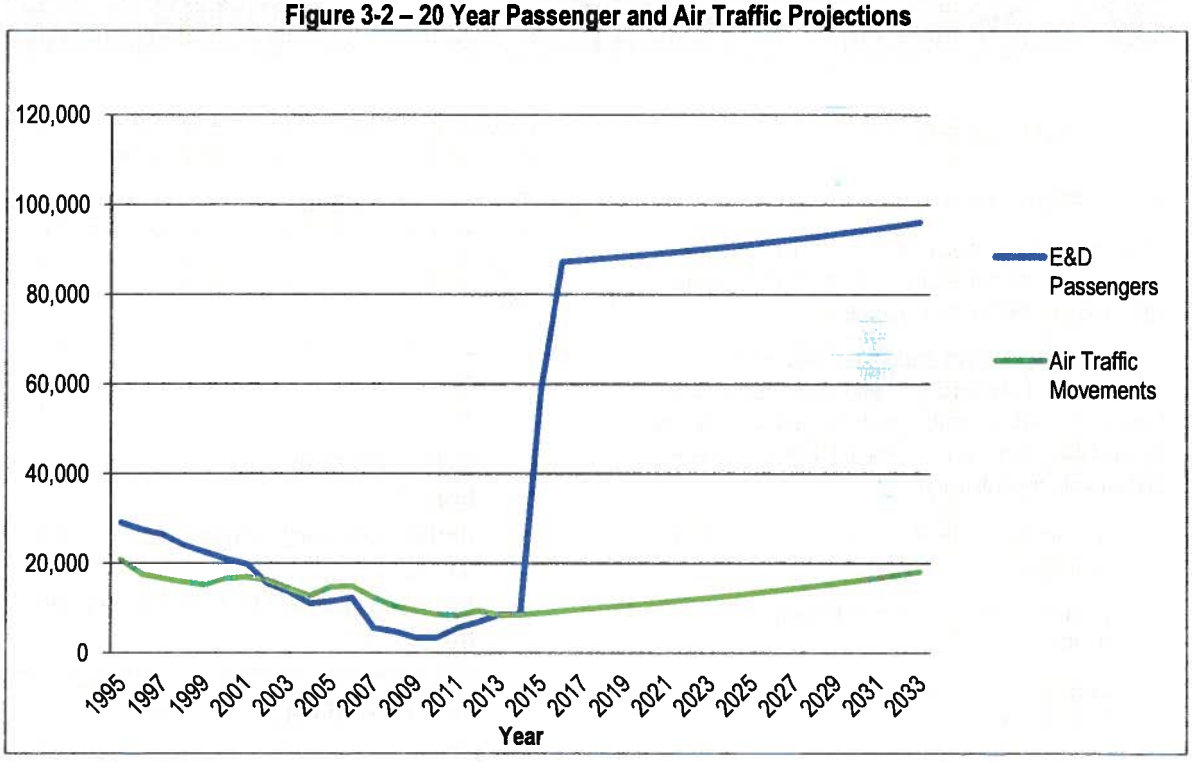
The underlying assumptions for the development of the 20 year forecasted passenger and air traffic movements are as follows:

- Historical passenger and air traffic movements will continue to grow from their estimated 2013 numbers with a nominal growth rate of 4% annually.

The movement scenario which produces the most demanding passenger volumes at any given time (i.e. larger values) is used in combination with other airport activity to determine passenger processing and subsequent space requirements.

Figure 3-2 summarizes the passenger and air traffic movement projections for a 20 year period. The actual number of passenger and air traffic movements at the Peace River Airport may vary depending on economic conditions in the region and commodity prices.

Figure 3-2 – 20 Year Passenger and Air Traffic Projections



4 Gap Analysis

4.1 Airside Facilities

4.1.1 Design Aircraft

Stipulation of the design aircraft determines many of the physical characteristics of an airport needed for safe and efficient aircraft operations.

Industry sources have suggested that for the purpose of this Airport Assessment and Gap Report that the Boeing 737-400 aircraft should be used as the basis for analysis. Key airport characteristics of the B737-400 include the following:

- a wingspan of 28.90 m, a wheel track of 5.23m and a tail height of 11.15m.
- a typical Maximum Takeoff Weight (MTOW) of 62,820 kg.
- Aircraft Load Rating (ALR) for the B737-400 of 10.1 (MTOW).

The aircraft is categorized as a Code C aircraft under Transport Canada's TP312 – Aerodrome Standards and Recommended Practices, 4th Edition.

B737-400 Performance Requirements

In order to determine the runway length requirements for the design aircraft, both take-off and landing requirements are considered.

Aircraft performance depends on many environmental factors, including but not limited to; temperature, altitude, aircraft weight, and wind speed and direction. Airport performance for the B737-400 was assessed based on a worse-case scenario in order to ensure optimal airport availability for industry under various environmental and operating conditions.

Typical aircraft weights were derived from Boeing Airport Planning Manuals and were used for runway performance calculations. Due to the limited availability of land to extend Runway 04-33 and the precision needed in the runway performance analysis, an aircraft performance analysis for the B737-400 was carried out by Automated Systems in Aircraft Performance Inc. (ASAP), and is provided in Appendix B.

Actual aircraft performance should be confirmed by the air carrier prior to commencing operations.

The following assumptions were used to assess the take-off performance of the B737-400 at the Peace River Airport, based on the current 5,000' runway length.

- Standard Day + 15°C;
- Zero Wind;
- Dry Runway;
- 0.28% Runway Slope;
- Flaps 15°;
- Aircraft Operating Empty Weight (OEW) = 33,643 kg
- 500 Nautical Mile (NM) flight segment with 200 NM fuel reserves;
- 152 passengers @ 100 kg per passenger; and
- Typical takeoff weight = 55,800 kg

Based on the above operating factors and assumptions, the ASAP analysis suggests that the typical takeoff weight limit for the B737-400 at the Peace River Airport is approximately 51,570 kg. This is well below the typical takeoff weight identified above, suggesting that the B737-400 is unable to operate on a 5,000' runway length at the Peace River Airport, under the conditions assumed above.

Based on analysis, an extension to Runway 04-22 is required to support the B737-400 under the assumed worst-case operating conditions. There are several constraints to extending Runway 04-22 at the Peace River Airport, including but not limited to:

- the presence of ravines beyond the property boundary, along the extended centreline for each runway;
- a perimeter fence; and
- Alberta Provincial Highway 2.

In addition, Transport Canada's Aerodrome Standards and Recommended Practices (TP312E) stipulates that runways in excess of 1,800 m (5,904'), must be classified as a Code 4, Non-Precision facility, compared to the current Code 3, Non-Precision designation currently assigned to Runway 04-22.

Runway code classifications have an impact on the dimensions of the protective areas that surround a runway. Generally speaking, the higher the code number, the greater the protection required around the runway and its associated obstacle limitation surfaces. Table 4-1 below compares some of the critical protective areas associated with Code 3 and Code 4, Non-Precision runways.

Table 4-1 – Code 3 vs. Code 4 Runway Classification

Element	Code 3 - NP	Code 4 - NP
Strip Width	150 m	300 m
Graded Area Width	90 m	150 m
Inner Edge Width	150 m	300 m

It can be seen from the table above that a Code 4 runway requires a substantially larger runway strip and graded area. The increased width of the runway strip results in a greater inner edge width, and subsequently a larger protective area beneath the approach surface. This greater inner edge width limits the length of runway because of obstacles beyond the runway end such as the perimeter fence, and Alberta Highway 2. These obstacles are not considered as significant constraints under a Code 3 runway classification, simply because of the narrower runway strip.

Due to the significant cost implications in extending Runway 04-22 to a Code 4 facility, as well as the constraints identified above, aircraft performance for the B737-400 at the Peace River Airport was assessed based on the maximum length for a Code 3 runway – 1,799 m (5,900').

Although 5,900' is the limit of a Code 3 runway, additional length can be provided for Take-off Distance Available (TORA) via clearways, to provide increased operational flexibility. Analysis of the current airport site and the runway extension constraints identified above suggest that a clearway can be provided beyond each runway end (598' for Runway 04, and 758' for Runway 22). Based on this, a runway extension scenario was developed for the Peace River Airport based on the declared distances identified in Table 4-2:

Table 4-2 – Future Declared Distances (B737-400 Operations)

	04	22
TORA	5,900'	5,900'
TODA	6,498'	6,658'
ASDA	5,900'	5,900'
LDA	5,900'	5,900'

The following assumptions were used to assess the take-off performance of the B737-400 at the Peace River Airport, based on the declared distances identified in Figure 4-2 above.

- Standard Day + 15°C;
- Zero Wind;
- 0.28% Runway Slope;
- Flaps 15°;
- Aircraft Operating Empty Weight (OEW) = 33,643 kg
- 500 Nautical Mile (NM) flight segment with 200 NM fuel reserves;
- 152 passengers @ 100 kg per passenger; and
- Typical takeoff weight = 55,800 kg

Based on the above operating factors, assumptions, and declared distances, the ASAP analysis suggests that the typical takeoff weight limit for the B737-400 at the Peace River Airport would be approximately 55,970 kg. This is above the typical take-off weight for the B737-400, indicating that a 5,900' runway extension at the Peace River Airport would allow for the operation of the B737-400 with very few restrictions.

Analysis was also conducted by providing a stopway beyond each runway end, increasing the Accelerate Stop Distance Available (ASDA) values for Runways 04 and 22 to 6,399' and 6,264' respectively.

It was determined that providing a stopway and additional ASDA length will not provide significant operational benefits when compared to the cost of construction, and are not recommended.

Landing distance was also evaluated by ASAP based on the 5,900' runway length identified above. The following assumptions were used to determine landing weight limitations for the B737-400 at the Peace River Airport:

- Zero Wind;
- Flaps 30º;
- Dry Runway;
- 0.28% Runway Slope;
- Typical Landing Weight = 50,825 kg; and
- Wet Runway.

Based on the above operating factors, it was determined by ASAP that the landing weight limit for the B737-400 is approximately 52,930 kg, well above the typical landing weight identified above.

Dash 8-400 Performance Requirements

Analysis has shown that operations of the DHC8-400 at Peace River Airport can be undertaken on the existing runway with respect to length and width, and the Declared Distances as provided in the Airport Operations Manual for the types of missions needed to support industry.

4.1.2 Runway 04-22

Deficiencies

Runway 04-22 has dimensions of 1,524.0m x 45.5m (5,000' x 150'). As per the results of the B737-400 Aircraft Performance Analysis, a 5,900' (1,798m) runway length is recommended to support the B737-400 at the Peace River Airport.

Longitudinal and transverse cracking on Runway 04-22.

The runway is experiencing longitudinal and transverse (discrete) cracking throughout its surface. This is likely due to the age of the asphalt with the last rehabilitation taking place in 1997. Also, discrete cracking is common among airfield pavements in cold weather regions.

The runway ends appear to be showing signs of reflective cracking in a consistent 6m x 6m pattern, which is likely a result of asphalt movement with respect to the underlying concrete panels.

Requirements

It is recommended that Runway 04-22 be extended by 170.7m (560') to the west, and 103.7m (340') to the east in order to provide adequate runway length to support the B737-400. The DHC8-400 will be able to operate from the current length of 1,524m (5,000)'.

Runway 04-22 will be expanded to the west by 170.7m and will include a RESA.

It is recommended that Runway 04-22 undergo full depth asphalt removal and replacement as recommended by the Runway 04-22 Preliminary Design Report submitted to the Town of Peace River by Genivar in April 2012.

Transport Canada's document TP312 – Aerodrome Standards and Recommended Practices recommends a runway width of 30 m to support the B737-400 (Code C); however, 45.5m of runway width is provided at the Peace River Airport.

Should cost reductions be needed, consideration may be given to reconstructing the runway at a 30m (100') width although this will require relocation of the runway edge lighting installed in 2005.

It is recommended that Runway End Safety Areas (RESAs) be provided beyond each runway end at the Peace River Airport. Although this is not a current requirement for certified airports in Canada, RESAs are an internationally accepted safety practice and are expected to become standard requirements at certain Canadian certified airports. It is recommended that RESAs be provided with dimensions of 90 m x 90 m, located at the end of the runway strip as shown in Figure 5-1.

4.1.3 Taxiways

Deficiencies

Taxiways 'A' and 'B' appear to be experiencing cracking extensively throughout their surfaces in the form of longitudinal and transverse cracks. Similarly to Runway 04-22, the last rehabilitation efforts for Taxiway 'A' and 'B' were in 1997.

Taxiway 'C' is in very poor condition with cracking prevalent throughout its surface.

Requirements

It is recommended that Taxiways 'A' and 'B' undergo full asphalt removal and replacement as recommended by the Runway 04-22 Preliminary Design Report submitted by Genivar to the Town of Peace River in April 2012.

Taxiway 'C' currently serves the commercial development lots to the west of the core area and is not anticipated to be used to increase circulation or capacity for industry's planned operations at the Peace River Airport.

4.1.4 Apron

Deficiencies

No deficiencies were observed in the structural capability of Apron I as it was recently overlaid.

The lack of apron pavement markings identifying taxilane centrelines, taxilane edge markings and aircraft parking positions currently makes it difficult for efficient apron use and parking of aircraft.

Requirements

An Apron Management Plan should be established and Apron I should be marked to support safe and efficient aircraft manoeuvring and parking.

It is recommended that four (4) aircraft parking stands be established with appropriate markings to facilitate use by B737-400, DHC8-400, B1900D and B350 aircraft simultaneously.

Apron I can provide four (4) aircraft stands accommodating the B737-400, DHC8-400, B1900D, and B350 aircraft.

4.1.5 Electronic Navigation Aids

Deficiencies

The approach procedures and accompanying navigational aids supporting Runway 04 and Runway 22 are considered to be adequate to provide an acceptable level of airport availability to support industry's scheduled charter operations, as shown by the Climatology Study presented in Appendix A.

Requirements

No requirements for additional navigational aids and procedures are required to improve airport availability. The airport availability statistics presented in Section 2.5 show that scheduled charter services at the Peace River Airport will be adequately supported with the current instrument approach facilities and supporting navigational aids.

Introduction of satellite-based approaches may provide benefits in the future.

4.1.6 Visual Aids

Deficiencies

The visual aids currently in operation at the Peace River Airport were found to be in good condition, including runway, taxiway and apron edge lighting, wind direction indicators, aerodrome beacon, airfield signage, approach lighting systems, and the Field Electrical Centre (FEC). A major field electrical systems upgrade program was completed in 2006.

Requirements

Some visual aids at the Peace River Airport may require relocation as a result of a runway extension.

The P2-type PAPI systems supporting Runways 04 and 22 will require relocation to correspond with the new threshold locations as a result of extending the runway.

The Simple Approach Lighting Systems (ODALS) will also require relocation as a result of extending Runway 04-22. These systems will extend outside the current airport boundary, and land easement agreements with Alberta Highways on the east end, and the adjacent landowner to the west should be updated and/or renegotiated to allow for ODALS relocation.

Simple Approach Lighting Fixtures (ODALS) fixtures and PAPI fixtures will require relocation to accommodate the extension of Runway 04-22 at both ends.

4.1.7 Aviation Services Facilities

Deficiencies

Most aviation service facilities at the Peace River Airport will adequately support intended B737-400 and DHC8-400 scheduled charter services with some exceptions:

1. Current aircraft de-icing services and facilities are not considered to be adequate to support intended scheduled charter services using the B737-400, and the DHC8-400.
2. The Airport does not currently have the capability to enplane/deplane passengers from larger narrow-body aircraft. A mobile stair will be required if charter aircraft are not equipped with an on-board airstair.
3. Baggage handling equipment and personnel are limited. Northern Air Charters currently provides contracted baggage handling services however, the company does not operate a belt loader and currently loads and unloads baggage by hand. In addition, Northern Air Charters indicated during consultations that they do not operate a tug vehicle capable of pulling baggage carts.
4. The current capacity of the aviation fuel truck at 10,000 L would not typically support a 737-400 operation; however, given the short stage length of proposed operations to Calgary (330 Nautical Miles), it may be adequate.

Requirements

In order to provide aircraft de-icing services to support the B737-400 and the DHC8-400, **it is recommended that a bucket-type de-icing vehicle be provided with the capability of dispensing both Type-I and Type-IV de-icing fluids**. De-icing services could be provided under contract with a third party.

It is recommended that air stairs be provided to support the enplaning and deplaning of passengers for large narrow-body aircraft, such as the B737-400.

It is recommended that a belt loader be provided to support the loading and unloading of aircraft baggage.

It is recommended that baggage carts and a tow vehicle be provided to transport baggage to and from the Air Terminal to departing and arriving aircraft. Based on the passenger configuration of the B737-400, it is recommended that covered baggage carts be provided.

It is assumed that aircraft tow tractors are not required to support scheduled charter operations with the B737-400 and the DHC8-400. The Core Area Development Plan shown in Figure 5-2 assumes aircraft will manoeuvre in and out of the parking positions under their own power (i.e. power in, power out).

Ground handling service and equipment requirements identified above could be provided under a contractual arrangement with a third party provider.

