

Yellowknife Airport Development Plan Update

InterVISTAS

strategic
transportation
& tourism
solutions



Prepared for
Government of the Northwest Territories,
Airports Division

Prepared by
InterVISTAS Consulting Inc.

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Preface

The Yellowknife Airport Development Plan Update is not a commitment on the part of the Territorial Government to expand/improve the infrastructure at the Yellowknife Airport. It serves as a framework within which future project proposals will be scrutinised. Justification of these projects and programs, however, will be detailed in program documentation once sufficient growth is realised. Implementation of these projects will be subject to territorial priorities and the availability of funds.

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Executive Summary

Introduction

This Yellowknife Airport Development Plan (ADP) update addresses future airport development needs and provides a framework for on-site development for the 20-year period (the 'planning horizon'), with a focus on the next 10 years. The objective of the update is to provide a program for development that takes into account recent changes to market conditions and the strong traffic growth experienced at the airport since completion of the previous 2004 ADP.

The timeline for undertaking the next stage of the 2004 ADP – the West-side Air Terminal Building (ATB) complex – was originally scheduled for the 2008-2013 period. With this timeframe now upon us and given the significant increase in construction costs in Northern Canada over the past few years, it is prudent to validate and review the timing of existing proposals to ensure they continue to meet current and forecast demand.

Traffic Growth

One of the primary reasons for updating the 2004 ADP is the tremendous growth (beyond original forecasts) that has occurred in both passengers and movements since completion of the 2004 document.

- **Passenger Traffic.** Since 2003, passenger traffic at the airport (ATB and off-ATB) has increased roughly 33%, from 396,500 to 527,000 total annual passengers. ATB passenger traffic has increased from 308,000 to 361,000 annually over the same period. By 2027, passenger traffic is forecast to reach between 773,000 and 1,137,500 annual passengers depending on the realization of low, medium or high growth scenarios outlined in the ADP Update document.
- **Aircraft movements.** Since 2003, itinerant movements have increased 36%, from 40,570 to 55,046 in 2007. It is clear that the majority of the increase in itinerant movements since 2003 involves additional passenger carrier services and mining-related movements. By 2027, itinerant aircraft activities are forecast to range between 66,000 and 102,000 annual movements, depending on the materialization of traffic growth scenarios.
- **Cargo.** Based on information provided during recent consultations, estimated volumes in 2007 would have surpassed 32,000 tonnes, representing an overall increase of approximately 40% since 2003.

Development Requirements and Program

The current Yellowknife Airport Development Plan Update validated, confirmed and/or revised a number of proposals contained in the 2004 ADP. Figure ES-1 provides a summary of key updated recommendations and requirements. These take into account the need to address issues deriving from the strong growth at the airport since completion of the 2004 ADP, while continuing to focus on the longer-term objective of initiating development of the West-side site.

The individual projects and timelines for development are detailed in the ADP document.

- **Long-term Development.** The long-term development plan for the airport remains relatively consistent with that proposed in the 2004 ADP. A number of minor changes to the long-term layout have been made however to reflect near-term requirements.
- **Near-term Development.** The stronger than anticipated traffic growth at the Yellowknife Airport, coupled with the extended process for funding the necessary West-side infrastructure, has resulted in the need to revise near-term development proposals. The revised proposals also take into account the need to create the necessary synergies that will enable effective initiation of the West-side development project, as well as the need to minimize throw-away costs associated with the expansion of existing infrastructure.

The recommended program is based on forecast traffic growth and identified traffic scenarios for the airport. The current capacity potential of the existing facilities is however considerably limited and provides little flexibility to address unexpected changes that may occur in the Yellowknife market. Stronger than forecast growth and, more importantly, the arrival of a new major market entrant operating with full passenger configurations could significantly alter peak hour demand on the ATB apron and within the ATB itself. In scheduling projects and implementing the recommendations contained in this updated ADP, it is important to note therefore that certain proposals may need to be advanced sooner than expected and require significantly higher capital injections than those put forward in current capital plans.

Costs

The costs associated with the realization of the near-term requirements (next 10 years) are estimated at \$70 million. These estimates include the following projects:

- Phase I Runway 15-33 extension (760m to length of 3,050m);
- R15-33 parallel taxiway development;
- R09-27 taxiway development to service new commercial lots;
- ATB reconfiguration (and associated apron expansion work); and
- Combined Services Building construction.

Estimates associated with initiation of the West-side development project, including new ATB development, water distribution and sanitary sewage systems, were outside of the scope of this study. Therefore, overall capital requirements for the airport over the 20-year planning periods will be much higher than those identified above. Considerably more detailed long-term programming than that provided in the updated ADP will be required to account for these major long-term projects. Final capital programming will be subject to approval of individual development items.

Runway 15-33 Parallel Taxiway

- Phase I: from R09-27 intersection to runway mid-point (new ATB apron) - 1,100 m
- Phase II: from runway mid-point to existing threshold - 780 m
- Phase III: consistent with potential runway extension - 450 m

West-side ATB Complex (Long-term)

Runway 09-27

- RESA at both extremities

ATB Apron

- Taxi B re-alignment
- Fire Hall relocation
- Reconfiguration/ expansion for 13-14 positions

ATB Reconfiguration

- Infill structure and consolidated arrivals area
- Expanded screened passenger holdroom and PBS checkpoint
- Restaurant reconfiguration (future)
- Check-in counter addition (as needed)

Parking and Curb

- Taxi stand passenger shelters
- Public parking lot expansion (as needed)

Commercial Development

- Near-term tenant lot development
- Associated taxiway development

Runway 15-33 Extension

- Phase I: 760m (with RESA integrated on runway surface and reduced TORA, as imposed by regulatory requirements or justified by demand)
- Phase II: 450m (when justified by demand)

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1. Introduction

1.1 Background: The 2004 Airport Development Plan

The Yellowknife Airport (YZF) is a critical component of the northern transportation system and a key lifeline for many northern communities. To provide the bases upon which the airport can address growth, the Government of the Northwest Territories (GNWT) periodically updates its plans to ensure existing infrastructure and development proposals continue to support the region's needs.

The most recent *Yellowknife Airport Development Plan* (ADP) was completed in 2004 and provided an integrated strategy to meet immediate and long-term capacity and market requirements. A key component of the Plan is the eventual relocation of the core operational area to a greenfield location on the West-side of the airport. This proposal includes a new Air Terminal Building (ATB), Combined Services Building (CSB), new tenant land and associated aircraft manoeuvring areas (e.g. taxiways and aprons). The eventual extension of the main runway is also proposed to address potential market opportunities for international services in support of northern tourism and for expanded domestic and international services. Key to the feasibility of this project is the successful extension of City of Yellowknife water and sanitary sewage systems to the West-side of the site. With the exception of the expansion of the airport's boundaries to accommodate the proposed new infrastructure, most of these proposals still remain in the planning stages.

Other proposals were also made to maximise use of the existing ATB until relocation is to occur. For the most part, these projects have been completed and included new baggage handling and screening systems, the addition of the ATB annex, expansion of the main aircraft apron and improvements to the public and tenant parking areas. Figure 1-1 summarizes the key proposals contained in the 2004 document.

The 2004 *Yellowknife Airport Development Plan* has served the airport well in addressing immediate demands, while providing a sound direction for long-term development of the airport site. The timeline for undertaking the next stage of the 2004 ADP – the West-side ATB complex – was originally scheduled for the 2008-2013 period. With this timeframe now upon us and given the significant increase in construction costs in Northern Canada over the past few years, it is prudent to validate and review the timing of existing proposals to ensure they continue to meet current and forecast demand. This also includes exploring options to further extend the life and capacity of existing facilities with the aim of providing more time for the extension of the Yellowknife water distribution and sanitary sewage network, and delaying the significant capital expenditures associated with the West-side development.

1.2 Changing Environment

Since completion of the 2004 ADP, the market conditions and operational environment of the airport have evolved at a rapid pace. Among the most significant changes is the continued strong growth of aviation traffic both in terms of passengers and aircraft movements at the airport. The introduction of Air Canada services to Yellowknife and the enhancement of other commercial carrier services have significantly stimulated the passenger market. There is also strong potential for further service expansion through introduction other commercial air carriers to the Yellowknife market. The combination of Air Canada and new carriers could significantly alter the air service environment in Yellowknife and alter peak period conditions at the airport.

The strength of the northern economy and continued expansion of the mining, oil and gas activities in the region are prime contributors to this growth. In addition to the pressure this situation places on existing public and private passenger facilities, this is fuelling demand for more aircraft parking, hangars, and other aviation-related facilities on the site. The development of a major Fixed Base Operator (FBO) facility to support corporate and private aviation is also becoming increasingly necessary.

In turn, the GNWT has increasingly faced requests for the opening of new tenant land to accommodate additional commercial activities. The absence of water and sanitary sewage networks on most of the airport site continues to significantly hinder opportunities for additional commercial development. The need to meet building code requirements for adequate fire suppression capabilities for new buildings, including the future West-side ATB is of particular importance. In addition, the absence of piped services adds considerable operational costs for the trucked delivery of water and collection of sewage from individual tenants. The GNWT and the City of Yellowknife have been working towards the expansion of municipal services to the site, in particular given recent development in the Engle and Kam Lake industrial areas adjacent to the southern extremities of the airport site.

Looking towards the future, the GNWT wishes to see the development of a strong international tourism industry in the North and to encourage the introduction of international air services to and from Yellowknife. The arrival of next generation aircraft such as the B787 and A350 along with the increased availability of other long-range twin-engine aircraft for charter operators such as the B767 and A330 provide the necessary economics for the latter types of services to and from Yellowknife.

Other potential domestic market entrants may also explore options for new services at the airport, which in turn pose new challenges for the existing facilities. Depending on the types of aircraft operated on these routes, operating schedules and routings, potential new domestic market entrants could significantly increase peak period traffic levels and, as a result, push forward requirements for expanded or construction of new passenger facilities.

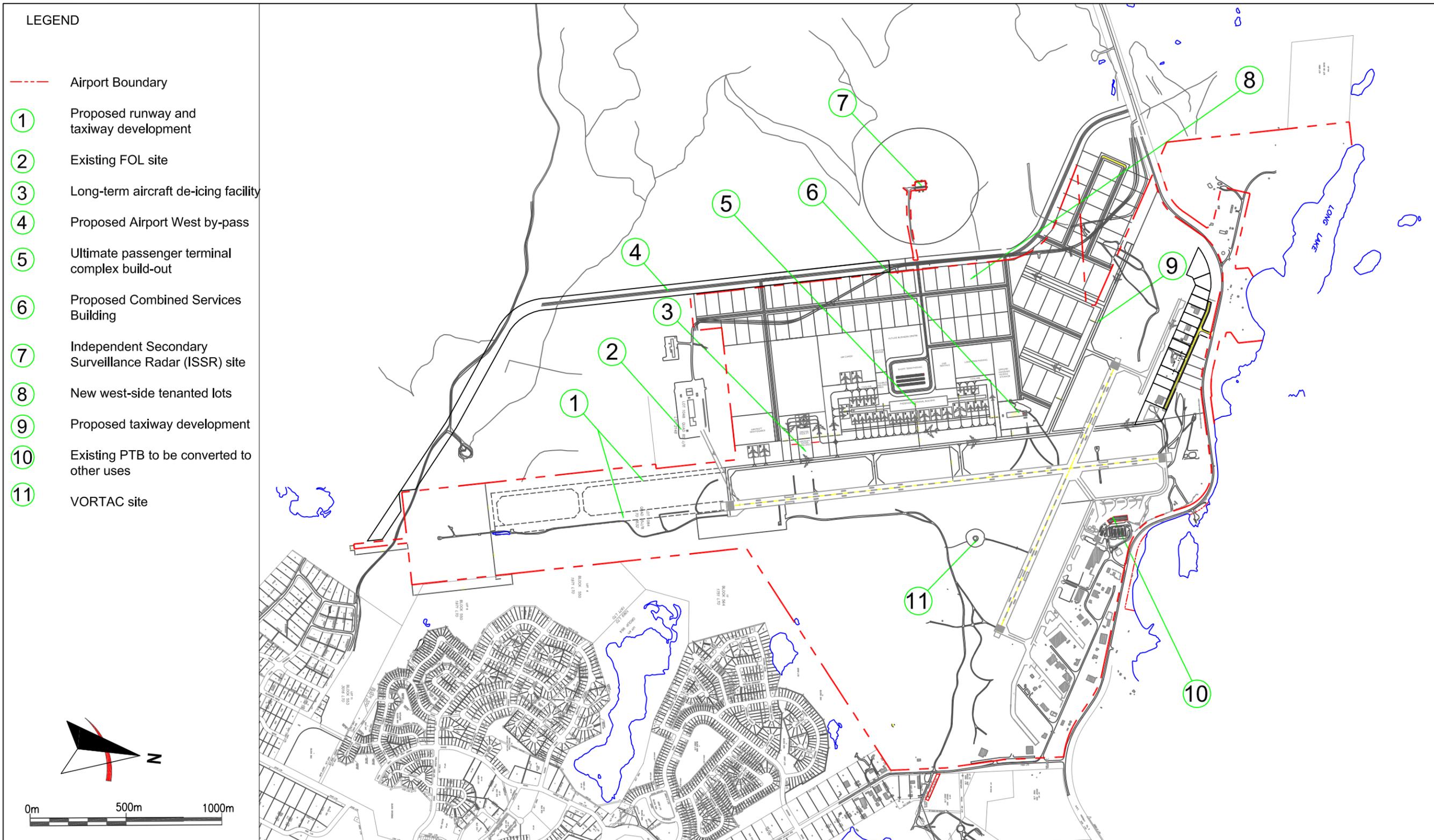


Figure 1-1: Summary of 2004 ADP Proposals

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Over the past few years, the airport's operational environment has also been challenged by changing security measures. New baggage systems have been installed and additional passenger screening capacity has been provided, but potential extension of pre-board screening requirements to greater numbers of passengers or new security measures themselves could impact future air carrier and ATB operations beyond the capabilities of the existing facilities.

In light of these opportunities and challenges, planning for the airport will need to address the more complex environment in which it operates compared to that originally envisioned in 2004. Sufficient flexibility is therefore required to address the ever changing challenges.

1.3 Study Scope

This ADP update addresses future airport development needs and provides a framework for on-site development for the 20-year period (the 'planning horizon'), with a focus on the next 10 years. In pursuing future airport development, the GNWT wishes to continue pursuing the overall development strategy proposed in the 2004 ADP. However, a revised strategy for the near-term period is necessary to provide flexibility around the timeline for initiation of the West-side development. The objective of this update is therefore to provide a program for development that takes into account recent changes to market conditions and the strong traffic growth experienced at the airport since completion of the 2004 ADP.

To achieve this, the update confirms requirements identified in the 2004 ADP and, where necessary, updates proposals and/or revises timelines for implementation of specific initiatives. Analyses undertaken for this update focus on extending the operational life of existing facilities where possible, while confirming the relevance and scope of future major projects.

Since the 2004 ADP provided highly detailed analyses of inventories and operational capabilities of existing infrastructure, facilities and land uses, similar analyses have not been reproduced as part of this update. Instead, relevant inventory information taken from the 2004 ADP is provided for reference purposes, as needed. Where previous analyses and recommendations remain valid, these are generally carried forward in this document with cross-reference to the related analyses found in the 2004 document. The background content of the 2004 ADP shall therefore continue to be considered valid, with the current update providing validation and redefinition of programming elements made necessary to address faster than anticipated change in the Yellowknife environment.

Geotechnical, environmental, and community planning reviews were outside the scope of this update and were not conducted.

Note to Readers:

Terminology – Aviation terms used throughout the document are described in the Glossary of Terms at Appendix A. Analysis and recommendations are consistent with applicable Airport Certification Standards.

Units of Measure – International aviation continues to use Imperial measures for many aviation applications. This report adopts Metric and Imperial measures interchangeably, reflecting both where necessary to avoid ambiguity.

2. Aviation Activity and Forecasts

Understanding the factors that influence traffic growth and the derived traffic levels themselves are essential components to the airport planning process. At the Yellowknife Airport, this understanding takes on an even greater importance given the unique character of the northern air transportation environment and the complexity of its aviation industry.

Air travel is a derived demand. Demand for air transportation between origin and destination markets is derived from the socio-economic interactions between these markets, shaped by carriers' network and available airlift capacity. Generally, business/trade activity, tourism/visitor activity, as well as visiting friends and relatives (VFR) constitute the primary components of air travel at any airport. The level of aviation traffic at the Yellowknife Airport is therefore related to the general socio-economic conditions of the markets and regions it serves and particularly the way in which these conditions affect each of its traffic components.

2.1 Recent Growth

One of the primary reasons for updating the Airport Development Plan for the Yellowknife Airport is the tremendous growth that occurred in both passengers and movements since the 2004 ADP was released.

2.1.1 Passenger Traffic

Recent Growth

Since 2003, passenger traffic at YZF (ATB and off-ATB) has increased roughly 33%, from 396,500 to 527,000 total annual passengers, with ATB passenger traffic increasing from 308,000 to 361,000 annually over the same period, as shown in Table 2-1. In 2007, close to 70% of all passengers handled at the airport utilized the terminal building. Note that an increasing share of passenger traffic is now being handled by off-ATB carriers – a reflection of increasing charter flight activities to mining and exploration sites.

Table 2-1: YZF Passenger Traffic Growth – 2003 vs. 2007

Passengers	2003	2007	Difference	% Growth
ATB Passengers	307,900	360,900	53,000	17%
Other Passengers	88,600	166,300	77,700	88%
Total Passengers	396,500	527,200	130,700	33%

The primary drivers of the strong passenger traffic growth at Yellowknife since 2003 include:

- Strong regional economic growth;
- New services (namely Air Canada Jazz in July 2006);
- Additional mining-related flights; and
- Increased demand through market stimulation from Jazz services (this pattern can be expected to be accentuated if another domestic carrier were to initiate services at the airport).

Passengers Peaking Profiles

In terms of passenger peaking, based on current carrier schedules for those using the terminal building, the one-directional (either arriving or departing) peak number of passengers handled per hour is 270. This is slightly lower than the 280 passengers that were recorded in 2003.

