

Government of Yukon

Yukon Aviation System Review

(Yukon, 2016-17)

Draft Plan #5 (100%): Phase 5 — Aviation System

Review & Investment Recommendations

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Sign Off Sheet

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Table of Contents

Exec	tutive Summary		1
GLOS	SSARY		11
1.0	INTRODUCTION		12
2.0	PROJECT OBJECTIVE		14
3.0	BACKGROUND & CO	DMMUNITY PROFILES	15
3.1	ECONOMIC GROW	TH IN THE YUKON	15
3.2	OVERVIEW - YUKON	COMMUNITIES	16
3.3	YUKON COMMUNITY	Y AND LOCALITY PROFILES	18
3.4	MINING PROJECTS		21
3.5	YUKON TOURISM		21
4.0	AVIATION FORECAS	Т	25
4.1			
4.2		DATA	
4.3	YUKON AVIATION C	ONTEXT	26
4.4	TRAFFIC DEVELOPM	ENT IN YUKON	27
	4.4.1 Estimation	n of Passengers, Cargo and Aircraft Movements	27
		of Findings	
4.5	MAIN SERVICE PRO\	VIDERS	32
4.6	FORECAST ASSUMPT	TONS	33
		Side: Socioeconomic, Demographic and Tourism	
		ons	
4.7	SUPPLY SIDE: SERVIC	E PROVIDERS	40
4.8	FORECAST METHOD	OLOGY	41
		ojections (Yukon and Whitehorse Airport Level)	
		ections for the 27 Individual Airports and Aerodromes	
4.9	FORECAST RESULTS		44
	4.9.1 Summary	of Forecasts	44
	4.9.2 Details of	Forecasts	46
5.0	SITE ASSESSMENTS		52
5.1		ASSESSMENTS	
5.2		CODE (NBC) 2015: INTERPRETATION OF POST-DISASTER	
		I AIR TERMINAL BUILDINGS	57
5.3		SESSMENTS	
		and Obstacle Limitation Surfaces (OLS)	
		Edition Checklist	
		ectrical Assessment	
		Availability	62
6.0	OPTIONS ANAIYSIS		٧3
6.1		1 AND OBLIGATIONS	



6.2	INVESTA	MENT MODELLING	
	6.2.1	Triple Bottom Line Approach	
6.3		MENDATIONS FOR COMPLIANCE	
6.4	PROJEC	CT EVALUATION	68
7.0	GOVERI	NANCE AND OBLIGATIONS TO THE PUBLIC	69
8.0		AVIATION SYSTEM PRIORITIES	
8.1		19 PRIORITIES	
8.2	20 YEAR	R DEVELOPMENT PLAN FOR YUKON AVIATION SYSTEM	72
9.0	PLAN O	F ACTION	74
APPI	ENDICES		
App	endix A	FORECAST METHODOLOGY-REGRESSION RESULTS	
App	endix B	BUILDING CONDITION SUMMARY	
App	endix C	FACILITY ASSESSMENT CHECKLISTS	
App	endix D	SITE PLANS AND O.L.S.	
App	endix E	TP312 5 [™] EDITION COMPLIANCE	
App	endix F	AIRPORT AND AERODROME EVALUATION	
App	endix G	PROJECT EVALUATIONS	
App	endix H	GRANULAR AVAILABILITY	
Ann	endix I	CONTACTUSTS	



Executive Summary

Project Objectives

The objective of the project is the development and delivery of a system review and plan to assess the current state and use of the Yukon Aviation System, assess the current investment model and prioritization criteria, and to identify and prioritize infrastructure investments that meet the current and future needs of stakeholders, create economic development opportunities and comply with governing regulations. The Yukon Aviation System Review (YASR) will provide recommendations that serve the territory and its aviation challenges in a manner that focuses on safe and compliant operations of the government airports and aerodromes and lays out a transition approach to move toward improved performance and reduced risk.

The Dawson City and Whitehorse airports are outside the scope of this project because they are the subjects of current and upcoming assessments and development plans.

Community profiles and roles

Each of the 27 airports and aerodromes have been assessed for its local activity and its role. This is a key element of the overall assessment of each site and its future requirements. There are only two of these communities that receive scheduled air service today and they are Old Crow (Air North) and Watson Lake (recently served by Alkan Air). The air carriers originate out of the main gateway, and only international airport in the Yukon, Erik Nielsen Whitehorse International Airport (ENWIA).

Over the past ten years (2007 – 2016) there have been only three communities in this review that have Compound Annual Average Growth Rates (CAAGR) of population over 2% and they are Carmacks (3.7%), Pelly Crossing (2.8%) and Mayo (2.2%). Growth of Yukon's GDP has moved in close step with global precious metals prices since the early 1990s. It is particularly noteworthy that the Yukon economy was in recession in 2013-15 and in recovery in 2016 and this corresponds with the precipitous decline in global commodity prices (precious metals in this case) and lower mineral production over this same period. There is a great deal of uncertainty associated with the mining sector but it has tremendous potential to impact the job creation and GDP for the territory. These projects are often in regionally isolated areas and only accessible via air. Several of the aerodromes in the review are primarily serving mining industry activity.

The lower Canadian dollar and the strengthening of the US economy in the past two years is a signal that the tourism market may be positioned for an uptick. Most visitors (66%) to Yukon enter via motor vehicles, while approximately 34% enter via air. In 2015, this translated to 328,000 visitors arrived by road, while 167,000 arrived by air to Whitehorse and another 5,000 arrived by air to Dawson City. Hence, despite some sites with a tourism focus such as Carcross and Silver City, tourism does not have a high impact on the 27 airports and aerodromes that were included in this study today.

Forecasted activity

Yukon Economic Development's expectations for 2017 are for Yukon's real GDP to fall by 5.7%, where the primary contributor to the contraction is lower year-over-year mineral production. Moreover, medium-term forecasts for the Canadian economy have been notched downward

in the wake of uncertainty surrounding the new US Administration's intentions. In the longer term, however, there is cause for optimism, as commodity prices recover and new mines open. Key assumptions for long-term growth of the Yukon economy:

- → Beyond 2025 commodity prices are expected to rise.
- → Efficiency gains in mining will make it feasible to make profits despite lower commodity prices.

Even with these assumptions, the Yukon economy is expected to experience growth (3.8% per annum) that is slower than the robust pace of 4.4% per annum that was set over the period 2001-2012, when commodity prices were relatively high and the mining sector was booming.

Looking ahead to the next two decades, we assume that Yukon's aviation will continue to develop faster than the national level but with a Yukon and Canadian economy projected to slowdown, we expect aviation at both the Territory and national level to show some signs of maturation. During the next two decades, the passenger demand at the 27 airports and aerodromes is projected to increase annually by 4.0% to reach 40,429 passengers by 2036. To compare, during the same period Yukon traffic is projected to increase by 4.5%, driven by its gateway to the Territory, namely ENWIA, and its projected annual increase of 4.5%.

Yukon aviation activity, including movements, is highly cyclical and, as noted earlier, influenced by the boom-bust cycles of the mining industry. While passenger activity is highly concentrated in a handful of airports and aerodromes (in 2016, the top 5 airports and aerodromes in the group of 27 accounted for 84% of all passengers in the group), movements, without surprise, are more evenly spread (the top 5 airports and aerodromes account for 70% of aircraft movements). In 2016, 15 of the 27 airports and aerodromes had less than 50 passengers in the entire year, or less that one per week. Moving forward, aircraft movements will remain more evenly spread than passengers (by 2036 the top 5 airports and aerodromes in the group of 27 are projected to account for 87% of all passengers in this group vs. 72% of aircraft movements); 15 of the 27 airports and aerodromes would still have less than 50 passengers per year.

Watson Lake, benefitting from a growing population and regional mining activity (Silver Tip, Cantung and Selwyn), is poised to remain the largest of the 27 airports and aerodromes while Old Crow is projected to have a stable population during the next twenty years and less opportunity for economic development. It is projected to grow below the average (1.4% vs. 3.9%) but remain the 2nd largest airport. Old Crow will have the highest cargo loads of the 27 airports and aerodromes due to no road access and Watson Lake will see increases in its cargo activity in the next 10 years before tapering off.

As indicated earlier in the report, Mayo is well placed to benefit from mining development. More specifically the Eagle Gold and Keno Hills Silver District projects are close to the aerodrome and we assume that most of the aerodrome related mining activity will take place in Mayo. Eagle Gold is the larger of the two projects and includes an important construction phase expected to start in 2017, which will translate to large passenger volumes in 2017-2018 which will then slowly decline as the project enters its operational phase. Recent Yukon Environmental and Socio-economic Assessment Board (YESAB) approval of the ATAC Resources road north of Keno to the Rackla area may also impact activity at the Mayo airport. The level of cargo activity for Mayo will grow throughout the planning period.

Three other aerodromes namely Burwash, Carmacks and Finlayson are expected to handle some of the mining activities respectively related to the Wellgreen, Casino and BMC minerals-KZK (Finlayson). This will result in increased cargo levels for the planning period at these aerodromes. We also have two remediation projects, namely Faro Mine and Mount Nansen Mine, which are respectively expected to rely on Faro and Carmacks aerodromes.



McQuesten has reported high levels of cargo being transported today and these levels will decrease significantly (decreasing by 15% annually) over the planning period. Haines Junction and Carcross have smaller cargo activity levels at their aerodromes and these will continue to experience modest increases.

Site Assessments – Buildings

There are only ten of the airports and aerodromes that have buildings or facilities and there are two that require more substantial investment in the facilities in the near term (Ross River terminal replacement and the Old Crow maintenance facility insulation). The terminal in Ross River is not suitable for renovation and a new facility will require meeting the National Building Code for post-disaster requirements. The Faro Aerodrome would benefit from a larger maintenance garage for storage of equipment.

During the site visits, it was noted that **most ATBs/facilities could benefit from relatively inexpensive energy improvements, such as penetration sealing by applying spray foam or weather-stripping kits on doors.** These upgrades often yield short pay-back periods and would help to reduce overall operating costs.

Other facility items requiring attention include: 1) Beaver Creek - addressing back-up generator issue and establish barrier free access; 2) Burwash – testing the water quality and additional parking on landside; 3) Carmacks – address some barrier free deficiencies and heating controls maintenance; 4) Faro – serious site and building foundation drainage problems to fix, improve crawl space ventilation and address roof leaking; 5) Haines Junction – replace roof in the mid to long term; 6) Mayo – require storage for snow blower, replacements of windows, doors, and lighting as well as water distribution system upgrade and washroom replacement; 7) Old Crow – the terminal could use a minor modification related to storage and, as noted above, the maintenance garage has energy consumption challenges due to being poorly insulated; 8) Ross River - as noted above, this building should be replaced and tied into a new community vision while addressing the NBC; 9) Teslin – some insulation, temperature controls and barrier free ramp replacement; 10) Watson Lake – potentially a heritage facility and challenging upgrades for the terminal. There are energy upgrades needed as well as roofing/shingle replacements to be done but require guidelines for work consistent with heritage status.

Additionally, all the building and facilities on airports and aerodromes are considered Emergency Coordination Centres and essential to the transportation, telecommunications, emergency response (including MEDEVAC) and the restoration and/or continuity of government (includes assisting with the identification of alternate sites for business continuity planning).

Site Assessments – Airfield/Airside

TP312 5th edition compliance

The airfield and airside compliance assessments have been completed based on the Transport Canada current standards (TP 312 5th edition) and are site specific for all 27 airports/aerodromes reviewed in the Yukon Aviation System Review. Each site has a critical aircraft identified to align with its Aircraft Group Number (AGN) and this determines the required infrastructure and protections for the site.

The major items for address are:

1) Ross River – wires cut on airfield lighting – still live and dangereous; threshold lights not working and need replacing; apron and taxiway markings and lights not compliant



- 2) Mayo Runway (section replacement) and grading; consider airfield lighting replacement as well as possible GPS approach when work is underway with runway repair
- 3) Carmacks Airfield Lighting replacement urgently required and replace VASIS with PAPIs
- 4) Burwash Airfield Lighting wiring protection with conduit and pull pits; fix ARCAL for pilots; replace foundation for VASIS (and change to PAPIs)
- 5) Faro Airfield Lighting threshold lights need fixing; upgrade to PAPIs (only need one side for each end); and fix generator; Runway Safety Area & Obstacle Limitation Surface challenges with fall off: need NOTAM and may not be affordable for compliance
- 6) Watson Lake decommission old taxiway, properly light on turning bay and taxiway D; replace old generator; consider replacing runway regulator; some equipment (airfield transformers, lighting ballasts) are of a vintage that is suspect for containing PCB's.
- 7) Beaver Creek add windsock; new generator; airfield lighting wiring protection with conduit and pullpits
- 8) Teslin taxiway lighting is confusing on corner and requires added blue lights; needs new generator
- 9) Carcross Runway Safety Area & Obstacle Limitation Surface clearing (primarily trees/brush)
- 10) MacMillan Pass Runway Widening for critical aircraft to 18m (from 15.2m) AGN I
- 11) Ogilvie Runway Widening for critical aircraft to 18m (from 15.2m) AGN I and Runway Safety Area & Obstacle Limitation Surface clearing (primarily trees/brush)
- 12) Old Crow HWOS equipment interference and requires relocation to far side of airfield; new road needs to be shifted slightly north to avoid RSA some fence interference
- 13) Finlayson Runway Widening for critical aircraft to 23m (from 15.2m) AGN II; Runway Safety Area & Obstacle Limitation Surface clearing (primarily trees/brush); RSA Grading and Road Relocation as it is in the strip
- 14) Silver City Runway Safety Area & Obstacle Limitation Surface clearing (primarily trees/brush) as well as entrance road crosses runway threshold and requires fencing and relocation
- 15) Haines Junction Apron lighting not compliant
- 16) Ogilvie Runway Safety Area & Obstacle Limitation Surface clearing (primarily trees/brush)
- 17) Wiley Runway Safety Area & Obstacle Limitation Surface clearing (primarily trees/brush)

<u>Airfield Electrical</u>

There are ten sites noted above that require attention for the airfield electrical components. Several sites have aged, 120V, direct-buried cabling systems (all but Watson Lake and Old Crow), that should eventually be replaced. A more desirable situation would be to not have direct-buried cable and direct-buried splices, and install pull pits and conduit to increase reliability and decrease service time for these ten sites. There are also VASIS at six of the sites that are near the end of their useful life and should be replaced with PAPIs sooner rather than later.

Investment Modelling and Evaluation Methodology

The investment modelling utilized for the Yukon Aviation System Review is a two stage assessment and filter approach. The first step is to apply a triple bottom line (TBL) investment approach by accounting for social, environmental, and economic performance, or three pillars of sustainability, in ranking each airport/aerodrome and its role and its responsibilities.

Three (3) airport/aerodrome types have been identified:

Group 1: Airports/aerodromes with scheduled service or connect the local community, while also generating aviation activity linked to the specific economic projects (i.e. mining projects).



- Group 2: Airports and aerodromes which serve the local community or area access; and
- Group 3: Aerodromes which do not serve a specific local community and have no economic prospects.

27 Yukon Airports/Aerodromes System by Group							
Group 1	Group 2	Group 3					
Burwash (3)	Beaver Creek	Braeburn					
Carmacks (3)	Carcross	Chapman					
Faro (3)	Haines Junction	Cousins					
Finlayson (2)	Pelly Crossing	Ft. Selkirk					
Mayo (3)	Ross River	Hyland					
Old Crow (1)	Teslin	MacMillian Pass					
Watson Lake (3)		McQuesten					
		Minto					
		Mule Creek					
		Ogilvie					
		Pine Lake					
(1) Community base		Silver City					
(2) Mining project		Twin Creeks					
(3) Both		Wiley					

The 27 airports and aerodromes have been ranked 1 to 27 and, in the second stage, this ranking gets integrated into the specific capital and program requirements to address both compliance and risk items as well as future capacity and strategic investments. The intention is to consider the importance of the airport or aerodrome and its role while also identifying and addressing the items of greatest risk to the safe operations of these sites. The capacity driven and strategic investments are also included in the mix and evaluation as well.

Options Analysis

A key question and assessment is 'Do all of these airports/aerodromes need to be managed and maintained by the government of the Yukon?'.

The overall assessment of the Aviation System and priority investment program would **remove (5) aerodromes from the Group 3 aerodromes through closure.** The airstrips for closure are Minto (as the mine has their own strip), Pine Lake (limited recreation activity with low aerodrome role), Braeburn (not an essential aerodrome and negligible activity), Chapman (negligible activity and Ogilvie is a better mid-point landing strip along the Dempster Highway for emergency although it could use a fueling option) and Twin Creeks (no community role, negligible activity and alternatives at Ross River and Faro).

In addition to these five aerodromes, there are five (5) sites that should have funding discussions with significant user groups or their future use and sustainability is questionable. These five (5) are Finlayson, Cousins, Silver City, MacMillan Pass and Mule Creek. They could all be transferred on a licence or lease agreement with various cost sharing or operating models explored or sold outright.

This is aggressive and may not be popular but provides essential investments to the airports/aerodromes that require attention while removing the risk, liability and oversight to aerodromes or airstrips that are not a part of a real aviation system. This forms the basis of the Development Plan and Action Plan.



Governance and Transition

The existing attention paid to airports and aerodromes in the system does not see this infrastructure as strategic assets but rather as costs. This requires a shifting of focus – airports and aerodromes are important strategic infrastructure in the Yukon and require an integrated approach. There is currently limited ACAP funding support for the airports and aerodromes in the Yukon Aviation System due to the limited amount of scheduled traffic and only one airport in Old Crow is ACAP eligible under the present formula. Unless there is a northern formula for ACAP funding support federally, the airports and aerodromes must find solutions within the means of the Government of Yukon. The solutions start with how many sites can the Yukon Aviation System support?

Recommendations stated earlier in this review would suggest the system could be 'right sized' to 22 airports and aerodromes with separate funding agreements for up to an additional five aerodromes. The necessary shift could be accomplished through the separation and assignment of airports and aerodromes to a separate stand-alone Ministry or Department, with an appropriate allocation of staffing, capital and operating dollars consistent with the responsibilities for compliance for the safe and secure travel of all passengers. This would create a heightened awareness of the role and linkage of the airports and aerodromes to the Yukon economy and growth. The new Ministry could also consider contracting with local groups or companies to provide regular maintenance and inspections.

Another Option that may be considered is for the Yukon Government could also **establish an Agency or Aviation Authority for the oversight of its airports and aerodromes** as an independent crown agency that would be established with various stakeholder and interest groups as a Board and be assigned the oversight of the airports and aerodromes. Funding support and shared regulatory oversight with the federal government would still be required.