4.2 Air Terminal

4.2.1 Assessment Methodology

The Systemized Terminal Expansion Program (STEP) was devised by Transport Canada as a guide for the design and progressive expansion of small Air Terminal Buildings. STEP was established on the basis of long-standing Canadian airport experience.

The standard is based on Peak Design Volumes (PDV) of passengers using the building. The PDV is determined through analysis of schedules, passenger loads, and forecasts. It is the peak half hour period passenger load for which the air carriers supply the most seats (arrival and departure).

Five levels of service (LOS) are considered in the STEP standards as described in Table 4-3. A new air terminal is usually designed to deliver a Level of Service B for the first 5 years of operation, with flexibility for LOS to deteriorate as activity levels increase over time. When service deteriorates to less than the desired level, action by management is recommended, and building expansions are usually executed.

Following the STEP methodology, 9 basic sizes of Air Terminal Buildings are classified in order of processing capability.

Each size of terminal is capable of processing a range of passenger volumes, depending on the desired Level of Service. Each size classification corresponds to a prescribed balance of functional services, amenities, and building areas. These may be adjusted as required to meet specific local characteristics.

Table 4-4 provides an overview of STEP terminal sizes, including all airport administrative and support areas.

By comparing the current space provided in an air terminal (Table 2-2) to serve a projected peak design volume of passengers, the adequacy of each of the existing functional areas may be assessed and adjusted as appropriate.

4.2.2 Space Requirements

The ATB holdroom is approximately 72.5 m^2 in area and is not adequate to serve the passenger volumes anticipated with the introduction of B737-400 service.

The terminal building does not include passenger security screening equipment or delineated areas for such operations.

Table 4-3 – Levels of Service (LOS)

Level	Quality	Characteristics
A	Excellent	Condition of free flow, no delays; excellent level of comfort.
B	High	Condition of stable flow; high level of comfort.
C	Good	Condition of stable flow, acceptable throughput; systems in balance.
D	Adequate	Conditions of unstable flow, delays for passengers; conditions acceptable for short-term periods.
E	Unacceptable	Unstable flow, conditions seriously limiting the capacity of the system.

Table 4-4 – STEP Terminal Sizes

ATB Class	Total Space Req'd (m^2)	Peak Design Volume (PDV)	
		Lower Limit LOS 'B'	Upper Limit LOS 'E'
STEP 3	314	26	60
STEP 3.5	424	34	80
STEP 4	628	47	110
STEP 4.5	841	64	150
STEP 5	1289	84	200
STEP 5.5	1623	109	260
STEP 6	2043	139	330
STEP 5.5X	2516	180	430
STEP 6.5X	3007	230	550

The travel activity associated with industry expansion will likely be based on two passenger movement scenarios:

- Over a three day period being able to move up to 250 people in and 250 people out per day over a 6 hour period.
- Over a five day period being able to move up to 150 people in and 150 people out per day over a 6 hour period.

Analysis shows the first movement scenario can be achieved with two B737-400 aircraft departures and arrivals, each with an approximate load factor of 80%. This would result in a PDV of 130, assuming aircraft arrivals at approximately 0830hrs and 1430hrs, and departures at 1000hrs and 1600hrs local time. The projected PDV for the busiest day (Wednesday) is shown in Figure 4-1.

The second movement scenario can be achieved with a single B737-400 aircraft departure and arrival using a 95% load factor. This movement scenario would result in a PDV of 140 and is used as a basis for determining what functional areas are required within the ATB. This scenario assumes the same arrival and departure times in the first scenario.

A PDV of 140 would result in a STEP terminal size of 5.5 while providing passengers a LOS C. For the purposes of this assessment, a modified STEP program is developed and summarized in Table 4-5.

A traditional STEP program does not provide functional areas for security processing. As such, some of the areas highlighted below will not reflect a STEP 5.5 and instead will more reflect the particular needs of industry and its proposed operations.

As seen from Table 4-5, the main deficiencies with respect to the terminal functional areas are the holdroom and future security processing function.

It is recommended that a portion of the underutilized space within the ATB be used to expand the current holdroom to the approximate 180 m^2 required to facilitate a PDV of 140.

A portion of the existing Public Area will be used for Holdroom expansion and future security area.

The wall between the Holdroom and Baggage Make-up Room will be relocated.

It is recommended that a portion of the underused baggage make-up room, underutilized airline check-in counters and airline support space be reallocated for use as a holdroom and queuing area.

It is recommended that a portion of the public area within the core of the ATB be reserved for a future passenger security processing area, potentially using a temporary swing wall. A proposed ATB Development Concept is presented in Figure 4-2.

Table 4-5 – Air Terminal Functional Areas

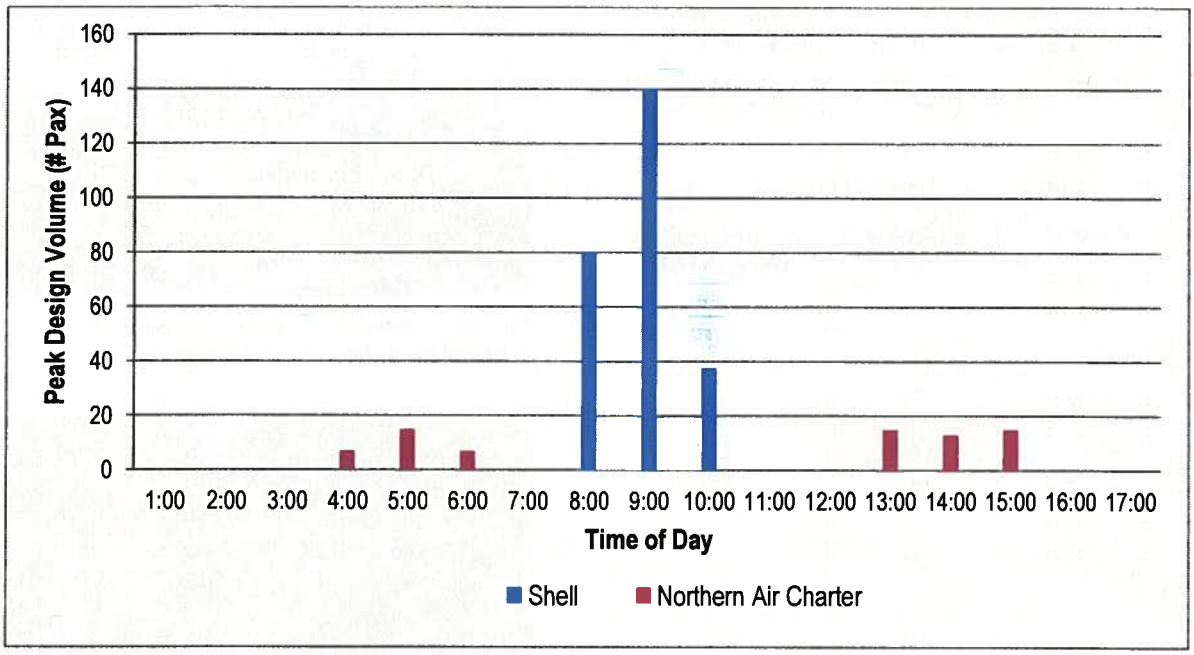
Element	Current Areas (m^2)	Modified STEP 5.5 Level of Service C
Public Areas		
Ticketing	51	68
General Waiting	31	31
Holdroom	72.5	179.2
Baggage Claim Area	112	112
Baggage Claim Device	21	21
Outgoing Baggage	116	80
Security	0	101.2
Washrooms	26	26
Air Carrier		
Airline Operations Area	66	31
Air Carrier Support	49.5	42
Concessions and Passenger Services		
Car Rentals	23	20
Vending	12	6
Storage/Office	80	14
Building Services & Equip.	39	53
Circulation & Structure	299	213.6
Gross Main Floor Area	**998**	**998**

The exterior of the Air Terminal Building will not be impacted as capacity is expanded within the building.

The surplus airline Check-in positions on the left will be removed to facilitate expansion of the Holdroom.

The baggage belt and chute will be removed/relocated. Out-bound Baggage Make-up Room will be reduced in size and drive-through capability for baggage carts re-established.

Figure 4-1 – Projected Air Terminal Peak Design Volume (PDV) - Wednesday



4.3 Groundside Facilities

4.3.1 Airport Maintenance Facilities

Deficiencies

No deficiencies were observed with the current airport maintenance facilities, equipment, and operational practices at the Peace River Airport which might be of relevance to increased operations due to expansion activities.

Requirements

The current airport maintenance equipment, systems, and operational practices at the Peace River Airport are considered to be sufficient to support industry's requirements.

4.3.2 Access Road and Parking

Deficiencies

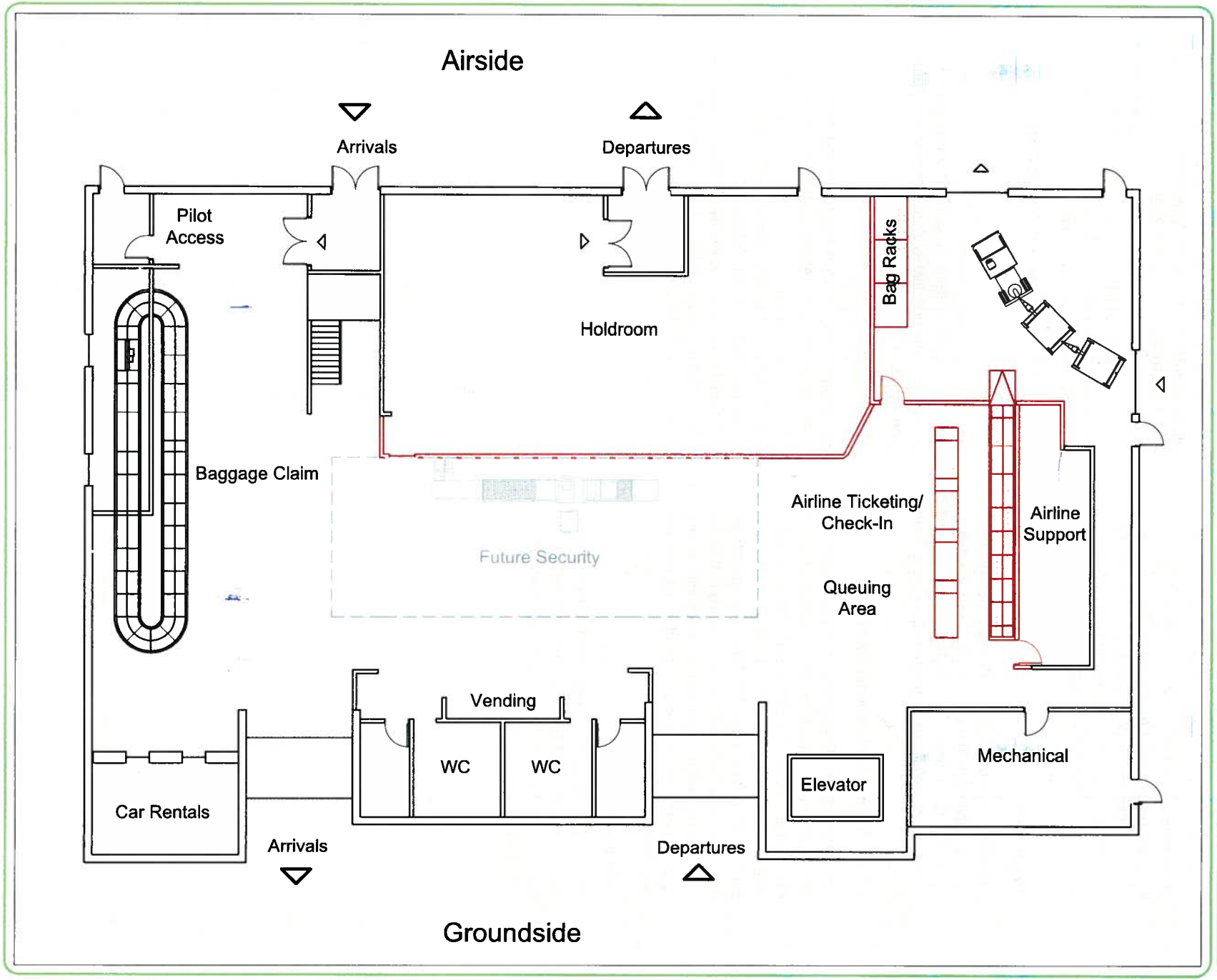
The long term parking lot is in very poor condition with crack prevalent throughout as well as weeds infiltrating its surface.

Requirements

Consultations with the Peace River Airport indicate that the ATB frontage road has undergone a major rehabilitation in the summer of 2013, as the pavement was considered to be in very poor condition and reached the end of its service life.

It is recommended that the long-term parking area be rehabilitated in order to support industry's vehicle parking requirements. Consultations revealed a requirement for approximately 100 parking stalls.

The Long-Term Parking Lot will be restored to accommodate additional parking stalls.



LPS AVIA CONSULTING
One Antares Drive, Suite 250, Ottawa, ON, Canada K2E 8C4
www.lpsaviation.ca

Client

Shell Canada
Carmon Creek Project

Title

Peace River

Airport Assessment and Gap Report

Air Terminal Development

Ground Floor Modification

Notes

1. Preliminary
2. All dimensions approximate

Figure No.	4-2
Drawn By	EDH
Approved By	RAM
Date	AUGUST 2, 2013
Scale	NTS
Filename	PR Terminal

4.3.3 Security and Access Control

Deficiencies

A review of the Peace River Airport's Safety Management System (SMS) Hazard Log has identified several occurrences where deer have been spotted within the airport boundary. Consultations with the airport operator suggest that the current 1.2m paige wire fence is not adequate to prevent deer from entering the airport property.

Requirements

It is recommended that the 1.2m paige wire perimeter fence be upgraded to a 2.4m wildlife fence in order to reduce the risk of deer within the airport property, and to improve overall levels of safety at the Peace River Airport.

4.3.4 Emergency Response Services

Dedicated airport Emergency Response Services (ERS) are not required by the Canadian Aviation Regulations (CARs) at the Peace River Airport, as the total number of enplaned and deplaned passengers per annum is less than 180,000. The passenger forecasts presented in Chapter 3 indicate that the 180,000 passenger per annum threshold is not expected to be reached within the planning horizons identified within this report.

Deficiencies

Emergency Response Services at the Peace River Airport are considered to be over and above the requirement for an airport with activities below 180,000 per annum.

Requirements

If industry's emergency response policies and procedures stipulate a higher level of service for ERS at the Peace River Airport, facilities on the airport could be expanded to meet their requirements, or operational arrangements could be made with the Town of Peace River's fire department (or another contracted organization) to have ERS on-site during industry's scheduled charter flight operations

4.3.5 Safety Management System (SMS)

Deficiencies

The Peace River Airport's Safety Management System appears, from a brief overview, to be satisfactory and effective in identifying safety hazards and appropriate corrective actions.

Requirements

No additional requirements have been identified as a result of deficiencies related to the airport's Safety Management System. A review of SMS documentation and consultations with the airport operator suggest that the SMS is likely compliant with the Canadian Aviation Regulations (CARs), and that regular Performance Validation Inspections (PVIs) are being conducted by regulators.

5 Development Plan and Costing

5.1 Recommended Airport Development Plan

The Development Concept presented in this chapter is expected to meet the current and future requirements for airside, air terminal, and groundside facilities in order to support the anticipated traffic levels resulting from industry expansion in the area.

The Development Concepts call for four main areas of airport infrastructure improvements as well as a number of other supporting upgrades. The four main areas for infrastructure improvement include:

- Extending Runway 04-22 and reconstructing its existing pavement and supporting elements i.e. improved drainage, relocation of runways lighting, etc.;
- Reconstructing Taxiway 'A' and 'B';
- Modifying the internal layout of the Air Terminal Building; and
- Improving the groundside long term parking facilities.

It should be noted that these are the four main areas of infrastructure improvements and a complete list of airport upgrades can be found in the Rough Order-of-Magnitude cost estimate in the following section.

The Proposed Development Plan is presented in Figure 5-1.