With respect to the combined peak (arriving + departing passengers), the peak is considerably lower in 2007 than in 2003 – 340 compared to 510. Figure 2-1 and Figure 2-2 present the daily profiles of passenger traffic (arriving and departing) at the Yellowknife Airport for the days when the combined peak hour passenger traffic occurred in 2003 and 2007, respectively.

Figure 2-1: Yellowknife Airport Peak Passenger Profile 2003

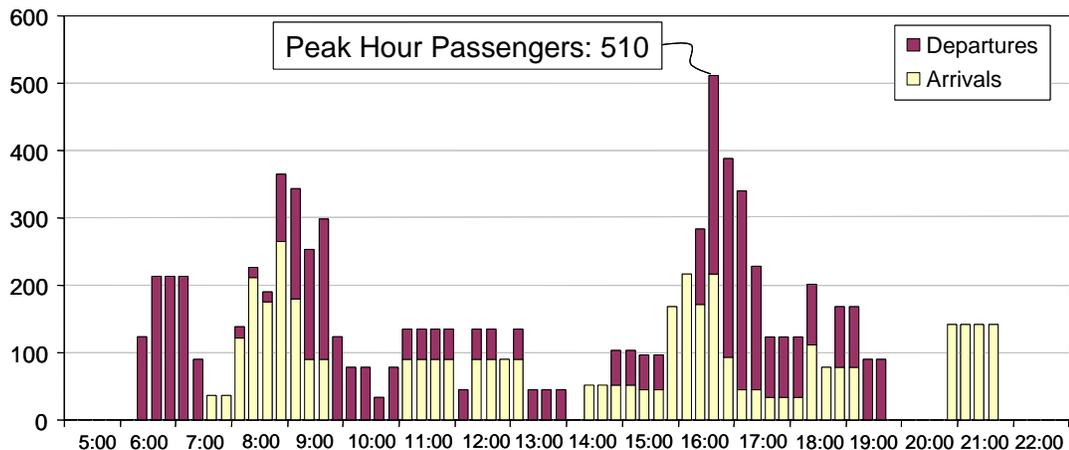
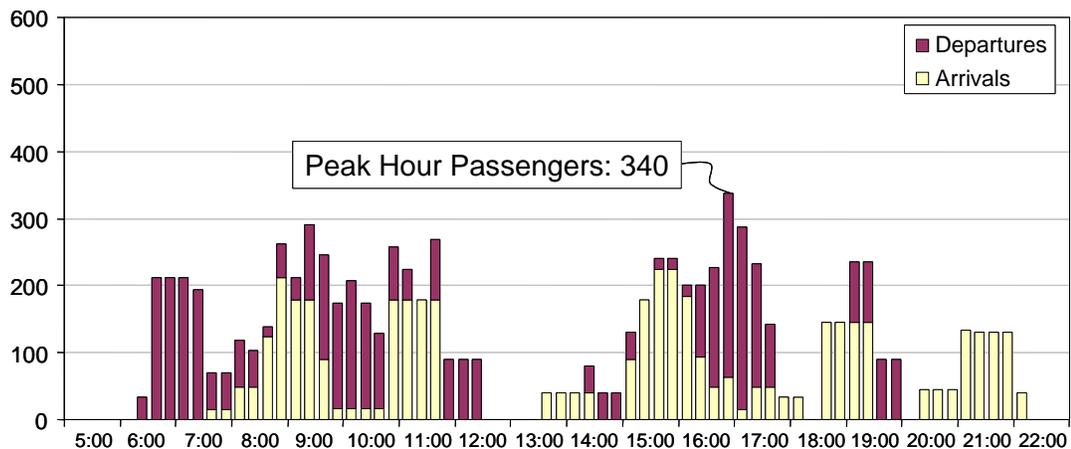


Figure 2-2: Yellowknife Airport Peak Passenger Profile 2007



The reason for the lower peak hour passenger traffic is peak spreading. That is, as traffic grows and markets mature, service evolves and spreads to other days of the week. Also, during the peak period of the day, carriers already serving markets during this time will add services to other periods of the day. As such, the growth in peak passengers is usually lower than the passenger growth. The peak profile figures provide evidence of the peak spreading throughout the day.

2.1.2 Aircraft Movements

Like passenger traffic, itinerant movements at the Yellowknife Airport have also increased significantly since the previous forecasts were produced for the 2004 ADP. Since 2003, itinerant movements have increased 36%, from 40,570 to 55,046 in 2007.

After reviewing carrier schedules and various other data sources, it is clear that the majority of the increase in itinerant movements since 2003 involves additional passenger carrier services and mining-related movements.

2.1.3 Air Cargo

Current reporting practices do not enable accurate estimation of cargo traffic at Canadian airports. Official and up to date cargo statistics are therefore not available for the Yellowknife Airport.

Nonetheless, consultations with Yellowknife Airport air carriers and cargo operators were conducted to obtain a pulse of current activities for the purpose of this ADP. These consultations indicate strong growth of the cargo sector in line with the growth of passenger and aircraft movements recorded since 2003.

The amount of air cargo handled at the Yellowknife Airport in 2003 was estimated at approximately 22,800 tonnes. Based on information provided during recent consultations, estimated volumes in 2007 would have surpassed 32,000 tonnes, representing an overall increase of approximately 40% since 2003. The increase in cargo volumes observed at

the airport would be attributed in part to strong growth in the mining and oil exploration activities in the North during this period.

2.2 Traffic Forecasts

Dependable forecasting practice requires awareness of the uncertainties surrounding the forecasts. In reviewing and updating traffic levels and forecasts for the airport, considerable effort has gone into analysing the factors affecting traffic activity. A pragmatic and yet systematic approach was adopted to produce a set of unbiased aviation activity forecasts for the airport. However, as with any forecasts, there are uncertainties regarding these factors, such as the outlook for the local and world economies and the structure of the airline industry. Reflecting this uncertainty, high, low and medium (most likely) forecasts have been developed. While the medium (base) case is what we expect to occur at Yellowknife, consideration of the low and high ranges will also capture the uncertainties inherent to long-term forecasting.

The Yellowknife socio-economic environment (or the 'natural market') is primarily based on government, northern business, and mining/oil industry activities. These drive the baseline traffic at the airport. The following provides some basic assumptions which add to the baseline traffic and differentiate the medium (base) case from the low and high cases.

- **Low:** Based on natural socio-economic growth, and the assumptions that no potential projects materialize and that little tourism is developed.
- **Medium:** Assume continued strong socio-economic growth (based on Transport Canada forecasts), that some potential projects materialize (ensuring incremental employment), minor tourism development and some new air service market entrants.
- **High:** Assume continued strong socio-economic growth (based on Transport Canada forecasts), that all potential projects materialize (ensuring incremental employment), more tourism development and market stimulation from new air service market entrants.

The following forecasts were prepared based on available 2006 traffic data, and further adjusted to reflect availability of 2007 traffic data and more recent traffic conditions.

2.2.1 Passenger Traffic

The updated Yellowknife Airport passenger forecasts were developed for a twenty-year period (2007-2027). Trend analyses, market and industry outlook, along with professional judgement were used to produce the various traffic forecasts.

Figure 2-3 displays historical passenger traffic at the airport, and compares the 2004 forecasts with those updated for the current planning exercise. Table 2-2 presents the forecast range and growth rates based on recent growth and changes in the socio-economic environment.

In the medium case, the airport is expected to reach 954,500 passengers by the end of the forecast horizon; which represents growth of 3% per annum. The short-term growth is expected to be stronger, averaging 5.5% per annum until 2012. The latter is projected to be fuelled by strong economic performance, continued major project development, and increased air services.

Figure 2-3: Yellowknife Airport Passenger Forecasts – 2004 – 2007 Comparison

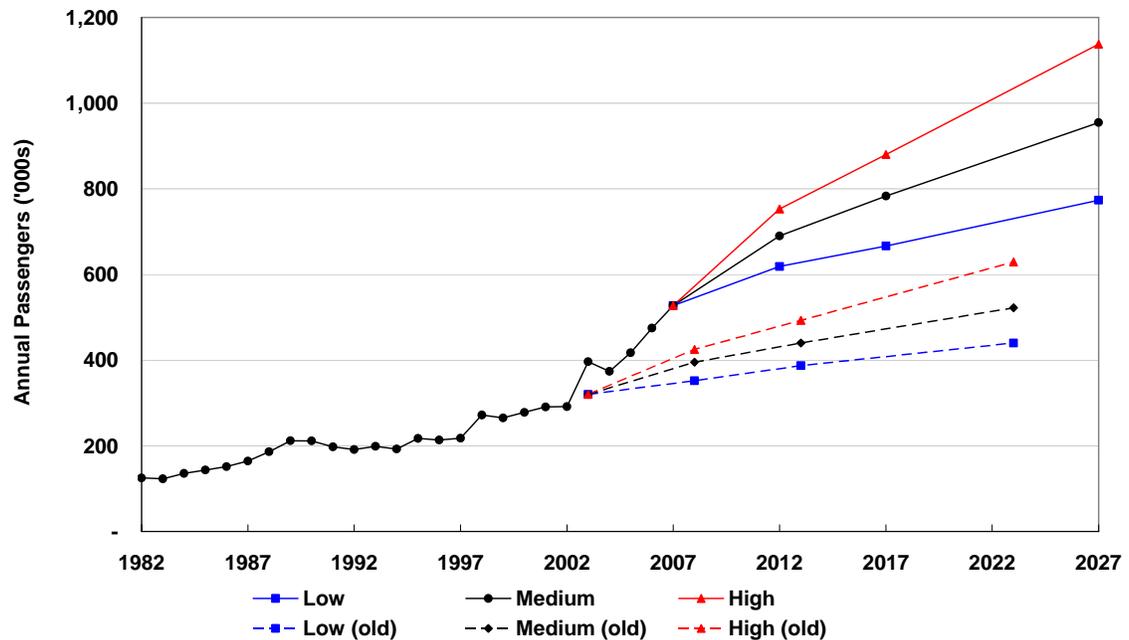


Table 2-2: Yellowknife Airport Passenger Forecasts Range

Year	Low	Medium	High
2007		527,170	
2012	618,700	690,000	753,000
2017	666,500	783,000	880,000
2027	773,500	954,500	1,137,500
2007-2012	3.3%	5.5%	7.4%
2007-2017	1.5%	2.6%	3.2%
2007-2027	1.5%	2.0%	2.6%

2.2.2 Aircraft Movements

Aircraft operations are generally a function of passenger traffic demand and air service development, shaped by air carrier networks and the average size of aircraft serving the airport. The forecasts of future aircraft movements for the airport are derived forecasts, which take into consideration passenger traffic demand (forecasts), potential service improvements/expansion and changes of average aircraft size and load factors.

Figure 2-4 presents historical Yellowknife Airport itinerant and local movements, and compares the new forecasts with the forecasts presented in the 2004 ADP. As depicted in the figure, the previous medium case itinerant movement forecasts are lower than current low case forecasts.

Figure 2-4: Yellowknife Airport Aircraft Movement Forecasts

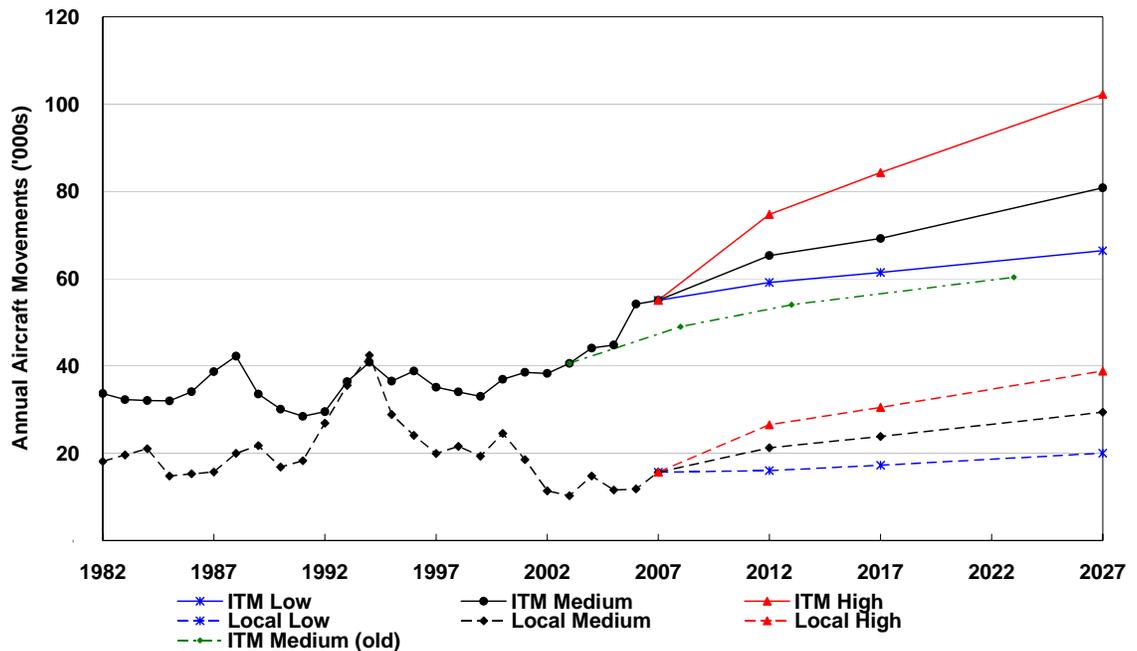


Table 2-3 presents the updated Itinerant movement forecast range for the Yellowknife Airport. While the Itinerant movement forecasts are slightly lower than the passenger forecasts (3.4% versus 5.5% per annum in the short-term), they are still quite strong. The lower growth would be attributed to several factors, including:

- Increased load factors;
- Increased average aircraft size; and
- Eventual transfer of some combi aircraft to all freight operations.

In the future, with the addition of incremental southern and mining flights, the average aircraft size and load factors are expected to increase, which in turn will result in lower movement growth.

Table 2-3: Yellowknife Airport Itinerant Movement Forecasts Range

Year	Low	Medium	High
2007		55,046	
2012	59,000	65,000	75,000
2017	61,000	69,000	84,000
2027	66,000	81,000	102,000
2007-2012	1.4%	3.4%	6.7%
2007-2017	1.0%	2.3%	4.5%
2007-2027	0.9%	2.0%	3.2%

As is evident from Table 2-3, even in the high case, itinerant movements are only slightly higher than 100,000 at the end of the forecast horizon (2027), which is well within the practical planning capacity of 150,000 annual movements outlined in the 2004 ADP.

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3. Airfield

The Yellowknife Airport airfield, consisting of taxiways, runways, aircraft parking aprons and supporting systems and facilities is described in detail in Sections 6 and 7 of the 2004 ADP. Since completion of the last ADP, a number of issues have emerged however that influence or may influence future airside operations. These issues include:

- The increase in itinerant aircraft movements and their impact on airside capacity;
- The relocation of the airport's maintenance facilities and fire hall to the proposed Combined Services Building on the West-side of the site; and
- Anticipated changes to Transport Canada aerodrome standards for Runway End Safety Areas.

In this update, the discussion focuses therefore on the impact these issues have on operations, the necessary changes to airside configuration and expansion requirements to meet changes in demand.

3.1 Current Conditions and Considerations

3.1.1 Inventory

For reference purposes, inventory of key airside infrastructure is presented in the following paragraphs. The current layout is depicted in Figure 3-1.

Runways

The Yellowknife Airport airside system has two intersecting runways, as illustrated in Figure 3-1. The characteristics of the runways are described below and summarised in Table 3-1.

- Runway 15-33 is the primary runway, 2,286m long, 45m wide, with two taxiway exits at the north end. Runway 33 is the main instrument runway, certified to 4C precision standards and equipped with a Category I Instrument Landing System (ILS). The runway is in good condition, but with some surface unevenness due to permafrost degradation/freeze-thaw activity. An ACAP¹ funded overlay project will be completed in 2008.
- Runway 09-27 is a secondary runway, 1,524m long, 45m wide and certified to 3C non-precision standards, but is protected by Registered Zoning and by the *Airport Operations Manual* for precision operations. The condition is good apart from unevenness due to permafrost degradation/freeze-thaw activity.

¹ Airport Capital Assistance Program (ACAP).

Table 3-1: Runway Data for Yellowknife Airport

Runway	15	33	09	27
Reference Code	4 C	4 C	3 C	3 C
Approach	Non-precision	Precision	Non-precision	Non-precision
Runway Dimensions	2,286m x 45m	2,286m x 45m	1,524m x 45m	1,524m x 45m
Clearway dimensions	305m x 152m	305m x 152m	305m x 152m	305m x 152m
Stopway length	Nil	Nil	Nil	Nil
Strip dimensions	2,406 X 300m		1,643 X 300m	

Taxiways

The Yellowknife Airport possesses a relatively limited taxiway system. The taxiway system connects the north side of the runway system with the airport's aircraft parking aprons and existing airside accessible tenant lots. Table 3-2 provides details of the physical characteristics of the various taxiways. The taxiway system is illustrated Figure 3-1.

Table 3-2: Taxiway Data for Yellowknife Airport

Taxiway	A	B	C	D	E	F	G	H	J	K
Reference Code	E	C	C	C	C	C	C	C	C	C
Taxiway Width	30m	23m	23m	23m	23m	23m	15m	23m	23m	23m

The existing taxiway system is a limiting factor for runway utilisation and capacity. The absence of a parallel taxiway south of the intersection of Runways 15-33 and 09-27 for access to or from Runway 33 creates runway occupancy problems and increased aircraft operation costs. Aircraft departing on Runway 33 must taxi on the runway. Aircraft landing on Runway 33 must taxi on the runway until they reach Taxiway A. These operations require extended runway occupancy time and cost to the aircraft operator. In addition, the frequent taxiing on active runways raises safety concerns and increases risk of runway incursions.

Aircraft departing on Runway 09 from all areas except the northwest quadrant must taxi on the runway. Aircraft landing on Runway 27 must taxi on the runway unless they can exit at Taxiway A. These operations require extended runway occupancy time and costs to the aircraft operator. Taxiway B is the only true parallel taxiway at the airport. However, Taxiway B must contend with two-way traffic demand. This situation can cause delays.