Priorities – capital spending 2018

There are 10 airports that are identified with priority compliance and higher risk airfield investments that need attention in the next 2 years. These projects are at a cost of \$6.7 million and a government cost of \$5.67 million after factoring in cost sharing arrangements.

20 year project list

There are 42 additional projects that have a total cost of over \$15 million² for compliance and capacity for the Yukon and its development. This will require careful planning and an annual capital budget of a minimum of \$1.5 million to sustain the Yukon Aviation environment, even in a scaled down number of aerodromes.

² Same comment as above



9

¹ Costing of capital items all will be reviewed to ensure they reflect a northern capital program premium.

Plan of Action

The Plan of Action for the Yukon Aviation System has six major areas for address. The Yukon Government must:

- determine if it is going to maintain all 27 airports and aerodromes or reduce the number as recommended in the Plan. The aerodromes recommended for closure could be offered to an outside party for transfer and operating responsibility as an option prior to closure.
- 2) contact the parties that have high use or shared responsibilities for an additional five aerodromes and establish the parameters for cost sharing in capital projects, operations and/or transfer of the aerodrome.
- 3) establish a revitalized governance model for the oversight and ongoing maintenance of the airports and aerodromes in the Yukon Aviation System.
- 4) Prioritize investments of \$5.87 million that are high risk environments at 10 sites in the near term for infrastructure upgrades related to compliance and safety.
- 5) Establish a regular capital program of a minimum of \$1.5 million for the Aviation System and the airports and aerodromes operated by, or on behalf of, the Yukon Government.
- 6) Lobby together with the territories of Nunavut and Government of the Northwest Territories for a northern ACAP program that better funds and supports Canada's development and sovereignty of the north.



GLOSSARY

ACAP: Airport Capital Assistance Program

AGL: Above Ground Level AGN: Airport Group Number

Aerodrome: Any area of land, water (including frozen surfaces) or other supporting surface

used or designed, prepared, equipped or set apart for use either in whole or in part for the arrival, departure, movement or servicing of aircraft and includes any buildings, installations and equipment situated thereon or associated therewith.

ARP: The Aerodrome Reference Point point normally is located near the geometric

centre of the runway complex that (a) establishes the geographical location of an aerodrome for charting purposes, and (b) establishes the locus of the radius or

radii of the outer surface as defined in a Zoning Regulation.

AHJ: Authority Having Jurisdiction

Airport: An aerodrome for which, under Part III of the Canadian Aviation Regulations, an

airport certificate has been issued by the Minister.

ARCAL: Aircraft radio control of aerodrome lighting

ASDA: Accelerate Stop Distance Available

ASL: Above Sea Level
ATB: Air Terminal Building

CAAGR: Compound Annual Average Growth Rate
CARS: Community Aerodrome Radio Surveillance

DME: Distance Measuring Equipment - is a transponder-based radio navigation

technology that measures slant range distance by timing the propagation delay

of VHF or UHF radio signals.

EIU: Economist Intelligence Unit

ENWIA: Erik Nielsen Whitehorse International Airport

GDP: Gross Domestic Product
GPS: Global Position System
IFR: Instrument Flight Rules

LOC: Localizer

MEDEVAC: Medical Evacuation Flights

OAG: Official Airline Guide

ODALS: Omni Directional Approach Light System – sequencing white flashing lights along

centerline prior to runway strip

OLS: Obstacle Limitation Surfaces establish the limit to which objects may project into

the airspace associated with an aerodrome consisting of the following; a takeoff surface, an approach surface, a transitional surface and an outer surface.

Runway Strip: A defined area including the runway, and stopway if provided, intended to

reduce the risk of damage to aircraft running off a runway and to protect aircraft

flying over it during takeoff or landing operations.

TBL: Triple Bottom Line - assessment model using social, environmental and economic

criteria

VFR: Visual Flight Rules

YASR: Yukon Aviation System Review



1.0 INTRODUCTION

The Yukon government has a challenging economy that is resource-rich and tourism dependent, spread out over a massive geographic area with a changing and demanding requirement for a strong territorial aviation system.

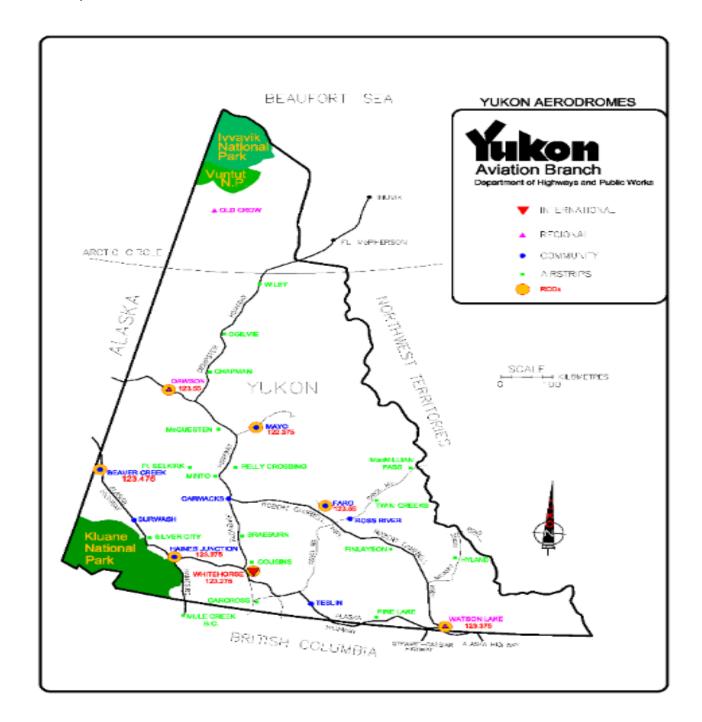
In the 1980's and 1990's the Yukon Territory's 29 airport and aerodromes were devolved from Transport Canada to the Government of Yukon. The Department of Highways and Public Works, Aviation Branch is responsible for providing a safe and effective transportation system at the Yukon government's 29 Airports and Aerodromes. These Airports and Aerodromes also provide communities with access to emergency health care through the support of Air MEDEVAC (medical evacuation) operations; facilitate RCMP, Justice and aerial firefighting activities; and are a hub to support emergency relief efforts following any real or potential disaster. Airport and aerodrome users include private, government and commercial carriers using helicopter and fixed-wing aircraft.

Year-round air transportation plays a huge role in providing the transportation of people and goods throughout the Yukon. As such, safe and efficient air transportation infrastructure is critical to the economic and social development of the territory. While limited, increased road development is occurring outside of municipal boundaries primarily to service the resource industry and this should be factored into accessibility assessments of the airports and aerodromes. Today, access to resources/markets remains a challenge for the Yukon: the only two scheduled domestic carriers are Air North, which flies between the Yukon communities of Whitehorse, Dawson City, and Old Crow as well as southern destinations with Edmonton and Ottawa service; and Alkan Air, which started scheduled service between Whitehorse and Watson Lake. Air Canada and WestJet operate services between Whitehorse and Vancouver. Other carriers mainly serve government jobs such as the MEDEVAC service, forest fire fighting and wildlife surveys, while others concentrate on the tourist market, either for hunting and fishing trips or aerial sightseeing trips.

As a member of the Transportation Division, the Aviation Branch is the operator of 1 international airport, 3 regional airports, and 25 community and local aerodromes. The network of these 29 sites is referred to as the Yukon Aviation System throughout this document (see Map for the Yukon Airports and Aerodromes on next page).



Yukon Airports and Aerodromes





2.0 PROJECT OBJECTIVE

The objective of the project is the development and delivery of a system review and plan to assess the current state and use of the Yukon Aviation System, assess the current investment model and prioritization criteria, and to identify and prioritize infrastructure investments that meet the current and future needs of stakeholders, create economic development opportunities and comply with governing regulations. The Dawson City and Whitehorse airports are outside the scope of this project because they are the subjects of current and upcoming assessments and development plans.

The Stantec team has been active in collecting data, establishing base plans, visiting several sites, communicating with stakeholders, providing assessments, identifying areas of non-compliance and gaining an in-depth understanding of the Aviation System in the Yukon. These inputs provide the basis for the Plan in delivering the Yukon Aviation System Review. High level analysis and recommendations have been provided in the following site assessment components:

- a) Airside and groundside facility and infrastructure conditions and needs,
- b) Visual Aids conditions and needs, including but not limited to: lighting controls, lighting fixtures; directional signage; cabling; and stand by power systems,
- c) Maintenance operational needs (including maintenance buildings and fuel facilities),
- d) Obstacle limitation surfaces and requirements for airport zoning regulations,
- e) Structural and on-site geotechnical material assessment, drainage/hydraulics analysis, and identification of existing and/or prospective geo-hazards (based on available information on a site by site basis).

The objectives of this high-level assessment have been to: a) identify safety and operating risks which require immediate attention to correct existing deficiencies; and b) identify the costs of undertaking future developments for capacity or strategic purposes. The assessment provides the inputs for the potential project prioritization list for the 27 airport/aerodrome system.

The airports and aerodromes will also be evaluated on their role and relationship with the community, region and Yukon Government oversight using social, economic and environmental criteria (Triple Bottom Line). The Yukon Aviation System Review will provide recommendations that serve the territory and its aviation challenges in a manner that focuses on safe and compliant operations of the government airports and aerodromes and lays out a transition approach to move toward improved performance and reduced risk.

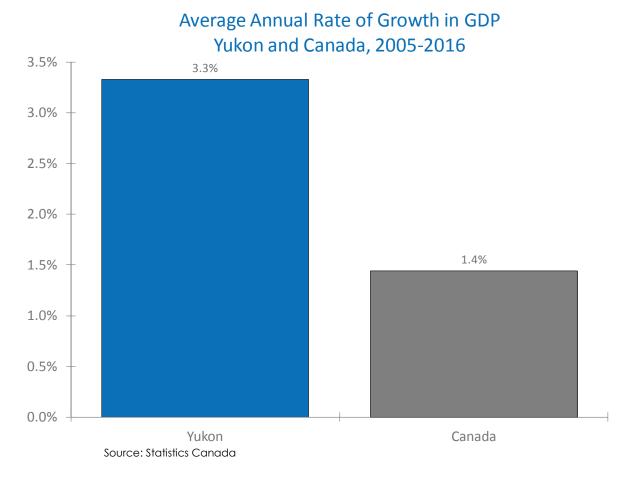


3.0 BACKGROUND & COMMUNITY PROFILES

This section covers economic and demographic features and trends for each community captured in this study.

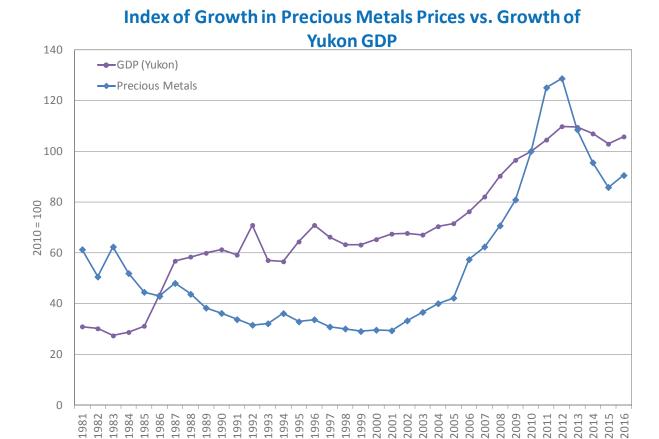
3.1 ECONOMIC GROWTH IN THE YUKON

Over the period 2005 through 2016 (Stats Canada estimate), the Yukon economy experienced fairly robust growth, albeit from a relatively small base within the Canadian context. In fact, the region's economy expanded by more than twice the pace of the country overall.



The region's strong performance is largely attributed to the substantial rise in global precious metals prices and the expansion in mining activity that followed.

As demonstrated in the following chart, growth of Yukon's GDP has moved in close step with global precious metals prices since the early 1990s. It is particularly noteworthy that the Yukon economy was in recession in 2013-15 and in recovery in 2016 and this corresponds with the precipitous decline in global commodity prices (precious metals in this case) and lower mineral production over this same period.



Source: Statistics Canada and World Bank

3.2 OVERVIEW - YUKON COMMUNITIES

Outside of federal transfer payments, there are variations in the Yukon economy and its communities related to natural resources exploration and extraction, and tourism. The following table provides a snapshot of each community/locality covered in this study in terms of population, income per capita and key type of economic activity.



		Population(est	.)	Sector Presence in Region/Regional Strengths			
Community	2016	CAAGR* (2006-2016)	Income Per Capita	Government Administration	Tourism	Mineral Exploration/ Mining	
Beaver Creek	122	0.2%	n/a	yes	yes	yes	
Braeburn	n/a	n/a	n/a		yes		
Burwash	108	n/a	n/a	yes	yes	yes	
Carcross	510	1.3%	\$35,570	yes	yes		
Carmacks	563	3.7%	n/a	yes	yes	yes	
Chapman Lake	n/a	n/a	n/a		yes	yes	
Cousins	n/a	n/a	n/a				
Faro	379	0.0%	\$39,968	yes	yes	yes	
Finlayson	n/a	n/a	n/a			yes	
Ft. Selkirk	n/a	n/a	n/a		yes		
Haines Junction	905	0.9%	\$42,975	yes	yes	yes	
Hyland River	n/a	n/a	n/a			yes	
MacMillan Pass	n/a	n/a	n/a		yes	yes	
Mayo	482	2.2%	n/a	yes	yes	yes	
McQuesten	n/a	n/a	n/a			yes	
Minto	n/a	n/a	n/a		yes	yes	
Mule Creek	n/a	n/a	n/a				
Ogilvie River	n/a	n/a	n/a		yes	yes	
Old Crow	261	0.1%	n/a	yes	yes		
Pelly Crossing	382	2.8%	\$26,585	yes	yes	yes	
Pine Lake	n/a	n/a	n/a				
Ross River	416	1.7%	\$31,927	yes	yes		
Silver City	n/a	n/a	n/a		yes		
Teslin	485	1.4%	n/a	yes	yes	yes	
Twin Creeks	n/a	n/a	n/a				
Wiley	n/a	n/a	n/a		yes		
Watson Lake	1,485	-0.2%	\$44,323	yes	yes	yes	

^{*} Compound Annual Average Growth Rate

Source: Yukon Government



17

3.3 YUKON COMMUNITY AND LOCALITY PROFILES

The following sections provide a brief overview of the local economy of each community/locality covered in this study.

Beaver Creek: Government services, which includes the Canadian Border Services Agency (CBSA), territorial government, and First Nation administration provides most employment opportunities in Beaver Creek. Local lodges and restaurants provide employment during the busy tourist months of May through September. Mineral exploration activity in the region holds potential for a greater demand for labour and services, which will also provide for additional opportunities for the people and local businesses. The Beaver Creek community also relies on subsistence and traditional activities. Many secure a significant portion of their food supply from hunting and fishing, and some earn income through trapping.

Braeburn: Braeburn is situated on the North Klondike Highway, east of Braeburn Lake and north of Braeburn Mountain. It is on the path of the former Dawson Overland Trail, which was built in 1902 between Whitehorse and Dawson City. It is estimated that the locality has about 5 residents. In addition, Braeburn Lodge is a roadhouse and a tourist destination: it is famous for its large cinnamon buns and every February, Braeburn Lodge hosts a checkpoint of the long-distance Yukon Quest sled dog race.

Burwash: Tourism is a major sector in this community; most tourist facilities are open only from May to September, the prime Yukon tourist season, while some remain open year-round including the facilities at nearby Destruction Bay. Burwash Airport could serve as a point of access to the prospective Wellgreen Mine site (see 'Assumptions' section).

Carcross: The principal economic activity in Carcross includes government services from federal, territorial, First Nation and municipal government. Tourism also plays a large role; the White Pass and Yukon Route Railroad transports tourists from major cruise ships between the Alaska port of Skagway and Carcross in summer months. Prince William and Princess Kate visited Carcross in summer 2016 as part of their day in the Yukon. Opportunities for local businesses to provide goods and services, from outdoor adventure to local art, are abundant.

Carmacks: The present economy of Carmacks includes government services from the federal, territorial, First Nation and municipal governments. The private sector provides employment in the construction, mining, service and tourism industries. A large mining project (Casino), which could have an impact on Carmacks, is under consideration (see 'Assumptions' section). This is a strategic location for other mining projects as well as a positioning for the Wildland Fire Management oversight in their coordination of and responses to regional wildfires.

Chapman Lake: This airstrip is on the Dempster Highway and is primarily used for tourism/outfitting and mining exploration.

Cousins: Located very close to Whitehorse. Primarily used by Canadian Owners and Pilots Association (COPA) for pilot training purposes.

Faro: Faro's present economy includes Government Services from the Federal, Territorial, and Municipal governments; mining; construction; transportation; energy; and service sectors. Faro is in the process of making an economic transition from mining to new opportunities, although, it is likely that mining will contribute at some level to the economic future of Faro, through remediation activities, and exploration activities.



Finlayson: Adjacent to Robert Campbell Highway near Ross River. Used for outfitting and mining/exploration (currently BMC Minerals – Kudz Ze Kayah (KZK) deposit) (see 'Assumptions' section).

Ft. Selkirk: Fort Selkirk is a historical site and former trading post on the Yukon River near Pelly Crossing. The Fort Selkirk site, was home to the Selkirk First Nation and is now owned and managed jointly by the Selkirk First Nation and the Government of Yukon's Department of Tourism and Culture. There is no road access and most visitors get there by boat, though there is an airstrip, Fort Selkirk Aerodrome, at the site.

Haines Junction: Economic development for Haines Junction focuses on education, ecotourism, and outdoor recreation; each of these sectors increases job opportunities, provides operating revenues to local governments, and is developed and maintained in a sustainable manner. The main employers in Haines Junction are with government: federal, territorial, First Nation and municipal. The private sector provides employment in the construction, mining, service industry, and tourism fields.

Hyland River: On Nahanni Range Road, this site is used for outfitting/exploration; previously for access to Cantung deposit and used by Golden Predator mine (see 'Assumptions' section).

MacMillan Pass: Situated on Canol Road, it is used for tourism and often for resource exploration. This is an airstrip that does see a fair amount of mining and outfitting activity. It also has been used by the Government of the NWT for a renewable resources base.

Mayo: The main employers in Mayo are with government: federal, territorial, First Nation and municipal. The private sector provides employment in the construction, mining, service industry, and tourism fields. Significant mining projects, such as Eagle Gold, Keno Hills Silver and Rackla Gold which could have an impact on Mayo, are under consideration (see 'Assumptions' section).