5.2 Costing

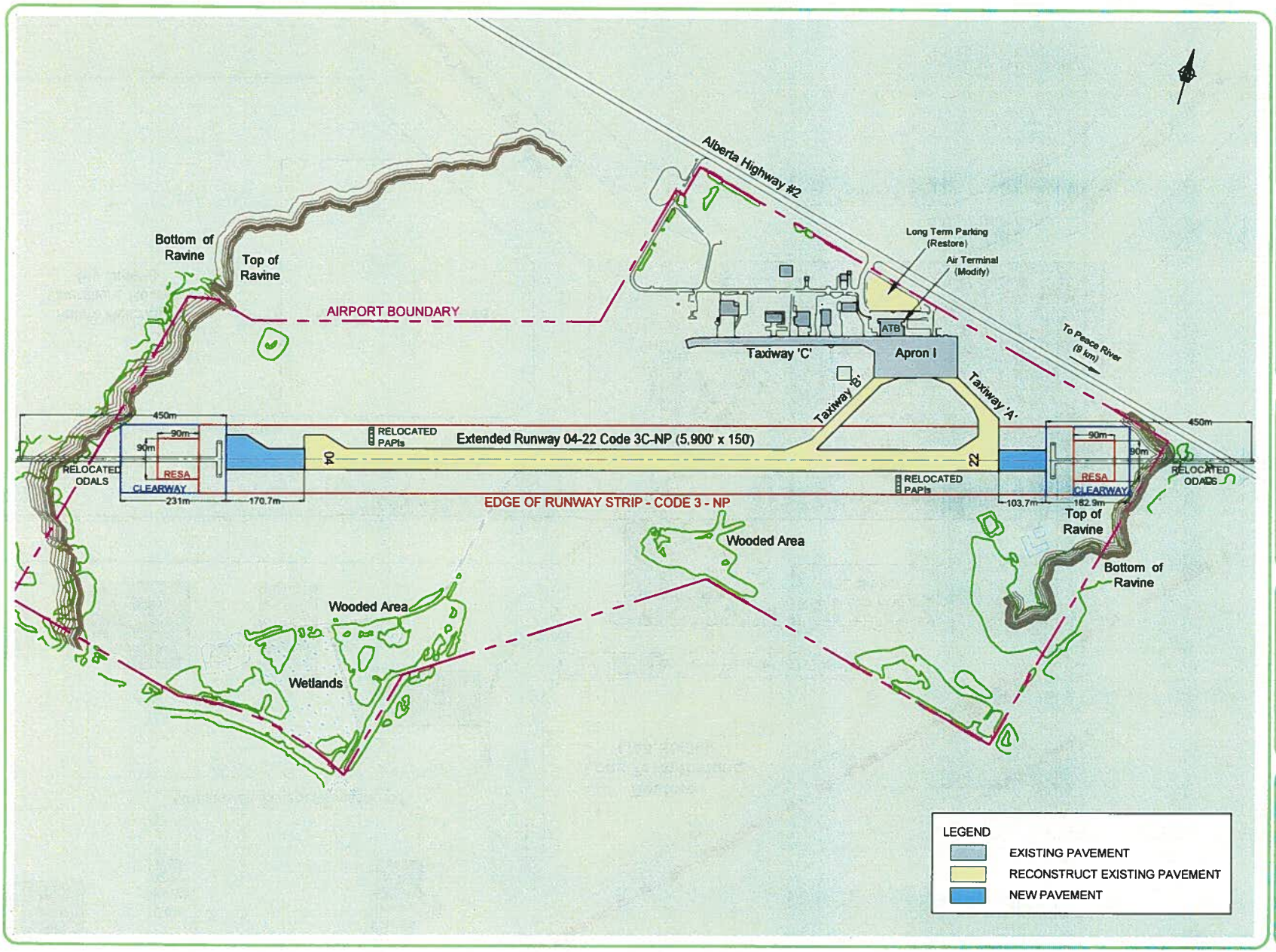
LPS AVIA has developed Rough Order-of-Magnitude (ROM) cost estimates for the recommended airport and Air Terminal developments. Capital costs have been determined based on similar airport construction projects, recent reports, and current industry experience.

A number of assumptions have been made in preparing the ROM cost estimates presented in Table 5-1.

- Airside civil work cost estimates include General Requirements, Runway 04-22 Rehabilitation, Drainage Works, Taxiway 'A' and 'B' Rehabilitation, and Electrical Work are based on a Preliminary Design Report provided by Genivar, dated April, 2012.
- 'Electrical Work' contained in the cost estimates is related to Runway 04-22 Rehabilitation, and includes removal of the existing runway and taxiway edge lighting for sub-drainage installation, and reinstallation of existing lights, pullpits, transformers, secondary cabling and connections. This was also provided within Genivar's Preliminary Design Report.
- The required ground handling equipment (belt loader, de-icing truck, baggage carts, etc.) to support scheduled charter services using the B737-400 and the DHC8-400 have been included in the cost estimates contained herein. Costs indicated assume new equipment purchases.
- Air Terminal Building renovation includes a provision for partitions and doors, finishes, fittings and equipment, as well as mechanical and electrical modifications. The cost estimate has been derived from Hanscomb Yardsticks for Costing for estimated Gross Building Costs for a Small Airport Terminal Building.
- A Design and Pricing Allowance, and an Escalation Allowance have been included at 2.5% and 5.0%, respectively.
- Engineering, Environmental, Architectural, and Project Management fees have been estimated at 15%. A Project Contingency of 10% has also been applied to the estimates.

Table 5-1 – ROM Project Cost Estimates

Item	B737-400 Design Aircraft Estimated Cost	DHC8-400 Design Aircraft Estimated Cost
Airside Civil Works		
General Requirements	$1,280,000	$1,280,000
Runway 04-22 Rehabilitation	$4,780,000	$4,780,000
Drainage Works	$2,020,000	$2,020,000
Taxiway 'A' & 'B' Rehabilitation	$750,000	$750,000
Apron Line Painting	$15,000	$15,000
Runway 04-22 Extension	$3,660,000	
RESA Construction	$650,000	
Runway 04-22 Extension Line Painting	$15,000	
Tree Trimming & Survey	$25,000	
Wildlife Fence Installation	$25,000	$25,000
Airside Electrical		
Electrical Works (Runway Rehabilitation)	$395,000	$395,000
New Runway Edge Light Installations	$34,000	
Runway End/Threshold Light Relocations	$200,000	
Relocate PAPIs	$150,000	
Relocate ODALS	$138,000	
Groundside Civil		
Parking Lot Rehabilitation	$980,000	$980,000
Air Terminal Building		
Air Terminal Building Renovation	$650,000	$650,000
Net Construction Subtotal	**$15,760,000**	**$10,890,000**
Design and Pricing Allowance	$394,000	$272,000
Escalation Allowance	$788,000	$545,000
Total Construction Cost Including Contingencies	**$16,940,000**	**$11,710,000**
Engineering, Environmental & Project Management	**$2,541,000**	**$1,760,000**
10% Project Contingency	**$1,948,000**	**$1,347,000**
Ground Support Equipment (GSE)		
De-icing Vehicle	$120,000	$120,000
Air Stairs	$60,000	
Belt Loader	$75,000	$75,000
Baggage Carts	$9,000	$9,000
Baggage Tow Vehicle	$35,000	$35,000
GSE Subtotal	**$299,000**	**$239,000**
Project Total Cost Estimate (ROM)	**$21,731,000**	**$15,112,000**



LPS AVIA CONSULTING
One Antares Drive, Suite 250, Ottawa, ON, Canada K2E 8C4
www.lpsaviation.ca

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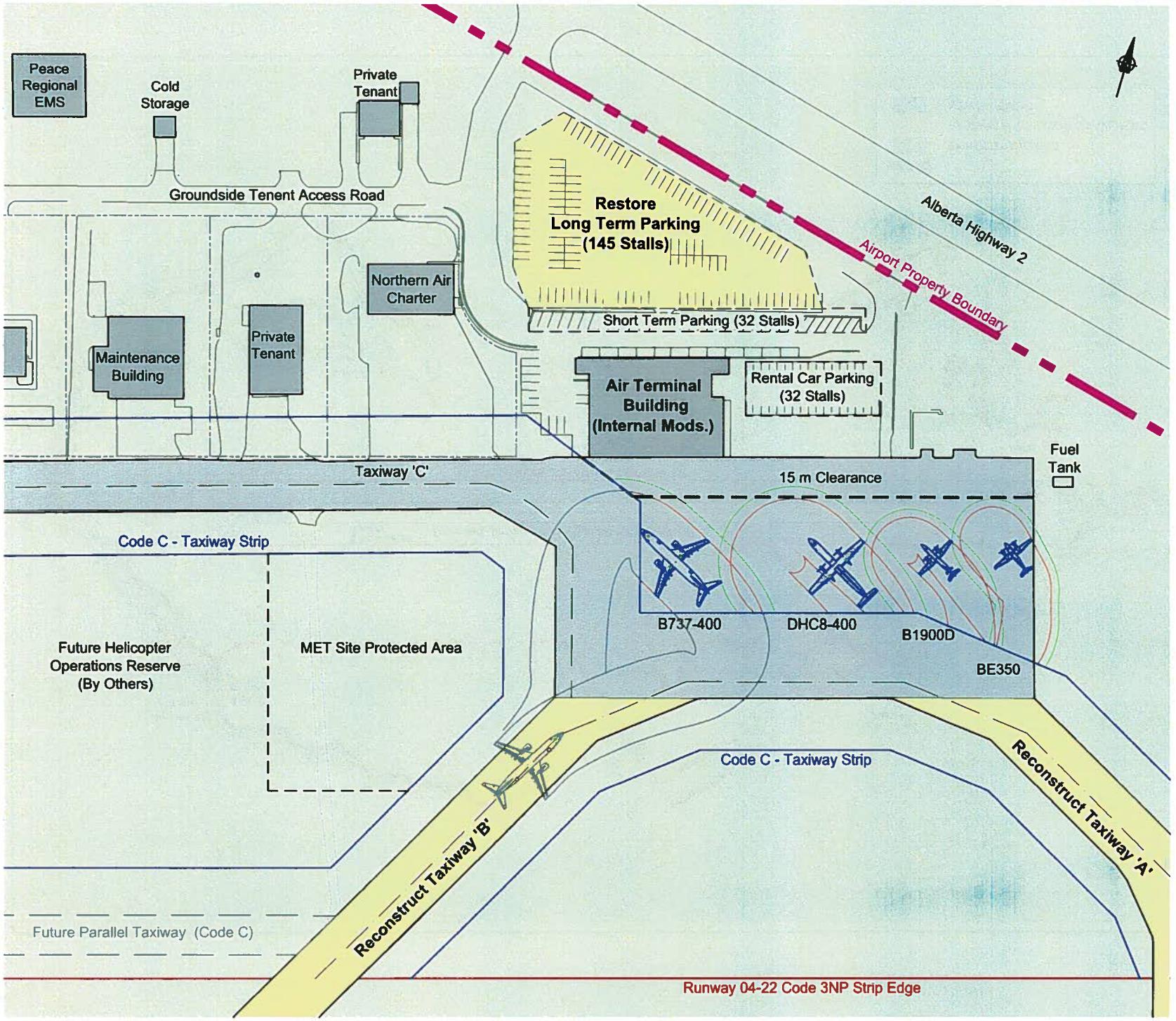
Notes

1. Preliminary
2. All dimensions approximate

Figure No.	5-1
Drawn By	EDH
Approved By	EGL
Date	AUGUST 2, 2013
Scale	NTS
Filename	LPS PR Airport.dwg



LPS AVIA CONSULTING
One Antares Drive, Suite 250, Ottawa, ON, Canada K2E 8C4
www.lpsaviation.ca

Client

Shell Canada

Carmon Creek Project

Title

Peace River Airport

Airport Assessment and Gap Report

Core Area Development Plan

Notes

1. Preliminary
2. All dimensions approximate

Restore/Reconsturct Existing Pavement

Figure No.	5-2
Drawn By	EDH
Approved By	EGL
Date	AUGUST 2, 2013
Scale	NTS
Filename	LPS PR Airport.dwg

6 Conclusions and Recommendations

6.1 Conclusions

- The airport can be expanded to meet the air transportation requirements of the Carmon Creek Project.
- The runway is capable of extension to a necessary length of 5,900' for B737-400 and Dash8-Q400 operations.
- The main apron can accommodate the projected level of aircraft traffic.
- The airport experiences very good aviation weather conditions and no additional navigation aids are required to meet the airport availability, or air service reliability requirements of the Carmon Creek Project.
- The existing air terminal building can be internally reconfigured to increase passenger capacity to a level suitable to support increased scheduled charter traffic and existing traffic.
- The proposed modifications will not add substantially to the long-term operating cost of the airport, which will be the responsibility of the Town of Peace River.
- The proposed airport expansion identified herein will not significantly impact current airport operations, if effectively staged.
- The development plan herein will relieve the Town of Peace River of responsibility for restoring the airport's aged infrastructure.

6.2 Recommendations

It is recommended that the Development Plan defined herein be used to guide the restoration and upgrading of Peace River Airport to support increased aircraft and passenger activity generated by the Carmon Creek Project.

Appendix A – Airport Climatology Study

LPS AVIA CONSULTING

Airport Climatological Study

Peace River Airport

Prepared for:

Mr. Neil Larsen
Aviation Contracts Manager
Upstream Americas, Onshore Logistics
Shell Canada Limited
400 – 4th Avenue S.W.
P.O. Box 100, Station M
Calgary, AB T2P 2H5

August 2, 2013

Submitted by:

Lou Ranahan
LPS Aviation Meteorologist

LPS Aviation Inc.
One Antares Drive, Suite 250
Ottawa, Ontario
CANADA K2E 8C4

Tel: (613) 226-6050 Fax: (613) 226-5236
e-mail: info@lpsaviation.ca
Web site: www.lpsaviation.ca

Executive Summary

This climatological study is a comprehensive analysis of thirty years of hourly aviation weather reports from the Peace River Airport. The analysis includes the calculation of frequencies of parameters such as ceiling and visibility categories, surface winds including cross winds on the main runway, and various phenomena that could be hazardous to aviation, such as freezing precipitation or thunderstorms.

This report includes details on the Peace River Airport, the methodology used to complete the analysis, the results of the analysis and a summary of the findings.

The Peace River Airport is located in Northwest Alberta approximately 480 km Northwest of Edmonton. The Peace River flows through the region northward into the Mackenzie River. The Airport is located on the plateau approximately 800 feet above the town site in the river valley. It has one main runway oriented 04-22 and is 5000 feet long.

There were 265,230 hours of data analyzed for this study. Percent frequencies were calculated for three categories of ceilings and visibilities:

- Below VFR (or IFR) – Ceilings and/or visibilities below 1000 feet and/or 3 miles;
- Below Non-Precision Approach Limit - Ceilings and/or visibilities below 500 feet and/or 1.5 miles;
- Below IFR - Ceilings and/or visibilities below 200 feet and/or 1/2 mile.

Generally, the aviation weather regime at the Peace River Airport is excellent. The weather averages 94% VFR or better on a year round basis. The month of November is an exception, where Below VFR weather is reported in the early-mid morning on an average of 18% of the time. The winter months are somewhat better, with just above 10% of the time recording Below VFR weather. Below Non-Precision Approach weather averages 3% year round and Below IFR ceilings and visibilities average 1%. During the six months April through September, Below VFR weather is rare at 2 to 4% of the time. During the daytime in these months, Below VFR weather is nearly non-existent.

By time of day, the lowest weather occurs in the early morning 0700-1000 LST, and the best weather occurs in the late afternoon, with slight variations from season to season.

Surface winds were analyzed for direction and speed of the mean wind observed on the hour. The frequency of higher gusts was also assessed. The wind regime is fairly light, with only 0.1% of the winds 25 knots or above. Crosswind components of the observed winds were also calculated. The crosswind limit of 25 knots was selected as representing the limit for the Boeing 737-400 aircraft. There were no statistically significant reports of crosswinds 25 knots or more in the thirty years of analysis. Wind gusts to 25 knots or more were reported 1% of the time.

Lastly, potential aviation weather hazards were assessed, including freezing precipitation, thunderstorms, and heavy snow and/or blowing snow. There were 376 occurrences of freezing precipitation in the thirty year record. This averages approximately 12 hours per year, and it was noted that the largest part of these occurrences were recorded in November. The frequency of freezing precipitation is considerably lower than points further south. Thunderstorms were fairly common in July, and less so in June and August. Approximately 20 thunderstorm hours are reported at the Airport each year, with half of these in July. Heavy snow and/or blowing snow are relatively rare. There is only an average of one snowfall per year of 10 cm or more accumulation. Therefore one would not expect much in the way of intense snow or blowing snow that would severely restrict visibility. The record showed an average of one hour per month in December and January where heavy snow/blowing snow was recorded.

As might be expected from the foregoing, airport availability with respect to weather is excellent, averaging 94% through the year on the basis of VFR operations, 97% through the year below Non-Precision approach limits, and 99% for IFR equipped aircraft. The month of November is the only exception when VFR availability drops to 82% in the early morning and averages 86% for the month, and IFR availability averages 96.7% for the month.

Table of Contents

List of Figures

List of Tables

1 Introduction

1.1 Climatological Study

This climatological study is a comprehensive analysis of thirty years of hourly aviation weather reports from the Peace River Airport. The analysis includes the calculation of frequencies of parameters such as ceiling and visibility categories, surface winds including cross winds on the main runway, and various phenomena that could be hazardous to aviation, such as freezing precipitation or thunderstorms.

The following chapters include details on the Peace River Airport, the methodology used to complete the analysis, the results of the analysis and a summary of the findings.

1.2 Peace River Region of Alberta

The Peace River Region is located in Northwest Alberta approximately 480 km Northwest of Edmonton. The Peace River flows through the region northward into the Mackenzie River. The Mackenzie Highway passes through Peace River connecting Edmonton with the Northwest Territories. The Peace River valley is approximately 800 feet below the surrounding terrain, and at the town of Peace River, is oriented North-South. The Peace River Airport is located on the plateau above the town. The climate of the region is a cold and relatively dry continental regime, with long summer days and long winter nights due to its northern latitude of 56 Deg. North.