LEGEND

- - - - - Airport Boundary
- "00" Runway Designators
- "X" Taxiway Designators
- "||" Apron Designators (Designated Aprons)

Independent Secondary Surveillance Radar (ISSR)

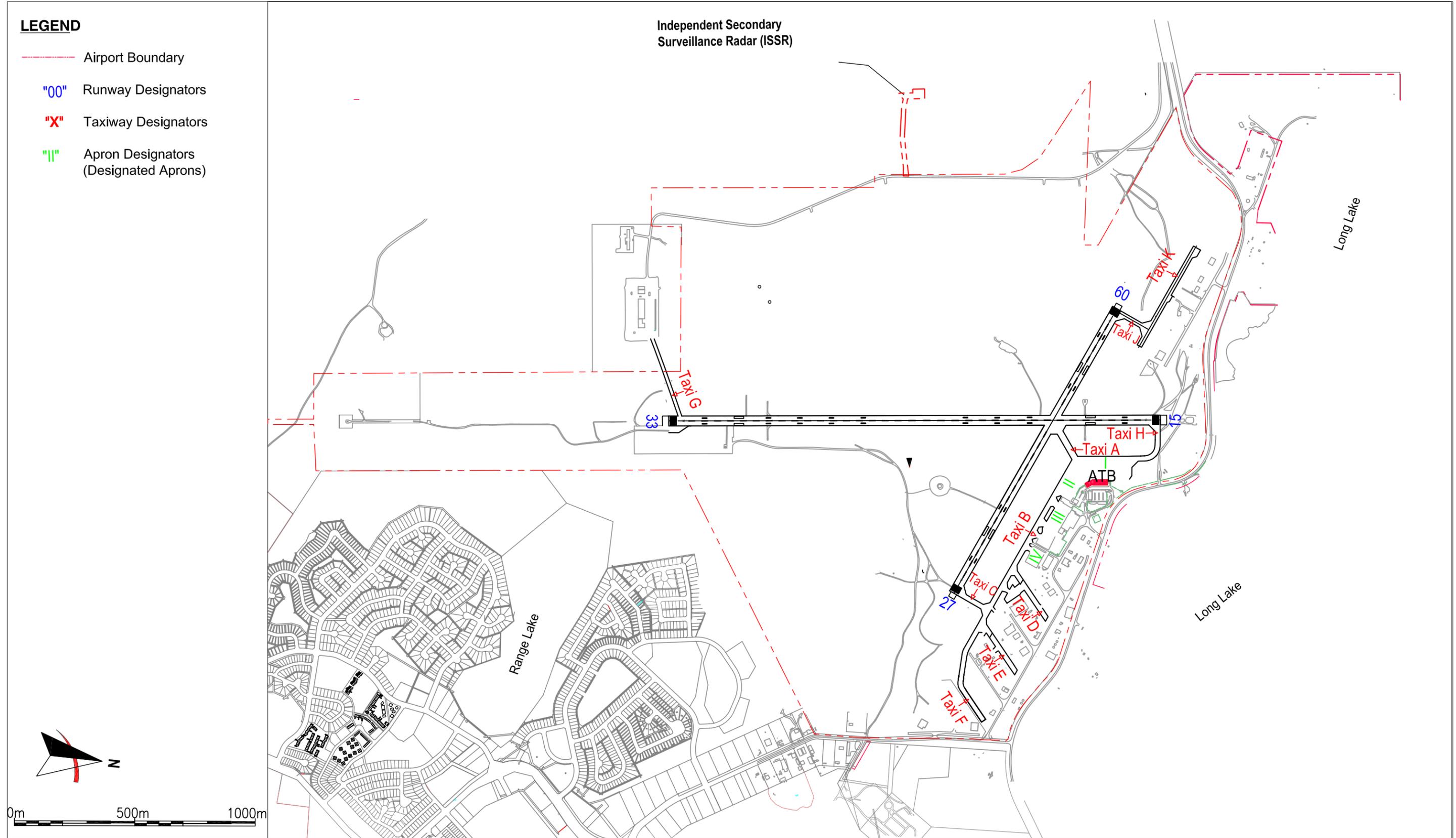


Figure 3-1: Current Airfield Layout

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Aircraft Parking Aprons

The Yellowknife Airport currently offers very limited aircraft parking surfaces. There are four designated aircraft parking aprons at the airport, including Aprons I and II serving the ATB, as well as eight non-designated parking aprons maintained on tenant lots. Most of the non-designated aprons have joint purposes, generally providing for charter, cargo, aircraft maintenance, government and general aviation activities. The lack of aprons pose significant operational challenges to airport administration and air carriers and limit the ability to attract new carriers and related air services. The location of each apron is shown in Figure 3-1.

Pavement Strength

Runway and taxiway surfaces should be capable of withstanding the traffic of aeroplanes they are intended to serve. Runway and taxiway surfaces at the airport, as well as Aprons I and II, possess a Pavement Load Rating (PLR) 12. This PLR indicates the strongest rated bearing strength for aircraft manoeuvring surfaces, and enables the runways and taxiways to accommodate all current and planned production aircraft.

3.1.2 Airside Capacity

Between 2003 and 2007, itinerant aircraft movements increased by 35% accompanied by even faster 42% growth in IFR itinerant movements. IFR operations involve the application of strict air traffic separation standards and IFR demand is now frequently approaching capacity during peak periods.

The estimated annual practical capacity of the airport's existing airside system is in the order of 150,000 movements. This is a low number for a 2-runway airport and it reflects the constraints imposed by the absence of a taxiway system to serve the primary Runway 15-33. With a full taxiway system, annual capacity would increase to about 240,000 movements.

While on an aggregate level, there appears to be sufficient capacity for the forecast 81,000 itinerant movements in 2027. When examined on an hourly basis in the context of IFR operations, peak period capacity is now frequently being tested. With solid growth expected to occur in the future and as IFR operations continue to grow, congestion and delays will ensue.

Planning Peak Hour Movement (PPHM) projections support a finer analysis of demand characteristics, and provide an indication of the onset of congestion during heavy demand periods. Since almost all itinerant aircraft are capable of operating under IFR conditions, the PPHM is used to evaluate IFR capacity. PPHM indicate the highest traffic levels

expected at an airport and serve to provide guidance with respect to maximal capacity requirements during the year's busiest periods.²

Table 3-3 reflects the current projected Planning Peak Hour Movement forecasts for 'Itinerant' traffic to 2027.

Table 3-3: Planning Peak Hour Aircraft Movement Forecast

	Current	2012	2017	2027
Itinerant	22	26–29	28–32	32–39

The hourly IFR runway capacity of Runway 15-33 is currently restricted by the limitations of the taxiway system. Without a parallel taxiway, aircraft must "backtrack" on the runway during landing or takeoff resulting in runway occupancy times in excess of 3 minutes. This compares to occupancy times of 1 minute less for runways equipped with a full parallel taxiway. The current IFR capacity is estimated to be in the range of 20-24 movements per hour. However, arrival capacity could be as low as 15 operations per hour during bad weather when Runway 15 is in use.

As shown in Table 3-3, it is apparent that IFR capacity will clearly be deficient by 2012. A capacity increase to approximately 30 movements per hour is required for the projected activity to 2017, with an increase to 39 movements per hour for the remainder of the planning period.

As discussed, the runway system has abundant capacity potential to meet future demand. Taxiway system development is required to unlock this capacity. (The latter is further discussed in Section 3.2.1 of this document.)

3.1.3 Maintenance Facility and Fire Hall Relocation

The relocation of the airport maintenance garage and fire hall to the proposed Combined Services Building on the West-side site is key to initiating the process that will eventually result in the relocation of the ATB complex to this sector of the airport. Moving the fire hall provides the ability to open up additional apron parking areas and make a significant contribution to extending the life of the present terminal.

Because Emergency Rescue Services (ERS) require direct access to the runway system, fire hall relocation relates to the development of an expanded taxiway system as discussed in Section 3.2.1.

² Analysis and forecasting of seasonal PPHM are not useful for planning purposes and require detailed scheduling analysis and nominal schedule forecasting outside the scope of a Development Plan exercise.

3.1.4 Runway End Safety Area

Aircraft runway overrun accidents, including that of Air France at Toronto Pearson in August, 2005, have brought increased emphasis on the provision of Runway End Safety Areas (RESA). As a result of ICAO standards and recommendations, it is anticipated that Transport Canada will introduce aerodrome standards requiring an increase in the minimum length of the RESA. The Transportation Safety Board report on the Air France accident recommended that 300m RESA's be provided on all Code 4 runways. While the exact length of the RESA that will be required is not yet decided, it is prudent to protect for this requirement for planning purposes. A discussion of RESA options is included in Section 3.2.2 dealing with runway length requirements.

3.2 Development Requirements

A review and update of the planning proposals for airfield infrastructure contained in the 2004 ADP was undertaken for airfield infrastructure. The exercise indicates that the following improvements continue to be necessary:

- Capacity increases through the expansion of the airport's taxiway system;
- Extension of the airport's market reach and meeting emerging safety standards associated with runway lengths;
- Enhancements to runway approach aids and lighting; and
- Increase the availability of aircraft parking surfaces.

Updated proposals and references are provided for each of these areas in the following pages. Figure 3-2 provides a summary of these proposals.

3.2.1 Taxiway System Expansion

The impending re-location of the airport maintenance facilities and fire hall, together with the eventual development of a new ATB complex, provide strong reasons to develop a parallel taxiway on the West-side of Runway 15-33. It is estimated that providing a partial length taxiway for approximately half of the distance from the intersection of Runway 09-27 to the Runway 33 threshold would increase IFR capacity to the 30 movements an hour range. Current projections suggest that this would be sufficient to meet demand to at least 2017.

As outlined in the 2004 ADP, commercial development opportunities also continue to justify taxiway development south of Runway 09-27. The development of this infrastructure should occur as part of the commercial strategies adopted for respective land areas (i.e. southeast quadrant and west-side).

3.2.2 Runway Length

Runway 15-33

By virtue of its length, the high percentage of time that it is available with respect to wind conditions, and the ILS on 33, Runway 15-33 is the primary airport runway. The 2004 ADP recommended a phased approach to runway extension with Phase I adding 760m to provide a total of 3,050m (10,000ft). The requirement for the extension was predicated on expanding passenger air services and the possibility of increased use by cargo aircraft in transit on polar routes. The key factors to be considered in this update are the need for additional runway length and the potential need to accommodate RESA.

With respect to the provision of RESA, the current ICAO standard applicable to the Yellowknife Airport calls for a 150m long by 90m wide (two runway widths) area capable of supporting the aircraft and preventing major damage. There is currently on-going debate within ICAO concerning the need to extend the standard to conform to the "Recommended" distance of 300m³ and Transport Canada's review of the requirement continues. At time of completion of the ADP, industry intelligence indicated that over the course of the planning period a RESA requirement would likely emerge for Code 3 and Code 4 runways in Canada.⁴

There is a possibility that the RESA requirement may be waived on the approach end of the runway if the latter is equipped with an ILS and/or PAPI. If this became the case, it would provide significant relief for Runway 15, where it is considered unlikely that terrain would permit RESA construction.

In cases where RESA cannot be provided, the solution is to incorporate the required distance into the existing runway by reducing the declared distances. For example, if the requirement was for a 300m RESA, the resulting Take-Off Run Available (TORA) distance on either Runway 15 or 33 would be 1983m (6500ft).

³ It should be noted that the FAA Runway Safety Area length is 1,000 feet.

⁴ As stated in Section 3.1.4 – Runway End Safety Area, the length of potential RESA is under review by ICAO and Transport Canada.

LEGEND

--- Airport Boundary

Future runway extension

Phase I - 760 m (2008 - 2017, as justified by demand or imposed by RESA requirements)

Phase II - 450 m (when justified by demand)

Runway 15-33 West Taxiway Development

Phase I - 1,100 m (2011-2012)

Phase II - 780 m (in association with ATB development)

Phase III - 1,213 m (concurrent with potential future runway extension)

Runway 09-27 RESA
300m RESA implemented at both extremities (as required by regulatory)

Runway 15-33 RESA
300 m RESA incorporated in runway surface and reduced TORA (In association with runway extension)

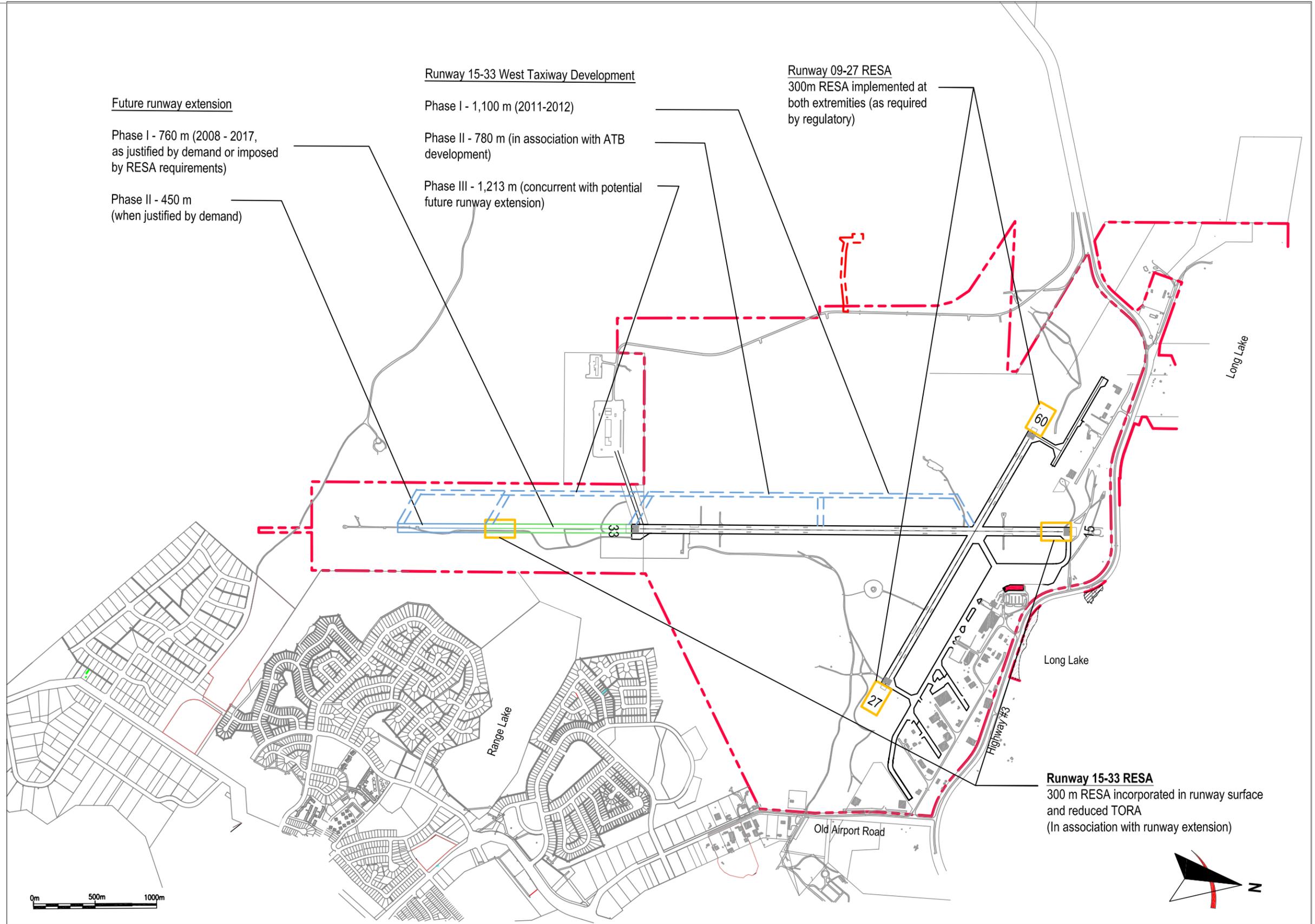


Figure 3-2: Airfield Improvement Proposals

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Table 3-4 provides values for takeoff run and landing distance available assuming a 300m RESA requirement for three cases:

- No extension and no RESA constructed (Declared distance solution)
- Construction of a 760m runway extension; no RESA construction
- Construction of a 760m runway extension; RESA constructed at Runway 33 threshold

It should be noted that a 300m RESA is used because it would have the greatest impact on declared distances and is currently the recommended ICAO distance. It is also assumed that a landing threshold RESA will not be required.

Table 3-4: Potential Runway 15-33 Extension Declared Distances (metres)

Runway	Extension	Length	RESA	15 TORA	15 LDA	33 TORA	33 LDA
Existing – Pre RESA	0	2,288	0	2,288	2,288	2,288	2,288
No Extension – RESA within runway surface	0	2,288	300	1,983	1,983	1,983	1,983
Extension – RESA within runway surface	763	3,050	300	2,745	2,745	2,745	2,745
Extension – RESA construction threshold R 33	763	3,050	300	3,050	3,050	2,745	2,745

⁽¹⁾ "Worst case" RESA assumed at 300m.

⁽²⁾ RESA not required for landing threshold

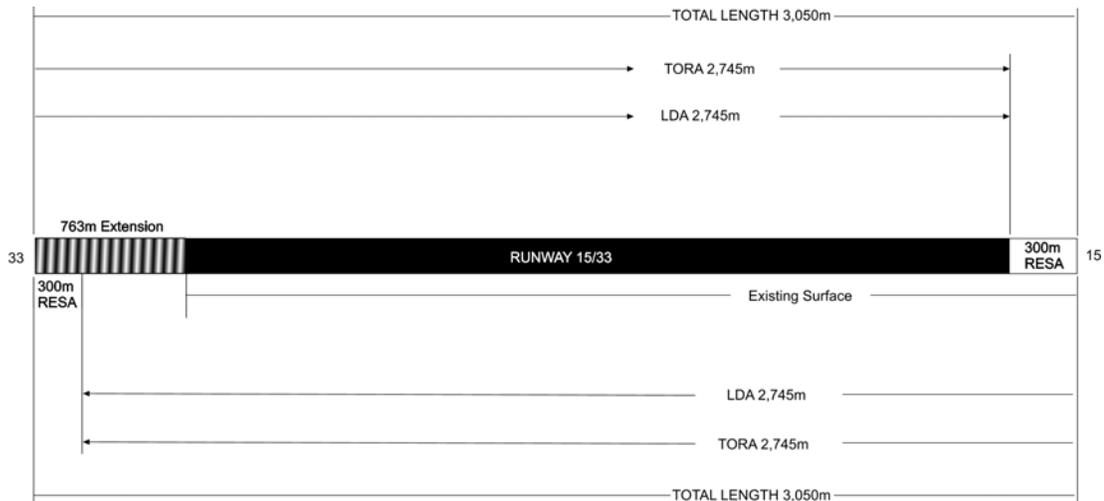
⁽³⁾ RESA will not be added to threshold to Runway 15 due to terrain constraints.