McQuesten: This airstrip is along the Klondike Highway and has occasional use for exploration and for flying in fuel and cargo to gold mines south of Dawson. It was quite active in moving cargo to the Coffee Mine properties now owned by Goldcorp.

Minto: Just north of Carmacks on the Klondike Highway with mining being the mainstay of the local economy. <u>Note:</u> Minto Mine does not use the Yukon government's airstrip as they have their own airstrip.

Mule Creek: It is situated along Haines Road and is currently used by heli-skiing operations.

Ogilvie River: Located on the Dempster Highway and used for tourism/outfitting. It is also near the Northern Cross oil and gas exploration area.

Old Crow: Old Crow is the only community in the territory with no road access. Its predominant employment involves positions with the Vuntut Gwitchin First Nation while others work with Yukon Government services such as healthcare, education or conservation. There is a Parks Canada Visitor Centre in the community and the area is a gateway to a Parks Canada site. The area has also had prehistoric fossils discovered in the region that are attracting interest from researchers and archaeologists.



Pelly Crossing: The main employers in Pelly Crossing are with government: federal, territorial, and First Nation. The private sector provides employment in the construction, mining, service industry, and tourism fields.

Pine Lake: Located along the Alaska Highway, the airstrip is located close to recreational properties in the area.

Ross River: Many residents work with federal, territorial, and First Nation governments, while others work in the service and tourism industry. Ross River is well positioned to develop business opportunities based on tourism, hunting, fishing, and adventure activities due to its proximity to a spectacular landscape and wilderness. Significant mining projects, such as BMC – Kudz Ze Kayah and Selwyn Chihong, which could have an impact on Ross River, are under consideration (see 'Assumptions' section).

Silver City: Silver City was a small community in the early 1900s with a trading post and included North West Mounted Police barracks. The ghost town enjoyed a brief resurgence during construction of the Alaska Highway, and then was abandoned again. Located on the shore of Kluane Lake and along the Alaska Highway between Burwash and Haines Junction, it is home to the Arctic Institute of North America, which uses the aerodrome quite regularly as a base for research. There is a busy seasonal glacier tours operation that uses the aerodrome as a base.

Teslin: The present economic activity of Teslin includes Government Services from the federal, territorial, First Nation and municipal governments. Economic activity in the private sector includes tourism, mining, construction, transportation, energy and service sectors. There are MEDEVAC flights that occasionally utilize the aerodrome in Teslin as well as a regional base for the Wildland Fire Management branch of the Government of the Yukon.

Twin Creeks: On the North Canol Road, it is occasionally used for resource exploration.

Wiley: Located just 35 kilometers south of the Arctic Circle along the Dempster Highway, the Wiley airstrip is in the Eagle Plains area and not regularly used. The region has a sweeping spectacular view of the Eagle Plains with the Richardson Mountains as a distant backdrop.

Watson Lake: Watson Lake, known as the 'gateway to the Yukon', is rich in business opportunities, outdoor adventures, and boasts exceptional recreational facilities. It is the first community encountered after crossing the border from British Columbia on the Alaska Highway, and therefore a key transportation hub for the Yukon Territory. The people of Watson Lake have a high degree of education, over 67% of Watson Lakers between the ages of 25 and 64 hold a certificate, diploma or degree. The Town of Watson Lake is a key transportation, communication and distribution center for mining, tourism, outfitting, trapping, and logging activities in southern Yukon, northern British Columbia and a portion of the Northwest Territories.

Watson Lake serves a potentially large mining presence in the area including one operating hard rock mine at Silver Tip. The Selwyn project near Howard's Pass is the world's largest lead-zinc deposit and is under development, while many mining exploration companies are active in the area. The area also serves as a major service area for tourism and is the site of the Regional Territorial Government administration services. There is a historic significance of the Watson Lake Airport and it was a strategic site in the US – Russia aircraft loan/lease program transporting aircraft to Russia via Yukon and Alaskan airspace at the early stages of WWII.

Significant mining projects, which could have an impact on Watson Lake, are under consideration (see 'Assumptions' section).



3.4 MINING PROJECTS

The resource rich Yukon and its economy is aligned with the level of exploration and development of the mining activity in the territory. There is a great deal of uncertainty associated with the mining sector but it has tremendous potential to impact the job creation and GDP for the territory. These projects are often in regionally isolated areas and only accessible via air. Significant mining projects, which could have an impact on airport/aerodromes are listed below.

Mining Projects	Airport Impacted
Eagle Gold	Mayo
Casino	Carmacks
Keno Hills Silver District	Mayo
Silver Tip Mine	Watson Lake
Cantung Mine - North American Tungsten Corporation Limited (NATCL)	Watson Lake
BMC Minerals: KZK	Finlayson
Wellgreen Platinum	Burwash
Selwyn Chihong	Watson Lake
Rackla Gold	Mayo
Remediation projects:	
Faro Mine Complex	Faro
Mount Nansen	Carmacks

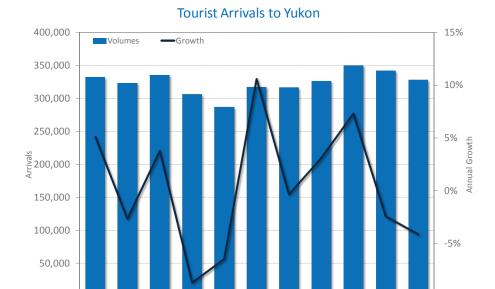
Source: Yukon Government, mining companies and media sources

Note: The table above is not a comprehensive listing of all mining/mining remediation projects (existing/prospective) in Yukon. Rather, the projects included here are those that are deemed to have an impact on one or more of the 27 airports and aerodromes covered in the System review. Concerning the sources of this information, it should be noted that the Yukon Department of Energy, Mines and Resources does not aggregate or track information on mining projects by individual communities that may be affected. Finally, it is recognized that not all of these projects will come to fruition and, over the forecast period, it is probable that other projects will come into existence. (See the 'Assumptions' section for more details on the mining projects that are included in this study.)

3.5 YUKON TOURISM

Yukon border crossings have been relatively flat across Yukon for the past ten years, fluctuating in a range of about 300 to 350 thousand arrivals, but many of these border crossings are simply people travelling between Alaska and the Lower 48. This flat performance in border crossings is in high probability explained by the negative impact of the global recession during 2007 – 2015 and the slow recovery in the US economy, which, as will be discussed below, accounts for a large component of Yukon's tourism market. The lower Canadian dollar and the strengthening of the US economy in the past two years is a signal that the tourism market may be positioned for an uptick.





Source: Yukon Government

2007

Enplaning and deplaning passenger volumes at Whitehorse Airport, however, have increased from 228,000 passengers in 2007 to 336,000 in 2016, which is an increase of 47% or an average annual increase of 4.7%. This overall increase in air travel to the Yukon is in high probability explained by changes in air access to the Yukon and the transition from driving vacations to fly/drive vacations.

2010

2011

2012

2013

2014

2015

The Yukon Government's publication '2012/2013 Yukon Visitor Tracking Program: Pathways Report' provides insight into how total visitor arrivals breakout by origin of visitors, purpose of trip and mode of transport to enter Yukon. There has been an increase in the tourist market from Asia for winter tourism products like the Yukon Quest and, similar to the Yellowknife market, the northern lights, but it is not yet a significant enough market to change the visitor profiles described in this publication.

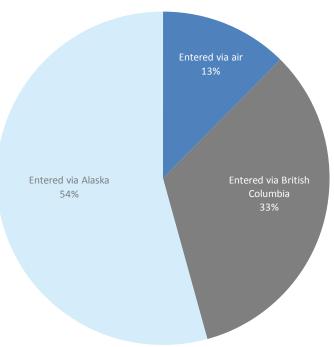
Most visitors to Yukon enter via motor vehicles, while approximately 34% enter via air. In 2015, 328,000 visitors arrived by road, while 167,000 arrived by air to Whitehorse and another 5,000 arrived by air to Dawson City, Also, of those entering Yukon via Alaska by road, 77% originated in the United States; of those entering via British Columbia by road, 60% originated in the United States; and of those entering via air, the vast majority (73%) originated in Canada. In general, it is clear that arrivals by road from the United States are very important to Yukon tourism, accounting for over 50% of total visitor arrivals to Yukon, but arrivals by air (through Whitehorse) are also play an important role.



22

-10%





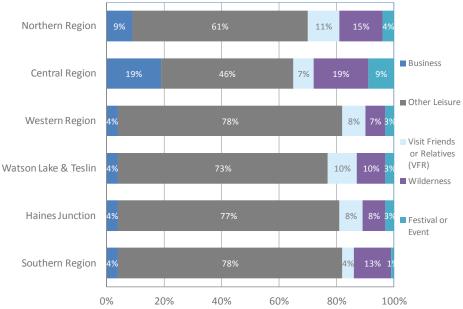
Source: 2012/2013 Yukon Visitor Tracking Program: Pathways Report

Leisure-related activities and visiting friends and relatives account for the vast majority of arrivals to Yukon. Comparing across regions, however, it is clear that business-related visitor arrivals were particularly important in the Central region (Carmacks, Ross River, Faro, Mayo, Pelly Crossing), which has had a significant amount of mining activity, especially when commodity prices were higher than at present.



23

Visitors to Regions of Yukon by Purpose of Trip

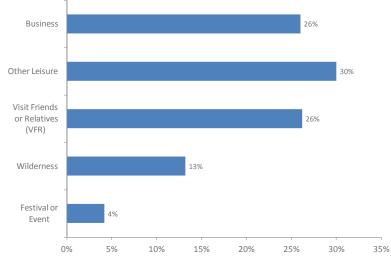


Northern Region (Old Crow, Tombstone, Inuvik); Central Region (Carmacks, Ross River, Faro, Mayo, Keno City, Pelly Crossing); Western Region (Beaver Creek, Destruction Bay, Burwash Landing); Southern Region (Carcross, Tagish, Atlin)

Source: 2012/2013 Yukon Visitor Tracking Program: Pathways Report

Based on survey figures published in the Yukon Government's 'Yukon Visitor Tracking Program: Pathways Report', a significant proportion (26%) of visitors to Yukon arriving by air come to the region for business purposes.

Visitors Arriving by Air: Purpose of Trip



Source: 2012/2013 Yukon Visitor Tracking Program: Pathways Report



The communities/localities where tourism is particularly important are identified in the table at the outset of this chapter, and the outlook for Yukon tourism is discussed in the 'Assumptions' section of this report.

Note: A definitive base of historical tourism statistics for individual communities/localities covered in this study was not available to the research team. However, based on information drawn from the '2012/2013 Yukon Visitor Tracking Program: Pathways Report', it is clear that the vast majority of visitors to Yukon's various regions use surface transport to reach their destination and only a tiny percentage both drive and fly within Yukon. The air access tourism is largely focused on Whitehorse and to a much lesser degree, Dawson City, and they were not a direct part of the study airports and aerodromes. Hence, despite some sites with a tourism focus such as Carcross and Silver City, tourism does not have a high impact on the 27 airports and aerodromes that were included in this study today.

4.0 AVIATION FORECAST

4.1 OVERVIEW

A twenty-year traffic forecast has been prepared for 27 of the 29 airports and aerodromes which together form the Yukon Aviation System. The traffic forecast will play a key role in the development of individual airports and aerodromes within the System and affect all parties with vested interests in the airports and aerodromes.

The mining industry is a key driver of economic growth in the Yukon Territory and airports and aerodromes within the Aviation System facilitate the development and growth of this sector. The mining industry is cyclical and, after a few years of slow growth, some mining projects are expected to commence over the next few years. Planning airport expansion in this environment is a challenge as mining projects tend to be cyclical and not all projects move forward.

The Government of Yukon should operate airports and aerodromes that facilitate economic growth and/or provide essential services for communities, but must be careful not to overbuild its airports and aerodromes. With this in mind, the forecasts of air traffic are key to the planning process and help airport planners understand the possible future levels of traffic.

For the purposes of developing the forecast, the team has been asked to provide an independent view, based on: discussions with local industry experts; its experience and knowledge gained over the years from undertaking similar studies; and its knowledge of travel market trends, airline strategies, and the degree of flexibility that airlines have to adapt to the changing environment. The forecast has analyzed past and recent trends in air transport activity in Yukon as well as the main socio-economic factors that influence its evolution to project annual passengers, cargo volumes and aircraft movements at the 27 individual airports and aerodromes included in the Yukon Aviation System Review.

4.2 MAIN SOURCES OF DATA

- ★ Airport statistics provided by the Aviation Branch of the Government of Yukon;
- Statistics Canada (StatsCan);
- Mining companies and the Yukon Chamber of Mines;
- Government of Yukon;



₹ The Economist Intelligence Unit (EIU); and

The Official Airline Guide (OAG).

4.3 YUKON AVIATION CONTEXT

Many areas of the Yukon Territory are over 100 km from the nearest major road, and this is a problem that particularly affects areas in the far North and Northeast Yukon. In this regard, it has long been recognized that resource/economic development in the North is closely linked to and dependent upon the development of transport infrastructure in that region. Moreover, development of the North is important to both strengthening the nation as a whole and creating and maintaining jobs for northerners.

To put things in perspective, the following table shows some of the geographical, economic and air transportation statistics for the Yukon versus the country. The GDP per Capita in Yukon is well above the national average, reflecting the fact that jobs in the mining industry can be well paid but more importantly reflecting the high cost of living in a remote area. Canada's vast territory is highlighted by the population density ratio (5.98 people/sq km) which is among the lowest in the world's mature economies but, without surprise, Yukon is even much lower (0.08 people/sq km). Many communities in the Yukon are remote and thus depend on the air transport livelihood sector for theirs. While the overall size of the air transport sector is small (less than half a million passengers), the trips per inhabitant is almost three times the national average. It is not shown in the table but the GDP per capita and the trips per inhabitant in Yukon are comparable to the figures for the city of Toronto.

	Overview of Yukon versus Canada									
Population Area Pop Density GDP GDP per Air Passengers Trips per 1										
	2016 Est.	(sq. KM)	(People/ Sq KM)	(\$Millions)	Capita	2015	Inhabitant			
All Provinces	36,286,378	6,062,931	5.98	1,973,043	55,510	127,907,683	3,525			
Yukon 37,694 482,443 0.08 2,603 70,351 331,612 8										

Source: StatsCan and ACI

Today, access to resources/markets remains a challenge for the Yukon: the very recent introduction of Alkan Air service to Watson Lake from Whitehorse joins Air North as the only other scheduled domestic carrier who flies in the Yukon. Air North flies between Whitehorse, Old Crow, Inuvik, Fairbanks (on a charter basis), Vancouver, Calgary, Edmonton and Kelowna, as well as to Ottawa via Yellowknife; Air Canada and WestJet operate services between Whitehorse and Vancouver. Other carriers mainly serve government jobs such as the Medevac (medical evacuation) service, forest fire fighting and wildlife surveys, while others concentrate on the tourist market, either for hunting and fishing trips or aerial sightseeing trips.



4.4 TRAFFIC DEVELOPMENT IN YUKON

4.4.1 Estimation of Passengers, Cargo and Aircraft Movements

By definition, to prepare a forecast it is necessary to have historical traffic statistics and for this study only partial data has been available. More precisely the forecast team had the following historical data:

- For aircraft movements, the Aviation Branch provided a data set from 2005 to 2016 (split between rotary and fixed wings) for the following 7 airports and aerodromes: Beaver Creek, Burwash, Faro, Mayo, Old Crow, Teslin and Watson Lake.
- In addition, from past studies, the team had, for the same 7 airports and aerodromes, total aircraft movements from 1997-2004. However, this dataset did not have the split between rotary and fixed wings.
- Air North, Alkan Air and Tintina Air provided us with their 2016 traffic statistics (passengers, cargo and movements).



The following table highlights 2016 data that is available (**Note: cargo volume is in Kilograms**).

2016 Traffic Statistics: Available vs. Missing Data							
301C D-+-		Passengers			Cargo		
2016 Data	Total	Commercial	Non-com.	Total	Fixed wings	Rotary	Total
1 Old Crow	5,839			1,174	1,126	48	326,111
2 Watson Lake	5			3,654	3,084	570	
3 Ross River	80			140			
4 Faro	30			782	480	302	5,000
5 Mayo	25			2,192	1,601	591	
6 Carmacks	300			81			
7 Haines Junction	5			70			
8 Burwash				2,149	1,759	390	
9 Beaver Creek	4			490	227	263	
10 Hyland	10			127			
11 Pine Lake				4			
12 Finlayson	450			117			5,000
13 Twin Creeks							
14 MacMillian Pass	30			22			1,000
15 Pelly Crossing				14			
16 Minto							
17 Cousins				0			
18 Braeburn	10			5			
19 Carcross	5			6			
20 Silver City				4			
21 Ft. Selkirk	10			2			
22 McQuesten				90			270,000
23 Chapman							
24 Ogilvie							
25 Wiley	5			1			
26 Teslin				127	94	33	
27 Mule Creek							

Source: Aviation Branch Statistics and Carrier Information

Despite the missing data, armed with partial information, the team has been able to construct a 2016 data set for each airport with the following assumptions and techniques.

A) Estimating passengers for the 7 airports/aerodromes with actual aircraft movements: In Dawson City Airport, we have a complete historical data set (i.e. passenger and movements) and from this we are able to estimate the 'trips per inhabitant'. In Dawson City Airport, for 2016, the trips per inhabitant are estimated at 6.2 (and this specifically excludes all the Holland America charter passengers). We assumed that Dawson City Airport, compared to the other 7 airports and aerodromes will have higher trips per inhabitant because, among other things, it has regular air service (which will stimulate travel) and it benefits from tourism. For the 7 other airports and aerodromes, we estimated that the trips per inhabitant would be 4 to 5 times smaller and to estimate passengers we multiplied the local population by the 'trips per inhabitant' assumed.

B) Estimating passengers and aircraft movements for the airports and aerodromes with population figures: Of the 27 airports and aerodromes under study, the Government of Yukon collects population data on 11 communities. Of those 11 communities, we have aircraft movements for some of them (e.g. Mayo/ see above) but no airport traffic statistics for 5 communities namely: Carcross, Carmacks, Haines Junction, Pelly Crossing and Ross River. To estimate passengers, we assumed trips per inhabitant 4 to 5 times lower than in Dawson City Airport and to estimate aircraft movements we needed to estimate average number of flights



per inhabitant. For 6 airports and aerodromes, we were able to calculate the flights per inhabitant (which ranged from a low of 0.3 and a high of 4.3 and averaged 4.2. This figure was applied to the population to derive flights.