Figure 1-1 – Map of Peace River Region

2 Peace River Airport

2.1 Airport Capabilities

The Peace River Airport is at an elevation of 1,867 feet ASL, and has one main runway that is oriented 04/22 and is 5,000 feet long. The Magnetic Variation is 20 Deg. East, which would give the runway an orientation of 060/240 Degrees True. Figure 2-1 is a photo of the Peace River Airport, and Figure 2-2 is a photo the approach to Runway 22.

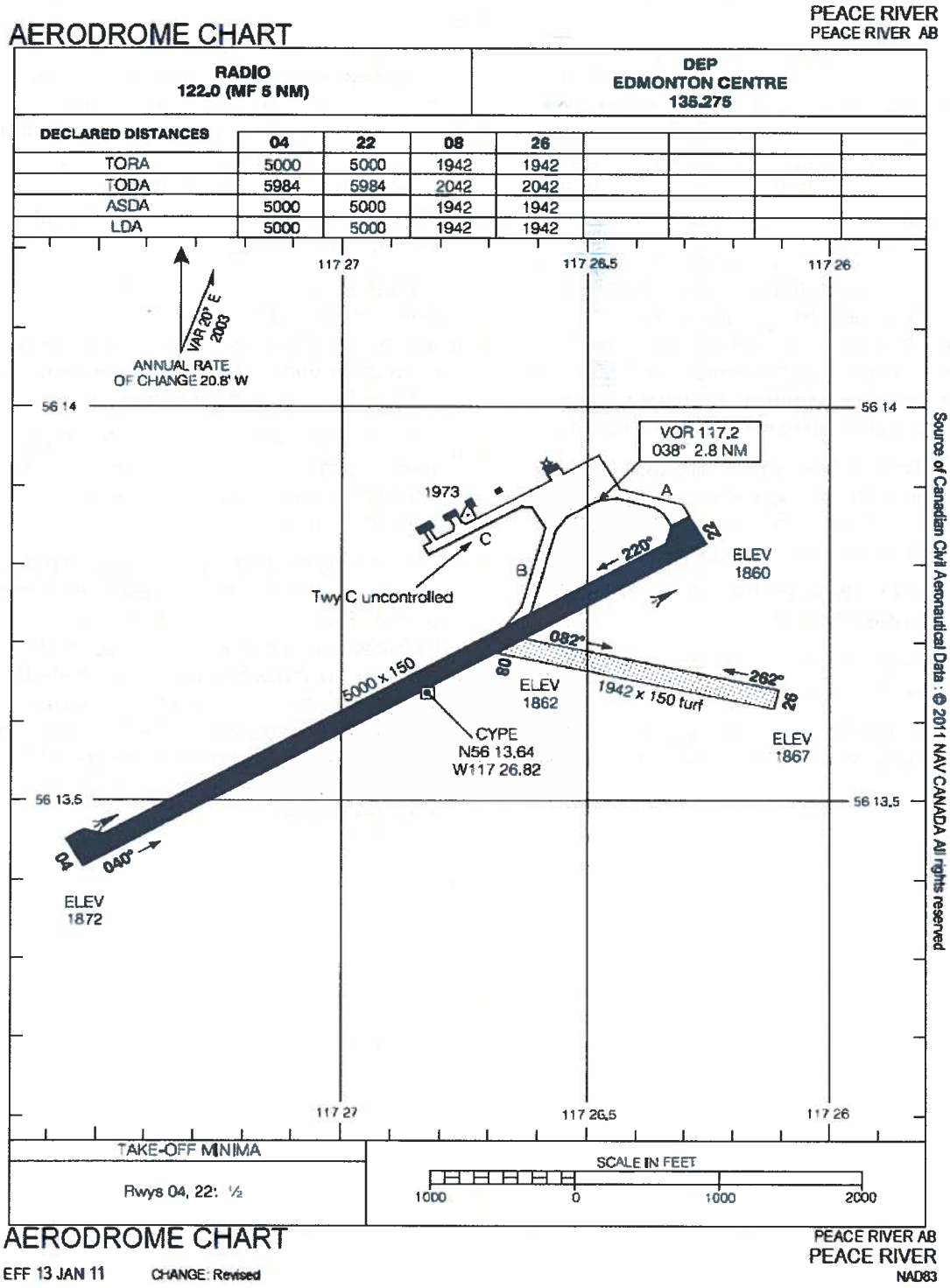
Figure 2-1 – Photo of Peace River Airport

2.2 Airport Diagram

Figure 2-3 is an Airport Chart from the NAV CANADA Canadian Airport Charts publication.

Figure 2-2 – Peace River Airport – Runway 22

Figure 2-3 – Aerodrome Chart for Peace River Airport



3 Methodology

Meteorological data was obtained from Environment Canada and the U.S. National Climate Data Center for the Peace River Airport for the period January 1983 to June, 2013 from the hourly observations archived for this period. There were 265,230 reports at hourly intervals analyzed for the study. A standard climatological period is thirty years.

Ceilings and visibilities were analyzed by time of day in order to correlate weather with the main operating periods. Most elements were also analyzed by month in order to assess the limitations of climatological conditions through various seasons of the year. An airport availability calculation was made on the basis of ceilings and visibilities below specific categories.

Tables and customized graphs were used to illustrate the frequencies of occurrence of ceilings and visibilities, and wind rose diagrams to illustrate the frequency and intensity of crosswinds.

In this report, there are three ceiling and visibility categories used. They include:

- Below VFR (or IFR) – Ceilings and/or visibilities below 1000 feet and/or 3 miles;
- Below Non-Precision Approach Limit - Ceilings and/or visibilities below 500 feet and/or 1.5 miles;
- Below IFR - Ceilings and/or visibilities below 200 feet and/or 1/2 mile.

Surface winds were extracted from the total data file by creating a separate file of surface wind speed and direction. This file was then analyzed using specialized software to categorize the wind speeds and direction. The categories of wind direction and speed were then reformatted and processed by software to produce a wind rose chart and tables of wind speed and direction categories.

Crosswinds on Runway 04-22 were calculated to determine the percent frequency of surface winds with components perpendicular to the runway that exceeded 25 knots, which is stated as the crosswind limitation threshold for B737-400 aircraft.

Lastly, the data was analyzed for the frequency of specific potential weather hazards to aviation, including freezing precipitation, thunderstorms, and moderate to heavy snow and blowing snow.

The presentation of charts and tables and statistics provides an assessment of the operational availability of the Peace River aerodrome. Availability is calculated by establishing the ratio of the non-occurrence of categorical events as a percentage of all observations. For example, the aerodrome is available for IFR operations for all hours except those where the ceiling and/or visibility are below IFR limits or for all hours where the runway is not affected by excessive crosswinds.

4 Analysis

4.1 Ceiling and Visibility

In this report, there are three ceiling and visibility categories used. They include:

- Below VFR (or IFR) – Ceilings and/or visibilities below 1000 feet and/or 3 miles;
- Below Non-Precision Approach Limit - Ceilings and/or visibilities below 500 feet and/or 1.5 miles;
- Below IFR - Ceilings and/or visibilities below 200 feet and/or 1/2 mile.

The 265,230 hours of data were analyzed by month and by time of day in order to assess the percent frequency of occurrence of the three categories of ceilings and visibilities.

Charts and tables were prepared to illustrate the results. Figure 4-1 presents the results of the analysis for the three categories by month.

There is a strong maximum frequency of lower ceilings and visibilities in November, with Below VFR weather peaking at 14.11%, Below Non Precision weather at 7.61%, and Below IFR weather at 3.28%. There is a broad minimum, i.e. good weather, stretching from May to September.

The same results are presented in tabular form as Table 4-1.

Figure 4-1 – Percent Frequency of Occurrence by Month - Ceiling and Visibility

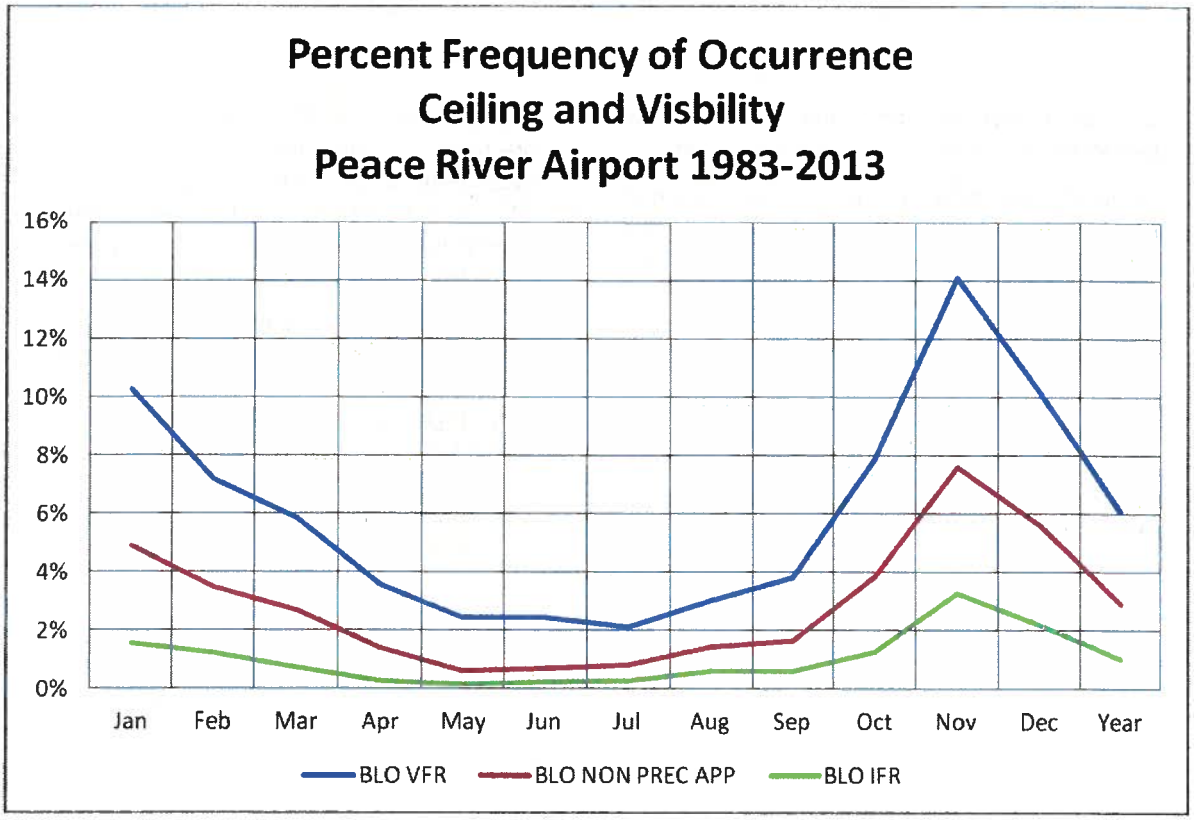


Table 4-1 – Percent Frequency of Occurrence by Month - Ceiling and Visibility

Month	BLO VFR	BLO NON PREC APP	BLO IFR
Jan	10.28%	4.92%	1.60%
Feb	7.18%	3.48%	1.24%
Mar	5.85%	2.72%	0.75%
Apr	3.58%	1.41%	0.29%
May	2.44%	0.63%	0.17%
Jun	2.45%	0.70%	0.24%
Jul	2.11%	0.85%	0.28%
Aug	3.04%	1.47%	0.62%
Sep	3.82%	1.65%	0.62%
Oct	7.88%	3.85%	1.28%
Nov	14.11%	7.61%	3.28%
Dec	10.19%	5.60%	2.20%
Year	6.08%	2.91%	1.05%

An analysis was also conducted on the percent frequencies by time of day for each monthly result.

Two months were selected to represent the maximum and minimum frequencies of lower ceilings and visibilities. The frequencies by time of day for November and May are presented in Figure 4-2. The same results are presented in tabular form in Table 4-2, and for the whole year in Tables A-1 to A-3.

The lowest ceilings and visibilities are most frequent mid-morning in November, at approximately 0900 LST. Below VFR weather peaks at just under 18%, below Non Precision at just over 2%, and Below IFR weather just under 5%.

During November, the lower ceilings that occur frequently in the morning reach a minimum occurrence in the evening at approximately 1900 LST. In November, Below IFR weather drops most significantly of the three categories, dropping from 5% in the early morning to less than 2% by early evening.

In May, Below VFR weather drops from a peak of nearly 6% at 0800 LST to less than 1% by early evening. Below Non Precision weather drops from a peak of just over 2% at 0800 LST to less than 0.5% by early evening. Below IFR weather never reaches 1% at any point during the day, and drops to nearly 0% by early evening

Figure 4-2 – Percent Frequency of Occurrence by Time of Day - Ceiling and Visibility

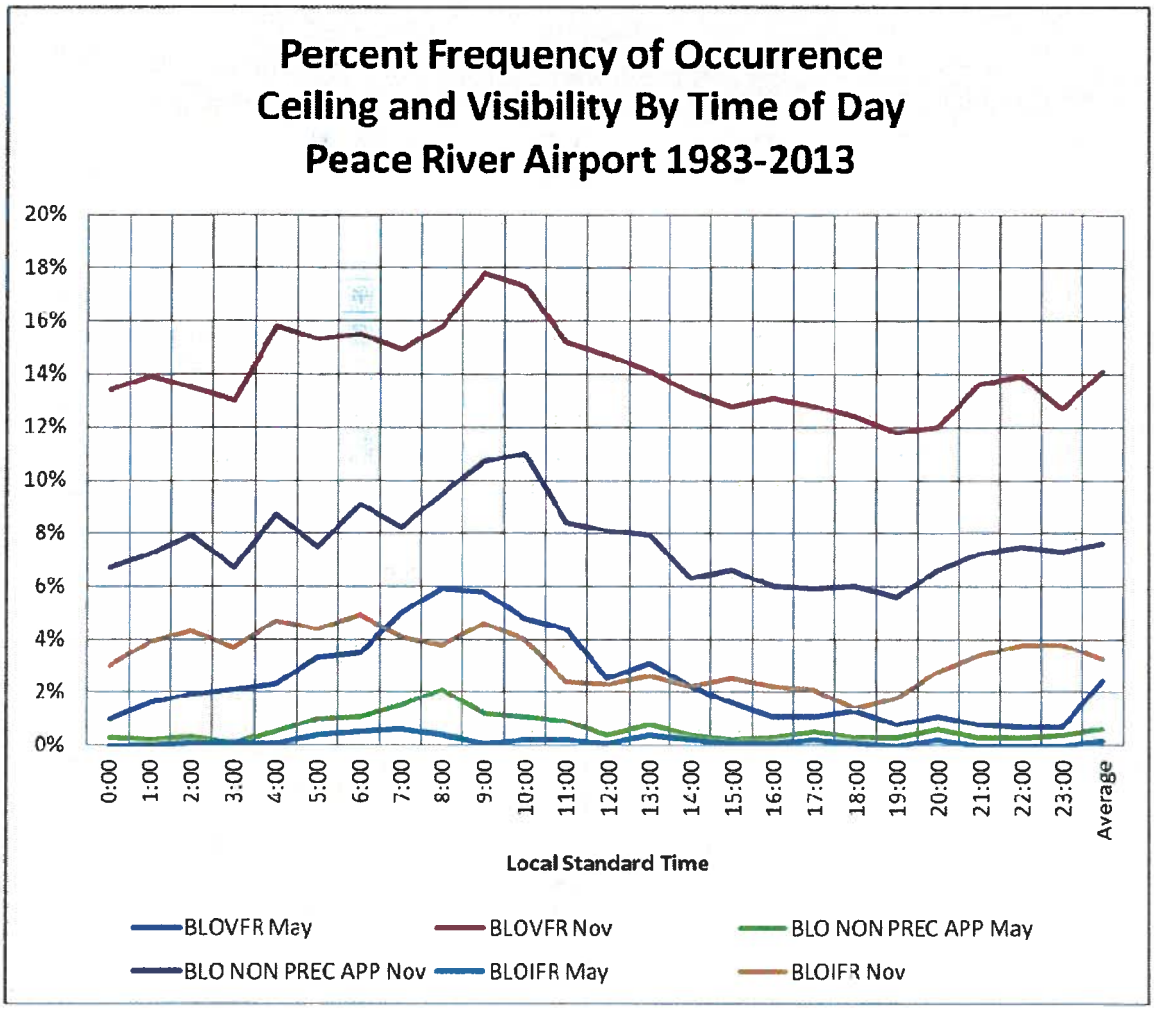


Table 4-2 – Percent Frequency of Occurrence by Time of Day - Ceiling and Visibility

HOUR(LST)	BLO VFR May	BLO VFR Nov	BLO NON PREC APP May	BLO NON PREC APP Nov	BLO IFR May	BLO IFR Nov
0:00	1.00%	13.40%	0.30%	6.70%	0.00%	3.00%
1:00	1.60%	13.90%	0.20%	7.20%	0.00%	3.90%
2:00	1.90%	13.50%	0.30%	7.90%	0.10%	4.30%
3:00	2.10%	13.00%	0.10%	6.70%	0.10%	3.70%
4:00	2.30%	15.80%	0.50%	8.70%	0.10%	4.70%
5:00	3.30%	15.30%	1.00%	7.50%	0.40%	4.40%
6:00	3.50%	15.50%	1.10%	9.10%	0.50%	4.90%
7:00	5.00%	14.90%	1.50%	8.20%	0.60%	4.10%
8:00	5.90%	15.80%	2.10%	9.50%	0.40%	3.80%
9:00	5.80%	17.80%	1.20%	10.70%	0.10%	4.60%
10:00	4.80%	17.30%	1.10%	11.00%	0.20%	4.00%
11:00	4.40%	15.20%	0.90%	8.40%	0.20%	2.40%
12:00	2.50%	14.70%	0.40%	8.10%	0.10%	2.30%
13:00	3.10%	14.10%	0.80%	7.90%	0.40%	2.60%
14:00	2.20%	13.30%	0.40%	6.30%	0.20%	2.20%
15:00	1.60%	12.80%	0.20%	6.60%	0.10%	2.50%
16:00	1.10%	13.10%	0.30%	6.00%	0.10%	2.20%
17:00	1.10%	12.80%	0.50%	5.90%	0.20%	2.10%
18:00	1.30%	12.40%	0.30%	6.00%	0.10%	1.40%
19:00	0.80%	11.80%	0.30%	5.60%	0.00%	1.80%
20:00	1.10%	12.00%	0.60%	6.60%	0.20%	2.80%
21:00	0.80%	13.60%	0.30%	7.20%	0.00%	3.40%
22:00	0.70%	13.90%	0.30%	7.50%	0.00%	3.80%
23:00	0.70%	12.70%	0.40%	7.30%	0.00%	3.80%
Average	2.44%	14.11%	0.63%	7.61%	0.17%	3.28%

4.2 Surface Winds

Hourly surface winds were analyzed for the period January 1983 through June 2013. The hourly data consisted of two minute mean winds observed on the hour and did not reflect gusts, which can be momentarily 40 to 50% stronger. Surface winds were analyzed in degrees True and in knots. Software was used to create wind roses and charts, as well as tables of percent frequencies by direction and speed.