⁽⁴⁾ "No RESA" case means RESA incorporated into runway length.

Based on the potential declared distances show in Table 3-4, it is evident that if a RESA requirement is applied to the current runway length without providing a dedicated off-runway RESA area on one or both ends of the surface, the reduction in declared distances will be significant.

Figure 3-3 illustrates the preferred option.

Figure 3-3: Runway 15-33 RESA Implementation Option



From the perspective of providing sufficient future runway length to support international travel services, it is important to note that improved takeoff performance are key characteristics of recent and emerging technology aircraft. For example, a 2,750m TORA would be sufficient for an A330-200 to provide service to points within a 4,500nm radius of Yellowknife – including Frankfurt and Tokyo. The B787 Dreamliner is expected to have similar or better performance.

Accordingly, it is recommended that the 2004 ADP proposal to extend Runway 33 to the south by 760m be retained as the Phase I option to support introduction of international air services at the airport. Given the relationship a RESA may have on the potential TORA for the runway, the runway extension will likely need to be addressed when and if the RESA requirement is issued at either of the 150m or 300m length.

While it is difficult to establish a specific timeline for meeting these requirements, a 10-year timeframe would be realistic from a planning perspective. Accordingly, revision of the Aeronautical Zoning that applies to this runway, as proposed in the 2004 ADP, should be undertaken. Given legal process and related timelines associated with the revision, steps will need to be undertaken over the very short-term period to ensure protection against incompatible development at the end and adjacent to the related runway strip and provide the necessary framework for City of Yellowknife planning. For reference purposes, the proposed Aeronautical Zoning is shown in Figure 3-4.

Runway 09-27

The implementation of a RESA at both ends of Runway 09-27 is a comparatively simple project from a terrain standpoint. Accordingly no extension to the runway is recommended at this time.

LEGEND

- Runway Strip Outline
- Transitional and Approach Surfaces Outline
- Height Maximums (m above runway reference level)
- - - Airport Boundary
- Outer Surface

■ Additional runway strip surface (Approx. 31.7 ha)

■ Area Impacted by Modified Obstacle Limitations and Aeronautical Zoning. Permissible heights would be lowered by approximately 20m.

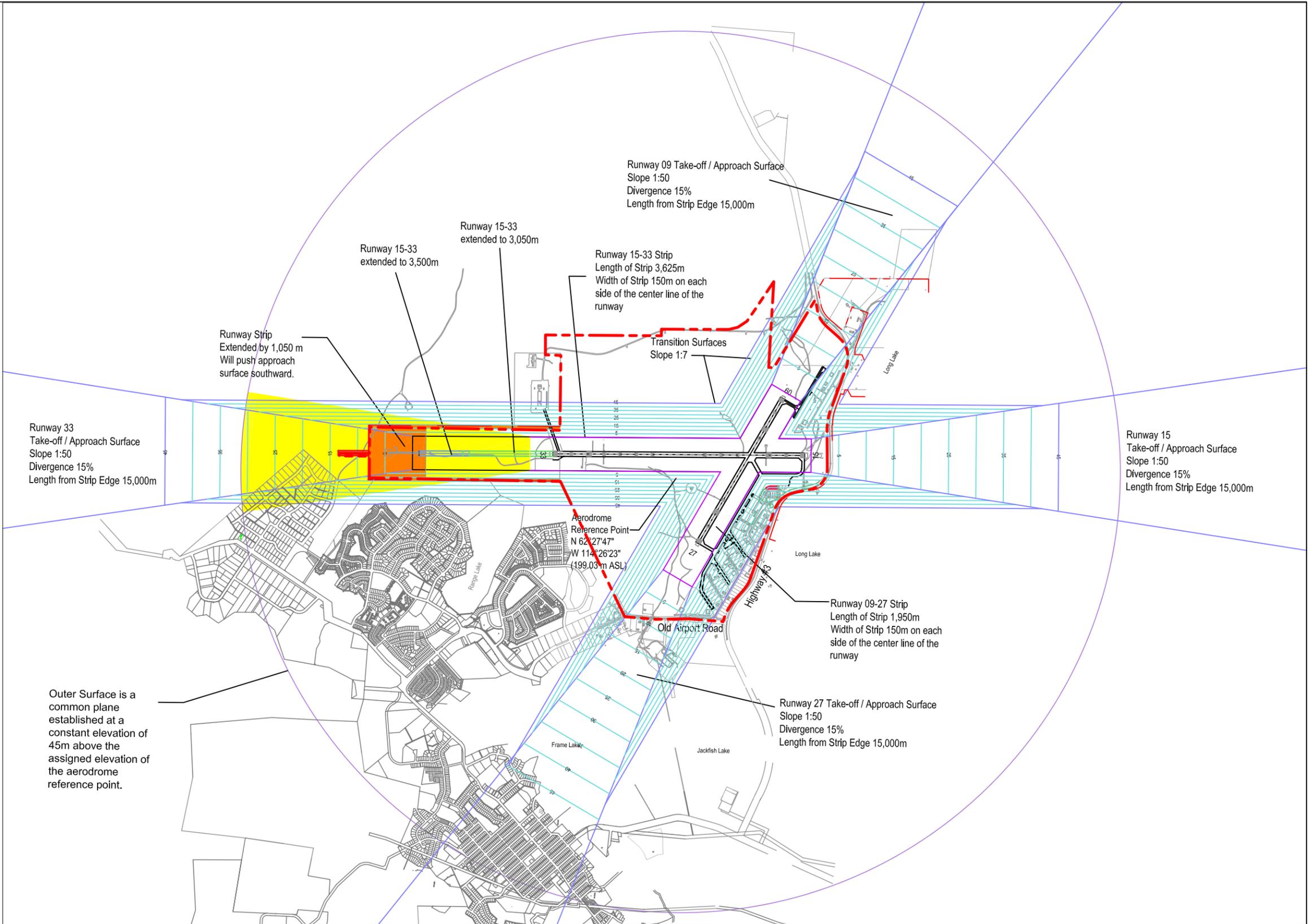


Figure 3-4: Proposed Airport Zoning (2004)

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It is important however to preserve the option to extend the runway in the future. When Runway 15-33 approaches practical capacity (seen as beyond 2027), an extension to Runway 09-27 would add significant capacity by permitting use by larger aircraft. Accordingly, the existing zoning should be maintained to protect this option.

3.2.3 Approach Aids and Lighting Requirements

Runway 15 is currently served only by non-precision approach aids and by simple Runway Identification Lights. While GPS and other on board systems are now off-setting the need for ground based systems, an upgraded approach lighting system would enhance low visibility approach operations.

The incorporation of a RESA for Runway 15 is may require a displaced threshold. It is recommended that as part of the re-configuration, an upgrade to the high intensity lighting be undertaken.

3.2.4 Aircraft Parking Aprons

The aircraft parking aprons at the airport are currently constrained by availability and related use. Given the relationship each apron has with adjoining infrastructure (e.g. ATB aprons, tenant locations), individual apron requirements are addressed further in this document as they relate to ATB operations (Section 4) and Commercial Development (Section 6).

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4. Air Terminal Building Complex

The Air Terminal Building complex comprises the facilities necessary for accommodating aircraft parking, passenger processing, air carrier and ancillary services to support scheduled commercial air services at the airport. These components were addressed in detail in Sections 7 – Apron, 9 – Passenger Terminal Building and 11 – Ground Transportation, Internal Airport Circulation and Parking of the 2004 ADP. The latter provided a basis for recent improvements to the existing ATB, main aircraft apron and vehicle parking, as well as the framework and conceptual layouts for West-side development.

Given the strong growth experienced in recent years and forecasts for the future, the West-side development proposal continues to be considered valid in this update in terms of overall development strategy and long-term capacity potential. The analyses and proposals provided in this document focus therefore on providing incremental capacity increases to the existing ATB complex until initiation of the West-side development becomes feasible from a capital planning perspective.

As mentioned previously in Chapter 2, approximately 30% of all passenger traffic is not handled in the ATB. These passengers are processed through the private Fixed Base Operator (FBO), expeditor or charter facilities situated in the northeast quadrant of the airport. The ensuing overview and derived proposals only consider this traffic component when relevant to future capacity and operational issues.

4.1 Site Constraints

The configuration of the ATB complex is largely dependent on the inherent characteristics of the site in which it is located. While the development and expansion potential of the proposed West-side ATB complex is relatively unconstrained due to the greenfield nature of its site, the existing ATB complex is constrained by the location and configuration of the runway system and associated Obstacle Limitation Surfaces, the sloping topography of the northern portion of the site, the proximity of Highway 3 and the competing requirements for ATB access roads and parking surfaces. Figure 4-1 illustrates the various constraints that apply to the ATB complex.

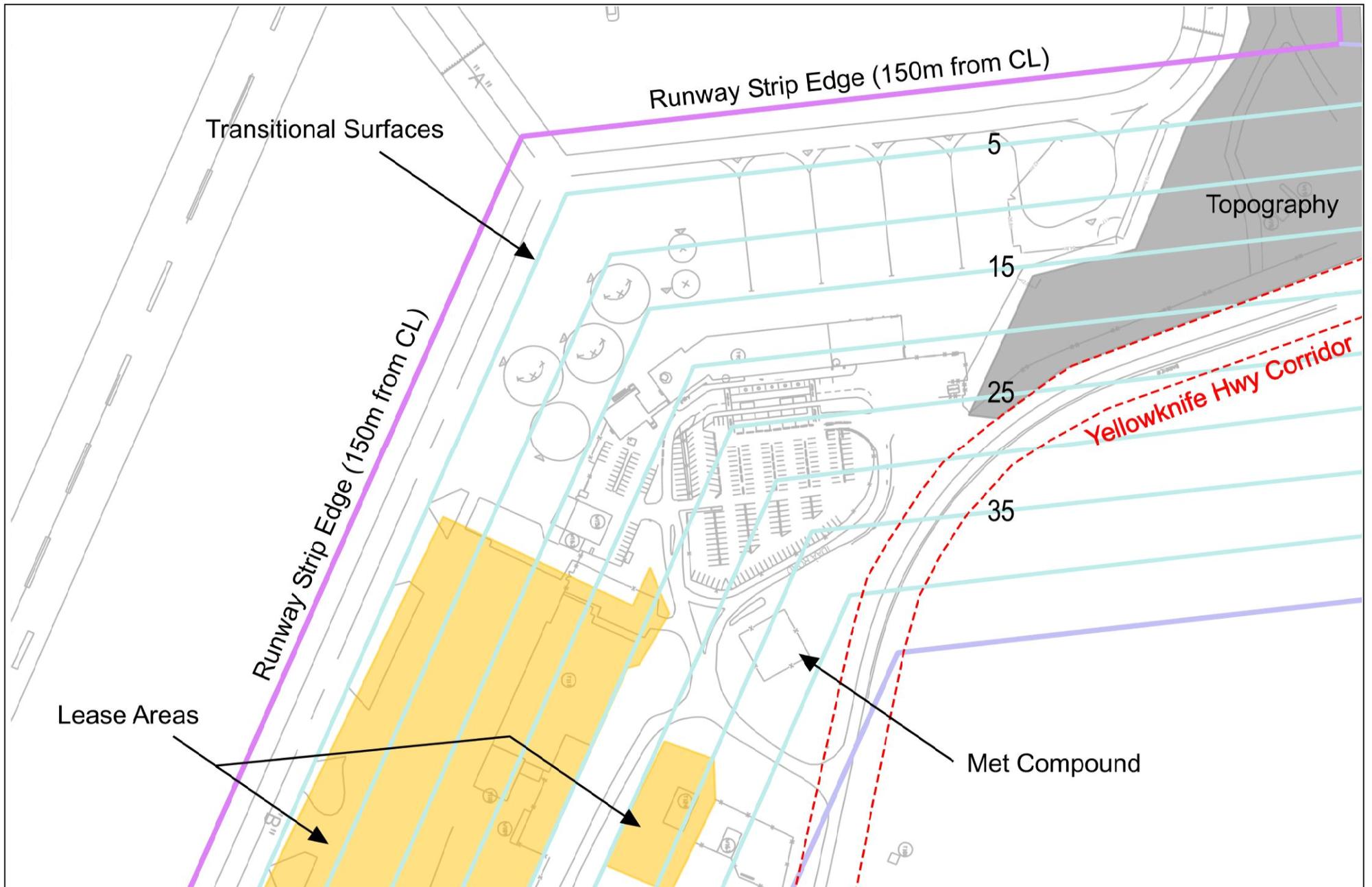


Figure 4-1: ATB Complex Site Constraints

4.2 ATB Aircraft Apron

4.2.1 Current Conditions and Considerations

The configuration and capacity potential of the ATB aircraft apron is the primary driver for overall ATB expansion capability.

The current layout of the ATB Apron (Aprons I and II) is illustrated in Figure 4-2. Following completion and adoption of key development proposals contained in the 2004 ADP, the ATB apron was reconfigured and expanded by 430 m² to accommodate additional aircraft parking positions and an aircraft de-icing bay. The apron capacity has as a result increased from a total of 7 aircraft positions in 2003/04 to 11 aircraft parking positions today including the de-icing position. The capacity increase was enabled partially through the physical expansion of the parking surface at its northern end and also through conversion of aircraft apron maneuvering operations from power-in/power-out mode to power-in/push-back mode.

Although the expansion/reconfiguration has provided some relief to the overall capacity issues highlighted in the previous ADP, the apron still experiences some congestion during peak periods and occasionally during de-icing operations. The location of the fire hall and the requirement for unobstructed access to the runway system limits the ability for intensive use of the surface in front of the building for aircraft operations and ground handling.

All aircraft operations on the apron remain ground-load type, with no passenger boarding bridges. In some cases, passengers must walk long distances on the ramp to reach some of the more remote parking positions.

As stated previously in this document, the apron strength is rated as PLR 12, capable of accommodating all aircraft weight categories that could serve the airport, and is currently considered to be in good condition.

4.2.2 Demand/Capacity

The review of the carrier schedules and derived peak hour traffic serves to identify current and future aircraft parking position requirements. The analysis of 2006/07 air carrier schedules serving the ATB indicates that 9 aircraft stands are simultaneously occupied during peak periods, with approximately a 50/50 split between jet (B737, CRJ) and turbo-prop (ATR-42, Dash-8) aircraft.

LEGEND

- Air Terminal Building
- ATB Annex
- Fire Hall
- Expanded apron surface
- Perimeter fence

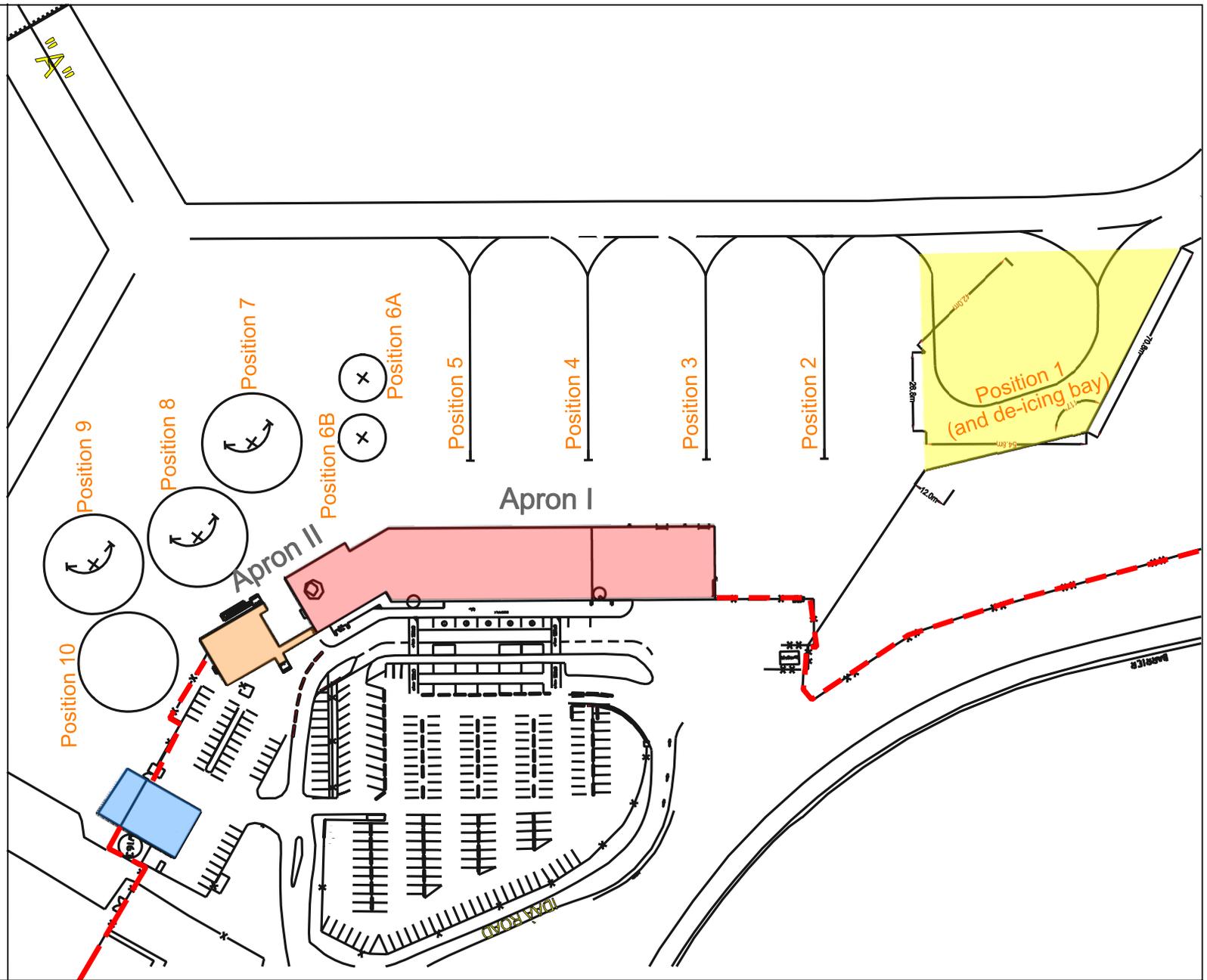


Figure 4-2: Existing ATB Aircraft Apron Layout

Table 4-1 identifies forecast peak hour movements and derived apron parking position requirements for the 20-year period covered by this update.