C) Estimating passenger and aircraft movements for the remaining airports and aerodromes: There are 15 aerodromes (essentially airstrips) for which we had no historical traffic statistics or any population data. Most of these aerodromes have limited activity. Given that we had no real guide to estimate demand we simply assumed that the activity at these aerodromes would be smaller than in the other cases.

D) Estimating cargo: For some airports and aerodromes we had cargo statistics from Air North and Tintina Air and for the airports and aerodromes for which we didn't have any information we assumed a passenger to cargo ratio which was applied to the passenger figures to derive cargo volumes.

E) General assumptions: For the airports and aerodromes where we had to estimate aircraft movements we also had to estimate the split between fixed wings and rotary. For all airports and aerodromes we estimated a share of 21% for rotary activity which is the share derived from the 7 airports and aerodromes for which we had the information. Also, we assumed that aside from Old Crow and Watson, none of the 25 other airports and aerodromes have scheduled passenger service.



The following table summarizes the actual and estimated 2016 traffic statistics. (**Note: cargo volume is in Kilograms**).

	2016 Traffic Statistics: Available vs. Estimated Data								
	201C Data		Passengers			Cargo			
	2016 Data	Total	Commercial	Non-com.	Total	Fixed wings	Rotary	Total	
1	Old Crow	5,839	5,819	20	1,174	1,126	48	326,111	
2	Watson Lake	7,600	7,000	600	3,654	3,084	570	30,400	
3	Ross River	80	0	80	140	140	0	320	
4	Faro	400	0	400	782	480	302	5,000	
5	Mayo	700	0	700	2,192	1,601	591	2,800	
6	Carmacks	300	0	300	98	81	17	1,200	
7	Haines Junction	1,100	0	1,100	2,900	2,295	605	4,400	
8	Burwash	800	0	800	2,149	1,759	390	3,200	
9	Beaver Creek	200	0	200	490	227	263	800	
10	Hyland	10	0	10	154	127	27	40	
11	Pine Lake	15	0	15	80	63	17	60	
12	Finlayson	450	0	450	71	70	1	5,000	
13	Twin Creeks	15	0	15	80	63	17	60	
14	MacMillian Pass	30	0	30	80	63	17	1,000	
15	Pelly Crossing	100	0	100	200	158	42	400	
16	Minto	15	0	15	80	63	17	60	
17	Cousins	15	0	15	80	63	17	60	
18	Braeburn	15	0	15	80	63	17	60	
19	Carcross	600	0	600	1,600	1,266	334	0	
20	Silver City	15	0	15	80	63	17	60	
21	Ft. Selkirk	15	0	15	80	63	17	60	
22	McQuesten	20	0	20	109	90	19	270,000	
23	Chapman	15	0	15	80	63	17	60	
24	Ogilvie	15	0	15	80	63	17	60	
25	Wiley	15	0	15	80	63	17	60	
26	Teslin	45	0	45	127	94	33	0	
27	Mule Creek	15	0	15	80	63	17	60	

Source: Aviation Branch Statistics, Carrier Information and DKMA estimates

4.4.2 Summary of Findings

In 2016, based on the traffic estimates and actual data, it is assumed that the 27 airports and aerodromes under study accounted for about 5% of all passengers in Yukon and a much greater share of movements estimated at around 32%. The graphs do not break out Old Crow as its traffic is part of the 27 airport and aerodrome Aviation System Review activity that is being captured. It is also the only fly in community with no road access.

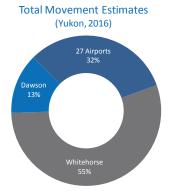


Total Passenger Estimates
(Yukon, 2016)

Dawson
7%
27 Airports
5%

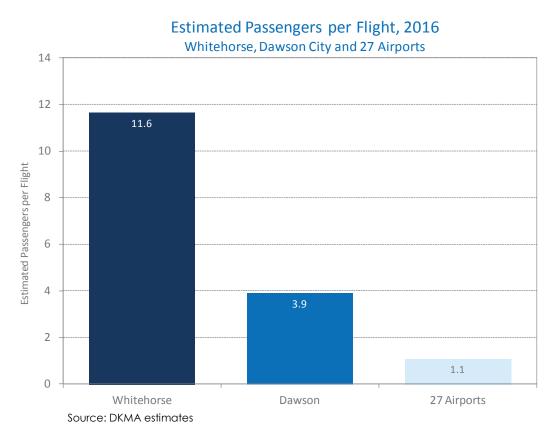
Whitehorse
88%

Total Est. Passengers in 2016: 383,162 Source: DKMA estimates



Total Est. Movements in 2016: 52,671

The following graphic shows the passengers per flight for Whitehorse and Dawson City (which are actuals) vs. the estimate for the 27 airports and aerodromes under study. While the actual figure is difficult to verify with available data, the estimate when compared to the actual values of Whitehorse and Dawson City, seems reasonable. Note: The estimate does include Old Crow Airport as part of the study group and it is estimated to have approximately 5 passengers per flight. The recently introduced scheduled service to Watson Lake will also provide a higher average passenger per flight, bringing the remaining 25 sites to less than 1 passenger per flight.



In addition to the 29 airports and aerodromes owned and operated by the Government of the Yukon, an unspecified number of registered and unregistered private airstrips also exist within the territory, which are predominantly owned and operated by mining interests, and hunting guides

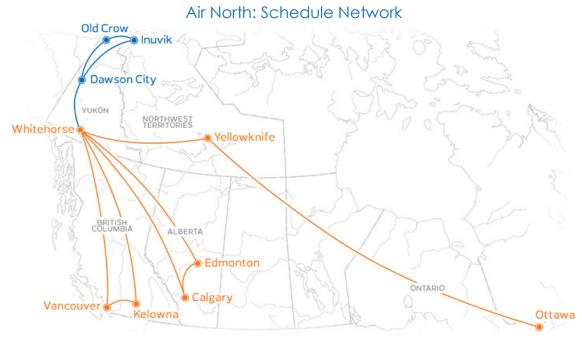


and outfitters. Of the 29 airports/aerodromes, there are several that are singular in purpose and this will be explored later in the report.

4.5 MAIN SERVICE PROVIDERS

Air North: Air North, Yukon's largest passenger airline based in Whitehorse, has a current fleet of thirteen (13) aircraft, comprising four Boeing 737-500, one Boeing 737-400, one Boeing 737-200 combi, and five Hawker Siddeley 748 (HS-748) and two ATR 42-300's combi aircraft.

Air North's northern routes include Whitehorse (YXY), Dawson City (YDA), Inuvik (YEV) and Old Crow (YOC), which operates six days per week. Air North also operates a series of southern routes from their Whitehorse base, as well as the route to Ottawa via Yellowknife. In addition, Air North provides a variety of air cargo and passenger charter services, the most important of which is the Fairbanks-Dawson City tourist charter, which is operated for the Holland America cruise line.



Source: Air North's website

Air North has embarked upon a program to replace its fleet of aging HS-748 aircraft. In June 2016, Air North received the first of two ATR-42-300 combi aircraft, and they expect to put the two aircraft into service by May 15, 2017. The ATRs are capable of take-off and landing on gravel runways, are more cost-efficient to operate and are more comfortable for passengers. The ATRs have a capacity of 42 passengers. However, Air North expects to configure the aircraft for only 34 passengers to allow for additional cargo capacity. Air North does not expect to vary the seating capacity of its ATR aircraft since it can take up to 8 hours to reconfigure (which is far greater than the current HS-748), plus the Yukon market is such that most passengers do not book their flights until about 10 days prior to the departure date. Air North plans to retain one or more of the HS-748 aircraft to provide charter passenger and cargo services, as well as serve as an alternative when other aircraft are being serviced.



Over the next few years, Air North will need to phase out its aging Boeing 737-200 aircraft (which can operate on gravel runways) due to the high maintenance costs and the fact that the airframe is approaching the end of its serviceable life.

Alkan Air: Alkan Air is a commercial air carrier providing scheduled passenger service between Whitehorse and Watson Lake, air charter services, flight training and air ambulance services (under contract with the Government of Yukon) from its FBO base at Whitehorse Airport (YXY). In September 2016, Alkan Air commenced scheduled passenger service from Whitehorse to Watson Lake (YQH) three days per week. Alkan has a fleet of seventeen (17) aircraft, including a Dornier Do-228, five Beechcraft Super King Airs, a Piper PA-34 Seneca, a Piper PA-31 Navajo, three Cessna 2068 Caravan, as well as several other smaller fixed wing aircraft.

Great River Air: Great River Air (GRA) is a commercial air charter company based at Whitehorse and Dawson City. It operates a Britten-Norman Islander (BN-2) and a Cessna 206 Stationair out of both airports, as well as a Cessna 172 Skyhawk that operates between the two locations based on demand. GRA is engaged in serving the mining operations outside of Dawson City including fuel hauling and shuttling crews. Additional air charter activities include caribou and salmon tracking and game counts, aerial surveillance and camera work, and hunting and fishing excursions (which usually only has an 8-week season, mostly involving American tourists). Over the long term, with the expansion of tourism and mining activities in the region, GRA is expecting the number of annual movements to increase in line with the growth in these two sectors.

Tinting Air: Tinting Air is a commercial air charter company based at Whitehorse which offers services using wheel, float and ski equipped planes. The carrier has a fleet of seven (7) aircraft including a Cessna Citation II jet capable of landing on a gravel runway. The nature of the flying that Tinting Air does is generally in support of the mining and exploration industries. In 2016 Tinting Air mainly operated to the Minto Mine, Finlayson and Carmacks.

Wildland Fire Management Air Service Activities: Wildland Fire Management is a branch of Yukon Government whose function is to coordinate and direct responses to combating wildfires. The Branch contracts with two companies presently that supply air tanker and support aircraft, namely Air Spray and Conair. The fire season is from May to September and while the frequency and location of fires is uncertain by nature and varies year-over-year, the expectation is that with warmer weather associated with climate change, this will lead to some increases in fire-fighting activities during the next 30-year period.

Other Air Service activities: There are additional air services which regularly serve the Yukon and include the non-Yukon air ambulance and the RCMP which occasionally flies into local communities to support local police activities (operating its Pilatus PC-12). Various airports and aerodromes also serve as a base from where various government-contracted services are conducted, such as wildlife tracking and surveys, aerial surveys and photography, and search and rescue.

4.6 FORECAST ASSUMPTIONS

Air transport forecast assumptions address both demand-side and supply-side drivers. Demand-side drivers tend to focus on socio-economic development, including tourism, and changes in population trends, while the supply-side drivers focus mostly on air service routes and air carrier fleet development.



4.6.1 Demand Side: Socioeconomic, Demographic and Tourism Assumptions

4.6.1.1 Socioeconomic Assumptions

It is generally acknowledged that growth in a region's GDP is the single largest predictor of passenger traffic growth in that region. We assume this to be the case for Yukon airports and aerodromes and, moving forward, we assume that this will remain the case over the forecast period. In that regard, we examine the outlook for the overall national economy, the Yukon economy and, where possible, community/locality economies.

The Canadian economy: According to the Bank of Canada (BoC), in 2016, growth was supported by net exports and consumption, whereas business investment and inventories weighed on growth. In 2017, growth is expected to be buoyed by consumption and a recovery in business investment. Note: These projections take into account commodity prices (principally oil) but do not account for the \$12 billion in infrastructure investment program, announced in the federal budget.

The Bank of Canada analysis further indicates that the Canadian economy's full adjustment to lower commodity prices (principally oil prices) is expected to take several years, since investment, including through the creation of new firms, is needed to build the capacity to absorb reallocated labour into the non-resource sector.

Based on the Economic Intelligence Unit's (EIU) projections, long-term growth of the nation's economy is expected to average 1.8% per year to 2036. This is considerably weaker than the 2.5% pace set over the past twenty years. However, this is not surprising, given that Canada's population is aging and will grow at a slower pace over the forecast (0.6%) period as compared with its rate over the past twenty years (0.8%); and population/labour force growth is a key determinant of long-term GDP growth.

The Yukon economy: As indicated previously, the Yukon economy is, in large part, driven by government; natural resources exploration and extraction; and tourism. By extension, many of the communities/localities covered in this study are dependent on government, the mining sector and tourism. With that in mind, the following tables summarise the key existing and proposed mining projects (mining and mine remediation) in Yukon, and presents the forecast team's assumptions concerning communities affected, timing of construction/operations and job impacts. Note: (1) Based on information obtained from the Yukon Government, the Yukon Mining Alliance, and media sources, the research team compiled a list of existing and prospective mining and mine remediation projects. From that broad list, the team focused on only those projects that are deemed likely to have an impact on airports and aerodromes captured in the 27-airport Aviation System study.

Concerning the sources of this information, it should be noted that the Yukon Department of Energy, Mines and Resources does not aggregate or track information on mining projects by individual communities that may be affected. (2) Projects not captured herein are estimated to be relatively small and should not generate any significant activity for the Airport System. To put this in perspective, the 3 Aces project at Highland River (not captured in the table) is a relatively small project - i.e., in terms of length of operation (2 years) and employment (40 construction, 30 operations), and it is assumed that it is representative of a "typical small size" mining project. On that basis, it is used as what could be a conservative benchmark for the range of projects that were considered for this study.



			Summary of	Mining Projects	s for the 27 Yuko	on Airports/Aer	odromes System	
Mining Projects	Airport Impacted (% of all flights at airport)	Construction Start Date	Construction End Date	Operations Phase (number of years)	Construction Employment	Operations Employment	Site Access	Sources for project listing
Eagle Gold	Mayo (90%)	Jun-17	Dec-18	18	400	375	The site is approximately 85 km by road north northeast of the village of Mayo and the Mayo aerodrome could be used to bring miners in and out.	Yukon Government and media
Casino	Carmacks (5%)	Jan-22	Dec-24	24	1,000	600	Employees and workers will be flown directly to the site from Whitehorse and outside the Territory. The on-site airstrip will provide access for Hawker Sidley 748 or Dash 8 sized aircrafts, which can seat 39-50 passengers.	Yukon Government and media
Keno Hills Silver District	Mayo (90%)			20		120	Mines in the Keno area could use the Mayo aerodrome to bring miners in and out.	Yukon Government and media
Silver Tip Mine	Watson Lake (90%)			21		200	JDS Silver is flying staff in and out of the Watson Lake airport for their Silver Tip mine. Where the mine road leaves the Alaska Highway (107 km west of Watson Lake) is relatively close to the Pine Lake Airstrip, but the Pine Lake Airstrip is not plowed in the winter and has no services.	Yukon Government and media
Cantung Mine - North American Tungsten Corporation Limited (NATCL)	Watson Lake (90%)			2		50	Access to the property is from Watson Lake, Yukon via Highway 4 (Campbell Highway) and then along Highway 10 (Nahanni Range Road) for a total distance of 310 km. In addition to the road access, NATCL also maintains an airstrip that is a 1,219 m long VFR-rated gravel strip and requires periodic grading to maintain operability.	Yukon Government and media
BMC Minerals: KZK	Finlayson (90%)	Jun-18	Jun-20	10	350	300	Site is near the Finlayson Lake airstrip, and there are rumours that they may want to lengthen and widen the Finlayson airstrip	Yukon Government and media
Wellgreen Platinum	Burwash (30%)	Jan-20	Dec-22	20	1,000	600	Located in south west Yukon, approx. 317km NW of Whitehorse. Accessible from Alaska Highway. Given the size of the project, it is expected that the mine will have its own airstrip.	Yukon Government and media
Selwyn Chihong	Watson Lake (5%)	Jan-20	Dec-21	11	1,500	750	Located 165 kms east of Ross River and 280 km north of Watson Lake. Given the size of the project, it is expected that the mine will have its own airstrip and only partially use Ross River/Watson Lake	Yukon Government and media
Rackla Gold	Mayo (90%)	Jan-19	Dec-20	5	120	80	Accessed by three airstrips [Rackla Airstrip, Stewart Airstrip and Rau Airstrip] with permitting underway for a tote road to the Rau Trend and Tiger Gold Deposit	Yukon Government and media



	Summary of Mining Projects for the 27 Yukon Airports/Aerodromes System (Cont'd - Mining Remediation Projects)									
Mining Impacted (% Projects of all flights at airport) Airport Construction Start Date Date Date Date Operations Phase Construction (number of years) Operations Phase Construction (number of years)						Site Access				
Remediation p	rojects:									
Faro Mine Complex	Faro (95%)	Jan-23	Dec-41	18	0	400	Faro airstrip			
Mount Nansen	Carmacks (70%)	Jan-18	Dec-28	10	0	400	Carmacks airstrip			

Notes

The time estimates for the remediation projects are based on news reporting on remediation for the Faro site. The employment estimates for these projects are based on the construction employment estimate for Eagle Gold (400 employees), which has a similar estimated project lifespan (18 years). That is, we used the Eagle Gold project as a benchmark for estimating the employment requirements for the remediation projects.

Source: Mining companies and media sources

It is assumed that some projects indicated in the tables above will to a development stage.

Taking a broader view of the Yukon economy, the Conference Board of Canada projects the near-term outlook for the Yukon economy to be muted, principally due to the suspension, shutdown or delay of various mining projects. In the near future, some mines are expected to reopen and some new projects are expected to come on stream. However, it is expected that it will take some time for these activities to fully ramp up and, in the interim, their contribution to Yukon GDP growth will be relatively minimal.

The Yukon economy's robust pace of expansion from 2003 through 2012, which was principally driven by rapidly rising global prices for precious metals and expanded mining activity in the region, is not expected to be repeated over the forecast period. As indicated by Yukon Economic Development in its 'Yukon Economic Outlook, Oct. 2015', the Yukon's world-class geology positions the territory favorably for further mineral development. However, weak mineral prices and an underperforming global mining industry are expected to continue to constrain Yukon's mining sector in the near-term.

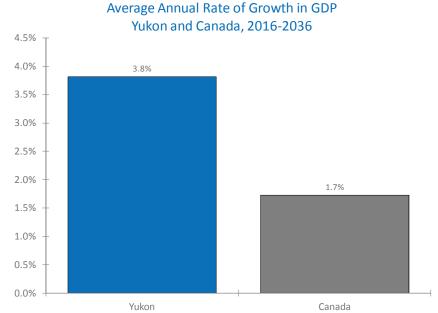
The Conference Board expects Yukon's GDP to contract significantly - dropping by about 10% between this year and next year (7.7% in 2017, then a further 3.1% in 2018). In this regard, Yukon Economic Development's expectations for 2017 are for Yukon's real GDP to fall by 5.7%, where the primary contributor to the contraction is lower year-over-year mineral production. Moreover, medium-term forecasts for the Canadian economy have been notched downward in the wake of uncertainty surrounding the new US Administration's intentions.