Figure 4-3 is a wind rose chart for the annual winds over the thirty year period. A line representing the runway orientation is overlaid on to the wind rose chart. The wind rose chart contains the colour legend for the various 5 knot wind speed categories. The winds were also analyzed by season, with December-January-February representing Winter; March-April-May representing Spring; June-July-August representing Summer, and September-October-November representing Fall. Figure 4-4 depicts wind roses for the four seasons.

Figure 4-3 – Wind Rose Chart (Annual) for Peace River Airport 1983-2013

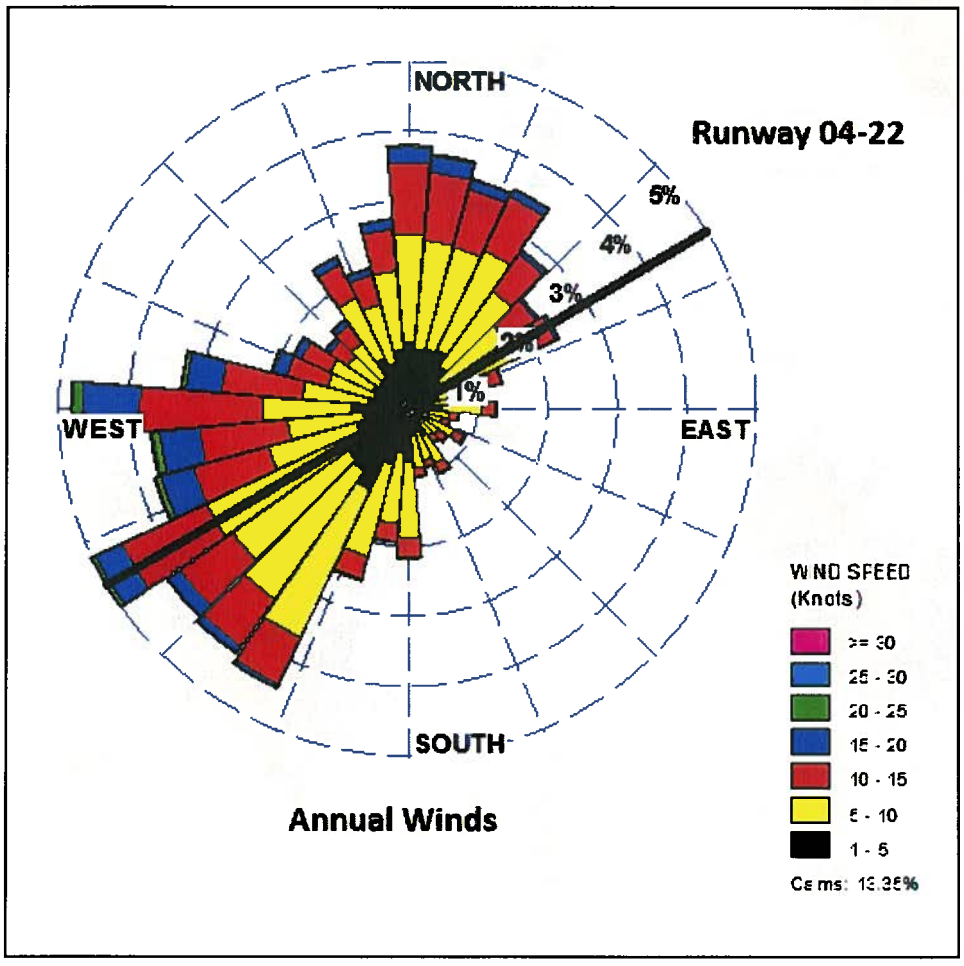
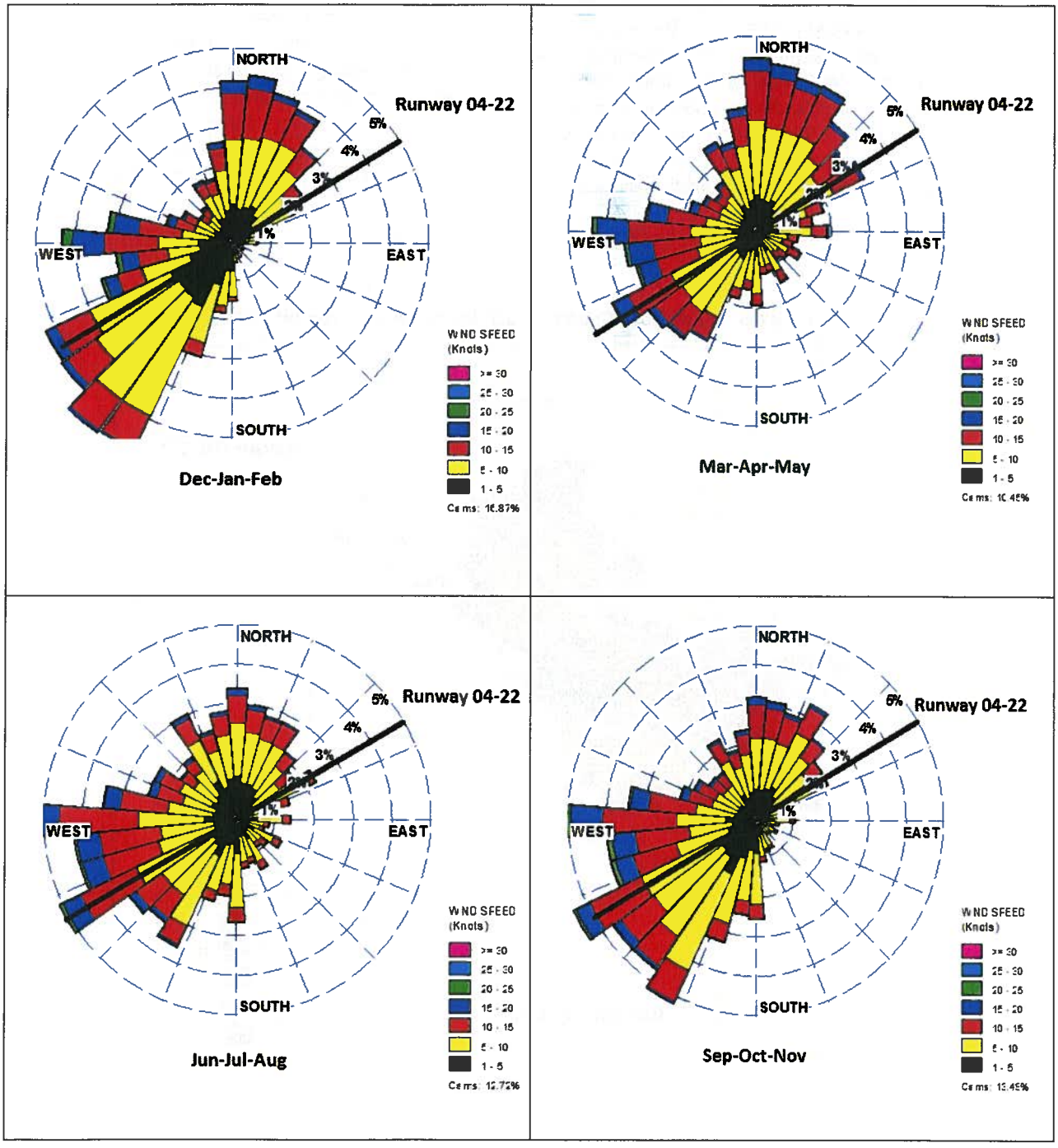


Figure 4-4 – Wind Rose Chart by Season Peace River Airport 1983-2013



On the wind rose chart depicting annual winds, the analysis shows that the winds are reasonably aligned with the runway. There are two maxima that are 30-40 degrees across the runway, one from the West and one from the North. The crosswind components of neither would be excessive, based on the observed wind speeds. There are few crosswinds that are perpendicular to the runway.

Table 4-3 presents the same results in tabular form, and provides an opportunity to calculate and demonstrate visually the extent of crosswinds. To illustrate how the frequency of crosswinds is calculated, the runways are outlined in green, and surface winds perpendicular to the runway are outlined in orange. Cells coloured red would represent percent frequencies of crosswinds greater than 25 knots. As can be easily seen from the table, there have been virtually no significant crosswinds observed greater than 25 knots. Figure 4-5 is a graph of wind speed categories, and there are only 0.1% of winds 25 knots or more. There were 2,513 hours, or 1% of the time, where wind gusts were recorded 25 knots or more. There were just 52 hours with gusts of 40 knots or more.

Tables A-3 through A-6 are included in Appendix A to include the seasonal wind variations in the same manner as is presented in Table 4-3.

Figure 4-5 – Wind Speed Frequency Chart – Annual Winds– Peace River Airport 1983-2013

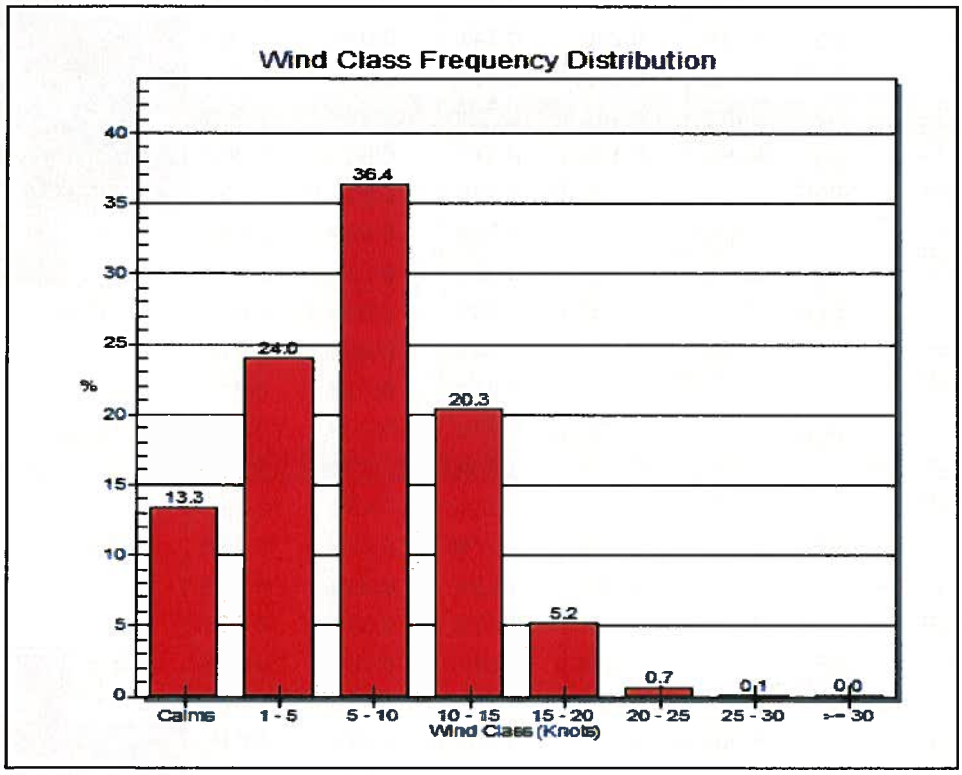


Table 4-3 – Percent Frequency of Wind Speed and Direction – Annual – Peace River Airport 1983-2013

Wind Direction	1-5kt	5-10kt	10-15kt	15-20kt	20-25kt	25-30kt	>30kt	Total
355 - 5	0.97%	1.55%	1.02%	0.24%	0.03%	0.00%	0.00%	3.80%
5 - 15	0.86%	1.57%	0.99%	0.23%	0.02%	0.00%	0.00%	3.67%
15 - 25	0.90%	1.52%	0.86%	0.15%	0.01%	0.00%	0.00%	3.44%
25 - 35	0.95%	1.57%	0.86%	0.13%	0.01%	0.00%	0.00%	3.52%
35 - 45	0.76%	1.31%	0.67%	0.08%	0.00%	0.00%	0.00%	2.81%
45 - 55	0.58%	1.12%	0.52%	0.05%	0.00%	0.00%	0.00%	2.28%
55 - 65	0.66%	1.19%	0.48%	0.05%	0.00%	0.00%	0.00%	2.39%
65 - 75	0.45%	0.69%	0.24%	0.02%	0.00%	0.00%	0.00%	1.40%
75 - 85	0.37%	0.47%	0.17%	0.02%	0.00%	0.00%	0.00%	1.03%
85 - 95	0.49%	0.55%	0.20%	0.03%	0.00%	0.00%	0.00%	1.27%
95 - 105	0.30%	0.30%	0.13%	0.02%	0.00%	0.00%	0.00%	0.74%
105 - 115	0.22%	0.27%	0.12%	0.02%	0.00%	0.00%	0.00%	0.63%
115 - 125	0.35%	0.38%	0.16%	0.03%	0.00%	0.00%	0.00%	0.92%
125 - 135	0.25%	0.29%	0.14%	0.02%	0.00%	0.00%	0.00%	0.70%
135 - 145	0.25%	0.24%	0.11%	0.02%	0.00%	0.00%	0.00%	0.63%
145 - 155	0.46%	0.42%	0.15%	0.02%	0.00%	0.00%	0.00%	1.06%
155 - 165	0.38%	0.41%	0.11%	0.01%	0.00%	0.00%	0.00%	0.90%
165 - 175	0.40%	0.47%	0.12%	0.01%	0.00%	0.00%	0.00%	1.01%
175 - 185	0.78%	1.08%	0.28%	0.02%	0.00%	0.00%	0.00%	2.16%
185 - 195	0.67%	1.00%	0.26%	0.01%	0.00%	0.00%	0.00%	1.95%
195 - 205	0.85%	1.36%	0.34%	0.03%	0.00%	0.00%	0.00%	2.58%
205 - 215	1.30%	2.34%	0.74%	0.06%	0.01%	0.00%	0.00%	4.45%
215 - 225	1.12%	2.23%	0.84%	0.11%	0.01%	0.00%	0.00%	4.31%
225 - 235	1.07%	2.02%	0.92%	0.20%	0.02%	0.00%	0.00%	4.24%
235 - 245	1.19%	2.01%	1.33%	0.41%	0.06%	0.01%	0.00%	5.00%
245 - 255	0.78%	1.30%	1.11%	0.47%	0.08%	0.01%	0.00%	3.77%
255 - 265	0.66%	1.08%	1.27%	0.57%	0.10%	0.01%	0.00%	3.70%
265 - 275	0.81%	1.28%	1.75%	0.81%	0.14%	0.02%	0.00%	4.81%
275 - 285	0.58%	0.95%	1.17%	0.51%	0.06%	0.01%	0.00%	3.28%
285 - 295	0.52%	0.68%	0.61%	0.20%	0.03%	0.00%	0.00%	2.05%
295 - 305	0.58%	0.66%	0.45%	0.12%	0.02%	0.00%	0.00%	1.84%
305 - 315	0.53%	0.53%	0.31%	0.08%	0.01%	0.00%	0.00%	1.47%
315 - 325	0.57%	0.58%	0.32%	0.09%	0.01%	0.00%	0.00%	1.58%
325 - 335	0.82%	0.94%	0.53%	0.12%	0.01%	0.00%	0.00%	2.43%
335 - 345	0.69%	0.87%	0.45%	0.09%	0.01%	0.00%	0.00%	2.11%
345 - 355	0.86%	1.13%	0.61%	0.14%	0.01%	0.00%	0.00%	2.75%
Sub-Total:	23.97%	36.36%	20.35%	5.20%	0.67%	0.08%	0.02%	86.65%
Calms:	13.35%							

4.3 Weather Hazards

The hourly data was further analyzed to determine the frequency of potential weather hazards to aviation. These weather elements include freezing precipitation, thunderstorms, heavy snow and blowing snow.