Table 4-1: Yellowknife Airport Planning Peak Hour Movement Forecasts (PPHM)

	Current	2012	2017	2027
Scheduled Peak Hour Movements	9	11-13	13-14	15-16

The combination of scheduled carrier movements and the regular occurrence of unscheduled movements results in demand for aircraft parking positions frequently reaching the available capacity of 11 parking positions during peak periods. This demand can at times be compounded by occasional apron congestion when de-icing operations are in effect, occupying one parking position and increasing taxiway occupancy times adjacent to the apron.

Changes to air carrier aircraft fleets and potential market development initiatives also raise some apron capacity issues. Of notable interest for the Yellowknife Airport in meeting aircraft parking requirements at the existing ATB complex is the potential to attract international passenger services on wide-body aircraft. Provisions will need to be made to accommodate these aircraft on the existing parking surface given the relative complexity associated with an additional expansion, the probable life-cycle of the existing ATB complex and the frequency by which these flights may operate from Yellowknife. The larger wingspan of these aircraft will incur additional space take-up and incrementally reduce the number of available parking positions on the apron when these aircraft are present. The Obstacle Limitation Surfaces resulting from the current configuration and operation of the runway system, particularly the protection of Runway 09-27 strip for precision approach capability, also limit most of the usable area of the apron to B737-type aircraft (Code C) or smaller.

4.2.3 Layout Potential

A number of apron layout options were prepared during the previous ADP exercise, with the current configuration emerging as the preferred and most feasible for the ATB complex. In consideration of the capacity constraints imposed by recent traffic growth and the prevailing site constraints, the previous layout options were updated to reflect the current operational and traffic needs. Generally consistent with the criteria adopted in the 2004 ADP, the updated concepts were developed and evaluated based on the following considerations:

- Flexibility in accommodating potential increases in aircraft sizes and operations, notably future wide-body operations;
- Ability to increase the usable apron surface by narrowing the strip width of Runway 09-27 to 150m from 300m (consistent with Code 3 non-precision standards);
- Use of power-in/push-back operations for jet aircraft; and

- Passenger flows deriving from the location, frequency of use and allocations for individual aircraft types at individual positions (e.g. location of turbo-prop and wide-body positions against ATB passenger processing locations).

The capital expenditures required to expand and reconfigure the existing terminal building, coupled with the site's physical constraints, significantly limit the number of configuration options that may be developed. Overall, the conceptual layouts indicate that the ATB apron could accommodate up to 13-14 aircraft positions, depending on the aircraft mix, the amount of surface expansion undertaken to the north or to the south and the degree to which existing taxiway surface are needed for apron expansion. Note that without pavement expansion or conversion/re-alignment of adjacent taxiways, the existing ATB apron cannot adequately provide the necessary capacity improvements.

The decision to expand pavement surfaces will ultimately depend on the growth and profiles associated with air carriers schedules. As noted previously, peak traffic profiles have tended to spread throughout the day rather than increase in intensity, likely as a result of the current apron capacity limitations. Further peak spreading may also mitigate requirements for short to medium-term capital requirements associated with apron surface expansion.

4.2.4 Preferred Layout Concept

The preferred layout concept is illustrated in Figure 4-3, with indication of related expansion requirements.

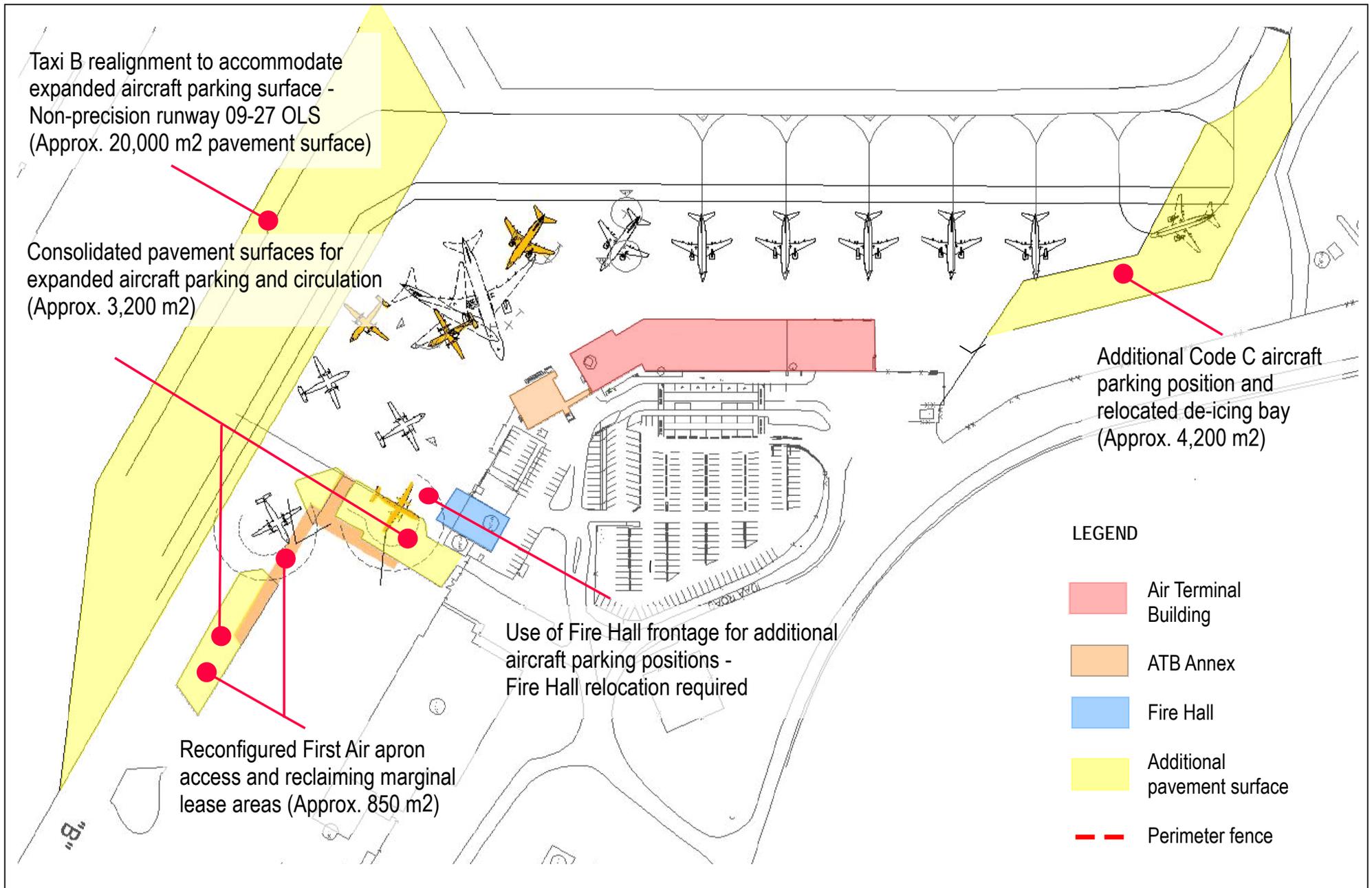


Figure 4-3: Maximum ATB Aircraft Apron Capacity Layout

If implemented in its entirety the preferred concept would involve the following:

- A partial re-alignment of Taxiway B adjacent to Apron II, and use of related surface for additional parking positions.
- The use of the fire hall frontage for aircraft parking, requiring relocation of the Fire Hall to the new West-side CSB.
- An incremental take-up of a portion of the First Air aircraft apron, requiring re-configuration of the tenant's lease and operational area.
- Considerable additional infill at the north end of the apron to accommodate one additional jet aircraft parking position. Requiring significant land fill at this location. (Note that this aircraft position is shown at this time for reference purposes to indicate the maximal expendability of the apron. Development shall be considered as needed once the remaining capacity potential is reached and the timing of West-side development is confirmed.)
- A potential reduction of the Runway 09-27 strip width, consistent with non-precision standards, to accommodate B767/A330-type aircraft positions (Code D) on Apron II. As detailed in the 2004 ADP, enacting this change would involve an amendment to the Airport Operations Manual, and would not affect the existing Airport Zoning Regulations. Depending on the frequency of use by these aircraft type, an alternative to the strip width reduction would be the occasional issuance of NOTAM's to advise of aircraft tail incursion on the runway's transitional surface.⁵

4.3 Existing Air Terminal Building

4.3.1 Current Conditions

The existing Yellowknife Airport ATB is a multi-story structure, with a single story northern wing addition. Totalling approximately 3,700 m² of floor space, the ground floor of the building currently accommodates all ATB-related passenger processing operations. These include check-in, pre-board screening, departure lounges (screened and non-screened) hold baggage screening and handling areas, as well as air carrier offices and concession areas (retail, food and beverage and car rental counters). The ground floor also currently accommodates the airport's administration offices.

The older multi-story portion of the ATB was originally built in 1963. It housed passenger operations on the main floor, and office and support on functions on the upper floors. The Air Traffic Control Tower was added to the building in 1972. The ATB was renovated and expanded in 1988-90. The latter saw the construction of the northern wing to accommodate most passenger processing activities. Incremental internal reconfigurations followed, including new washroom facilities, and expanded pre-board screening checkpoint and screened departure lounge.

⁵ NAV CANADA has indicated that the issuance of NOTAMs would be the favored approach.

Following adoption of the 2004 ADP, significant capital expenditures were made to the building to accommodate new hold baggage screening and make-up areas in a northern expansion; and a dedicated non-screened passenger departure lounge and new airport administration offices through the addition of a southern annex structure. Additional air carrier office space, a further expansion of the screened passenger departure lounge and a second arrivals baggage claim area (Carousel B) were also provided through reconfiguration of related vacated space. The rapid traffic growth that has occurred at the airport since completion of the 2004 is however already constraining some of the recently expanded and reconfigured areas. The existing layout is shown in Figure 4-4.

Plans currently exist to relocate NAV CANADA from their second floor offices to the space currently occupied by the airport's administration offices. The latter would in turn relocate to the vacated space on the second floor. This would better meet NAV CANADA's operational requirements and free some space for air carrier storage in the ATB annex.

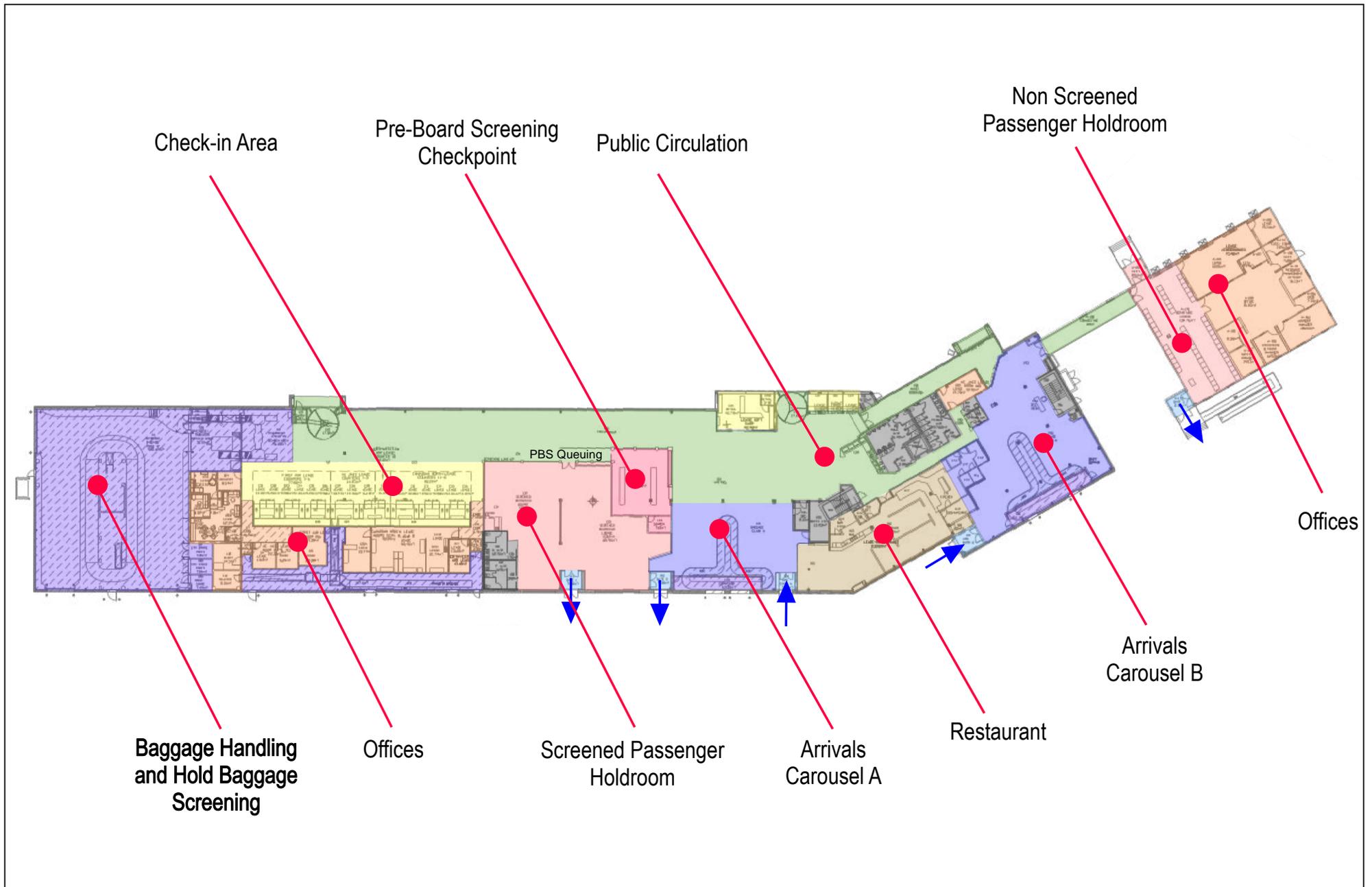


Figure 4-4: Yellowknife Airport ATB - Existing Layout (Ground Floor)

4.3.2 Demand/Capacity

Forecast air carrier activities and derived peak hour traffic dictate the requirements for ATB development. A set of space requirements was previously prepared for the 2004 ADP; however the strong traffic growth that has occurred at the airport since completion of the plan requires further review and updating of overall floor space requirements in the building. Table 4-2 identifies the updated forecast peak hour passenger traffic and provides a breakdown of ATB space requirement for the short (5-year), medium (10-year) and long-term (20-year) periods, based on IATA Level of Service C standards, and validated against the professional judgment of the project team and recent experience at other airports of similar size category (100,000 to one million annual passengers).

Table 4-2: ATB Forecast Space Requirements

Year	Current Space	Forecast Space Requirements		
	2007	2012	2017	2027
Peak Hour Pax (one way)	270	310	360	430
Terminal Subsystems				
Check-in counters (#)	17	18	20	23
Check-in Area and Queuing	231	300	320	400
Airline Offices	253	300	350	500
HBS	636	636	636	700
PBS	81	300	300	400
Holdrooms	333	400	470	600
Baggage Claim area	408	408	408	450
Customs/Immigration		75	85	100
Wait/Circulation Space	812	1000	1100	1300
Concessions	321	400	460	500
Washrooms	113	200	200	250
Admin/Operations	357	357	410	450
Other Support	114	175	175	250
Total Ground Floor	3,659	4,551	4,914	5,900

While the current ATB has undergone significant expansion and reconfiguration over the years, the building possesses a number of characteristics that limit the level of service provided to its users, and will face some capacity constraints over the near-term period as a result of the existing internal configuration. Key deficiencies are outlined below:

- **Check-in Area.** Additional space will be required to accommodate additional check-in counters to provide capacity for forecast carrier peaks. Note that space savings may

be achieved by optimizing check-in counter allocations through common use management and/or installation of check-in kiosks. The latter would reduce requirements to 16 check-in counters by 2017.

- **Pre-Board Screening Checkpoint.** The existing PBS checkpoint is undersized for the type and quantity of screening equipment in use and does not provide sufficient space for effective screening officer movement. The spatial constraints impose limitations on screening officer movements and passenger flows. With the forecast traffic growth, this constraint will impact overall throughput and contribute to increasing queues and associated queuing space.
- **Holdrooms.** The sizing of the screened passenger departure lounge is adequate to meet current peak requirements, but the configuration and position of internal partitions do not encourage best use by passengers. Over the short-term period, the space will increasingly experience congestion and provide lower levels of service (i.e. limited seating availability, etc) during peak departure periods.
- **Customs/Immigration.** The lack of formal border inspection facilities in the ATB challenges the airport's ability to attract international air services. Ad-hoc inspection operations can be set-up to accommodate occasional international flights through use of moveable partitions, but sustained services over the long-term period will command the need for more permanent inspection facilities.

Demand/capacity analyses performed for the ADP originally concluded that the overall capacity would be reached within a timeframe similar to that of the aircraft apron and that the new West-side ATB would need to be initiated to provide the necessary capacity and levels of service by approximately 2013. The traffic profiles outlined earlier in this document and the review of potential layout alternatives indicates that some flexibility may be afforded with the existing structure and that it may continue to meet requirements until approximately 2016/17. Some compromises may be required however with regards to the provision of ancillary spaces such as public circulation, and concession areas within the building to minimize capital requirements for major structural work or building footprint expansion in the immediate years leading up to the initiation of the West-side ATB complex.

4.3.3 Functional Assessment

The functional assessment of the building conducted for the 2004 ADP continues to be considered valid and relevant. Key conclusions of this assessment as they relate to the current update are:

- **Condition.** Although a detailed condition assessment was not conducted as part of the current update, the existing structure is still generally considered to be in good condition, with few deficiencies in terms of compliance with the *National Building Code of Canada*. A number of structural and mechanical components of the original structure would approach the end of their useful life and would require replacement or considerable rehabilitation approximately by the middle of the next decade.

-
- **Configuration.** The oldest and original portion of the building continues to constrain efficient use for passenger services due its structural layout.