In the longer term, however, there is cause for optimism, as commodity prices recover and new mines open. Key assumptions for long-term growth of the Yukon economy:

- → Beyond 2025 commodity prices are expected to rise.
- → Efficiency gains in mining will make it feasible to make profits despite lower commodity prices.



→ Despite expectations for increasing precious metals prices beyond 2025, they are not expected to reach the lofty heights attained in the period 2000-2012, and productivity improvements, while they will lift investment, will not completely offset lower commodity prices. As such, over the long-term, the Yukon economy is expected to experience growth (3.8% per annum) that is much slower than the robust pace of 4.4% per annum that was set over the period 2001-2012, when commodity prices were relatively high and the mining sector was booming



Source: Statistics Canada, Yukon Government, Conference Board and DKMA



4.6.1.2 Demographic Assumptions

The Yukon population is projected to expand by 1.2% per annum over the forecast period. Growth is expected to be led by Whitehorse, which is Yukon's commercial centre, but communities with proposed and existing key mining projects are also expected to experience population growth rates above that of the Yukon average growth rate.



AAGR: Average Annual Growth Rate Source: Yukon Government, Statistics Canada and DKMA

Community/Locality	Population Projection					
Community/Locality	2016 (est)	2036	2016-2036			
Beaver Creek	122	125	0.1%			
Burwash Landing	108	119	0.5%			
Carcross	510	535	0.2%			
Carmacks	563	996	2.9%			
Dawson City	2,090	2,834	1.5%			
Destruction Bay	51	42	-1.0%			
Faro	379	377	0.0%			
Haines Junction	905	1,022	0.6%			
Mayo	482	644	1.5%			
Old Crow	261	263	0.0%			
Pelly Crossing	382	453	0.8%			
Ross River	416	469	0.6%			
Tagish	265	299	0.6%			
Teslin	485	522	0.4%			
Watson Lake	1,485	1,308	-0.6%			
Whitehorse	29,190	37,955	1.3%			
Total Yukon	37,694	47,962	1.2%			

Source: Yukon Government and DKMA



4.6.1.3 Tourism Assumptions

For the short-term, several factors are expected to work in Yukon's favour for tourism including:3

- A weaker Canadian dollar will make Yukon more affordable for US and overseas visitors and may encourage Canadians to travel domestically;
- ★ Lower oil prices, which are being reflected in lower gasoline prices, are leaving Canadians with more disposable income, while also reducing transportation-related vacation costs. There is also a possibility for spillover from the reduced operational costs for airlines to consumers;
- Improving consumer confidence, employment growth, and gains in disposable income in the United States are expected to contribute to increased visitation from Americans;
- Domestic airline seat capacity to Yukon is expected to increase, resulting in improved air access to the territory, making Yukon more accessible to visitors;
- Increased awareness of Yukon as a travel destination through the **Yukon Now** marketing initiatives; and
- The growing Aboriginal tourism sector will make Yukon a more appealing destination for a wider breadth of visitors.

As mentioned in the 'Socioeconomics' section, tourist arrivals by motor vehicles to Yukon were flat over the past decade, but arrivals by air showed overall growth. However, as mentioned in the points above, there are a number of factors that are now favouring tourist inflows from the US and these elements are expected to be a key driver of tourist inflows to Yukon communities/localities moving forward.

On balance, Yukon tourist arrivals can reasonably be expected to grow in the range of 1% - 2% per annum over the forecast period. Note: long-term growth for mature tourism markets is roughly 2% per annum. However, those markets (e.g., USA, France, Germany, China, Japan, United Kingdom, etc.) are generally more easily accessible relative to Yukon, and this fact will prevent a long-term, sustained high pace of growth in tourist arrivals to Yukon. While it is acknowledged that Yukon has significant tourist appeal in terms of its cultural, historic and natural attributes, no major tourism projects are assumed for any of the communities/localities covered in this study: i.e., projects that would cause a significant and prolonged uptick in tourist arrivals. Also, as mentioned in the 'Socioeconomics' section above, the vast majority of visitors to Yukon arrive via motor vehicles and aircraft, it is assumed that this will continue to be the case over the forecast period. Hence, any increase in tourist arrivals are expected to be largely accounted for by arrivals by both ground and air transport, but any future increase in tourism is unlikely to create any significant increase in demand for flights to/from any of the airports and aerodromes captured in the System Review. Note: It is quite feasible that some visitors arriving by motor vehicle may decide to take sightseeing flights at some of the airports and aerodromes under study. However, this would not be expected to create any significant increase in demand at any of the Airports and aerodromes.

Finally, disaggregating total visitor arrivals by market segment, it is anticipated that the share of total arrivals accounted for by business travelers could increase in the coming years as some mining projects come to fruition (see 'Assumptions' section). Moreover, this uptick would most likely favour the Central Region (i.e., Carmacks, Ross River, Mayo and Pelly Crossing) which has several key ongoing and prospective mining projects.

³ 'Yukon Tourism Indicators, Year-End Report 2015'.



4.7 SUPPLY SIDE: SERVICE PROVIDERS

Air North: With the acquisition of two ATR-42-300 aircraft, Air North is planning on increasing its frequency on the northern scheduled route (YXY-YDA-YOC-YEV-YDA-YXY). Air North plans to make schedule enhancements during 2017, the purpose of which will be to reduce delays/cancellations due to weather and other factors. As well, the schedule changes will aim to provide more reliable year-round connections between Air North's northern and southern routes. For purposes of the forecast, we have assumed a northern schedule comprised of seven (7) days per week for a YXY-YDA-YOC-YEV-YDA-YXY route.

Aside from the scheduled service that it offers, it is likely that Air North will expand its charter activities correlated to the expansion and increased exploration and development of the mining projects. For example, we believe that as the Mayo aerodrome develops (to support the Eagle Gold project), that Air North will cater to this demand in both the passenger and cargo markets.

Alkan Air: In September 2016, Alkan Air commenced scheduled passenger service from Whitehorse (YXY) to Watson Lake (YQH) three days per week. Given that Watson Lake is an airport expected to benefit from the development of the Selwyn Chihong and Cantung mining projects, we assume that the scheduled service operated at Watson Lake will remain in place.

Non-Scheduled Commercial Operators: It is assumed that the number and type of non-scheduled commercial operators in Yukon including existing carriers such as Great River Air (GRA) and Tintina Air and possibly new carriers will closely align their level of activity with the needs of the mining sector and the overall strength of the Yukon economy. Tintina Air expects additional flying in Finlayson (linked to the BMC Minerals/ KZK project), Carmacks (linked to the Capstone/ Minto Mine) and from Mayo (linked to the Eagle Gold/ Alexco project).

Other services provided by the non-scheduled commercial operators, such as tourism, aerial surveys, fire fighting support, air ambulance, etc. are expected to grow at slow rate throughout the forecast period, since they tend to be closely linked to the growth in the Yukon's population.

Rotary Operators: At present, there are about eight rotary operators in the Yukon Territory. The rotary operators are expected to support the mining projects during periods of heavy mining/resource exploration and do experience fairly busy periods of helicopter activity during peak forest fire-fighting season. We anticipate the past trends in rotary activity to continue during the forecast period.

General Aviation (GA): Private general aviation aircraft account for a significant number of the air movements in the Yukon but vary greatly by year and by airport. Typically, these will be smaller fixed wing aircraft, although there are some operators who use the airportvarious s and aerodromes for their helicopters. Traffic being generated by private GA operators varies from economic activities (i.e. placer mining) to flights for general touring, travel and recreational activities. Business, recreation and personal transportation drive this sector of the air transport industry and with the projected increase in the local population. General Aviation's use of Yukon airports and aerodromes is expected to grow as well.



4.8 FORECAST METHODOLOGY

The objective is to deliver a 20 year passenger, cargo and aircraft movement forecast for each of the 27 airports and aerodromes included in this study. Furthermore, passengers will be split between commercial and non-commercial while aircraft movements will be split between fixed wings and rotary.

In the field of air traffic forecasting, the strong correlation between growth in a region's income/economy and demand for air travel to/from that region is both intuitive and borne out by experience. Put simply, at an economy's micro level: an individual's demand for air transport will increase in some proportion to an increase in that individual's income. Moreover, in the case of Yukon, mining projects will have a direct impact on airport operations and development.

Based on this premise, the classic long term forecast methodology is to develop a top down model based on a regression/econometric analysis. An econometric analysis postulates a relationship between a dependent variable and one or more independent/explanatory variables. The dependent variable is the historical traffic development, while the explanatory variables are those variables that have an influence on the demand for air travel. The most common and reliable explanatory variable is GDP. In other words, the model explains how economic growth influences air travel demand.

To develop a credible forecast model, the forecaster must have a long term historical time series. In the context of this study, we had no historical passenger numbers for the 27 airports/aerodromes and this meant that it was impossible to rely on a classic regression model to project demand for each of the airports and aerodromes. However, we were able to develop a model based on this approach at the Yukon level which served as a benchmark. We also had historical passenger numbers for Whitehorse Airport which meant that we could also prepare a regression analysis for this airport.

Therefore, to project demand for the 27 airports and aerodromes the team developed a <u>bottom up</u> forecast that projects demand at an airport level. In the end, when these 27 airports and aerodromes are combined with the forecast of Whitehorse and Dawson City⁴, the sum of these 29 airports and aerodromes must be comparable to the forecast prepared at the Yukon level.



4.8.1 Traffic Projections (Yukon and Whitehorse Airport Level)

Prior to undertaking forecasts for the individual airports and aerodromes, it is important to prepare a top-level Yukon-wide forecast and a forecast for Whitehorse. The forecast at the

⁴ Late in 2016, as part of the Dawson City Airport Functional Plan study, DKMA prepared a forecast for Dawson City Airport.



Territory level will serve as a benchmark for all of the individual airport forecasts and in order to prepare the forecast, the consulting team will combine two complementary approaches:

- A short term annual traffic forecast driven by a growing economy and airline planned capacity. This bottom-up approach will cover 2017.
- For the remainder of the 20-year forecast, DKMA will prepare a top-down long term annual traffic forecast, based on regressions driven by the economy, to which adjustments are made if necessary.

An econometric model was developed which explains, as already mentioned, the demand for air travel as being caused by the changes in the explanatory variables most notably the economy (in other words how economic growth influences air travel demand).

Various models were examined and the model with the highest/best explanatory power was retained (see Appendix A for more details). More specifically, the model retained had GDP elasticity of 1.2 (which means that when the Yukon economy grows by 1% that air traffic is projected to grow by 1.2%). For domestic air travel (which composes the majority of traffic in the Yukon) an elasticity ranging from 0.8 to 1.3 is expected. Armed with these two regressions the team was able to project demand for the Territory and for Whitehorse Airport.

4.8.2 Traffic Projections for the 27 Individual Airports and Aerodromes

Once forecasts for Yukon and Whitehorse were prepared, the team focused on the individual airport and aerodrome forecasts. These 27 forecasts will be split into three additional categories:

- ✓ Group 1: Airports and aerodromes which generate airport activity linked to the specific economic projects (i.e. mining projects) and/ or have scheduled passenger service. Note: The later includes two airports, namely Watson Lake and Old Crow, and while Old Crow is not an airport expected to have significant growth in the future (more on this later) the community is not accessible by road and hence the airport is critical to the community.
- Group 2: Airports and aerodromes which serve the local community or area access but have no scheduled service and no specific mining projects; and
- Group 3: Aerodromes which do not serve a specific local community and have no economic prospects.

It is important to note that the grouping of the 27 airports/aerodromes is not based on their current size but, instead, on their role within the Yukon Aviation System. For example, we include in Group 1 an airstrip that today is largely unused but, in the future, it is expected to become a key asset for a mining project and significant impact on jobs and air traffic.

At an airport/aerodrome level we will develop a bottom up forecast which will involve individually projecting the key traffic forecast component (passengers, cargo and movements) at each of these airports and aerodromes.

Group 1: For airports and aerodromes in Group 1, the team will estimate demand linked to the local community, to which we will then add the future air demand linked to mining projects. To project the future demand of the local community we will:

- 1) Estimate the 2016 'trips per inhabitant'; and
- 2) Estimate the 2016 'flights per inhabitant'.



These two ratios are then projected in the future (where they are assumed to slowly increase) and once multiplied by the projected population we are able to derive passenger and aircraft movements for each airport.

To estimate the demand linked to specific mining projects it will be important to:

- Identify current and future projects that have the potential to generate air transport activity and are likely to use the public airports and aerodromes (i.e. not rely on private airstrips); and
- Distinguish between air demand generated by the start-up phase of a project (e.g. construction phase) vs. demand linked to the day to day running of a mine. The former is generally an intense phase which generates much more demand than the latter.

Group 2: Airports and aerodromes in this category serve a local community only and the methodology to project demand will be the identical to the one described above.

Group 3: For aerodromes which do not specifically serve local communities, and have no specific economic prospect, demand will be projected (with some air carrier input where available, on a case-by-case basis.

The following table highlights the three Groups of airports and aerodromes.

27 Yukon Airpo	rts/Aerodromes S	ys tem by Group
Group 1	Group 2	Group 3
Burwash (3)	Beaver Creek	Braeburn
Carmacks (3)	Carcross	Chapman
Faro (3)	Haines Junction	Cousins
Finlayson (2)	Pelly Crossing	Ft. Selkirk
Mayo (3)	Ross River	Hyland
Old Crow (1)	Teslin	MacMillian Pass
Watson Lake (3)		McQuesten
		Minto
		Mule Creek
		Ogilvie
		Pine Lake
(1) Community base		Silver City
(2) Mining project		Twin Creeks
(3) Both		Wiley

Source: DKMA Analysis

The impact on traffic at the various airports and aerodromes that are expected to support mining projects was estimated, as already mentioned, for both the construction and operation phase, for each major project identified (see 'Summary of Mining Projects by Community' table, under 'Yukon Economy' in the 'Assumption' section). For each project we considered the following:

- Number of direct workers on the project (average over a year);
- Workers living in work camp vs. workers living locally;
- Proportion of workers who 'fly-in and fly-out'; and
- ₹ Work shift rotation (days on/ days off).

From these assumptions, we could estimate the number of annual passengers. The estimated passengers were then split between schedule and non-schedule (where the vast majority are non-schedule/ charter passengers).



Yukon Aviation System Review May 23, 2017

Typically, major projects generate important aircraft movement traffic and to estimate the movements we assumed an average passenger number per flight. Finally, air cargo associated with each mining project was estimated by assuming an average cargo volume in kilograms per number of workers.

4.9 FORECAST RESULTS

A traffic forecast covering the 27 airports and aerodromes was prepared under a baseline unconstrained scenario and covers a 20-year period (2017-2036). The following variables are covered:

- ▼ Total Passengers split between:
 - o commercial and non-commercial;
- Total cargo volume; and
- ▼ Total aircraft movements split between:
 - Rotary and fixed wings.

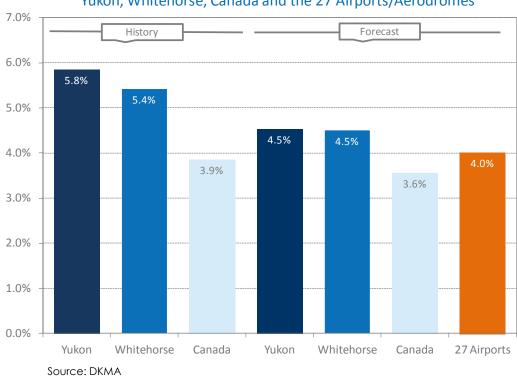
<u>Note:</u> The detailed numerical forecast results can be found in the accompanying Excel files, while this chapter provides commentary on the key forecast results.

4.9.1 Summary of Forecasts

While aviation has played a fundamental role in the development of Canada, this is even more so in the Yukon Territory and has historically translated into faster growth rates (see the following graphic). Looking ahead to the next two decades, we assume that Yukon's aviation will continue to develop faster than at the national level but with time, and with a Yukon and Canadian economy projected to slowdown, we expect aviation at both the Territory and national level to show some signs of maturation. **During the next two decades, the passenger demand at the 27 airports and aerodromes is projected to increase annually by 4.0% to reach 40,429 passengers by 2036.** To compare, during the same period Yukon is projected to increase by 4.5%, while the gateway to the Territory, namely Whitehorse, is projected to increase annually by 4.5%. During this period, Canada is projected to increase at a more modest pace of 3.6%⁵ per annum. It seems reasonable to assume that in the future, the Territory and the airports and aerodromes comprising its aviation system will continue to outpace the Canadian average.

⁵ Annually DKMA publishes a Traffic Forecast Report which projects 20 year demand at a global, regional and country level. The most recent report was published in November 2016 and Canada is one of the 100 countries included in the report.





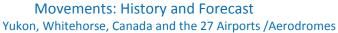
Passengers: Historical vs. Forecast Yukon, Whitehorse, Canada and the 27 Airports/Aerodromes

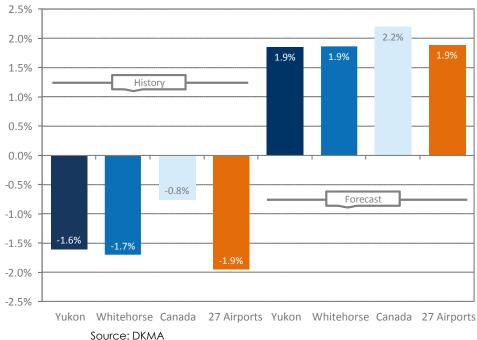
In terms of aircraft movements over the last years, movements at a national, Territory and airport/aerodrome level have declined significantly. Several elements explain this such as (a) the steady increase of load factors⁶ which are rapidly reaching a natural ceiling and (b) the rapid development of international routes (using larger aircraft compared to domestic routes). Specifically, in the case of Yukon, aviation activity, including movements, is highly cyclical and influenced by the boom-bust cycles of the mining industry. The particular historical period selected for the graphic (namely 1997-2016) starts from a fairly high point in the cycle and 2016 is, on the contrary, at the lower end of the cycle, which partially explains the decline in movements.

Looking ahead we project aircraft movements to increase. Over the last decade the average load factors of the main carriers have increased by about 10 points and while they will continue to increase, the pace will clearly slow down forcing carriers to increase movements (and/ or deploy larger aircraft) to meet a growing demand. Specifically, in the case of Yukon, we believe that 2016 is a relatively low point in the mining cycle and during the next few years significant mining projects are scheduled to become a reality which will stimulate demand during the construction phase and also, but to a smaller degree, once the mine is in operation. Aside from the mining industry, a growing local population, modest increases in tourism and other elements such as a warmer climate, which will normally increase the number of forest fires, will also generate airline activity.