Freezing precipitation includes freezing rain and freezing drizzle, both of which contaminate wing surfaces, ramps and runways.

Thunderstorms produce lightning, wind shears, gusty surface winds, and in some cases, heavy rain and possibly hail. The presence of lightning is a hazard to refuelling operations in particular.

Heavy snow (intensity) and blowing snow dramatically reduces visibility and contaminates runway surfaces, possibly even closing runways.

Table 4-4 lists the frequency of weather hazards by month for the Peace River Airport. One occurrence is a report in one hourly sequence. In one month of thirty days, there would be the potential for 720 occurrences. In thirty years, there would be the potential for 720 x 30 = 21,600 occurrences. A total of 30 occurrences over 30 years would represent an average of one event per year in that month.

Freezing precipitation is relatively rare at the Peace River Airport. It is most common in November however even then it is only reported about four or five hours per month over the thirty year period.

Thunderstorms are more common, with July recording 236 hours of thunderstorms over the 30 year period. June and August also report an average of four thunderstorm hours each month.

Heavy snow and/or blowing snow was reported 161 times over the thirty year period. December and January reported the most frequent occurrences, averaging one or two hours of heavy snow/blowing snow each month. Heavy snow does not refer to a long period of light snow, but rather a report of intense snow and/or blowing snow restricting visibility to ½ mile or less.

Table 4-4 – Frequency of Potential Weather Hazards Peace River Airport 1983-2013

Element/ Month	Freezing Precipitation	Thunder storms	Heavy Snow/ Blowing Snow
Jan	72		38
Feb	38		19
Mar	35		25
Apr	2	7	11
May		30	1
Jun		140	
Jul		236	
Aug		123	
Sep		14	2
Oct	27		24
Nov	141		14
Dec	61		27
Year	376	550	161

4.4 Availability

Availability is calculated by establishing the ratio of the non-occurrence of categorical events as a percentage of all observations. For example, the aerodrome is available for IFR operations for all hours except those where the ceiling and/or visibility are below IFR limits or for all hours where the runway is not affected by excessive crosswinds.

Availability in terms of ceiling and visibility averages 93.92% for VFR equipped aircraft on a year round basis. This figure rises to 98.89% in July and drops significantly to 85.89% in November. By time of day, the availability of the aerodrome for VFR operations peaks at approximately 99% May through August in the late afternoon, but drops as low as 82% in the early morning in November.

Availability for Non-Precision Approach operations (as low as 500 feet and 1.5 miles) averages 97.09% for the year. It peaks in May at 97.37% and drops to 92.39% in November. By time of day, the availability in this ceiling/visibility category reaches a high of 100% in the early afternoon of July, and drops to 89% mid-mornings in November.

Availability for IFR operations averages 98.95% for the year, peaking at 99.83% in May and dropping to 96.72% in November. By time of day, the availability is highest mid-day in June, July and August at 100%, and drops to 95.1% in the early mornings of November.

These availability statistics are somewhat better than most airports in Canada. For example, VFR availability at Fort Nelson, BC averages 92.5% and at Yellowknife it averages 91.6%. The excellent weather at mid-day at Peace River with 1-2% of below VFR weather runs from April through September, and during the same period at mid-day, Below IFR weather is nearly non-existent.

The next parameter to be examined as to impact on availability of the Peace River aerodrome is surface winds. It was found that the wind regime at Peace River Airport is relatively benign, with only 0.02% of the hourly surface winds (two minute mean) were greater than 30 knots. It should be noted that wind gusts may be 50% stronger than mean winds observed on the hour. Less than one percent of the winds were greater than 20 knots. Crosswinds are significant in that there are crosswind limitations published for each aircraft type. An analysis was conducted to determine the frequency of crosswind components perpendicular to Runway 04-22 for a crosswind limitation of 25 knots, using a Boeing 737-400 as an example. It was found there were no statistically significant crosswinds of this magnitude at the Peace River Airport during the 30 years of hourly records examined.

Lastly, potential weather hazards to aviation were examined. Although aircraft operations may still be possible under conditions of hazardous weather, they are likely to be impeded. At the Peace River Airport, the aerodrome availability was found to be unlikely affected in a significant way by weather hazards. Compared to other stations further south, freezing precipitation is relatively rare, occurring only a few hours per month on the average during the winter. Thunderstorms are common during July, with 236 hours recorded over the 30 years. This would mean 8 hours of thunderstorms per month in July would be reported at the airport, or approximately 1% of the time. Intense heavy snow and/or blowing snow occurs mostly in December and January, on an average of one or two hours per month. In general, then, weather hazards have little impact on the availability of the Peace River Airport, on the basis of a long term analysis.

In summary, the availability of the Peace River Airport is relatively high through the year, with the exception of November, where low ceilings and visibilities have a significant impact, particularly in the early-mid morning hours.

5 Summary and Conclusions

The Peace River Airport has one of the best aviation weather regimes in Canada. With the exception of November, where there is a relatively greater frequency of low ceilings and visibilities, the weather is favourable overall, with a wind regime oriented to the runway and relatively few weather hazards through the year.

For six months of the year, April through September, the weather at the Peace River Airport is VFR or better 96% to 98% of the time. At mid-day, during the summer months, Below VFR weather is non-existent.

November is an exception to the rule, where the early to mid morning is characterized by below VFR weather an average of 18% of the time, and Below IFR weather nearly 5% of the time. December and January are less impacted by low ceilings and visibilities, averaging just over 10% Below VFR and approximately 2% Below IFR.

The graphs and tables in this report provide more detail of frequencies of lower weather by month and by time of day.

The wind regime at the Peace River Airport varies substantially in terms of direction. A high percentage of the winds are oriented across the runway, although this is compensated for in that the winds are relatively light. There are only 0.1% of the winds where the two minute mean is 25 knots or more, the crosswind component limit for a Boeing 737-400. Recorded wind gusts exceed 25 knots or more 1% of the time. The crosswind analysis for the 25 knot limit indicated that the percent frequency of occurrence of crosswind components 25 knots or more for a mean wind is non-existent.

An analysis of weather hazards was undertaken including assessing the frequency of freezing precipitation, thunderstorms and heavy snow/blowing snow. Compared to airports further south, the incidence of freezing precipitation at the Peace River Airport is low. On average, there were about 12 hours of freezing precipitation per winter, the largest part of these occurring in November. About half were incidents of freezing drizzle and the remainder were freezing rain. An airport in Ontario might have four times the frequency of freezing precipitation in any given winter compared to the Peace River Airport.

However, thunderstorms are reasonably frequent during the summer months. There is an average of about 8 hours of thunderstorms at the airport in July, with half that frequency during the other summer months.

Heavy snow and/or blowing snow are actually fairly rare at the Peace River Airport. The Climate Normals published by Environment Canada show there is only an average of 1 day per year where snowfall equals or exceeds 10 cm and only 7 days per year where the snowfall is 5 cm or more. The analysis of hourly reports showed a total of 161 hours where heavy snow was reported and/or low visibility in blowing snow, an average of just 5 or 6 hours per winter.

Appendix A – Supplementary Tables

Table A-1 – Percent Frequency Below VFR Ceiling and Visibility by Month and by Time of Day

HOUR (LST)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
0:00	9.10%	6.90%	4.10%	2.60%	1.00%	0.80%	1.20%	1.50%	2.10%	6.30%	13.40%	10.20%	4.93%
1:00	8.80%	6.40%	3.80%	3.60%	1.60%	1.10%	1.80%	1.70%	2.30%	5.30%	13.90%	10.80%	5.09%
2:00	8.50%	6.40%	4.40%	4.00%	1.90%	1.40%	1.50%	1.70%	2.00%	6.10%	13.50%	11.30%	5.23%
3:00	9.70%	6.90%	4.70%	4.50%	2.10%	1.60%	2.10%	2.20%	3.80%	7.90%	13.00%	10.70%	5.77%
4:00	10.30%	7.20%	4.60%	4.60%	2.30%	3.10%	2.50%	3.70%	3.90%	8.60%	15.80%	10.80%	6.45%
5:00	10.50%	7.40%	5.80%	3.50%	3.30%	3.90%	4.50%	4.60%	5.00%	9.70%	15.30%	9.00%	6.88%
6:00	12.40%	9.20%	6.50%	5.60%	3.50%	5.80%	5.00%	7.50%	6.20%	10.20%	15.50%	9.70%	8.09%
7:00	12.00%	9.50%	8.80%	6.40%	5.00%	5.70%	5.20%	7.90%	8.70%	12.10%	14.90%	11.30%	8.96%
8:00	12.30%	10.00%	9.60%	6.00%	5.90%	6.40%	5.10%	7.60%	9.30%	14.00%	15.80%	11.00%	9.42%
9:00	15.60%	10.90%	9.90%	6.00%	5.80%	5.70%	4.60%	8.60%	7.90%	11.90%	17.80%	11.70%	9.70%
10:00	15.60%	11.70%	8.70%	5.90%	4.80%	4.20%	4.00%	5.70%	6.70%	12.20%	17.30%	12.10%	9.08%
11:00	13.70%	10.10%	7.50%	5.20%	4.40%	3.60%	3.10%	3.90%	6.70%	11.00%	15.20%	12.20%	8.05%
12:00	12.10%	9.50%	7.40%	3.80%	2.50%	2.50%	2.90%	2.60%	5.00%	9.70%	14.70%	12.80%	7.13%
13:00	11.80%	7.50%	6.20%	3.50%	3.10%	2.00%	1.40%	1.70%	2.90%	7.60%	14.10%	11.20%	6.08%
14:00	10.30%	7.20%	6.00%	2.40%	2.20%	1.40%	1.20%	1.40%	2.60%	7.40%	13.30%	10.80%	5.52%
15:00	8.80%	5.00%	5.50%	2.30%	1.60%	1.20%	1.00%	1.30%	1.70%	6.30%	12.80%	9.30%	4.73%
16:00	8.90%	4.40%	4.80%	2.40%	1.10%	0.70%	0.50%	1.10%	1.70%	5.80%	13.10%	10.70%	4.60%
17:00	8.60%	4.60%	4.10%	1.80%	1.10%	1.00%	0.30%	1.10%	2.20%	5.20%	12.80%	8.70%	4.29%
18:00	6.80%	5.50%	4.70%	1.90%	1.30%	0.90%	0.20%	0.90%	2.00%	5.20%	12.40%	9.40%	4.27%
19:00	7.80%	5.80%	5.80%	2.20%	0.80%	1.10%	0.20%	1.20%	1.80%	4.70%	11.80%	8.40%	4.30%
20:00	7.70%	4.30%	5.10%	1.90%	1.10%	1.40%	0.20%	1.30%	1.70%	5.00%	12.00%	7.30%	4.08%
21:00	8.40%	4.90%	4.30%	1.80%	0.80%	1.10%	0.80%	1.10%	2.00%	5.60%	13.60%	8.10%	4.38%
22:00	8.80%	5.70%	3.80%	1.70%	0.70%	1.20%	0.80%	1.40%	1.70%	5.50%	13.90%	8.50%	4.48%
23:00	8.10%	5.40%	4.20%	2.20%	0.70%	1.00%	0.60%	1.20%	1.80%	5.70%	12.70%	8.60%	4.35%
Average	10.28%	7.18%	5.85%	3.58%	2.44%	2.45%	2.11%	3.04%	3.82%	7.88%	14.11%	10.19%	6.08%

Table A-2 – Percent Frequency Below Non-Precision Appr. Ceiling and Visibility by Month and By Time of Day

HOUR (LST)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
0:00	3.80%	2.90%	1.80%	0.30%	0.30%	0.00%	0.30%	0.70%	0.60%	2.60%	6.70%	5.40%	2.12%
1:00	4.30%	2.60%	1.50%	1.00%	0.20%	0.10%	0.40%	0.50%	1.00%	1.90%	7.20%	5.90%	2.22%
2:00	4.40%	2.70%	1.90%	1.50%	0.30%	0.50%	1.00%	0.70%	0.70%	3.20%	7.90%	6.10%	2.58%
3:00	4.60%	3.80%	1.90%	1.30%	0.10%	0.30%	1.10%	1.10%	1.50%	4.10%	6.70%	5.40%	2.66%
4:00	4.70%	3.60%	1.60%	2.00%	0.50%	1.10%	1.70%	2.60%	2.40%	4.10%	8.70%	5.50%	3.21%
5:00	5.00%	4.00%	2.90%	1.60%	1.00%	1.30%	2.70%	3.10%	3.40%	5.20%	7.50%	5.40%	3.59%
6:00	5.90%	4.80%	2.70%	2.50%	1.10%	2.40%	3.10%	5.40%	4.30%	5.40%	9.10%	6.40%	4.43%
7:00	6.50%	5.20%	4.30%	2.20%	1.50%	2.60%	3.10%	5.40%	5.10%	6.40%	8.20%	6.50%	4.75%
8:00	7.20%	6.20%	4.80%	2.90%	2.10%	2.50%	2.70%	4.80%	5.30%	8.30%	9.50%	6.60%	5.24%
9:00	8.50%	6.30%	4.30%	2.60%	1.20%	1.90%	1.40%	5.00%	4.50%	7.00%	10.70%	6.40%	4.98%
10:00	8.50%	6.10%	3.40%	2.40%	1.10%	0.70%	1.00%	2.20%	3.00%	6.90%	11.00%	6.10%	4.37%
11:00	7.90%	5.40%	4.10%	2.30%	0.90%	0.30%	0.90%	1.50%	2.30%	5.70%	8.40%	6.60%	3.86%
12:00	5.70%	3.80%	3.50%	1.70%	0.40%	0.40%	0.10%	0.50%	0.90%	4.80%	8.10%	6.90%	3.07%
13:00	5.20%	3.30%	3.20%	1.20%	0.80%	0.40%	0.00%	0.30%	0.30%	3.00%	7.90%	5.90%	2.63%
14:00	4.40%	2.50%	3.40%	1.20%	0.40%	0.40%	0.30%	0.20%	1.00%	3.50%	6.30%	6.00%	2.47%
15:00	3.80%	2.30%	2.40%	1.00%	0.20%	0.20%	0.10%	0.00%	0.40%	2.80%	6.60%	5.10%	2.08%
16:00	3.80%	1.60%	2.30%	1.10%	0.30%	0.10%	0.10%	0.10%	0.30%	2.90%	6.00%	5.90%	2.04%
17:00	4.10%	2.30%	2.00%	0.60%	0.50%	0.20%	0.10%	0.10%	0.70%	2.40%	5.90%	5.10%	2.00%
18:00	2.90%	2.90%	2.60%	0.80%	0.30%	0.00%	0.10%	0.00%	0.40%	2.40%	6.00%	4.50%	1.91%
19:00	3.50%	2.20%	2.90%	0.90%	0.30%	0.20%	0.00%	0.00%	0.40%	1.40%	5.60%	3.90%	1.78%
20:00	3.40%	2.20%	2.50%	1.10%	0.60%	0.70%	0.10%	0.50%	0.20%	1.60%	6.60%	4.10%	1.97%
21:00	3.10%	1.90%	2.00%	0.80%	0.30%	0.10%	0.10%	0.10%	0.30%	2.30%	7.20%	4.40%	1.88%
22:00	3.80%	2.30%	1.50%	0.40%	0.30%	0.20%	0.00%	0.10%	0.30%	2.10%	7.50%	4.70%	1.93%
23:00	3.00%	2.50%	1.80%	0.50%	0.40%	0.10%	0.10%	0.30%	0.30%	2.30%	7.30%	5.50%	2.01%
Average	4.92%	3.48%	2.72%	1.41%	0.63%	0.70%	0.85%	1.47%	1.65%	3.85%	7.61%	5.60%	2.91%

Table A-3 – Percent Frequency Below IFR Ceiling and Visibility by Month and By Time of Day