Since completion of the most recent capital improvements to the ATB, a number of additional issues will also need to be considered with regards to near-term functional requirements. Key issues involve:

- **Arrivals Area/Baggage Claim.** The total floor space allocation for baggage claim is sufficient to meet requirements to approximately 2017. While this has resulted from the addition of a new baggage claim device (Carousel B), its location within the older portion of the ATB in isolation of the original baggage claim area (Carousel A) does not encourage balanced operational use of both arrivals areas.
- **Check-in Area.** Check-in counter use and allocation among air carriers, along with the derived queuing space, is not optimal and challenges the airport's capability to address new market opportunities.
- **Concessions.** While existing concessions areas enable the provision of acceptable levels of service to airport users, location, configuration and spatial allocations limit opportunities for service enhancements.
- **Wait/Circulate.** The existing configuration of the ground floor results in considerable unused circulation space, notably in the original older portion of the building. By contrast, the remainder of the circulation space becomes congested with well-wishers mixing with departing passenger queues in front of the pre-board screening checkpoint or with arriving passengers near Carousel A.

While the ATB currently provides adequate levels of service – reflecting recommendations made in previous ADPs, specific components will increasingly become strained due to the shortfalls of the existing layout. Relocation or reconfiguration of some of these components within the existing structure will improve the functionality and incrementally enhance the capacity of the building.

4.3.4 Layout Alternatives

Based on the current condition and functional assessment of the building and forecast demand for individual ATB components, a number of layout alternatives were prepared and reviewed to support the extension of the operational life of the current facility. Key considerations in developing these alternatives were:

- Addressing growing capacity constraints of existing ATB processors;
- The constraints imposed by the location and configuration of adjacent infrastructure (i.e. aircraft apron, vehicle parking, etc.);
- The current internal layout of the building considerably limiting northern expansion options due to the location of the recently completed hold baggage screening and handling area within the facility; and

- The relative permanency of the existing building footprint, resulting from the terms of a number of existing tenant leases, and the desire to avoid relocation of existing tenant spaces before expiry of existing lease agreements.

Given the objectives to relocate the ATB complex to the West-side site over the current planning horizon, minimization of capital requirements is the primary criterion in the evaluation and refinement of expansion alternatives. This criterion imposes concessions in meeting all functional space requirements until the new West-side ATB is completed. As a result, certain processors may not necessarily meet the most optimal levels of service but may still adequately accommodate forecast traffic levels.

4.3.5 Preferred Layout

Baseline reconfiguration/expansion concepts were developed for initial stakeholder review and input. The amalgamation of preferred elements of each concept and further refinement of the overall concept has resulted in a preferred configuration for the ATB. The preferred layout is shown in Figure 4-5.

Key characteristics of layout are:

- **Pre-Board Screening Checkpoint.** The preferred configuration is driven by the location and operational requirements of the pre-board screening checkpoint given the limited amount of floor space available within the existing building footprint. The layout and location of the checkpoint is based on CATSA standards and guidelines for screening line layouts and takes into consideration equipment dimension, setbacks and operational requirements. Although space requirements allocate approximately 300 m² for the pre-board screening facilities, this allocation also includes space for passenger queuing. The preferred concept allocates less floor space (approximately 230 m²), but excludes queuing space. The latter would continue to be situated within the general circulation space along the ATB frontage.
- **Baggage Claim.** Infill of the unoccupied space situated between the original portion of the ATB structure and the annex structure will enable the relocation of Carousel A. The relocation is needed to create a consolidated arrivals area that will optimize public and operational use of the arrivals area. The infill project will need to be undertaken as the initial stage of reconfiguration (between 2008-2010) to enable implementation of the remainder of the ATB proposals. The infill option considers the location of the existing stairwells and ventilation systems and can be completed based on low cost construction methods, such as the expansion of the extension of the portable annex structure. The infill and related reconfiguration of the arrivals area will also require a partial expansion of the related ATB frontage to improve passenger flows and enable adequate repositioning of the access ramp to the existing annex structure.

Relocated PBS Checkpoint

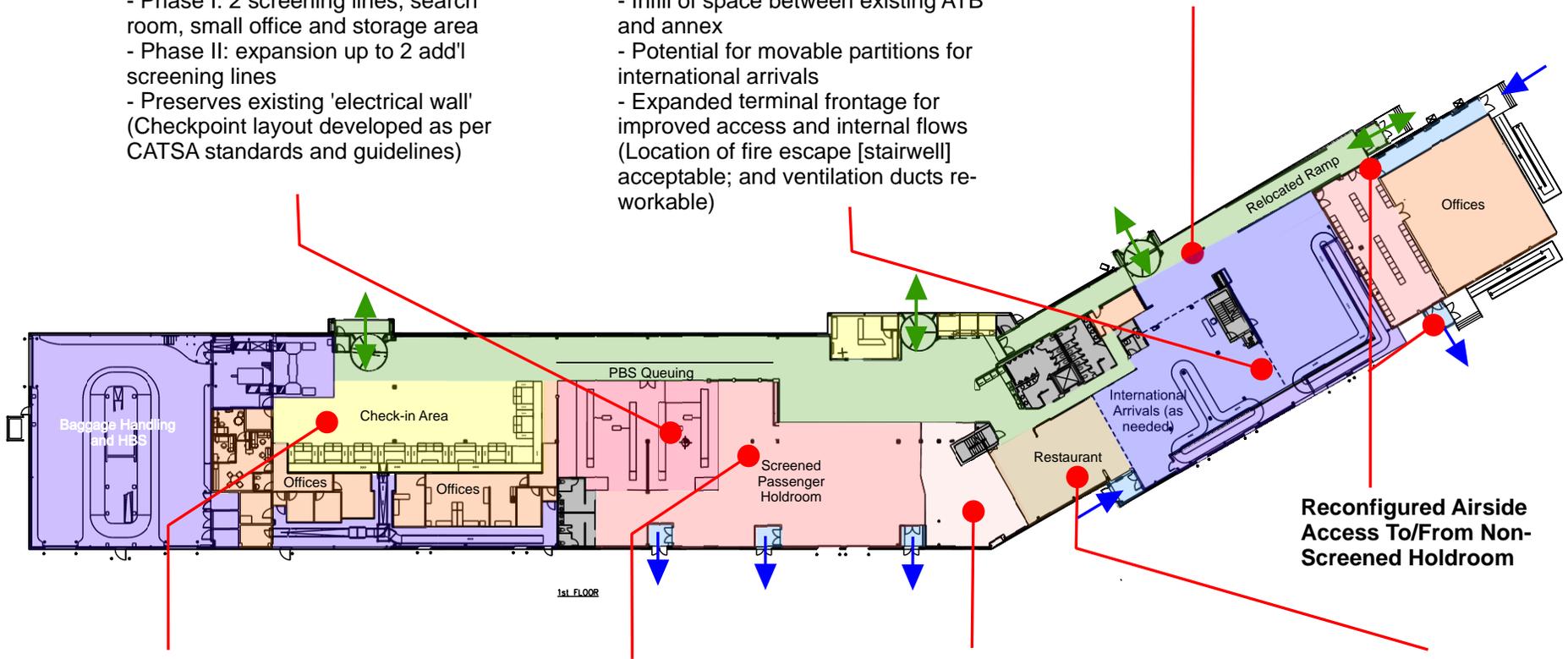
- ~230 m2 (capacity to 2016+)
- Phase I: 2 screening lines, search room, small office and storage area
- Phase II: expansion up to 2 add'l screening lines
- Preserves existing 'electrical wall' (Checkpoint layout developed as per CATSA standards and guidelines)

Consolidated Baggage Claim Area

- ~585 m2 (capacity to 2016+)
- Infill of space between existing ATB and annex
- Potential for movable partitions for international arrivals
- Expanded terminal frontage for improved access and internal flows (Location of fire escape [stairwell] acceptable; and ventilation ducts re-workable)

Expanded Terminal Frontage

- Improved access and internal flows



Reconfigured Airside Access To/From Non-Screened Holdroom

Check-in Counter Expansion

- (as needed)
- Requires reallocation of existing air carrier spaces and queue re-organization

Phase I Holdroom Expansion

- ~400 m2 (capacity to ~ 2011), includes:
- Carousel A relocation
- PBS checkpoint relocation
- Preservation of existing washrooms
- Potential for movable partitions for non-screened departures

Phase II Holdroom Expansion

- ~120 m2 (sufficient additional capacity to 2016+), includes:
- Reclaiming of portion of existing restaurant space (upon lease expiry in 2011)
- Reclaiming security office and janitor/duct room

Reconfigured Restaurant

- (Open Plan Food Court Concept)
- ~132 m2, including seat area
- Preserve existing 'electrical wall'

Figure 4-5: Preferred ATB Reconfiguration

- **Holdroom.** A two-phase expansion of the screened passenger holdroom is proposed to accommodate existing lease agreements within the ATB. Phase I expansion will meet space requirements forecast for the 2012 period and will be enabled through the relocation of Carousel A to the proposed infill area. Phase II expansion will occupy a portion of the existing ATB restaurant and the existing security office and janitor/duct room. This would be initiated following the expiry of the current lease agreement for the space. Given the timing of lease expansion, Phase II will be initiated to address capacity requirements forecast for the 2012-2017 period. Note that the functionality of the Phase II expansion will depend on the ability to reclaim the existing security office and janitor/duct room.
- **Check-in Area.** Depending on the operational management and type of check-in technology infrastructure to be used in the building (e.g. common use counters, check-in kiosks), addition of check-in counters may or may not be necessary. A potential configuration with 18-19 check-in counters exists through alignment of new positions along the screened passenger holdroom wall. This could provide sufficient capacity to meet standard requirements to approximately 2012-2017 and may be implemented as needed. The positioning is not considered optimal however and would complicate queue management during peak periods as well as a re-allocation of air carrier positions.

Initiation of most of the necessary reconfiguration work will be required over the next 2-3 years (by 2010-11) to match space delivery with the forecast level of traffic and related peak activities. On-going monitoring of the operational capacities of individual components may result in the need to accelerate or push-back specific projects. Timing of capital works will also depend on the availability of capital funds and the availability of specific floor space areas that are currently under lease.

4.4 Future Air Terminal Building

As outlined previously in this document, the existing ATB can continue to meet traffic levels expected by approximately 2017 subject to the reconfiguration of a number of internal components – three to five years later than in the plans highlighted in the 2004 ADP. Beyond these upgraded capacity levels, the facility will become deficient in meeting user requirements and significant capital expenditures will be required to undertake either a complete redevelopment of the existing ATB complex (including aircraft apron, vehicle parking and adjacent tenant lease areas) or pursue initiation of the West-side ATB proposed in the 2004 ADP. The latter project continues to be favored by the GNWT and airport stakeholders in light of the flexibility and considerable benefits this project will provide to the airport.

Details of the overall West-side proposal and overall strategy are outlined in Section 9 of the 2004 ADP.

4.5 Other Considerations

In developing the layout alternatives for the ATB, consideration has been given to potential changes in security regulations that could impact operations at the Yellowknife Airport. Of particular importance is the potential requirement to extend passenger screening to general aviation flights. While the regulations have yet to be formalized, the screening of flights operated on aircraft larger than 65 seats is a requirement that has been advanced for review.

The peak hour capacity requirements for the ATB complex presented in this document do not integrate potential traffic levels derived from the charter flights operated by the airports FBOs and expeditors. The potential extension of screening requirements to these flights will impose a shift in operations at the airport with as a likely result the transfer of passenger processing and/or pre-board screening activities to the ATB.

A review of these operations indicates that these flights would currently add up to 100 passengers and 2-3 aircraft movements to peak hour requirements. The capacity constraints of the ATB apron will likely impose a requirement for continued use of FBO/expeditor aircraft aprons, with departing passengers bused to the appropriate aircraft after completion of the necessary ATB processing.⁶ The additional departing peak hour traffic in the ATB can be absorbed given the overall capacity potential of the building discussed earlier depending on the manner by which these passengers are processed (e.g. bused to and from the ATB for pre-board screening, use of ATB check-in facilities, etc.). However, this may require acceleration of specific capacity improvements to the existing facility, such as the holdroom and pre-board screening checkpoint expansion, as well as an earlier initiation of the proposed West-side development.

⁶ Arriving passengers would still continue to be served by the existing off-ATB facilities.

5. Access and Parking

The airport access and parking components include the main ATB access road network, parking and curb facilities, and the service roads linking the various commercial development areas to the city's primary road network. Detailed analysis of these components was undertaken for the 2004 ADP. For the most part, the resulting improvements and outstanding initiatives, particularly as they relate to the proposed West-side development, remain valid. This section provides an overview of current conditions for reference purposes, outlines changes that have occurred to the airport's access and parking infrastructure, and highlights key improvements that need to be considered in the revised development strategy derived from this update.

5.1 Access

5.1.1 Current Conditions and Considerations

ATB Complex Access

Access to the existing ATB complex is made via Idaa Road, intersecting with Highway 3 to the east of the main terminal area. The roadway is considered to be in fair condition to good condition, only requiring regular maintenance, and provides sufficient capacity for current needs.⁷

Service Roads

The roads currently serving tenanted lots in the northwest and northeast quadrant provide adequate levels of service to meet current needs and are also considered to be in fair to good condition, requiring regular maintenance.

West-side Access

The existing FOL Access Road remains the only roadway available to the West-side site. Situated in part within the extended boundary of the airport site, the road is currently gravel surfaced and enables access to the FOL site itself, the Independent Secondary Surveillance Radar (ISSR) facility to the west of the airport, and the location of the proposed CSB facility. The road was recently partially extended to provide access and initiate development of the Engle Business Park to the south of the FOL site.

⁷ The current roadway design can accommodate in excess of 600 vehicles per hour based on general planning guidelines.

Plans exist to partially re-align, extend and upgrade this road to serve as a new by-pass truck route between Highway 3 and the developing industrial areas situated to the south of the airport.

Ground Transportation Services

The ATB is currently served by a number of shuttle bus and taxi operators. The limited availability of taxi services in the City of Yellowknife sometimes results in extended wait times for arriving passengers during peak periods and lowers overall levels of service at the airport.

This situation is compounded by the absence of an on-site ground transportation coordinator to manage service calls and passenger queues, leaving waiting passengers to haphazardly self-manage the taxi stand area.

5.1.2 Future Requirements

FOL Access Road

As outlined in the 2004 ADP, considerable upgrades and extension of the FOL Access Road towards Deh Cho/Fiddlers Lake Road are required to enable the development of the proposed West-side ATB complex and emerging adjacent industrial areas. These improvements would also facilitate access to the airport site from the Kam Lake Industrial subdivision, provide an alternate access route to the airport from the subdivisions located southeast of the site, and provide alternate emergency access to the new development areas.

The City of Yellowknife, along with the GNWT, Department of Transportation, have worked together on proposals to upgrade and extend the FOL Access Road. This project is highlighted in the *City of Yellowknife, General Plan (2004)* as a key element of the City's long-term industrial and urban development strategy.

Ground Transportation Services

The lack of on-site ground transportation coordination and appropriate waiting arrangements significantly reduce levels of service to arriving passengers during peak periods, in particular during winter months. While current operating budgets may not permit the addition of additional airport personnel dedicated to the purpose, the GNWT will need to work with current ground transportation service providers to improve overall coordination of on-site services. The addition of covered shelters on the ATB curb shall also be considered to improve service levels and provide a means to better organize waiting passenger queues.

5.2 ATB Parking and Curb

5.2.1 Current Conditions and Considerations

The general characteristics of the ATB complex vehicle parking and curb infrastructure are provided in Section 11 of the 2004 ADP. The opening of the tenant parking lot on Bristol Avenue in 2003 has significantly contributed to alleviating much of the capacity issues identified in the 2004 ADP. Since completion of this planning document, the GNWT has also proceeded with some improvements to the layout to further increase capacity and levels of service offered to users. Key improvements include:

- Resurfacing of the gravel surfaced areas and formalization of the overall parking stall layout to maximize capacity potential; and
- Reorganization of the pick-up and drop-off zone of the ATB curb and addition of designated shuttle bus loading areas.

The most recent improvements have resulted in an approximate 30% increase in overall parking capacity to approximately 240 parking stalls. While this increase generally meets current requirements, the operational management of this infrastructure continued to be challenged by a number of operations management issues, notably an inadequate parking fee system that encourages excessive parking durations and the inability for the GNWT to directly enforce parking regulations. However, the GNWT is completing the installation of a new positive parking control system on the ATB public parking lot and recently received the necessary jurisdictional authority to directly enforce parking regulations through ticketing and towing if necessary. These initiatives should significantly control parking demand and alleviate current capacity issues.

The current allocation of a high number of stalls within the existing public parking lot for use by tenants and employees continues to pose challenges and will need to be addressed through expansion and better delineation of association parking areas.

5.2.2 Demand/Capacity

With the strong growth in air traffic in Yellowknife over the past few years, demand for parking has increased accordingly. The improvements made to the ATB complex parking and curb infrastructure generally meet current needs. However, the infrastructure occasionally shows signs of strain as a result of the operational issues highlighted above.

As traffic continues to increase, demand and operational considerations will also continue to increase beyond the forecasts originally established in the 2004 ADP. Table 5-1 updates these forecasts, taking into account current capacity, demand, allocations and shifts in utilization patterns.

Table 5-1: Forecast ATB Complex Parking Requirements

	Current	2012	2017	2027
Public	122	175	195	225
Car Rental	8	15	20	30
Employee (ATB-related)	110	130	140	165
Total	240	320	355	420

The existing ATB parking facility is generally configured to provide maximal capacity within the existing boundaries. Beyond the current capacity, additional parking spaces will likely need to be added to address demand from the continued increases in air traffic activities. This demand may also be compounded if any or all charter flights to mining sites eventually require pre-board screening in the ATB. The land occupied by the MET compound adjacent to the public parking facility can provide the needed extra capacity. The latter areas could add up to approximately 120 stalls, depending on configuration, if fully allocated to parking uses.

Note that the preferred reconfiguration of the ATB will not directly require reconfiguration of the ATB curb. The existing layout is generally considered capable of meeting overall requirements albeit at slightly lower levels of service in the future. Reconfiguration of the curb to align more closely with the preferred integrated arrivals area would require significant capital expenditures associated with re-aligning the roadway and reconfiguring related parking areas. Given the adequacy of the overall layout, this project is not further considered in order to minimize capital requirements.