⁶ Over the last 20 years carriers have seen their load factors increase and based on ICAO statistics load factors increased from 55.0% in 1994 to 74.0% by 2015; a nearly 20 points increase. Closer to home in 2015 Air Canada reported a system-wide load factor of 83.4% and at Toronto-Pearson the annual average load factor has increased from 67.2% in 2003 to 82.0% by 2015; a 12 point increase in 12 years.







4.9.2 Details of Forecasts

The following table shows the passenger forecast results for each of the 27 airports and aerodromes which comprise this study. Within the aviation system in Yukon, each of these airports and aerodromes plays a different role. Some might serve a specific community with its specific needs and thus, during the next twenty years, some will have greater development potential than others.

Today only two airports of the 27 facilities in this study, namely Old Crow and Watson Lake, have scheduled service (respectively operated by Air North and Alkan Air) and moving forward this is expected to remain the case. In terms of overall passenger activity (i.e. commercial and non-commercial) they are today the two busiest airports, but this is expected to change.

Watson Lake, benefitting from a growing population and regional mining activity (Silver Tip, Cantung and Selwyn), is poised to remain the largest of the 27 airports and aerodromes while Old Crow is projected to have a stable population during the next twenty years and less opportunity for economic development. It is projected to grow below the average (1.4% vs. 3.9%) but remain the 2nd largest airport.

As indicated earlier in the report, Mayo is well placed to benefit from the mining development. More specifically the Eagle Gold and Keno Hills Silver District projects are close to the aerodrome and we assume that most of the aerodrome related mining activity will take place in Mayo. Eagle Gold is the larger of the two projects and includes an important construction phase expected to start in 2017, which will translate to large passenger volumes in 2017-2018 which will then slowly decline as the project enters its operational phase.



Three other aerodromes namely Burwash, Carmacks and Finlayson are expected to handle some of the mining activities respectively related to the Wellgreen, Casino and BMC minerals-KZK (Finlayson). We also have two remediation projects, namely Faro Mine and Mount Nansen Mine, which are respectively expected to rely on Faro and Carmacks aerodromes.

All other airports and aerodromes are expected to see passenger growth below the 27 group average (1.9% vs. 3.9%) due to the fact that these airports/aerodromes are not expected to see much benefit from mining projects.

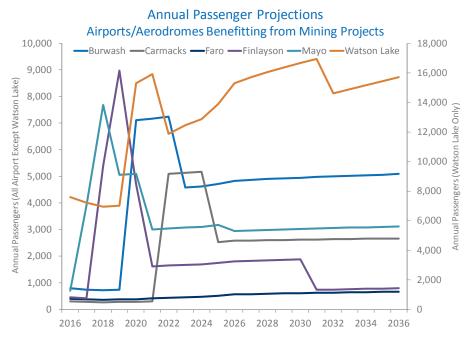
	Total Passenger Forecast										
	Airport/	Volumes					AAGR				
Group	Aerodrome	2016	2021	2026	2031	2036	2016-21	2021-26	2026-31	2031-36	2016-36
1	Old Crow	5,839	5,948	7,030	7,409	7,703	0.4%	3.4%	1.1%	0.8%	1.4%
1	Watson Lake	7,600	15,915	15,300	16,952	15,717	15.9%	-0.8%	2.1%	-1.5%	3.7%
2	Ross River	80	84	134	155	175	1.0%	9.8%	3.0%	2.5%	4.0%
1	Faro	400	414	801	858	904	0.7%	14.1%	1.4%	1.0%	4.2%
1	Mayo	700	3,007	2,943	3,042	3,122	33.8%	-0.4%	0.7%	0.5%	7.8%
1	Carmacks	300	310	2,582	2,631	2,671	0.7%	52.8%	0.4%	0.3%	11.6%
2	Haines Junction	1,100	1,147	1,723	1,963	2,163	0.8%	8.5%	2.6%	2.0%	3.4%
1	Burwash	800	7,170	4,834	4,975	5,091	55.1%	-7.6%	0.6%	0.5%	9.7%
2	Beaver Creek	200	205	259	279	294	0.5%	4.8%	1.5%	1.1%	1.9%
3	Hyland	10	10	15	15	15	0.0%	8.4%	0.0%	0.0%	2.0%
3	Pine Lake	15	15	21	22	22	0.0%	7.0%	0.9%	0.0%	1.9%
1	Finlayson	450	1,621	1,813	735	797	29.2%	2.3%	-16.5%	1.6%	2.9%
3	Twin Creeks	15	16	18	18	18	1.3%	2.4%	0.0%	0.0%	0.9%
3	MacMillian Pass	30	31	38	39	39	0.7%	4.2%	0.5%	0.0%	1.3%
2	Pelly Crossing	100	105	155	175	190	1.0%	8.1%	2.5%	1.7%	3.3%
3	Minto	15	16	18	18	18	1.3%	2.4%	0.0%	0.0%	0.9%
3	Cousins	15	16	18	18	18	1.3%	2.4%	0.0%	0.0%	0.9%
3	Braeburn	15	16	18	18	18	1.3%	2.4%	0.0%	0.0%	0.9%
2	Carcross	600	627	984	1,138	1,268	0.9%	9.4%	3.0%	2.2%	3.8%
3	Silver City	15	16	18	18	18	1.3%	2.4%	0.0%	0.0%	0.9%
3	Ft. Selkirk	15	16	18	18	18	1.3%	2.4%	0.0%	0.0%	0.9%
3	McQuesten	20	20	24	24	24	0.0%	3.7%	0.0%	0.0%	0.9%
3	Chapman	15	16	18	18	18	1.3%	2.4%	0.0%	0.0%	0.9%
3	Ogilvie	15	16	18	18	18	1.3%	2.4%	0.0%	0.0%	0.9%
3	Wiley	15	16	18	18	18	1.3%	2.4%	0.0%	0.0%	0.9%
2	Teslin	45	46	53	54	54	0.4%	2.9%	0.4%	0.0%	0.9%
3	Mule Creek	15	16	18	18	18	1.3%	2.4%	0.0%	0.0%	0.9%

AAGR: Annual Average Growth Rate

Source: DKMA

The next graphic shows, for the 6 airports and aerodromes expected to benefit from mining projects, the annual passenger projections and, as can been seen, there are important annual variations which are linked with size of the mining projects, the timing of the construction phase and the operational phase.





Source: DKMA

While passenger activity is highly concentrated in a handful of airports and aerodromes (in 2016, the top 5 airports and aerodromes in the group of 27 accounted for 84% of all passengers), movements, without surprise, are more evenly spread (the top 5 airports and aerodromes account for 70% of aircraft movements). Moving forward, aircraft movements will remain more evenly spread than passengers (by 2036 the top 5 airports and aerodromes are projected to account for 87% of all passengers vs. 72% for aircraft movements).



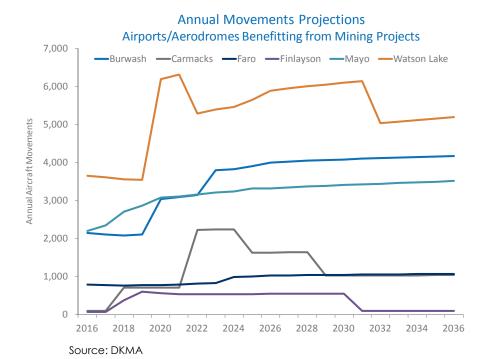
	Total Aircraft Movement Forecast										
	Airport/		Volumes				AAGR				
Group	Aerodrome	2016	2021	2026	2031	2036	2016-21	2021-26	2026-31	2031-36	2016-36
1	Old Crow	1,174	1,181	1,253	1,276	1,294	0.1%	1.2%	0.4%	0.3%	0.5%
1	Watson Lake	3,654	6,316	5,885	6,136	5,192	11.6%	-1.4%	0.8%	-3.3%	1.8%
2	Ross River	140	143	170	180	190	0.4%	3.5%	1.1%	1.1%	1.5%
1	Faro	782	792	1,023	1,048	1,067	0.3%	5.2%	0.5%	0.4%	1.6%
1	Mayo	2,192	3,100	3,309	3,423	3,511	7.2%	1.3%	0.7%	0.5%	2.4%
1	Carmacks	98	707	1,631	1,028	1,033	48.5%	18.2%	-8.8%	0.1%	12.5%
2	Haines Junction	2,900	2,948	3,415	3,577	3,701	0.3%	3.0%	0.9%	0.7%	1.2%
1	Burwash	2,149	3,092	3,997	4,097	4,173	7.5%	5.3%	0.5%	0.4%	3.4%
2	Beaver Creek	490	494	537	551	562	0.2%	1.7%	0.5%	0.4%	0.7%
3	Hyland	154	154	165	165	165	0.1%	1.4%	0.0%	0.0%	0.4%
3	Pine Lake	80	80	95	97	97	0.0%	3.5%	0.5%	0.0%	1.0%
1	Finlayson	71	528	541	90	95	49.4%	0.5%	-30.1%	1.1%	1.5%
3	Twin Creeks	80	82	85	85	85	0.5%	0.8%	0.0%	0.0%	0.3%
3	MacMillian Pass	80	81	87	88	88	0.2%	1.5%	0.2%	0.0%	0.5%
2	Pelly Crossing	200	204	235	245	250	0.4%	2.9%	0.8%	0.4%	1.1%
3	Minto	80	82	85	85	85	0.5%	0.8%	0.0%	0.0%	0.3%
3	Cousins	80	82	86	86	86	0.5%	1.0%	0.0%	0.0%	0.4%
3	Braeburn	80	82	86	86	86	0.5%	1.0%	0.0%	0.0%	0.4%
2	Carcross	1,600	1,628	1,916	2,018	2,096	0.3%	3.3%	1.0%	0.8%	1.4%
3	Silver City	80	82	85	85	85	0.5%	0.8%	0.0%	0.0%	0.3%
3	Ft. Selkirk	80	82	85	85	85	0.5%	0.8%	0.0%	0.0%	0.3%
3	McQuesten	109	109	116	116	116	0.0%	1.3%	0.0%	0.0%	0.3%
3	Chapman	80	82	85	85	85	0.5%	0.8%	0.0%	0.0%	0.3%
3	Ogilvie	80	82	85	85	85	0.5%	0.8%	0.0%	0.0%	0.3%
3	Wiley	80	82	86	86	86	0.5%	1.0%	0.0%	0.0%	0.4%
2	Teslin	127	128	135	136	136	0.2%	1.1%	0.1%	0.0%	0.3%
3	Mule Creek	80	82	85	85	85	0.5%	0.8%	0.0%	0.0%	0.3%

AAGR: Annual Average Growth Rate

Source: DKMA

Without surprise, similar to what was noted for passengers, airports/aerodromes which are linked to mining projects are expected to see their activity develop in parallel with the development of these projects.







Over the next two decades cargo activities are projected to grow annually by 3.0%.

	Total Cargo Forecast											
	Airport/	Volumes						AAGR				
Group	Aerodrome	2016	2021	2026	2031	2036	2016-21	2021-26	2026-31	2031-36	2016-36	
1	Old Crow	326,111	330,750	375,141	390,230	401,798	0.3%	2.6%	0.8%	0.6%	1.0%	
1	Watson Lake	30,400	51,393	137,737	142,133	70,692	11.1%	21.8%	0.6%	-13.0%	4.3%	
2	Ross River	320	333	474	529	580	0.8%	7.4%	2.2%	1.8%	3.0%	
1	Faro	5,000	5,135	46,480	46,967	47,352	0.5%	55.4%	0.2%	0.2%	11.9%	
1	Mayo	2,800	56,621	49,358	49,629	49,844	82.5%	-2.7%	0.1%	0.1%	15.5%	
1	Carmacks	1,200	41,231	42,788	2,921	3,027	102.9%	0.7%	-41.5%	0.7%	4.7%	
2	Haines Junction	4,400	4,547	6,192	6,830	7,347	0.7%	6.4%	2.0%	1.5%	2.6%	
1	Burwash	3,200	3,293	104,310	104,691	104,996	0.6%	99.6%	0.1%	0.1%	19.1%	
2	Beaver Creek	800	815	973	1,029	1,070	0.4%	3.6%	1.1%	0.8%	1.5%	
3	Hyland	40	40	55	55	55	0.0%	6.4%	0.0%	0.0%	1.6%	
3	Pine Lake	60	60	77	80	80	0.0%	5.2%	0.7%	0.0%	1.5%	
1	Finlayson	5,000	32,004	32,040	5,051	5,060	45.0%	0.0%	-30.9%	0.0%	0.1%	
3	Twin Creeks	60	63	69	69	69	1.0%	1.8%	0.0%	0.0%	0.7%	
3	MacMillian Pass	1,000	1,025	1,195	1,219	1,219	0.5%	3.1%	0.4%	0.0%	1.0%	
2	Pelly Crossing	400	416	558	612	651	0.8%	6.1%	1.8%	1.2%	2.5%	
3	Minto	60	63	69	69	69	1.0%	1.8%	0.0%	0.0%	0.7%	
3	Cousins	60	63	69	69	69	1.0%	1.8%	0.0%	0.0%	0.7%	
3	Braeburn	60	63	69	69	69	1.0%	1.8%	0.0%	0.0%	0.7%	
2	Carcross	2,400	2,485	3 <i>,</i> 500	3,904	4,235	0.7%	7.1%	2.2%	1.6%	2.9%	
3	Silver City	60	63	69	69	69	1.0%	1.8%	0.0%	0.0%	0.7%	
3	Ft. Selkirk	60	63	69	69	69	1.0%	1.8%	0.0%	0.0%	0.7%	
3	McQuesten	270,000	119,800	53,156	23,586	10,465	-15.0%	-15.0%	-15.0%	-15.0%	-15.0%	
3	Chapman	60	63	69	69	69	1.0%	1.8%	0.0%	0.0%	0.7%	
3	Ogilvie	60	63	69	69	69	1.0%	1.8%	0.0%	0.0%	0.7%	
3	Wiley	60	63	69	69	69	1.0%	1.8%	0.0%	0.0%	0.7%	
2	Teslin	180	183	203	206	206	0.3%	2.2%	0.3%	0.0%	0.7%	
3	Mule Creek	60	63	69	69	69	1.0%	1.8%	0.0%	0.0%	0.7%	

AAGR: Annual Average Growth Rate

Source: DKMA



5.0 SITE ASSESSMENTS

The objective of this portion of the review is to provide an architectural and engineering assessment related to condition, capacity and risks associated with safe operations today and in future. This will also provide context to the future requirements and costs of correcting existing deficiencies and undertaking future developments. The priorities for the engineering assessment are the airports and aerodromes with facilities on site, including those with scheduled service (Old Crow, Watson Lake) and the community aerodromes, while the local aerodromes without facilities are a lessor priority.

5.1 BUILDING/FACILITY ASSESSMENTS

Condition of the various Air Terminal Buildings (ATBs) and accessory structures (such as maintenance garages, Field Electrical Centres, generator buildings) were assessed at a high level through review of existing documents, site visit, and interviews with operators. There are only nine of the airports and aerodromes that had buildings or facilities and a summary table for the building conditions is included as Appendix B. The facility checklists for individual buildings supplement the summaries and associated Table details and are in Appendix C.

ATBs were sorted into one of three overall condition groups, as noted below. These groups are only related to either full replacement or major renovations.

- High Priority: Replace/major renovation within 0-3 years: Building has major envelope, structural, or operational issues, is heavily used, and requires immediate replacement or major renovation.
- Medium Priority: Replace/major renovation within 4-10 years: Building has large problems with envelope, structure, or operations, is in moderate use, and requires attention in the medium term.
- Low Priority: Replace/major renovation in 10+ years: Building is generally fit for its current use, and only requires more minor work over the next 10 years.

During the site visits, it was noted that most ATBs/facilities could benefit from relatively inexpensive energy improvements, such as penetration sealing by applying sprayfoam or weather-stripping kits on doors. These upgrades often yield short periods and would help to reduce overall operating costs.



Beaver Creek (YXQ)



Overall Condition: Low Priority

Size: ATB & CARS Office 123 sq. m.

Notes/current concerns:

- Exterior siding requires painting
- Interior finishes are aged
- Ramps require refinishing
- Decommissioned generator
- Air sealing, envelope upgrades recommended
- Barrier free upgrades recommended

Burwash (YDB)



Overall Condition: Medium Priority

Size: ATB & CARS Office 188 sq. m.

Notes/current concerns:

- Siding, envelope recently upgraded
- Provide turn-around area, additional parking
- Floor and wall finishes aged
- Hazardous Building Materials likely present
- Separate generator building: heating, ventilation systems to be updated
- Water supply should be tested

Carmacks (EX4)



Overall Condition: Low Priority

Size: ATB 114.6 sq. m.

Notes/current concerns:

- Heated crawl space requires ground sheet
- Needs window blinds on tower for solar gain reduction
- Interior handrails, barrier free not to code
- Lighting upgrades
- Maintenance on heating control

Faro (ZFA)





Overall Condition: Medium Priority

Size: CARS Office 164 sq. m. Maintenance Garage 166 sq. m.

Notes/current concerns:

- Proper site and foundation drainage required
- Roof retrofit (intermittent leaks)
- Repair alarm system and door hardware
- Parking lot requires regrading
- Upgrade domestic water distribution
- Provide crawl space ventilation
- Cracks in walls, walls require painting
- Larger garage for grader storage and snow blower

Haines Junction (YHT)



Overall Condition: Low Priority

Size: ATB 346 sq. m. Maintenance Garage 100 sq. m.

Notes/current concerns:

- Generally well-kept
- Roofing requires replacement
- Siding requires repainting
- Provide door release on basement door

Mayo (YMA)



Overall Condition: Medium Priority

Size: ATB & CARS Office 173 sq. m.

Notes/current concerns:

- Upgrade domestic water distribution
- Replace windows
- Stairs and handrails code upgrade
- Replace interior doors & hardware, flooring, wall finishes
- Replace lighting
- Renovate washroom
- Refinish building exterior
- Clean ducts/vents and ceiling fan
- Provide exterior storage for snow blower



Old Crow (YOC)



Overall Condition: ATB - Low Priority

Maintenance Garage - High Priority

Size: YOC Maintenance Garage 468 sq. m. ATB & CARS Office 349 sq. m.