HOUR (LST)	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Year
0:00	1.40%	1.30%	0.70%	0.10%	0.00%	0.00%	0.00%	0.30%	0.00%	0.90%	3.00%	2.00%	0.81%
1:00	1.50%	0.80%	0.70%	0.20%	0.00%	0.10%	0.30%	0.20%	0.20%	0.80%	3.90%	2.90%	0.97%
2:00	1.90%	0.80%	0.50%	0.40%	0.10%	0.00%	0.40%	0.20%	0.00%	1.50%	4.30%	2.80%	1.08%
3:00	1.90%	1.50%	0.80%	0.40%	0.10%	0.00%	0.20%	0.30%	0.80%	1.90%	3.70%	2.20%	1.15%
4:00	1.60%	1.10%	0.20%	0.40%	0.10%	0.60%	0.80%	1.30%	1.20%	1.80%	4.70%	2.30%	1.34%
5:00	2.20%	1.90%	0.90%	0.30%	0.40%	0.80%	0.90%	2.20%	1.80%	3.00%	4.40%	2.40%	1.77%
6:00	2.70%	2.40%	1.40%	0.70%	0.50%	1.20%	0.80%	2.70%	2.30%	2.40%	4.90%	2.50%	2.04%
7:00	2.60%	2.50%	1.90%	0.60%	0.60%	1.10%	1.10%	3.00%	2.90%	3.50%	4.10%	2.70%	2.22%
8:00	3.00%	2.50%	1.40%	0.40%	0.40%	0.60%	0.90%	2.30%	2.30%	3.60%	3.80%	2.70%	1.99%
9:00	3.60%	2.40%	1.60%	0.40%	0.10%	0.20%	0.80%	1.30%	1.40%	2.10%	4.60%	2.80%	1.78%
10:00	2.30%	2.00%	1.50%	0.60%	0.20%	0.40%	0.30%	0.20%	0.80%	1.80%	4.00%	2.70%	1.40%
11:00	2.40%	1.30%	0.90%	0.20%	0.20%	0.10%	0.00%	0.10%	0.20%	1.40%	2.40%	1.90%	0.93%
12:00	1.20%	1.30%	0.60%	0.20%	0.10%	0.10%	0.00%	0.10%	0.00%	1.10%	2.30%	2.20%	0.77%
13:00	0.90%	0.90%	0.30%	0.30%	0.40%	0.10%	0.00%	0.00%	0.00%	0.80%	2.60%	1.50%	0.65%
14:00	0.60%	0.90%	0.60%	0.20%	0.20%	0.10%	0.10%	0.10%	0.30%	0.60%	2.20%	1.90%	0.65%
15:00	0.40%	0.70%	0.60%	0.10%	0.10%	0.00%	0.00%	0.00%	0.10%	0.30%	2.50%	2.10%	0.58%
16:00	0.70%	0.50%	0.40%	0.30%	0.10%	0.00%	0.00%	0.00%	0.00%	0.30%	2.20%	1.80%	0.53%
17:00	0.50%	0.30%	0.20%	0.30%	0.20%	0.10%	0.00%	0.10%	0.30%	0.20%	2.10%	1.70%	0.50%
18:00	1.00%	0.10%	0.30%	0.20%	0.10%	0.00%	0.10%	0.00%	0.00%	0.20%	1.40%	1.50%	0.41%
19:00	1.10%	0.30%	0.40%	0.20%	0.00%	0.00%	0.00%	0.00%	0.00%	0.20%	1.80%	1.70%	0.48%
20:00	1.00%	0.50%	0.30%	0.20%	0.20%	0.20%	0.10%	0.30%	0.00%	0.20%	2.80%	1.80%	0.63%
21:00	1.10%	1.00%	0.40%	0.00%	0.00%	0.00%	0.00%	0.00%	0.10%	0.50%	3.40%	1.90%	0.70%
22:00	1.50%	1.40%	0.60%	0.00%	0.00%	0.10%	0.00%	0.00%	0.10%	0.80%	3.80%	2.50%	0.90%
23:00	1.30%	1.30%	0.80%	0.20%	0.00%	0.00%	0.00%	0.10%	0.10%	0.80%	3.80%	2.40%	0.90%
Average	1.60%	1.24%	0.75%	0.29%	0.17%	0.24%	0.28%	0.62%	0.62%	1.28%	3.28%	2.20%	1.05%

Table A-4 – Percent Frequency of Wind Speed and Direction – Winter – Peace River Airport 1983-2013

Wind Direction	1-5kt	5-10kt	10-15kt	15-20kt	20-25kt	25-30kt	>30kt	Total
355 - 5	0.99%	1.65%	1.19%	0.30%	0.04%	0.00%	0.00%	4.17%
5 - 15	0.88%	1.82%	1.28%	0.32%	0.03%	0.00%	0.00%	4.33%
15 - 25	0.96%	1.85%	1.02%	0.16%	0.01%	0.00%	0.00%	3.99%
25 - 35	1.05%	1.74%	0.87%	0.13%	0.01%	0.00%	0.00%	3.81%
35 - 45	0.87%	1.42%	0.67%	0.07%	0.00%	0.00%	0.00%	3.04%
45 - 55	0.65%	1.11%	0.36%	0.03%	0.00%	0.00%	0.00%	2.16%
55 - 65	0.67%	1.04%	0.24%	0.02%	0.00%	0.00%	0.00%	1.97%
65 - 75	0.50%	0.59%	0.08%	0.00%	0.00%	0.00%	0.00%	1.17%
75 - 85	0.35%	0.28%	0.03%	0.00%	0.00%	0.00%	0.00%	0.67%
85 - 95	0.39%	0.23%	0.04%	0.00%	0.00%	0.00%	0.00%	0.66%
95 - 105	0.20%	0.10%	0.01%	0.00%	0.00%	0.00%	0.00%	0.31%
105 - 115	0.14%	0.06%	0.02%	0.00%	0.00%	0.00%	0.00%	0.22%
115 - 125	0.21%	0.10%	0.03%	0.00%	0.00%	0.00%	0.00%	0.35%
125 - 135	0.13%	0.06%	0.02%	0.00%	0.00%	0.00%	0.00%	0.21%
135 - 145	0.11%	0.05%	0.01%	0.00%	0.00%	0.00%	0.00%	0.18%
145 - 155	0.30%	0.11%	0.01%	0.00%	0.00%	0.00%	0.00%	0.43%
155 - 165	0.28%	0.15%	0.01%	0.00%	0.00%	0.00%	0.00%	0.43%
165 - 175	0.32%	0.18%	0.03%	0.00%	0.00%	0.00%	0.00%	0.53%
175 - 185	0.74%	0.66%	0.11%	0.00%	0.00%	0.00%	0.00%	1.52%
185 - 195	0.74%	0.91%	0.17%	0.01%	0.00%	0.00%	0.00%	1.83%
195 - 205	1.13%	1.55%	0.36%	0.02%	0.00%	0.00%	0.00%	3.06%
205 - 215	1.84%	3.06%	0.93%	0.06%	0.00%	0.00%	0.00%	5.89%
215 - 225	1.74%	3.16%	0.96%	0.09%	0.00%	0.00%	0.00%	5.96%
225 - 235	1.71%	2.53%	0.91%	0.17%	0.01%	0.00%	0.00%	5.33%
235 - 245	1.76%	2.26%	0.93%	0.27%	0.03%	0.00%	0.00%	5.27%
245 - 255	1.16%	1.24%	0.64%	0.34%	0.07%	0.02%	0.00%	3.47%
255 - 265	0.87%	0.80%	0.76%	0.43%	0.11%	0.02%	0.00%	2.99%
265 - 275	0.91%	0.99%	1.35%	0.83%	0.22%	0.03%	0.01%	4.35%
275 - 285	0.62%	0.70%	1.09%	0.64%	0.14%	0.02%	0.00%	3.21%
285 - 295	0.49%	0.54%	0.49%	0.19%	0.05%	0.02%	0.00%	1.77%
295 - 305	0.55%	0.48%	0.32%	0.09%	0.03%	0.00%	0.00%	1.46%
305 - 315	0.45%	0.33%	0.21%	0.06%	0.02%	0.00%	0.00%	1.07%
315 - 325	0.48%	0.36%	0.23%	0.08%	0.02%	0.00%	0.00%	1.18%
325 - 335	0.69%	0.64%	0.36%	0.09%	0.01%	0.00%	0.00%	1.80%
335 - 345	0.66%	0.64%	0.35%	0.07%	0.01%	0.00%	0.00%	1.74%
345 - 355	0.85%	1.02%	0.59%	0.15%	0.02%	0.00%	0.00%	2.62%
Sub-Total:	26.38%	34.43%	16.69%	4.66%	0.82%	0.12%	0.03%	83.13%
Calms:	16.87%							

Table A-5 – Percent Frequency of Wind Speed and Direction – Spring – Peace River Airport 1983-2013

Wind Direction	1-5kt	5-10kt	10-15kt	15-20kt	20-25kt	25-30kt	>30kt	Total
355 - 5	0.94%	1.89%	1.27%	0.29%	0.03%	0.00%	0.00%	4.43%
5 - 15	0.84%	1.82%	1.29%	0.33%	0.02%	0.00%	0.00%	4.30%
15 - 25	0.81%	1.84%	1.16%	0.25%	0.02%	0.00%	0.00%	4.08%
25 - 35	0.89%	1.79%	1.23%	0.20%	0.01%	0.00%	0.00%	4.12%
35 - 45	0.70%	1.61%	1.00%	0.13%	0.00%	0.00%	0.00%	3.45%
45 - 55	0.56%	1.45%	0.82%	0.10%	0.00%	0.00%	0.00%	2.93%
55 - 65	0.68%	1.56%	0.81%	0.12%	0.00%	0.00%	0.00%	3.17%
65 - 75	0.43%	0.96%	0.42%	0.05%	0.00%	0.00%	0.00%	1.87%
75 - 85	0.42%	0.74%	0.33%	0.03%	0.00%	0.00%	0.00%	1.52%
85 - 95	0.58%	0.87%	0.42%	0.06%	0.00%	0.00%	0.00%	1.93%
95 - 105	0.36%	0.48%	0.25%	0.03%	0.00%	0.00%	0.00%	1.13%
105 - 115	0.27%	0.46%	0.27%	0.03%	0.00%	0.00%	0.00%	1.04%
115 - 125	0.36%	0.59%	0.32%	0.06%	0.00%	0.00%	0.00%	1.33%
125 - 135	0.30%	0.43%	0.25%	0.05%	0.01%	0.00%	0.00%	1.05%
135 - 145	0.29%	0.37%	0.21%	0.05%	0.02%	0.00%	0.00%	0.93%
145 - 155	0.57%	0.59%	0.28%	0.05%	0.01%	0.00%	0.00%	1.49%
155 - 165	0.39%	0.51%	0.19%	0.03%	0.00%	0.00%	0.00%	1.11%
165 - 175	0.40%	0.53%	0.17%	0.02%	0.00%	0.00%	0.00%	1.13%
175 - 185	0.64%	0.94%	0.30%	0.02%	0.00%	0.00%	0.00%	1.92%
185 - 195	0.49%	0.79%	0.24%	0.02%	0.00%	0.00%	0.00%	1.54%
195 - 205	0.55%	0.98%	0.25%	0.04%	0.00%	0.00%	0.00%	1.82%
205 - 215	0.81%	1.64%	0.62%	0.06%	0.00%	0.00%	0.00%	3.13%
215 - 225	0.74%	1.77%	0.78%	0.09%	0.02%	0.00%	0.00%	3.40%
225 - 235	0.69%	1.73%	0.91%	0.19%	0.01%	0.01%	0.00%	3.54%
235 - 245	0.82%	1.70%	1.29%	0.42%	0.05%	0.01%	0.00%	4.29%
245 - 255	0.58%	1.06%	1.14%	0.50%	0.08%	0.01%	0.00%	3.36%
255 - 265	0.51%	1.01%	1.28%	0.65%	0.09%	0.01%	0.01%	3.56%
265 - 275	0.65%	1.10%	1.67%	0.83%	0.12%	0.03%	0.00%	4.40%
275 - 285	0.48%	0.89%	1.05%	0.51%	0.04%	0.00%	0.00%	2.97%
285 - 295	0.44%	0.62%	0.60%	0.21%	0.02%	0.00%	0.00%	1.89%
295 - 305	0.49%	0.59%	0.42%	0.12%	0.01%	0.00%	0.00%	1.62%
305 - 315	0.46%	0.57%	0.27%	0.08%	0.01%	0.00%	0.00%	1.39%
315 - 325	0.54%	0.58%	0.33%	0.12%	0.01%	0.00%	0.00%	1.58%
325 - 335	0.76%	1.01%	0.60%	0.16%	0.01%	0.00%	0.00%	2.55%
335 - 345	0.62%	1.04%	0.57%	0.14%	0.02%	0.00%	0.00%	2.38%
345 - 355	0.80%	1.40%	0.79%	0.19%	0.02%	0.00%	0.00%	3.20%
Sub-Total:	20.87%	37.90%	23.79%	6.25%	0.66%	0.08%	0.02%	89.55%
Calms:	10.45%							

Table A-6 – Percent Frequency of Wind Speed and Direction – Summer – Peace River Airport 1983-2013

Wind Direction	1-5kt	5-10kt	10-15kt	15-20kt	20-25kt	25-30kt	>30kt	Total
355 - 5	1.12%	1.35%	0.72%	0.16%	0.02%	0.00%	0.00%	3.38%
5 - 15	0.95%	1.31%	0.59%	0.11%	0.01%	0.00%	0.00%	2.97%
15 - 25	0.95%	1.19%	0.56%	0.07%	0.00%	0.00%	0.00%	2.78%
25 - 35	0.90%	1.23%	0.59%	0.06%	0.00%	0.00%	0.00%	2.79%
35 - 45	0.72%	0.96%	0.42%	0.06%	0.00%	0.00%	0.00%	2.16%
45 - 55	0.52%	0.81%	0.47%	0.05%	0.00%	0.00%	0.00%	1.85%
55 - 65	0.64%	1.08%	0.51%	0.03%	0.01%	0.00%	0.00%	2.28%
65 - 75	0.45%	0.67%	0.29%	0.02%	0.00%	0.00%	0.00%	1.44%
75 - 85	0.35%	0.48%	0.21%	0.02%	0.00%	0.00%	0.00%	1.06%
85 - 95	0.53%	0.65%	0.19%	0.03%	0.00%	0.00%	0.00%	1.41%
95 - 105	0.33%	0.37%	0.15%	0.02%	0.00%	0.00%	0.00%	0.87%
105 - 115	0.29%	0.33%	0.12%	0.02%	0.00%	0.00%	0.00%	0.77%
115 - 125	0.50%	0.56%	0.21%	0.04%	0.00%	0.00%	0.00%	1.31%
125 - 135	0.34%	0.43%	0.20%	0.02%	0.00%	0.00%	0.00%	1.01%
135 - 145	0.39%	0.35%	0.15%	0.02%	0.00%	0.00%	0.00%	0.90%
145 - 155	0.59%	0.63%	0.21%	0.03%	0.00%	0.00%	0.00%	1.45%
155 - 165	0.46%	0.57%	0.15%	0.02%	0.00%	0.00%	0.00%	1.19%
165 - 175	0.46%	0.65%	0.16%	0.02%	0.00%	0.00%	0.00%	1.28%
175 - 185	0.89%	1.40%	0.36%	0.02%	0.00%	0.00%	0.00%	2.67%
185 - 195	0.67%	1.03%	0.27%	0.02%	0.00%	0.00%	0.00%	1.98%
195 - 205	0.71%	1.21%	0.26%	0.03%	0.00%	0.00%	0.00%	2.20%
205 - 215	1.05%	1.96%	0.53%	0.08%	0.01%	0.00%	0.00%	3.63%
215 - 225	0.83%	1.54%	0.71%	0.13%	0.01%	0.00%	0.01%	3.23%
225 - 235	0.76%	1.61%	0.81%	0.22%	0.02%	0.00%	0.00%	3.42%
235 - 245	0.97%	1.91%	1.59%	0.52%	0.09%	0.00%	0.00%	5.09%
245 - 255	0.62%	1.49%	1.48%	0.56%	0.07%	0.00%	0.00%	4.22%
255 - 265	0.62%	1.36%	1.58%	0.60%	0.06%	0.00%	0.00%	4.24%
265 - 275	0.84%	1.72%	2.03%	0.71%	0.07%	0.01%	0.00%	5.38%
275 - 285	0.63%	1.17%	1.24%	0.41%	0.03%	0.01%	0.00%	3.49%
285 - 295	0.60%	0.88%	0.68%	0.21%	0.03%	0.00%	0.00%	2.39%
295 - 305	0.76%	0.89%	0.56%	0.16%	0.02%	0.00%	0.00%	2.38%
305 - 315	0.68%	0.69%	0.38%	0.06%	0.01%	0.00%	0.00%	1.82%
315 - 325	0.79%	0.75%	0.35%	0.10%	0.02%	0.00%	0.00%	2.01%
325 - 335	1.10%	1.16%	0.62%	0.12%	0.02%	0.00%	0.00%	3.03%
335 - 345	0.87%	0.96%	0.46%	0.08%	0.01%	0.00%	0.00%	2.39%
345 - 355	1.06%	1.12%	0.52%	0.10%	0.01%	0.00%	0.00%	2.82%
Sub-Total:	24.95%	36.48%	20.31%	4.94%	0.54%	0.04%	0.02%	87.28%
Calms:	12.72%							