5.2.3 Layout and Expansion

Figure 5-1 identifies the capacity and configuration of the existing layout and identifies the area identified for future expansion. Note that the timing, location and degree of expansion will be dependent on the evolution of demand and the ability to relocate MET compound equipment to another suitable location.

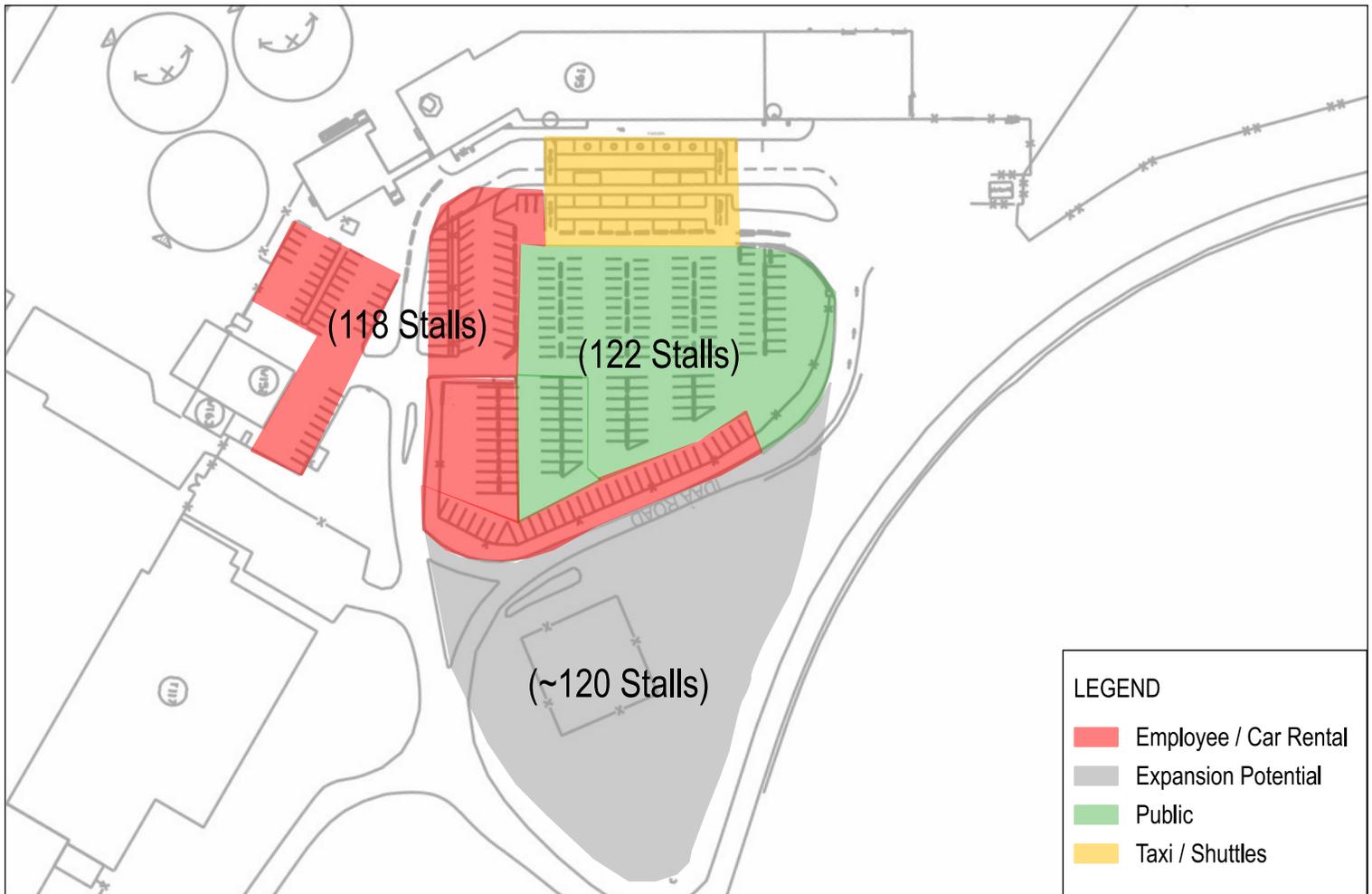


Figure 5-1: Existing ATB Parking and Curb Facilities and Expansion Potential

6. Commercial Development

Commercial development plays an important role in ensuring the financial viability of an airport's operations, and in supporting its overall business objectives. The highest and best use of available commercial and/or undeveloped land is critical to successful long-term airport development; especially airside accessible land, which is considered a prime asset. In addition to air operations, commercial aviation facilities (e.g. corporate business and general aviation) and an airport's support installations (e.g. car rental, fuel storage) form the core of an airport's commercial assets.

It is important to provide sufficient land to meet market demand while at the same time staging land development in accordance with the airport's financial capabilities. There is a recognized strong demand for commercial land at the Yellowknife Airport; but a current shortage in available leasable land due to access limitations, the geotechnical characteristics of portions of the site, and most importantly the lack of suitable water distribution and sanitary sewage collection systems on most of the airport site. These constraints were detailed in the 2004 ADP.

The 2004 ADP was structured in a manner that broke down the various elements of the airport's commercial development components (e.g. cargo, aprons, etc.) throughout the overall analyses. For the purpose of this update, the commercial development assessment for the Yellowknife Airport is approached in a more integrated manner and takes into consideration existing land inventories, land development requirements and the long-term strategy for West-side development.

6.1 Current Conditions and Considerations

Airport commercial development is characterized by the nature of the activities occurring on the site, and the degree to which airfield access is afforded. Aviation-related activities, including air cargo operations, are typically located on, or in proximity to, airside accessible areas, whereas non-aviation-related activities are normally situated on land that does not provide direct airside access.

At the Yellowknife Airport, a significant amount of commercial activities occurs on tenanted land in the northeast quadrant of the airport. These tenants benefit from the proximity of the ATB, existing apron surfaces and road access to and from the City of Yellowknife. Airside commercial activities at the airport consist mostly of ground handling and fuel storage facilities, aircraft maintenance/operations and general aviation/aircraft parking. The site is also home to some unique government facilities including the forest fire fighting base in the northeast quadrant and the Department of National Defence's Forward Operating Location facilities and associated taxiway on the West-side of the airport, south of the proposed future ATB complex. The northwest quadrant, developed in the 1990's, is home mostly to several tenants related to the diamond industry and aircraft storage.

Non-aviation related activities at the airport are, at present, located in proximity to the ATB complex or along Highway 3 to the northeast, benefiting from both good location and visibility.

The overall development strategy adopted in the 2004 ADP focuses on increasing the inventory of tenant land in advance of or in tandem with the West-side ATB complex. To date, the absence of water distribution and sanitary sewage systems have hindered the ability to successfully lease land in this area of the airport.

6.2 Development Priorities and Staging

The GNWT has advanced an overall development layout for the airport site that incorporates long-term development options for the West-side ATB complex, along with more immediate options for land development. The latter have been advanced to address opportunities that may materialize prior to the initiation of the West-site development project. The overall layout is consistent with the concepts advanced in the 2004 ADP.

The overall concept takes into considerations key requirements for addressing gaps in the availability of aviation support services at the airport, future commercial development opportunities and the pursuit of the airport's overall development strategy. These involve:

- **Commercial Aircraft Parking Aprons.** As stated earlier in this document, the airport is deficient in the availability of dedicated areas for the parking of commercial and private aircraft. The ATB apron currently accommodates some business and overnight parking, but due to the volume of traffic currently handled at the ATB, aircraft parking is difficult to accommodate on this apron. The remaining aircraft operations occur on the limited amount of apron space provided by private land tenants. The current situation does not provide opportunities to increase corporate aviation activities and/or third-party cargo or maintenance activities. It also does not facilitate the marketing of the airport site for new market entrants that would require apron access.

The 2004 ADP makes no specific provision for the development of designated aircraft parking aprons. However, the development of airport infrastructure will likely result in some excess apron capacity through future ATB redevelopment or the potential vacation of existing leased lots. Designation of these areas for dedicated aircraft parking will be considered as excess capacity is created on the site.

- **Corporate Aviation.** Concurrent with the limited availability of aircraft parking surfaces and forecast continued growth in the regional economy, it is expected that demand for corporate aviation services will increase. The establishment of a formal and dedicated FBO for this traffic sector is desirable. An appropriate area for this development, taking into account potential short-term business opportunities and the runway utilization pattern of related aircraft, has been identified adjacent to and south of the threshold to Runway 27. The advantage this site provides for near-term development is the opportunity for linkages to the City of Yellowknife water distribution and sanitary sewage system off Old Airport Road, and is therefore an opportunity that can be addressed over the short-term period.

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- **Aircraft Maintenance and Storage.** With the arrival of new carriers to the Yellowknife market, and scheduling practices that involve overnight parking of non-Yellowknife based carrier aircraft, demand and/or opportunities currently exists for the development of third-party aircraft maintenance services and hangers. For this purpose, the commercial development layout must consider the ability for tenants to access airfield infrastructure and the future location of ATB operations. A suitable location for these types of activities would therefore be south of the western end of Runway 09. Near-term development can be accommodated on land within the existing airport boundary. Accommodating longer-term development will require acquisition of the parcels currently located within the seismic reserve between the realigned FOL access road and the current boundary.

Figure 6-1 illustrates the overall development concept and outlines an accompanying commercial strategy that highlights highest and best use of general development areas, along with the most probable staging for the opening of related land areas. Note that development that may occur in locations on the West-side of the airport prior to the extension of City of Yellowknife water distribution and sanitary sewer systems will need to ensure sufficient fire suppression capabilities to individual structures are provided and must account for trucked water and sewage services.

A staged approach is also needed to ensure proper integration with the overall development strategy for the airport, in particular projects associated with West-side development.



Figure 6-1: Commercial Development Concept

7. Operations and Support Infrastructure

Airport operations and support facilities consist of those that enable the on-going safe operation of the airport and support aviation activities on the site. These typically include airport administration and maintenance structures, emergency services, and meteorological services. Section 12 of the 2004 ADP provides an in-depth review of all related infrastructure and services. This section focuses on those that are relevant to the advancement of the proposals contained in this update while at the same time establishing the framework for future West-side development.

7.1 Water Supply and Sanitation

As discussed in Section 15 of the 2004 ADP, the limitations of the existing water supply and sanitary sewage collection system are among the most important issues that constrain the GNWT's ability to fully address development opportunities on the airport site. These dictate to a large extent the timing for implementation of West-side development. Specific issues, capacities and requirements are addressed in full detail in the 2004 document.

The provision of water and sanitation services to the West-side site, as well as to areas currently not served by a piped delivery/collection system, are critical to achieving the development objectives of the airport, notably with regards to meeting fire suppression requirements, reducing water and sewage trucking costs, and minimizing building size and layouts deriving from water and sewage storage.

The GNWT continues to work with the City of Yellowknife and other stakeholders towards creating the necessary synergies and funding required for the extension of water and sanitation system towards the West-side site. Recent industrial development to the south of the airport site, supported by the extension of the FOL Access Road to the Engle Business Park, and coupled with the need to address the shortage of residential development sites within the City's boundaries, will likely increase the feasibility and viability of such a large infrastructure project.

The GNWT encourages advancement of this project in concurrence with the timelines projected for meeting traffic demand by approximately 2017.

Connection of the Southeast quadrant to the City of Yellowknife's system off Old Airport Road has also been reviewed in previous ADPs. This initiative may still be considered to increase the development potential of this quadrant and provide adequate fire suppression capabilities. Further cost-benefit analysis will be required however prior to approving this project.

7.2 Combined Services Building

7.2.1 Current Conditions and Considerations

Analyses undertaken in work leading up to the 2004 ADP have identified detailed deficiencies and long-term requirements for the airport's maintenance and Emergency Response Services (ERS). The conclusions of these assessments have resulted in the project to consolidate these facilities under one roof in a new Combined Services Building (CSB).

Given the long-term location of core airport activities and to provide opportunities for initiation of the West-side development, the GNWT has initiated the development process for the new CSB facility. At time of preparation of the current ADP, the GNWT was evaluating submissions with the objective of tendering the project for completion in 2009.

7.2.2 Development Priorities and Staging

A key decision factor in the evaluation of the project submissions will be the construction of a structure that incorporates both maintenance and ERS functions under one roof, or the partial development of a facility that addresses urgent requirements for new maintenance facilities and postpones completion of the ERS component to a later date.

Given the apron capacity benefits afforded by the relocation of the existing fire hall, it is recommend that the GNWT undertake a one stage development of the CSB facility, immediately providing for the relocation of both services within the same structure.

7.3 NAV CANADA Facilities

The existing Air Traffic Control Tower is situated atop the older portion of the ATB. Once the terminal is re-located to the West-side site, it will be desirable that a new control tower in a better operational location be established. This would particularly be important if Runway 15-33 is extended to the south.

While an ATC Tower location was identified in the 2004 ADP, the GNWT will need to approach NAV CANADA prior to implementing the West-side development project to confirm or select the optimum location for these services so that future land uses can be protected accordingly.

7.4 Meteorological Services

Environment Canada, under contract with NAV CANADA, is responsible for the collection of weather observations and production of aviation weather forecasts at the airport.

Weather observations are collected at the airport's Meteorological Observation Site (commonly referred to as the 'Met Compound'). The site currently occupies a 900 m² of land located between the ATB parking facility and Highway #3. The site has been identified earlier in this document as a potential location for expansion of the ATB parking lot. In the event the parcel of land would be needed to accommodate parking infrastructure, consultations with NAV CANADA will be undertaken to identify a location suitable for this equipment. The roof of the existing ATB is suggested as a preliminary location for the relocated equipment. Given the benefits of proximity with NAV CANADA staff, the evaluation may also be tied with that of the potential future ATC Tower discussed above.

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8. Recommended Development Program

This update has validated, confirmed and/or revised a number of proposals contained in the 2004 ADP. This chapter summarises and integrates the updated proposals to provide a current program for development of the airport site. These take into account the need to address issues deriving from the strong growth at the airport since completion of the 2004 ADP, while continuing to focus on the longer-term objective of initiating development of the West-side site. The updated development scheme, reflecting the vision for the future layout of the airport site, is presented in this section along with near-term development proposals. The individual projects, general timelines for development and related cost estimates are outlined in this chapter to support the achievement of the development scheme.

8.1 Airport Development Concept

8.1.1 Long-term Development

The long-term development plan for the airport remains relatively consistent with that proposed in the 2004 ADP as presented in Section 1 – Introduction of this document. A number of minor changes to the long-term layout have been made however to reflect near-term requirements. These are addressed in the following paragraphs. Updated implementation programming elements are provided later in this section.

8.1.2 Near-term Development

The stronger than anticipated traffic growth at the Yellowknife Airport, coupled with the extended process for funding the necessary West-side infrastructure, has resulted in the need to revise near-term development proposals. As stated throughout this document, these proposals also take into account the need to create the necessary synergies that will enable effective initiation of the West-side development project, as well as the need to minimize throw-away costs associated with the expansion of existing infrastructure.

The updated development concept, along with key near-term and long-term development proposals, is provided in Figure 8-1.

Runway 15-33 Parallel Taxiway

- Phase I: from R09-27 intersection to runway mid-point (new ATB apron) - 1,100 m
- Phase II: from runway mid-point to existing threshold - 780 m
- Phase III: consistent with potential runway extension - 450 m

West-side ATB Complex (Long-term)

Runway 09-27

- RESA at both extremities

ATB Apron

- Taxi B re-alignment
- Fire Hall relocation
- Reconfiguration/ expansion for 13-14 positions

ATB Reconfiguration

- Infill structure and consolidated arrivals area
- Expanded screened passenger holdroom and PBS checkpoint
- Restaurant reconfiguration (future)
- Check-in counter addition (as needed)

Runway 15-33 Extension

- Phase I: 760m (with RESA integrated on runway surface and reduced TORA, as imposed by regulatory requirements or justified by demand)
- Phase II: 450m (when justified by demand)

Commercial Development

- Near-term tenant lot development
- Associated taxiway development

Parking and Curb

- Taxi stand passenger shelters
- Public parking lot expansion (as needed)

8.2 Recommended Implementation Program

Reflecting the updated airport development concept and land use plan illustrated in the previous pages, a proposed implementation program summarizing specific facility and land development requirements, along with the timeframe proposed for individual implementation are provided in Table 8-1.

The recommended implantation program is based on forecast traffic growth and identified traffic scenarios for the airport. The current capacity potential of the existing facilities is however considerably limited and provide little flexibility to address unexpected changes to the Yellowknife market. Stronger than forecast growth and, more importantly, the arrival of a new major market entrant operating with full passenger configurations could significantly alter peak hour demand on the ATB apron and within the ATB itself. In scheduling projects and implementing the recommendations contained in this updated ADP, it is important to note therefore that certain proposals may need to be advanced sooner than expected and require significantly higher capital injections than those put forward in current capital plans.

The occurrence of this situation may also justify more rapid advancement of the West-side development project prior to the 2017 target advanced in this document. Inaction or failure to initiate these projects concurrent with traffic demand will significantly limit economic growth in Yellowknife and North.