Notes/current concerns:

- Insulate and upgrade the maintenance garage envelope
- Adjust building foundations to compensate for settlement, repair drywall cracks
- Provide additional storage space

Ross River (YDM)



Overall Condition: High Priority

Size: ATB 97 sq. m.

Notes/current concerns:

- Building should be considered for replacement
- Replace damaged exterior walls, all windows, and roof shingles.
- Roof requires repairs (leaking)
- Replace flooring, paint interior walls
- Interior handrails, ramps upgraded to code
- Repair leaks in mechanical room
- Maintenance required on forced air furnace

Teslin (YZW)



Overall Condition: Low Priority

Size: ATB & CARS Office 105 sq. m.

Notes/current concerns:

- Basement walls not insulated, sealed
- Missing handrails
- Very little use by public
- Barrier-Free ramp needs upgrades



Watson Lake (YQH)



Overall Condition: ATB – Medium Priority

Maintenance Facility – Low Priority

FEC – Low Priority

Size: ATB & CARS Office 722 sq. m. FEC/Backup Generator 66 sq. m. Maintenance Garage 360 sq. m.

Notes/current concerns:

- Assess for possible replacement or down-sizing
- Envelope upgrades is required (excessive energy use)
- Hazardous Building Materials present
- Roof shingles require replacement
- Penetrations in outer walls require sealing



5.2 NATIONAL BUILDING CODE (NBC) 2015: INTERPRETATION OF POST-DISASTER RATING FOR YUKON AIR TERMINAL BUILDINGS

Stantec has approached and reviewed the Post-Disaster rating for Yukon air terminal buildings (ATB) as part of our Yukon Aviation System Review.

In recent discussions with the Chief Building Inspector, Yukon Government, Community Services, it was made clear that all ATB's are classified as 'Post-Disaster buildings', based on this department's interpretation of the National Building Code 2015 (NBC 2015) definition.

The Chief Building Inspector's email of March 29, 2016 (in italics below) spells out this requirement:

For clarification, please be advised that the Authority Having Jurisdiction has determined that all ATB's are classified as "Post-Disaster Buildings", as defined by the NBC, (see attached NBC definition for "Post-Disaster Buildings").

The following is a list of some of the examples used in determining the classification of the ATB's by the Authority Having Jurisdiction, however, this is not an exhaustive list:

- Does the ATB have communication equipment that is used to assist airplanes in landing or take-offs?
- Is there runway lighting?
- Is there a back-up generator?
- Does the ATB have scheduled flights?
- Is the ATB used as an emergency response facility?
- Are there controls or lighting etc. that the pilot can activate on approach?

Based on the Government of Yukon interpretation, we understand that any future **structural** renovations of significance will require renovations to include structural upgrades that meet this interpretation of NBC 2015. That said, Stantec considers future renovations to existing ATB's carry the risk of upgrading to meet Post-Disaster rating as defined in the NBC 2015 or future applicable codes. This structural upgrading could be a significant cost, dependent on the existing condition of each-and-every ATB. The scope of this review was not intended to gather sufficiently detailed information on these existing ATB's to determine how extensive the required renovations could be. The Table in this section summarizes the criteria used by the 'Authority Having Jurisdiction' (AHJ) as to whether ATBs are classified as post-disaster.

Additionally, all the building and facilities on airports and aerodromes are considered Emergency Coordination Centres and essential to the transportation, telecommunications, emergency response (including MEDEVAC) and the restoration and/or continuity of government (includes assisting with the identification of alternate sites for business continuity planning).



Summary of Yukon ATBs per Authority Having Jurisdiction (AHJ) criteria of post-disaster

АТВ	Communication Equipment	Runway Lighting	Back-up Generator	Scheduled Flights	Emergency Response Facility	Controls/Lighting Activated by Pilot
Old Crow	✓	√	✓	√	✓	✓
Teslin	✓	✓	Х	*	✓	✓
Watson Lake	✓	✓	✓	✓	✓	Х
Carmacks	*	✓	*	×	✓	✓
Мауо	✓	✓	✓	×	✓	Х
Ross River	×	✓	*	×	✓	✓
Faro	✓	✓	✓	*	✓	✓
Burwash	✓	✓	✓	*	✓	✓
Beaver Creek	✓	✓	✓	*	✓	✓
Haines Junction	✓	✓	✓	*	✓	✓

5.3 AIRSIDE/AIRFIELD ASSESSMENTS

5.3.1 Site Plans and Obstacle Limitation Surfaces (OLS)

The site plans for the twenty-seven (27) sites and the associated Obstacle Limitation Surfaces are essential aspects of the Yukon Aviation System Review and they contain a lot of detail and data that is central to the airside references of both compliance and development priorities. The site plans identify the items for address and deficiencies while the OLS maps provide an overlay for the protection surfaces for the airport or aerodrome for reference and clarity. The site plans and OLS maps for each of the 27 airports and aerodromes are included in Appendix D.

Upon the acceptance and completion of the Review and its recommendations, it would be appropriate to relocate these files onto the Yukon government website for public access.

5.3.2 TP312 5th Edition Checklist

The airfield and airside compliance assessments related to the 27 airports/aerodromes reviewed are enclosed in this section and identify the areas of non-compliance as well as areas that require additional attention or development in future. There were 14 sites visited during February and the remaining 13 sites were assessed via existing site plans and aerial mapping.

The airfield and airside compliance assessments have been completed based on the Transport Canada current standards (TP 312 5th edition) and are site specific for all 27 airports/aerodromes reviewed in the Yukon Aviation System Review. Each site has a critical aircraft identified to align with its Aircraft Group Number (AGN) and this determines the required infrastructure and protections for the site. The assessments identify the areas of non-compliance related to the



AGN. For the AGN numbers for each site referenced on the planning sheets, it will relate to the runway and taxiway environments and establish width and length for aircraft acceptance.

The major items for address are:

- 1) Ross River wires cut on airfield lighting still live and dangereous; threshold lights not working and need replacing; apron and taxiway markings and lights not compliant
- 2) Mayo Runway (section replacement) and grading; consider airfield lighting replacement as well as possible GPS approach when work is underway with runway repair
- 3) Carmacks Airfield Lighting replacement urgently required and replace VASIS with PAPIs
- 4) Burwash Airfield Lighting wiring protection with conduit and pull pits; fix ARCAL for pilots
- 5) Faro Airfield Lighting threshold lights need fixing; upgrade to PAPIs (only need one side for each end); and fix generator; Runway Safety Area & Obstacle Limitation Surface challenges with fall off: need NOTAM and may not be affordable for compliance
- 6) Watson Lake decommission old taxiway, properly light on turning bay and taxiway D; replace old generator; consider replacing runway regulator
- 7) Beaver Creek add windsock; new generator; airfield lighting wiring protection with conduit and pullpits
- 8) Teslin taxiway lighting is confusing on corner and requires added blue lights; needs new generator
- 9) Carcross Runway Safety Area & Obstacle Limitation Surface clearing (primarily trees/brush)
- 10) MacMillan Pass Runway Widening for critical aircraft to 18m (from 15.2m) AGN I
- 11) Ogilvie Runway Widening for critical aircraft to 18m (from 15.2m) AGN I and Runway Safety Area & Obstacle Limitation Surface clearing (primarily trees/brush)
- 12) Old Crow HWOS equipment interference and requires relocation to far side of airfield; new road needs to be shifted slightly north to avoid RSA some fence interference
- 13) Finlayson Runway Widening for critical aircraft to 23m (from 15.2m) AGN II; Runway Safety Area & Obstacle Limitation Surface clearing (primarily trees/brush); RSA Grading and Road Relocation as it is in the strip
- 14) Silver City Runway Safety Area & Obstacle Limitation Surface clearing (primarily trees/brush) as well as entrance road crosses runway threshold and requires fencing and relocation
- 15) Haines Junction Apron lighting not compliant
- 16) Ogilvie Runway Safety Area & Obstacle Limitation Surface clearing (primarily trees/brush)
- 17) Wiley Runway Safety Area & Obstacle Limitation Surface clearing (primarily trees/brush)

In specific sites, a downgraded AGN could provide compliance but lower the aircraft acceptance environment to smaller or lower performance aircraft. Anything pink must be worked on, even with a reduced AGN – in other words, it still would not be compliant. Anything purple can have its AGN reduced in order to avoid any work whatsoever.

The sites affected with a downgraded AGN are:

Finlayson – Currently has a width of 15.2m. This is not wide enough even for an AGN I (18m), therefore no matter what something has to be done. The desired AGN is II (23m). **Taclin** — Currently has a width of 30.5m. No work would be needed if we left it as AGN IIIIA/R.

Teslin – Currently has a width of 30.5m. No work would be needed if we left it as AGN IIIA/B. Desired AGN is IV (45m).

MacMillan Pass – Currently has a width of 15.2m. This is not wide enough even for an AGN I (18m), therefore no matter what something has to be done. The desired AGN is II (23m). **Mule Creek** – Currently has a width of 19.8m. No work would be needed if we left it as AGN I (18m). Desired AGN is II (23m).

Ogilvie - Currently has a width of 15.2m. This is not wide enough even for an AGN I (18m), therefore no matter what something has to be done. The desired AGN is II (23m).



Twin Creeks – Currently has a width of 22.9m No work would be needed if we left it as AGN I (18m). Desired AGN is II (23m).

Wiley – Currently has a width of 18.3m. No work would be needed if we left it as AGN I (18m). Desired AGN is II (23m).

The detailed site specific assessments are included in Appendix E.

5.3.3 Airfield Electrical Assessment

Many of the site issues were related to the airfield electrical systems and this additional assessment is supplemental to the field work and has been formulated through an in-depth interview with YG Airports electrician on April 27, 2017. There are ten sites that had identified need for immediate attention for the airfield electrical components in the previous section.

Note that for the sites with aged, 120V, direct-buried cabling systems (all but Watson Lake and Old Crow), these have been categorized in the context of them remaining functional through careful management and attention as is now being done. This means that faults occur somewhat often (and very often at some sites) but are diagnosed and repaired by YG staff or contractors. A more desirable situation would be to not have direct-buried cable and direct-buried splices, and install pull pits and conduit to increase reliability and decrease service time.

The priority ranking and assessments use the same index as used for other airfield priorities:

]	High Priority (0-3 years)
2	Medium Short Priority (4-10 years)
3	Low Priority (10+ years)

Group 1	Priority	Comments
Burwash		
	2	Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices; near end of useful life. 120Vac parallel system.
	2	Significant problem of animals chewing cables due to above-ground exposure at lights.
	3	New regulators for VASIS recently installed.
	1	VASIS's located on swampy ground and mounted on wooden posts that are rotting (currently a NOTAM at this site for this issue).
	2	Consider replacing VASIS's with PAPI's or APAPI's
	2	Issues with cabling and splices failing.
	3	Recently replaced beacon.
	2	Generator old but functioning. Will need attention.
Carmacks		
	1	Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices in especially bad shape with low megger readings and low burial depth (within 25mm in some cases). Numerous cable/splice failures; a number of lights not working. Not reliable and delisted as an illuminated aerodrome in Flight Supplement. 120Vac parallel system.
	3	New regulators for VASIS recently installed.
	1	Low megger readings on VASIS wiring.



	2	Consider replacing VASIS's with PAPI's or APAPI's
	<u>Z</u> 1	
	3	Issues with cabling and splices failing. No beacon at this site. Required?
Faro	J	No beacon at this site. Required?
Talo	3	Wiring and lighting systems very old (date unknown) with
	3	direct-buried cable and buried splices, however lighting is
		operational. 120Vac parallel system.
	3	New regulators for VASIS recently installed.
	2	Consider replacing VASIS's with PAPI's or APAPI's
	1	Low megger readings on VASIS wiring.
	3	Recently replaced beacon.
	1	New generator, but not functional.
Мауо		general, techniques
	3	Wiring and lighting systems very old (date unknown) with
		direct-buried cable and buried splices, however lighting is
		operational with not many faults. 120Vac parallel system.
	3	New PAPI's and new regulator recently installed.
	3	Recently replaced beacon.
	2	Old generator and transfer switch but with low hours;
		functioning but will need attention.
Old Crow		
	3	
		Airfield electrical upgrades in 2005-06. All in good shape
		and functioning.
Watson Lake		
	2	Runway cabling problems, requiring fault detection and
		repair; low megger readings. Constant current type system with one regulator for all runway lighting; installed in poly-
		tubing; splices in pull-pits.
	2	Runway regulator is old, malfunctioning and in need of
	2	replacement.
	3	Taxiway/apron lighting was replaced in 2016 with separate
1		, , , , , , , , , , , , , , , , , , , ,
	2	regulator.
	2	, , , , , , , , , , , , , , , , , , , ,
	2	regulator. Glide path building feed experiencing cabling problems.
	2	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced.
Group 2	2	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced. Generator is very old and underloaded causing excessive
Group 2 Beaver Creek	1	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced. Generator is very old and underloaded causing excessive oil burn and fouling.
	2	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced. Generator is very old and underloaded causing excessive oil burn and fouling. Wiring and lighting systems very old (date unknown) with
	1	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced. Generator is very old and underloaded causing excessive oil burn and fouling. Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices, however lighting is
	2	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced. Generator is very old and underloaded causing excessive oil burn and fouling. Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices, however lighting is operational. 120Vac parallel system.
	2	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced. Generator is very old and underloaded causing excessive oil burn and fouling. Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices, however lighting is operational. 120Vac parallel system. Consider replacing VASIS's with PAPI's or APAPI's
	2	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced. Generator is very old and underloaded causing excessive oil burn and fouling. Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices, however lighting is operational. 120Vac parallel system. Consider replacing VASIS's with PAPI's or APAPI's VASIS regulators are old and will need replacement in near
	2	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced. Generator is very old and underloaded causing excessive oil burn and fouling. Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices, however lighting is operational. 120Vac parallel system. Consider replacing VASIS's with PAPI's or APAPI's VASIS regulators are old and will need replacement in near future. Regulators are located in the crawlspace, which is
	2	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced. Generator is very old and underloaded causing excessive oil burn and fouling. Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices, however lighting is operational. 120Vac parallel system. Consider replacing VASIS's with PAPI's or APAPI's VASIS regulators are old and will need replacement in near future. Regulators are located in the crawlspace, which is not suitable for such equipment and is not incompliance
	2	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced. Generator is very old and underloaded causing excessive oil burn and fouling. Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices, however lighting is operational. 120Vac parallel system. Consider replacing VASIS's with PAPI's or APAPI's VASIS regulators are old and will need replacement in near future. Regulators are located in the crawlspace, which is not suitable for such equipment and is not incompliance with the Canadian Electrical Code (CEC).
	2	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced. Generator is very old and underloaded causing excessive oil burn and fouling. Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices, however lighting is operational. 120Vac parallel system. Consider replacing VASIS's with PAPI's or APAPI's VASIS regulators are old and will need replacement in near future. Regulators are located in the crawlspace, which is not suitable for such equipment and is not incompliance with the Canadian Electrical Code (CEC). Generator decommissioned due to location (in
	2	regulator. Glide path building feed experiencing cabling problems. Some sections recently replaced. Generator is very old and underloaded causing excessive oil burn and fouling. Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices, however lighting is operational. 120Vac parallel system. Consider replacing VASIS's with PAPI's or APAPI's VASIS regulators are old and will need replacement in near future. Regulators are located in the crawlspace, which is not suitable for such equipment and is not incompliance with the Canadian Electrical Code (CEC).



Haines Junction		
	3	Wiring and lighting systems appear to date from 1992; direct-buried cable and buried splices, however lighting is operational and relatively problem-free. 120Vac parallel system.
	3	New PAPI's recently installed; sound installation.
Ross River		
	3	Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices, however lighting is operational. 120Vac parallel system.
	3	New regulators for VASIS recently installed.
	2	Consider replacing VASIS's with PAPI's or APAPI's
	1	Low megger readings on VASIS wiring.
	3	No beacon. Required?
Teslin		
	2	Wiring and lighting systems very old (date unknown) with direct-buried cable and buried splices; near end of useful life. 120Vac parallel system.
	3	New regulators for VASIS recently installed.
	3	VASIS's are on solid footing.
	2	Consider replacing VASIS's with PAPI's or APAPI's
	2	Issues with cabling and splices failing.
	3	Recently replaced beacon.
	1	Generator decommissioned due to location (in basement) causing fumes and affecting CARS.

5.3.4 Granular Availability

An important part of airfield maintenance and upgrades is the availability of granular material. Yukon Government, Transportation Engineering Branch provided detailed information on availability of granular material for all pits in proximity (<50 km) to aerodromes. A listing of pits along with what quantities and types of granular material are available is found in Appendix F.



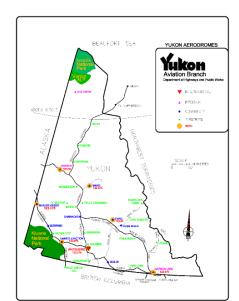
6.0 OPTIONS ANALYSIS

Based on the assessment of the current Aviation System, the airport/aerodrome requirements will be identified for each site and assessed by the TBL evaluation criteria for investment and prioritization for the next 20 years of operation and development of the Yukon Aviation System. The site specific regulatory review and the recommendations are related to compliance and best practices for Canadian Standards and Recommended Practices as noted in the TP312 5th edition checklist.

6.1 THE AIRPORT SYSTEM AND OBLIGATIONS

The Department of Highways and Public Works, Aviation Branch are responsible for providing a safe and effective transportation system at the Yukon government's 29 Airports and Aerodromes. Many of these Airports and Aerodromes also provide communities with access to emergency health care through the support of Air MEDEVAC operations, facilitate RCMP, Justice, aerial firefighting activities, and are a hub to support emergency relief efforts following any real or potential disaster. A key question and assessment is 'Do all of these airports/aerodromes need to be managed and maintained by the government of the Yukon?'

The assessment has reviewed 27 sites (excluding Whitehorse and Dawson City) and provided groupings and a categorization for the airports/aerodromes, as noted earlier in this report. Three (3) airport/aerodrome types have been identified:



Yukon Airports and Aerodromes

- Group 1: Airports/aerodromes with scheduled service or connect the local community, while also generating airport activity linked to the specific economic projects (i.e. mining projects).
- ▼ Group 2: Airports and aerodromes which serve the local community or area access; and
- Group 3: Aerodromes which do not serve a specific local community and have no economic prospects.

The system review has assigned a priority to the role of the Group 1 and 2 airports/aerodromes (see the following table) due to the public service and economic role served by these sites. The group 3 aerodromes/strips are of a lower priority for both purposes of investment and development but, more to the point, in a further reflection on what role the Yukon government plays for these sites and what its role should be going forward. The discussion introduced here also considers the level of service required for each site. In some cases, the sites are simply maintained based on responding to complaints or requests for service on demand without a preventative or active oversight for their operating conditions. There is a level of safety and risk associated with this level of oversight for the aerodromes and it is important for the government and the public to understand that not all of the sites are an essential government infrastructure.