Table A-7 – Percent Frequency of Wind Speed and Direction – Fall – Peace River Airport 1983-2013

Wind Direction	1-5kt	5-10kt	10-15kt	15-20kt	20-25kt	25-30kt	>30kt	Total
355 - 5	0.81%	1.29%	0.87%	0.19%	0.01%	0.00%	0.00%	3.17%
5 - 15	0.78%	1.33%	0.78%	0.18%	0.02%	0.00%	0.00%	3.09%
15 - 25	0.85%	1.20%	0.71%	0.11%	0.00%	0.00%	0.00%	2.88%
25 - 35	0.95%	1.52%	0.75%	0.11%	0.00%	0.00%	0.00%	3.33%
35 - 45	0.74%	1.24%	0.56%	0.06%	0.00%	0.00%	0.00%	2.60%
45 - 55	0.59%	1.10%	0.43%	0.03%	0.00%	0.00%	0.00%	2.16%
55 - 65	0.67%	1.08%	0.34%	0.03%	0.00%	0.00%	0.00%	2.12%
65 - 75	0.41%	0.53%	0.18%	0.00%	0.00%	0.00%	0.00%	1.12%
75 - 85	0.37%	0.37%	0.12%	0.01%	0.00%	0.00%	0.00%	0.88%
85 - 95	0.47%	0.41%	0.14%	0.02%	0.00%	0.00%	0.00%	1.04%
95 - 105	0.28%	0.24%	0.09%	0.01%	0.00%	0.00%	0.00%	0.62%
105 - 115	0.19%	0.21%	0.07%	0.01%	0.00%	0.00%	0.00%	0.48%
115 - 125	0.30%	0.25%	0.09%	0.02%	0.00%	0.00%	0.00%	0.66%
125 - 135	0.22%	0.21%	0.08%	0.00%	0.00%	0.00%	0.00%	0.52%
135 - 145	0.21%	0.20%	0.07%	0.01%	0.00%	0.00%	0.00%	0.49%
145 - 155	0.37%	0.36%	0.09%	0.01%	0.00%	0.00%	0.00%	0.84%
155 - 165	0.39%	0.41%	0.08%	0.01%	0.00%	0.00%	0.00%	0.88%
165 - 175	0.43%	0.52%	0.13%	0.02%	0.00%	0.00%	0.00%	1.11%
175 - 185	0.85%	1.33%	0.36%	0.02%	0.00%	0.00%	0.00%	2.56%
185 - 195	0.80%	1.30%	0.36%	0.01%	0.00%	0.00%	0.00%	2.47%
195 - 205	1.03%	1.72%	0.49%	0.03%	0.00%	0.00%	0.00%	3.27%
205 - 215	1.54%	2.72%	0.87%	0.07%	0.00%	0.00%	0.00%	5.21%
215 - 225	1.18%	2.46%	0.91%	0.12%	0.00%	0.00%	0.00%	4.68%
225 - 235	1.12%	2.22%	1.08%	0.23%	0.03%	0.00%	0.00%	4.68%
235 - 245	1.19%	2.20%	1.51%	0.41%	0.07%	0.01%	0.00%	5.39%
245 - 255	0.79%	1.42%	1.21%	0.49%	0.12%	0.02%	0.00%	4.04%
255 - 265	0.64%	1.16%	1.45%	0.61%	0.13%	0.02%	0.01%	4.02%
265 - 275	0.83%	1.30%	1.96%	0.86%	0.14%	0.02%	0.00%	5.10%
275 - 285	0.59%	1.03%	1.28%	0.48%	0.05%	0.01%	0.00%	3.45%
285 - 295	0.54%	0.69%	0.66%	0.20%	0.03%	0.00%	0.00%	2.13%
295 - 305	0.53%	0.67%	0.51%	0.12%	0.02%	0.00%	0.00%	1.86%
305 - 315	0.55%	0.54%	0.38%	0.10%	0.00%	0.00%	0.00%	1.57%
315 - 325	0.46%	0.63%	0.39%	0.07%	0.00%	0.00%	0.00%	1.55%
325 - 335	0.73%	0.95%	0.55%	0.09%	0.01%	0.00%	0.00%	2.33%
335 - 345	0.60%	0.81%	0.39%	0.08%	0.00%	0.00%	0.00%	1.89%
345 - 355	0.72%	0.98%	0.52%	0.12%	0.01%	0.00%	0.00%	2.35%
Sub-Total:	23.74%	36.59%	20.48%	4.93%	0.67%	0.08%	0.02%	86.51%
Calms:	13.49%							

Appendix B – B737-400 Performance Analysis

DATE: 07/23/2013 | SAMPLE AIRLINES | CYPE / YPE
AIR CONDITIONING: OFF | TAKEOFF PERFORMANCE | PEACE RIVER, AB.
ANTI-SKID: OPERATIVE | B737-400 CFM56-3C-1 | PEACE RIVER
225 MPH TIRE | FLAP 15 | ELEV= 1872 FT

CHECK MAX STRUCTURAL TAKEOFF WEIGHT LIMIT FOR AIRCRAFT

OAT F	OAT C	PERCENT N1 GAGE	RUNWAYS - 100'S KGS 04	04 5899	04 ASDA6399	22	22 5899	22 ASDA6264	SEC. SEG. CLIMB
0	-18	90.9	570.6 R	619.6 C	628.7 C	565.6 R	611.9 R	619.2 C	617.8
10	-12	91.9	565.6 R	614.2 R	623.2 C	560.2 R	606.5 R	614.2 R	617.8
20	-7	92.8	560.2 R	608.7 R	617.8 R	555.2 R	601.0 R	608.7 R	617.8
30	-1	93.8	555.7 R	603.7 R	612.8 R	550.7 R	596.0 R	603.7 R	617.8
40	4	94.7	551.1 R	598.7 R	607.8 R	546.1 R	591.5 R	598.7 R	617.8
50	10	95.7	546.1 R	593.8 R	602.8 R	541.1 R	586.5 R	593.8 R	617.8
55	13	96.1	543.9 R	591.5 R	600.1 R	538.9 R	584.2 R	591.0 R	617.8
60	16	96.6	541.6 R	588.8 R	597.4 R	536.6 R	581.5 R	588.8 R	617.8
65	18	97.1	539.3 R	586.5 R	595.1 R	534.3 R	579.2 R	586.0 R	617.8
70	21	97.5	537.1 R	583.8 R	592.4 R	532.1 R	576.5 R	583.8 R	617.8
72	22	97.7	536.1 R	582.9 R	591.5 R	531.2 R	575.6 R	582.9 R	617.8
74	23	97.9	535.2 R	582.0 R	590.6 R	530.2 R	574.7 R	582.0 R	617.8
76	24	98.1	533.9 R	581.1 R	589.7 R	529.3 R	573.8 R	581.1 R	617.8
78	26	98.3	532.5 R	579.7 R	588.3 R	528.0 R	572.4 R	579.2 R	617.8
80	27	98.3	529.8 R	576.5 R	585.1 R	525.3 R	569.3 R	576.5 R	613.7
82	28	98.2	526.6 R	573.3 R	582.0 R	522.1 R	566.1 R	573.3 R	609.2
84	29	98.0	523.9 R	570.2 R	578.3 R	518.9 R	562.9 R	569.7 R	603.7
86	30	97.9	520.7 R	566.5 R	575.2 R	515.7 R	559.7 R	566.5 R	598.7
88	31	97.8	517.5 R	563.4 R	571.5 R	512.6 R	556.6 R	563.4 R	593.8
90	32	97.6	514.4 R	560.2 R	568.4 R	509.8 R	553.4 R	559.7 R	588.3
92	33	97.5	511.2 R	556.6 R	565.2 R	506.7 R	549.8 R	556.6 R	583.8
94	34	97.3	508.0 R	553.4 R	561.5 R	503.5 R	546.6 R	553.4 R	578.8
96	36	97.2	504.8 R	550.2 R	558.4 R	500.3 R	543.4 R	550.2 R	574.2
98	37	97.1	500.8 R	546.6 R	555.2 R	496.2 R	540.2 R	546.6 R	569.3
100	38	96.9	497.6 R	543.0 R	552.0 R	493.5 R	537.1 R	543.4 R	564.7
104	40	96.7	491.2 R	536.6 R	545.2 R	487.2 R	530.7 R	536.6 R	554.7
108	42	96.4	485.3 R	529.8 R	538.4 R	480.8 R	523.9 R	530.2 R	544.3
112	44	96.1	479.0 R	523.4 R	532.1 R	474.9 R	517.5 R	523.4 R	533.9
116	47	95.8	472.6 R	516.2 R	524.8 C	468.6 R	509.8 R	516.6 R	520.7
120	49	95.2	462.2 R	504.8 R	513.5 C	457.7 R	498.0 R	506.2 R	506.2
WIND CORR		KGS/KT HW	119	116	114	117	37	11	---
		KGS/KT TW	-989	-511	-518	-942	-510	-510	---
RUNWAY DIM		LENGTH-FT	5000	5899	5899	5000	5899	5899	---
		SLOPE - %	-0.24	-0.24	-0.24	0.24	0.24	0.24	---
LVLOFF ALT		FTMSL	2872	2872	2872	2872	2872	2872	---
QNH		KGS/hPa>1013	42	44	45	43	43	44	40
		KGS/hPa<1013	-58	-62	-62	-58	-62	-59	-67
1/4" SLUSH		KGS	N/A	-21183	-22135	N/A	-20412	-21183	---
		KIAS	N/A	-10	-9	N/A	-10	-10	---
1/2" SLUSH		KGS	N/A	-16193	-17100	N/A	-15422	-16148	---
		KIAS	N/A	0	0	N/A	0	0	---
ANTI-SKID INOP		KGS	N/A	N/A	-7484	N/A	N/A	-7484	---
		KIAS	N/A	N/A	-27	N/A	N/A	-27	---
ENG ANTI-ICE ON		KGS	-272	-227	-272	-272	-318	-227	-136

RWY 04 ASDA 6399 TEST RUNWAY
TORA 5899 FT
TODA 6499 FT
ASDA 6399 FT
LDA 5899 FT

RWY 22 5899 TEST RUNWAY
TORA 5899 FT
TODA 6657 FT
ASDA 5899 FT
LDA 5899 FT

RWY 04 5899 TEST RUNWAY
TORA 5899 FT
TODA 6499 FT
ASDA 5899 FT
LDA 5899 FT

RWY 22 ASDA6264 TEST RUNWAY
TORA 5899 FT
TODA 6657 FT
ASDA 6264 FT
LDA 5899 FT

ASAP

DATE: 07/23/2013 | SAMPLE AIRLINES | CYPE / YPE

AIR CONDITIONING: ON | LANDING PERFORMANCE | PEACE RIVER, AB.

CATEGORY A BRAKES | B737-400 CFM56-3C-1 | PEACE RIVER

AUTO SPEED BRAKE OPERATIVE | FLAPS 30 | ELEV= 1872 FT

CHECK MAX STRUCTURAL LANDING WEIGHT LIMIT FOR AIRCRAFT

APPROACH AND LANDING CLIMB LIMIT WEIGHTS - 100'S KGS

OAT - °F / °C	-30 / -34	-10 / -23	10 / -12	30 / -1	50 / 10	70 / 21	80 / 27	100 / 38	120 / 49	ICING CONDTS
NO A/I	688.1	687.6	686.7	685.8	684.9	684.0	677.7	618.2	552.0	-49
ENG A/I	681.3	680.4	679.5	678.6	677.7	N/A	N/A	N/A	N/A	-49
ENG & WING A/I	643.2	642.3	641.4	640.5	639.6	N/A	N/A	N/A	N/A	-49

LANDING RUNWAY LIMIT WEIGHTS - 100'S KGS

RUNWAY NO		LENGTH	ANTI-SKID CONFIG	DRY MAX WT 0-WIND KGS	DRY ADD KGS/KT H.W. KGS	DRY SUBT CRIT T.W. KTS	DRY SUBT KGS/KT T.W. KGS	WET MAX WT 0-WIND KGS	WET ADD KGS/KT H.W. KGS	WET SUBT CRIT T.W. KTS	WET SUBT KGS/KT T.W. KGS
04		5000	OPER	519.8	172	0	-1048	449.1	254	0	-1049
		5000	INOP	------- NOT AUTHORIZED -------				------- NOT AUTHORIZED -------			
04	5899	5899	OPER	583.8	195	0	-632	529.3	168	0	-1002
		5899	INOP	------- NOT AUTHORIZED -------				------- NOT AUTHORIZED -------			
04	ASDA63	5899	OPER	583.8	195	0	-632	529.3	168	0	-1002
		5899	INOP	------- NOT AUTHORIZED -------				------- NOT AUTHORIZED -------			
22		5000	OPER	519.8	172	0	-1048	449.1	254	0	-1049
		5000	INOP	------- NOT AUTHORIZED -------				------- NOT AUTHORIZED -------			
22	5899	5899	OPER	583.8	195	0	-632	529.3	168	0	-1002
		5899	INOP	------- NOT AUTHORIZED -------				------- NOT AUTHORIZED -------			
22	ASDA62	5899	OPER	583.8	195	0	-632	529.3	168	0	-1002
		5899	INOP	------- NOT AUTHORIZED -------				------- NOT AUTHORIZED -------			

MAXIMUM QUICK TURN AROUND - BRAKE ENERGY WGTS - 100'S KGS

OAT - °F / °C	-30 / -34	-10 / -23	10 / -12	30 / -1	50 / 10	70 / 21	80 / 27	100 / 38	120 / 49	PER KNOT WIND ADJ
ZERO WIND WEIGHT	581.1	567.4	555.2	543.0	532.5	522.1	517.5	508.5	499.4	HW 1 TW -5

ASAP

DATE: 07/23/2013 | **SAMPLE AIRLINES** | **CYPE / YPE**

AIR CONDITIONING: ON | **LANDING PERFORMANCE** | **PEACE RIVER, AB.**

CATEGORY A BRAKES | **B737-400 CFM56-3C-1** | **PEACE RIVER**

AUTO SPEED BRAKE OPERATIVE | **FLAPS 40** | **ELEV= 1872 FT**

CHECK MAX STRUCTURAL LANDING WEIGHT LIMIT FOR AIRCRAFT

APPROACH AND LANDING CLIMB LIMIT WEIGHTS - 100'S KGS

OAT - °F °C	-30 -34	-10 -23	10 -12	30 -1	50 10	70 21	80 27	100 38	120 49	ICING CONDTS
NO A/I	664.1	664.1	663.6	663.2	662.7	662.2	652.3	594.7	530.2	-51
ENG A/I	652.3	652.3	651.8	651.4	650.9	N/A	N/A	N/A	N/A	-51
ENG & WING A/I	616.9	616.9	616.4	616.0	615.5	N/A	N/A	N/A	N/A	-51

LANDING RUNWAY LIMIT WEIGHTS - 100'S KGS

RUNWAY NO		LENGTH	ANTI-SKID CONFIG	DRY MAX WT 0-WIND KGS	DRY ADD KGS/KT H.W. KGS	DRY SUBT CRIT T.W. KTS	DRY SUBT KGS/KT T.W. KGS	WET MAX WT 0-WIND KGS	WET ADD KGS/KT H.W. KGS	WET SUBT CRIT T.W. KTS	WET SUBT KGS/KT T.W. KGS
04		5000	OPER	541.6	181	0	-1086	465.8	281	0	-1082
		5000	INOP	------- NOT AUTHORIZED -------				------- NOT AUTHORIZED -------			
04	5899	5899	OPER	609.6	209	0	-689	551.6	186	0	-1038
		5899	INOP	------- NOT AUTHORIZED -------				------- NOT AUTHORIZED -------			
04	ASDA63	5899	OPER	609.6	209	0	-689	551.6	186	0	-1038
		5899	INOP	------- NOT AUTHORIZED -------				------- NOT AUTHORIZED -------			
22		5000	OPER	541.6	181	0	-1086	465.8	281	0	-1082
		5000	INOP	------- NOT AUTHORIZED -------				------- NOT AUTHORIZED -------			
22	5899	5899	OPER	609.6	209	0	-689	551.6	186	0	-1038
		5899	INOP	------- NOT AUTHORIZED -------				------- NOT AUTHORIZED -------			
22	ASDA62	5899	OPER	609.6	209	0	-689	551.6	186	0	-1038
		5899	INOP	------- NOT AUTHORIZED -------				------- NOT AUTHORIZED -------			

MAXIMUM QUICK TURN AROUND - BRAKE ENERGY WGTS - 100'S KGS

OAT - °F °C	-30 -34	-10 -23	10 -12	30 -1	50 10	70 21	80 27	100 38	120 49	PER KNOT WIND ADJ
ZERO WIND WEIGHT	604.2	590.1	577.0	564.3	553.4	542.5	537.5	528.0	518.9	HW 2 TW -5

ASAP

LPS AVIA
CONSULTING

One Antares Drive, Suite 250

Ottawa, ON K2E 8C4

Telephone: (613) 226-6050

Fax: (613) 226-5236

e-mail: info@lpsaviation.ca

www.lpsaviation.ca