Table 8-1: Summary of Development Proposals

Proposal	2008 - 10	2011 - 12	2012-17	2018-27
Runways and Taxiways				
Runway 15-33				
Submission to revise Yellowknife Airport Zoning Regulations applicable to Runway 15-33				
Phase I extension – 760m extension (to a length of 3,050m) and integration of RESA within pavement surface (reduced TORA)	As justified by demand or imposed by RESA reqmts			
Phase II extension – 450m extension (to a length of 3,500m)				When justified by demand
Upgrade High Intensity Approach Lighting	In association with runway extension proposal			
Runway 09-27				
Implement RESA at both runway extremities	As justified by demand or imposed by RESA reqmts			
Taxiway System				
Phase I Runway 15-33 parallel taxiway– from Runway 09-27 intersection to mid-point (1,100m extension)				
Phase II Runway 15-33 parallel taxiway– from mid-point to existing threshold (780m extension)				
Phase III Runway 15-33 parallel taxiway – Consistent with potential additional runway extensions				When justified by demand
Runway 09-27 Taxiway (southern) to accommodate commercial lot development at both extremities	When justified by demand			
Existing Air Terminal Building Complex				
Air Terminal Building				
Develop infill structure, relocate Carousel A and increase associated public circulation on ATB frontage				
Phase I screened passenger holdroom expansion (~400m ²) and relocation/expansion of pre-board screening checkpoint (2 screening lines)				
Phase II screening passenger holdroom expansion (~120 m ²)				
Restaurant reconfiguration				
Pre-board screening checkpoint expansion (2 additional screening lines)				
Check-in counter expansion	As required			

Table 8-1 (cont'd)

Proposal	2008 - 10	2011 - 12	2012-17	2018-27
ATB Apron				
Re-alignment of Taxiway B and reconfiguration of access to First Air Apron	Subject to more detailed assessment of ultimate expansion requirement			
ATB apron reconfiguration (13-14 positions)				
Parking and Curb				
Installation of taxi stand passenger shelters on ATB curb				
ATB public lot expansion	As required			
Commercial Development				
Tenant Land Parcels				
Southeast quadrant FBO operation				
West-side commercial land parcels				
Operations and Support Elements				
Connect south quadrant to municipal water distribution and sewage collection system off of Old Airport Road to support development	Subject to more detail cost benefit analysis			
Other Requirements				
Connect northern quadrants to City of Yellowknife water distribution and sewage collection system	Not scheduled – subject to funding availability			
West-side Development				
New Air Terminal Building				
Planning for West-side ATB development				
ATB construction				
ATB operation				
Potential expansion				As required
New ATB Apron				
Initial west-side ATB apron surface				
West-side ATB apron expansion				As required
Develop West-side de-icing apron				

Table 8-1 (cont'd)

Proposal	2008 - 10	2011 - 12	2012-17	2018-27
Access and Internal Circulation				
Realign and extend the FOL access road for west-side access				
Develop internal west-side road network		As required		
Parking				
West-side ATB public parking lot development				
Operations and Support Elements				
Combined Service Building development (airport maintenance facility and ERS relocation)				
Connect west-side site to City of Yellowknife water distribution and sewage collection system		Subject to development levels west of the airport site and availability of funding		

8.2.1 Capital Requirements

Table 8-2 (below) identifies the specific capital projects associated with the near-term proposals (next 10 years) contained in the current *Yellowknife Airport Development Plan Update*. With the exception of ATB estimates, costs are identified as Class D estimates, in current dollars, and do not include contingency, engineering or ancillary consulting expenses. The estimates are provided for general planning purposes only and will require more detailed evaluation before individual projects are approved by the GNWT.

Estimates associated with initiation of the West-side development project, including the new ATB, water distribution and sanitary sewage systems and ground access infrastructure, were outside of the scope of this study and have not been provided. Costs associated with these projects will be significant given the magnitude of work involved, in particular the provision of water and sewage systems, the development of the new ATB complex and associated site preparation works. Overall capital requirements for the airport over the planning period will therefore be much higher and encompass considerably more detailed long-term programming than that identified below. Final capital programming will be subject to approval of individual development items.

Table 8-2: 10-Year Updated Development Plan Capital Requirements

Items	\$(Thousands – Current Dollars)
Runway 15-33 Extension	
Phase I – 760m extension (to length of 3,050m)	\$21,300 ⁽¹⁾
Taxiway System Expansion	
R15-33 Parallel Taxiway Phase I – from R09-27 to mid-point (1,100m)	\$6,460
R15-33 Parallel Taxiway Phase II – from mid-point to existing threshold (780m)	\$4,810
R09-27 Taxiway – West –side (up to 700m)	\$5,690
R09-27 Taxiway – Southeast Quadrant (up to 550m)	\$2,840
Existing ATB Reconfiguration	
Infill structure	\$1,830 ⁽²⁾
Internal reconfigurations	\$2,740 ⁽²⁾
ATB Apron	
Re-alignment of Taxi B	\$2,350
Northern Expansion	<i>Subject to more detailed geotechnical evaluations</i>
West-side Development	
Combined Services Building	\$22,000
New Air Terminal Building Complex	Subject to further planning and engineering work
Water and Sewage Systems	
Piped water distribution and sewage collection to development areas	Subject to further planning and engineering work
Total	\$70,020

⁽¹⁾ Estimate does not include revision to the Registered Aeronautical Zoning, as costs depend on extent of legal research and land surveying required.

⁽²⁾ Preliminary estimates only.

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Appendix A - Glossary of Terms

Aerodrome Reference Point – The designated point or points on an aerodrome normally located at or near the geometric centre of the runway complex that establishes the locus of the radius or radii of the outer surface (as defined in the Zoning Regulation).

Aircraft Movement – An aircraft take-off or landing at an airport. For airport traffic purposes, one arrival and one departure is counted as two movements.

Aircraft Operations – Made up of 'Itinerant' aircraft movements (aircraft which depart or arrive at an airport en-route to or from other destinations) and 'Local' aircraft movements (movements that do not leave the Air Traffic Control circuit, largely training/recreational flights). At the Yellowknife Airport, 'Itinerant' activity accounts for more than half of total operations.

Aircraft Stand – A designated area on an apron intended to be used for parking an aircraft.

Airport Tenant Parking – Ancillary parking areas situated on the airport site and dedicated to those tenants and their customers that do not require access to the PTB.

Airside – The movement area of an aerodrome, adjacent terrain and buildings and portions thereof, to which access is controlled.

Air Terminal Building Curb – Component of access and internal airport circulation infrastructure, generally fronting and using the main public access-way to the PTB. Main components of this facility generally include vehicular traffic lanes, through lanes, bypass lanes, curb/manoeuvring lanes, sidewalk platforms for passenger/baggage loading and unloading, and pedestrian crossings.

Air Traffic Control (ATC) – A service provided for the purposes of preventing collisions between aircraft, and on the manoeuvring area between aircraft and obstructions, and expediting and maintaining an orderly flow of air traffic.

Air Traffic Control (ATC) Tower – A facility established on an airport to provide ATC services on and in the vicinity of that airport.

Apron Taxiway – A portion of a taxiway system located on an apron and intended to provide a through taxi route across the apron.

Baggage Make-up Area – The area where checked baggage for departing flights is sorted and loaded into containers or onto baggage carts.

Cargo – Any goods carried on an aircraft and covered by a waybill.

Combi Aircraft – An aircraft that is designed to carry both passengers and cargo within the passenger cabin. Usually, the configuration of the aircraft can quickly be changed in order to carry more cargo or passengers, whichever is necessary.

Controlled Apron – Apron on which aircraft and vehicle movements are radio-controlled by NAV CANADA Air Traffic Control.

Departure Lounge – A common area used for assembling originating, transit or transfer passengers who have been accepted by the airline prior to boarding the aircraft.

Deplaned Passengers/Cargo – Passengers or cargo off-loaded from an aircraft at an airport in Canada.

Distance Measuring Equipment (DME) – A device used to measure, in nautical miles, the slant range distance of an aircraft from the DME navigational aid.

Emergency Response Services (ERS) – On-site emergency and fire fighting services. Formerly "Crash, Firefighting and Rescue Services".

Enplaned/Deplaned (E+D) Passenger Traffic – The general expression of total passenger demand. E+D passengers include all those originating from or destined to the Yellowknife Airport, plus those passengers connecting through the airport en-route to other destinations on licensed scheduled/charter air services. They include not only passengers utilising the Yellowknife PTB, but also the reported/estimated passenger traffic from carriers using their own terminal, hangar or apron facilities.

Enplaned Passengers/Cargo – Passengers or cargo loaded on to an aircraft at an airport in Canada.

Federal Aeronautical Zoning Regulations – A regulation respecting a given aerodrome pursuant to Section 4 of the Aeronautics Act.

Freighter Aircraft – An aircraft that is strictly designed to carry only cargo.

Glidepath – A descent profile determined for vertical guidance during a final approach.

Global Position System (GPS) – A system of orbiting satellites used for navigation purposes and capable of giving highly accurate geographic co-ordinates.

Hold Baggage Screening (HBS) – Screening of baggage destined for the hold of an aircraft.

HVAC – Heating, ventilation and air conditioning system.

Instrument Approach Procedure – A series of predetermined manoeuvres by reference to flight instruments for the orderly transfer of an aircraft from the beginning of the initial approach to a landing, or to a point from which a landing may be made.

Instrument Flight Rules (IFR) – A set of rules governing the conduct of flight under instrument meteorological conditions.

Instrument Landing System (ILS) – Radio navigation system that provides aircraft with horizontal and vertical guidance during an approach landing. ILS equipment includes a localiser for azimuth guidance and glidepath transmitter for vertical guidance. There are three categories of ILS – each providing specific decision height minima and visual ranges for runway approach procedures.

ILS Category I – An approach procedure to a height above touchdown of not less than 61m and with runway visual range of not less than 549m.

'Itinerant' Movement – At airports with Air Traffic Control Towers and/or Flight Service Stations, 'Itinerant' movements are those in which aircraft proceed to or arrive from another location; or where aircraft leave the circuit but return without landing at another airport. At airports without Air Traffic Control Towers, a movement in which the aircraft arrives from or departs to a point other than the reporting airport, or a movement by an aircraft that leaves the close proximity of an airport and returns without landing at another airport.

Landing Distance Available (LDA) – The length of a runway at an aerodrome that the aerodrome operator declares available and suitable for the ground run of an aeroplane that is landing.

Landside – The area of an aerodrome not intended to be used for activities related to aircraft operations and to which the public normally has unrestricted access.

'Local' Movement – At airports with air traffic control towers and/or flight service stations, 'Local' movements are considered as movements in which aircraft remain in the circuit. At airports without Air Traffic Control Towers, a movement in which the aircraft remains in the close proximity to the airport. 'Local' movements are often carried out during training flights, equipment tests, etc.

Localiser – The component of an Instrument Landing System (ILS) which provides lateral guidance with respect to the runway centreline.

Long-term Parking – Defined as vehicle parking for a duration surpassing the 3-hours short-term period, or generally more than a day. Users are mainly comprised of members of the travelling public who leave their vehicles at the airport for the duration of their trip.

Meteorological Observation Site – Site that contains weather observation equipment. The purpose of this site is to obtain weather data representative of the runway complex for the support of forecasting and aircraft operations.

Non Directional Beacon (NDB) – A radio beacon transmitting non-directional signals whereby the pilot of an aircraft equipped with direction-finding equipment can determine bearing to or from the radio beacon.

NOTAM – A notice distributed by means of telecommunication containing information concerning the establishment, condition or change in any aeronautical facility, service, procedure or hazard, the timely knowledge of which is essential to personnel concerned with flight operations. See *Aeronautical Information Publication (AIP) Canada, Section MAP 5.0* for complete definition and details.

Obstacle Limitation Surfaces – A surface that establishes the limit to which objects may project into the airspace associated with an aerodrome so that aircraft operations at the aerodrome may be conducted safely.

'Other Commercial' Movement – Flights performed by Commercial aircraft operators not included in the 'Air Carrier' categories. Flying schools, agricultural sprayers, water-bombers, aerial photographers and surveyors, etc. are examples.

PAPI – Precision approach path indicator.

Pavement Load Ratings (PLR) – Numbers expressing the bearing strength of a pavement for unrestricted aircraft operations. PLR are expressed on a scale of 1 (weakest pavements) to 12 (strongest pavements).

Planning Peak Hour (PPH) – The hourly traffic volume used for facility planning purposes. This level (which falls between the average traffic volume and the absolute peak) is determined in accordance with planning standards.

Power-in/Power-out – Aircraft manoeuvring in and out of parking stand by means of engine power.

Power-in/Power-out – Aircraft manoeuvring into parking stand by means of engine power and manoeuvring out of parking stand position by means of ground equipment (tug).

Pre-Board Screening (PBS) – Security screening of persons and their personal belongings and carry-on baggage prior to entering a designated sterile area, conducted before boarding an aircraft.

Pre-Board Screening Checkpoint – An area of an airport used for the screening of persons and carry-on baggage and other things in the possession or control of persons who are screened; includes an explosive detection screening checkpoint used for the screening of carry-on baggage.

Precision Approach – Instrument approach using azimuth and glide path information provided by an instrument landing system or a precision approach radar.

Runway – A defined rectangular area on a land aerodrome prepared for the landing and take-off of aircraft.

RILs – Runway Identification Lights.

Runway Identification Lights (RILS) – Two uni-directional flashing strobe lights situated at the approach end of the runway.

Runway Strip – A defined area including the runway and stopway intended to reduce the risk of damage to aircraft running off a runway; and to protect aircraft flying over it during take-off or landing operations.

Short-term Parking – Defined as parking duration of less than 2-3 hours, which effectively comprises individuals seeing passengers off at the terminal or coming to meet them.

Take-Off Run Available (TORA) – The length of a runway declared available and suitable by the operator of the aerodrome for the ground run of an aeroplane during take-off.

Taxiway – A defined path on a land aerodrome established for the taxiing of aircraft and intended to provide a link between one part of the aerodrome and another.

Taxiway Strip – An area including a taxiway intended to protect an aircraft operating on the taxiway and to reduce the risk of damage to an aircraft accidentally running off the taxiway.

VHF Omni-directional Range (VOR) – A ground-based electronic navigation aid transmitting very high frequency navigation signals, 360 degrees in azimuth, oriented from magnetic north.

Visual Approach Slope Indicator System (VASIS) – An airport lighting facility providing approach slope guidance to aircraft during approach to landing by radiating a directional pattern of high intensity red and white focused light beams.

Visual Flight Rules (VFR) – Rules that govern the procedures for conducting flight under visual conditions.

VORTAC – A combination of a VOR and TACAN at one location. VORTAC provides azimuth navigational information on VHF, and azimuth and distance information on UHF.

Weight Group – The classification of weight classes in groups for statistical purposes.

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Appendix B - Forecast Tables

Table B-1: Annual Enplaned + Deplaned Passengers

	Low	Medium	High
1981		129,400	
1982		124,800	
1983		123,000	
1984		135,512	
1985		143,400	
1986		151,400	
1987		164,400	
1988		186,300	
1989		211,988	
1990		211,454	
1991		197,372	
1992		191,410	
1993		198,988	
1994		192,498	
1995		217,169	
1996		213,287	
1997		217,744	
1998		271,635	
1999		265,143	
2000		278,000	
2001		290,841	
2002		291,596	
2003		396,543	
2004		373,852	
2005		417,495	
2006		474,800	
2007	527,170	527,170	527,170
2012	618,700	690,000	753,000
2017	666,500	783,000	880,000
2027	773,500	954,500	1,137,500
Average annual growth rate			
2007-2012	3.3%	5.5%	7.4%
2012-2017	1.5%	2.6%	3.2%
2017-2027	1.5%	2.0%	2.6%
2007-2012	3.3%	5.5%	7.4%
2007-2017	2.4%	4.0%	5.3%
2007-2027	1.9%	3.0%	3.9%

* Based on carrier reported data to GNWT/YZF

* Pre-2003 based on Statistics Canada/TC published data.

Table B-2: Annual Total Aircraft Movements

	Total			Itinerant			Local		
1981		66,117		42,179		23,938			
1982		51,795		33,662		18,133			
1983		51,837		32,255		19,582			
1984		53,117		32,079		21,038			
1985		46,762		31,998		14,764			
1986		49,381		34,096		15,285			
1987		54,371		38,696		15,675			
1988		62,226		42,252		19,974			
1989		55,296		33,555		21,741			
1990		46,969		30,112		16,857			
1991		46,719		28,430		18,289			
1992		56,376		29,498		26,878			
1993		71,914		36,395		35,519			
1994		83,281		40,844		42,437			
1995		65,341		36,494		28,847			
1996		62,882		38,802		24,080			
1997		55,058		35,123		19,935			
1998		55,598		34,039		21,559			
1999		52,323		33,003		19,320			
2000		61,455		36,913		24,542			
2001		57,052		38,528		18,524			
2002		49,657		38,304		11,353			
2003		50,802		40,570		10,232			
2004		58,885		44,096		14,789			
2005		56,342		44,775		11,567			
2006		65,969		54,170		11,799			
2007		70,700		55,046		15,654			
2012	75,100	86,550	101,200	59,100	65,300	74,700	16,000	21,250	26,500
2017	78,650	93,050	114,800	61,400	69,200	84,300	17,250	23,850	30,500
2027	86,400	110,200	141,000	66,400	80,800	102,200	20,000	29,400	38,800
Average annual growth rate									
2007-2012	1.2%	4.1%	7.4%	1.4%	3.5%	6.3%	0.4%	6.3%	11.1%
2007-2017	1.1%	2.8%	5.0%	1.1%	2.3%	4.4%	1.0%	4.3%	6.9%
2007-2027	1.0%	2.2%	3.5%	0.9%	1.9%	3.1%	1.2%	3.2%	4.6%

Table B-3: Annual Itinerant Aircraft Movements

	Itinerant			Air Carrier			General Aviation		
1990		30,112			23,223			6,889	
1991		28,430			21,789			6,641	
1992		29,498			22,121			7,377	
1993		36,395			26,229			10,166	
1994		40,844			28,838			12,006	
1995		36,494			27,292			9,202	
1996		38,802			29,645			9,157	
1997		35,123			30,080			5,043	
1998		34,039			28,603			5,436	
1999		33,003			27,759			5,244	
2000		36,913			30,916			5,997	
2001		38,528			33,793			4,735	
2002		38,304			34,214			4,090	
2003		40,570			34,361			6,209	
2004		44,096			37,427			6,669	
2005		44,775			41,264			3,511	
2006		54,170			50,554			3,616	
2007		55,046			52,222			2,824	
2012	59,000	65,000	75,000	56,200	60,600	68,200	2,900	4,700	6,500
2017	61,000	69,000	84,000	58,200	64,000	76,900	3,200	5,200	7,400
2027	66,000	81,000	102,000	63,000	74,500	93,200	3,400	6,300	9,000
Average annual growth rate				new					
2007-2012	1.4%	3.4%	6.7%	1.5%	3.0%	5.5%	0.5%	10.7%	18.1%
2007-2017	1.0%	2.3%	4.5%	1.1%	2.1%	3.9%	1.3%	6.3%	10.1%
2007-2026	0.9%	2.0%	3.2%	0.9%	1.8%	2.9%	0.9%	4.1%	6.0%



Prepared by
InterVISTAS Consulting Inc.

Airport Square - Suite 550
1200 West 73rd Avenue
Vancouver, BC
Canada V6P 6G5

Telephone: (604) 717-1800
Facsimile: (604) 717-1818
www.intervistas.com