The available capital and operational budgets and existing constraints as well as available funding, federal programs such as Airport Capital Assistance Program (ACAP) fund eligibility also have a factor in the priorities.

27 Airports by Group							
Group 1	Group 2	Group 3					
Burwash	Beaver Creek	Braeburn					
Carmacks	Carcross	Chapman					
Faro	Haines Junction	Cousins					
Finlayson	Pelly Crossing	Ft. Selkirk					
Mayo	Ross River	Hyland					
Old Crow	Teslin	MacMillian Pass					
Watson Lake		McQuesten					
		Minto					
		Mule Creek					
		Ogilvie					
		Pine Lake					
		Silver City					
		Twin Creeks					
		Wiley					

6.2 INVESTMENT MODELLING

6.2.1 Triple Bottom Line Approach

The theoretical basis for a triple bottom line (TBL) investment approach is to create greater value by accounting for social, environmental, and economic performance, or the three pillars of sustainability.

The Triple Bottom Line (TBL) investment model proposed for the Yukon Aviation System consists of a three (3) phase process used to prioritize various investment alternatives. The three (3) phase process includes: 1) establishing profiles for all 27 aerodromes under review (the groupings); 2) identifying and prioritizing maintenance and improvement needs (compliance and infrastructure requirements); and 3) merging the profiles and recommended projects to support decision-making.



<u>Aerodrome Profiles</u>

The first step in developing the aerodrome profiles is to define the most relevant criteria for evaluation. Criteria are classified as social, economic, or environmental to reflect the three (3) pillars or sustainability, or the triple bottom line. The criteria established for the Yukon Aviation System Review are outlined and described below. For the purposes of this study, each criteria has been provided an equal weighting.



Social Criteria – 33%

CRITERIA	WEIGHT	DESCRIPTION
Aviation Demand	20%	Relationship to human populations and their transportation requirements
Health & Safety	20%	Relationship to hazard control and individual wellbeing
Mobility & Access	20%	Importance of role in transporting people and goods into the catchment area with consideration for alternative modes
History & Culture	20%	Presence of historic buildings or cultural landmarks
CARS Support	20%	Importance of role in communicating information for the aviation community

Economic Criteria – 33%

CRITERIA	WEIGHT	DESCRIPTION
Industry Activity	20%	Relationship to regional economic development
Operations	20%	Operating environment with consideration for human resource capacity and financial performance
Third Party Funding	20%	Capital budget implications/leverage
Affordability	20%	Capital cost implications and financial risk
Useful Life	20%	Relationship to the asset's useful life and asset management objectives

Environmental Criteria – 33%

CRITERIA	WEIGHT	DESCRIPTION
Ecosystem Preservation	20%	Influence on natural ecosystems and their ability to provide long- term value for habitat, recreation, and food production
Climate Resiliency	20%	Conformity to the environment with consideration for ecosystem stability and the impacts of permafrost
Wildlife Implications	20%	Conservation practices and mutually beneficial outcomes for wildlife and airport operators
Wildland Fire Management	20%	Regional role in managing wildfires and relative response capacity
Resource Efficiency	20%	Opportunities to conserve energy and water during the construction and operation of infrastructure

With criteria established, each aerodrome is scored using the following system:

PROFILE	SCORING
Strong	7-10
Moderate	4-6
Low	1-3
N/A	0



The individual scores (Appendix F) are supported by site assessments, stakeholder feedback, and aviation forecasts, among other indicators; however, it is recognized that a level of subjectivity is implicit to the scoring process.

Based on the overall scores, the airports and aerodromes noted in the three (3) tiers below were identified as having the greater role and value to the Yukon Aviation System.

Group 1	Group 2	Group 3
Мауо	Beaver Creek	Fort Selkirk*
Old Crow	Teslin	Hyland
Watson Lake	Haines Junction	Cousins*
Carmacks	Carcross	MacMillan Pass*
Burwash	Ross River	McQuesten
Faro	Silver City*	Ogilvie
Finlayson*	Pelly Crossing	Wiley
		Mule Creek*

Beyond the 22 airports and aerodromes listed above, the evaluation has omitted **five (5)** aerodromes that do not play a significant enough future role in the Yukon Aviation System and/or others provide a better long term benefit. These five do not warrant further investment and include: Braeburn; Chapman; Minto; Pine Lake; and Twin Creeks. The aerodromes identified with an asterisk should also be considered for cost-sharing arrangements due to their location, user group or current singular purpose use.

Compliance and Site Improvement Requirements

The second phase of the evaluation consists of identifying and prioritizing the compliance and site improvement requirements of each aerodrome. Each project is assigned a score of 0-5 based on priority.



6.3 RECOMMENDATIONS FOR COMPLIANCE

The TP312 5th edition compliance checklists for each site (also in the FTP shared site) have been summarized for priority related to the risk and urgency of addressing the deficiency.

A A GN

		Social	FCONOTE	Environ	Total	Current	Runwa Besired	Runway Widenin	Airfield Grading	RSA (Cighting	RSA Cols Clearing	Taxim	Taxiwa Widenin	Road & Grading	a Kelocation
	Aerodrome	Tri	ple I e Ro	Botte	om							urit			Comments
	Burwash	8	4	7	5	IIIB		Χ	Χ		Χ	Χ	Χ	Χ	
ı	Carmacks	7	3	3	4	IIIB		Χ	Χ		Χ	Χ	Χ		
0	Faro	4	5	4	6	IIIB		Χ	Χ	Χ	Χ		Χ		
Group	Finlayson	9	1	11	7	-11	Χ	Χ	Χ	Χ	Χ		Χ	Χ	Runway width = 15.2m (23m currently required)
ঠ	Mayo	2	2	1	1	IIIB		Χ	Χ	Χ	Χ		Χ	Χ	
ı	Old Crow	1	13	5	2	IIIB		Χ	Χ	Χ	Χ		Χ	Χ	
	Watson Lake	3	8	7	3	IIIB		Χ	Χ	Χ	Χ		Χ	Χ	
	Beaver Creek	5	9	6	8	IIIB		Χ	χ		Χ		Χ		
ı	Carcross	13	5	8	11	Ш		Χ	Χ	Χ	Χ		Χ	Χ	
0.2	Haines Junction	10	5	8	10	IIIB		Χ	Χ	Χ	Χ		Χ		
Group	Silver City	14	14	13	13	\equiv		Χ	Χ	Χ	Χ		Χ	Χ	
Ğ	Pelly Crossing	12	10	19	14	Ш		Χ	Χ		Χ		Χ		
	Ross River	11	10	12	12	IIIB		Χ	Χ	Χ	Χ		Χ	Χ	
	Teslin	5	10	8	9	IV	Χ	Χ	Χ	X	Χ		Χ	Χ	Runway width = 30.5m (45m currently required)
	Braeburn	22	21	19	23	Ш		Χ	Χ	Χ	Χ		Χ	Χ	
ı	Chapman	22	23	19	24	Ш		Χ	Χ	Χ	Χ		Χ	Χ	
ı	Cousins	19	18	17	18	Ш		Χ	Χ		Χ		Χ	Χ	
ı	Ft. Selkirk	15	16	14	15	П		Χ	Χ	Χ	Χ		Χ		
ı	Hyland	19	15	15	16	Ш		Χ	Χ	Χ	Χ		Χ	Χ	
3	MacMillan Pass	19	17	18	19	II.	Χ	Χ	Χ	Χ	Χ		Χ		Runway width = 15.2m (23m currently required)
Group	McQuesten	18	21	19	20	Ш		Χ	Χ	Χ	Χ		Χ		
5	Minto	22	23	19	24	Ш		Χ	Χ	Χ	Χ		Χ		
	Mule Creek	22	20	19	20	Ш	Χ	Χ	Χ	Χ	Χ		Χ	Χ	Runway width = 19.8m (23m currently required)
1	Ogilvie	16	23	19	20	Ш	Χ	Χ	Χ	Χ	Χ		Χ		Runway width = 15.2m (23m currently required)
1	Pine Lake	22	23	19	24	Ш		Χ	Χ	Χ	Χ		Χ		
1	Twin Creeks	22	23	19	24	Ш	Χ	Χ	Χ	Χ	Χ		Χ		Runway width = 22.9m (23m currently required)
	Wiley	16	18	15	17	Ш	Χ	Χ	Χ	Χ	Χ		Χ	Χ	Runway width = 18.3m (23m currently required)

5	High Priority (0-3 years)
4	Medium Short Priority (3-4 years)
	Medium Long Priority (5-10 years)
2	Low Priority (10+ years) Ongoing Maintenance
1	Ongoing Maintenance
0	No Work Needed

Table :	3.1.1.1—Minimum Runway Width (in n	netres)
Aircraft Group Number Table 1-1 Column III	Non-Instrument / Non-Precision Runways	Precision Runways
1	18	23
II.	23	30
III (A & B)	30	30
IV.	45	45
V (2)	45	45
VI (2)	60	60

Note: Some aircraft may require additional width to comply with their operational standards.



[#] Could Reduce AGN to Avoid Runway Work
Could Reduce AGN to Reduce Runway Work

The TP312 5th edition compliance checklists for each site identify the items that require attention. This table also has incorporated columns and elements for a broader application of priority spending for the Yukon government.

6.4 PROJECT EVALUATION

Based on the established understanding of each aerodrome and the required improvements, the model follows the logical progression of merging the data with the overall aviation system projects in Appendix G. This model takes into account the airport or aerodrome's role and its TBL ranking and scores (i.e Mayo is 76.6 with Old Crow at 67.9), and then considers the serious nature of compliance issues and risk identified with the red boxes (scores of 5) and the general condition and impact on future operations and capacity. In reviewing and reflecting on this project evaluation modelling tool, it is quick to assert which projects are the priority for investment.

Although it is best practice to complete safety improvements prior to facility improvements, the profile of these facilities may warrant greater priority, and the lower activity level sites may see attention later than a medium priority at a higher use airport or aerodrome. This is part of the overall risk assessment for the Aviation System and limited resources – priorities are always about spending our resources on the areas that best achieve an organization's objectives. The earlier airport and aerodrome TBL assessment identified five aerodromes to remove from the Yukon Government's oversight and these are Braeburn, Chapman, Minto, Pine Lake and Twin Creeks. Projects associated with these sites would not be pursued and closure is a consideration unless another interest group is willing to have the site transferred.

The airports and aerodromes with an asterisk (Finlayson, Fort Selkirk, Silver City, MacMillan Pass, Cousins and Mule Creek) are potential aviation system sites but all have significant singular or majority interest user groups that should be approached for alternative funding, cost sharing or operating arrangements.



7.0 GOVERNANCE AND OBLIGATIONS TO THE PUBLIC

The discussion on governance and oversight must note that the existing attention paid to airports and aerodromes in the system does not see this infrastructure as strategic assets but rather as costs. The approach to several sites is to wait for a complaint to respond to maintenance issues rather than a pro-active response. There are some elements that are very well done, such as the CARS operations, but there are several sites that do not have the oversight and attention needed for its government infrastructure to ensure operations and associated risk is managed well. This is the result of a visible lack of maintenance at many sites (due to isolation and limited capital and operating budgets) and a delivery model provided through the Ministry of Highways and Public Works roads crews that may place airport and aerodrome maintenance as a lower priority for scarce maintenance resources. It is understood that within the Department of Highways and Public Works, some aspects of Aviation and other transportation obligations operate under separate directorships however the Director of Transportation Planning is responsible for oversight of all transportation needs within the territory, including airports. As is required nationally, compliance obligations under the requirements of Transport Canada are assigned to responsible persons within organizations that manage airports. It is strongly recommended that the Government of Yukon ensure that the individual(s) assigned the responsibility for compliance also have the associated control of appropriate capital and maintenance funding and personnel that allow for compliance to be achieved and maintained.

This requires a shifting of focus – airports and aerodromes are important strategic infrastructure in the Yukon and require an integrated approach.

There is currently limited ACAP funding support for the airports and aerodromes in the Yukon Aviation System due to the limited amount of scheduled traffic. Unless there is a northern formula for ACAP funding support federally, the airports and aerodromes must find solutions within its own means. The solutions start with how many sites can the Yukon Aviation System support?

One of the first items to address is to determine what airports and aerodromes should properly be the responsibility of the Yukon Government. Recommendations stated earlier in this review would suggest the system could be 'right sized' to 22 airports and aerodromes with separate funding agreements for up to an additional five aerodromes. Once this decision is reached, and consistent with the planning adage "Form follows Function", the oversight decision should then consider how the remaining sites will be brought up to compliance and maintained.

The Yukon Government can continue to **provide a minimalist 'status quo' approach** to its aviation environment and focus on cost effectiveness considering that many aerodromes are very lightly used. This does create gaps in the ongoing maintenance and inspections and lags in response times. This translates to increased risk for the government.

The shift could be accomplished through the separation and assignment of airports and aerodromes to a separate stand-alone Ministry or Department, with an appropriate allocation of staffing, capital and operating dollars consistent with the responsibilities for compliance for the



safe and secure travel of all passengers. This would create a heightened awareness of the role and linkage of the airports and aerodromes to the Yukon economy and growth. The new Ministry could also consider contracting with local groups or companies to provide regular maintenance and inspections.

The Yukon Government could also establish an Agency or Aviation Authority for the oversight of its airports and aerodromes as an independent crown agency that would be established with various stakeholder and interest groups as a Board and be assigned the oversight of the airports and aerodromes (outside of ENWIA and Dawson Creek due to it being outside the scope of this review). This agency would have ability to contract, hire or consider other partnerships for the ongoing development and performance of the Yukon Aviation System. This agency would have mandated public accountability principles established for its activities and there would be annual general meeting requirements. The Yukon Government would still be required to participate as an active partner for funding and as a part of the regulatory role together with the federal government.

The Option of considering **P3 opportunities are not seen as viable** or possible due to 1) ENWIA not included in the package and 2) the 27 sites (or 22 sites if reduced) are not seen as having sufficient revenue generating potential.

The overall assessment of the Aviation System and priority investment program would benefit from reducing the number of sites. The airstrips for closure are Minto (as the mine has their own strip), Pine Lake (limited recreation activity with low aerodrome role), Braeburn (not an essential aerodrome and negligible activity), Chapman (negligible activity and Ogilvie is a better midpoint landing strip along the Dempster Highway for emergency although it could use a fueling option) and Twin Creeks (no community role, negligible activity and alternatives at Ross River and Faro). The sites to also consider for a form of cost sharing or licencing for operational oversight are Cousins, Silver City, MacMillan Pass, Mule Creek and Fort Selkirk.

This is aggressive and may not be popular but provides essential investments to the airports/aerodromes that require attention while removing the risk, liability and oversight to aerodromes or airstrips that are not a part of a real aviation system. This forms the basis of the Development Plan and Action Plan.



8.0 YUKON AVIATION SYSTEM PRIORITIES

The Yukon Aviation System Review has established several project requirements and reassessed the roles of each airport and aerodrome in the system. The integration of the projects, blended with the airport and aerodrome rankings that identified five sites for possible removal from the system has now established a framework to identify the projects and priorities for the near term as well as the 20 year development plan. Additionally, there are five sites for cost sharing or transfer of operational oversight.

8.1 2018-2019 PRIORITIES

The Priorities are related to the highest risk items and affect 10 airports and aerodromes for 2018 and 2019. These projects and priorities will greatly improve the flying environment for the Yukon but also stimulate the aviation activity through the provision of improved flying conditions. The priorities are as follows:

Priority Rank	Aerodrome	Project	2017 Cost Estimate
1	Мауо	Runway replacement and grading	\$700,000
2	Ross River	Airfield electrical fixes and upgrades	\$450,000
3	Мауо	Airfield Lighting replacement	\$830,000
4	Carmacks	Airfield Lighting replacement	\$860,000
5	Burwash	Airfield Lighting upgrade	\$700,000
6	Faro	Airfield Lighting and generator fix	\$500,000
7	Beaver Creek	Airfield Lighting and windsock	\$640,000
8	Carcross	RSA/OLS Clearing	\$55,000
9	Finlayson*	Runway Widening	\$450,000
10	Finlayson*	RSA/OLS Clearing	\$75,000
11	Finlayson*	RSA Grading	\$275,000
12	Finlayson*	Road Relocation	\$850,000
13	Ogilvie	RSA/OLS Clearing	\$152,000
14	Wiley	RSA/OLS Clearing	\$155,000

sub-total \$6,692,000⁷

*adjust for BMC 50% Finlayson funding ___\$5,867,000

*Note that BMC are looking to extend the runway by 1200' as well and this would still require the above compliance items to be addressed as part of the runway extension. This group of airfield upgrades may take a year to plan and approve before construction and redevelopment.

⁷ All capital costs will be confirmed to ensure an appropriate northern allowance is factored in.



8.2 20 YEAR DEVELOPMENT PLAN FOR YUKON AVIATION SYSTEM

The 20 year Development Plan has identified an additional 42 projects and infrastructure upgrades that should be attended to in the next 10-15 years. The items highlighted in yellow are possible cost sharing or operating transfers for the future. The items are listed in order of their priority and reflect 2017 high level cost estimates and are not adjusted for inflation.

Priority Rank	Aerodrome	Project	2017 Cost Estimate
1	Мауо	Road Relocation	\$450,000
2	, Old Crow	Airfield Lighting - relocate AWOS	\$150,000
3	Old Crow	Maintenance Garage	\$500,000
4	Watson Lake	Airfield Lighting - taxiways and turn arounds	\$500,000
5	Carmacks	Taxiway Widening	\$150,000
6	Finlayson	Airfield Lighting	\$320,000
7	Мауо	RSA/OLS Clearing	\$90,000
8	Мауо	ATB & CARS Office	\$400,000
9	Teslin	Airfield Lighting upgrade and replace VASIS	\$300,000
10	Teslin	RSA/OLS Clearing	\$400,000
11	Silver City	RSA/OLS Clearing	\$110,000
12	Haines Junction	Airfield - apron lighting	\$100,000
13	Haines Junction Watson	Gate Upgrade	\$100,000
14	Lake*	pavement resurfacing	\$4,000,000
15	Watson Lake	ATB & CARS Office	\$900,000
16	Carcross	fencing and airport road closure	\$200,000
17	Burwash	ATB & CARS Office	\$60,000
18	Faro	ATB & CARS Office	\$150,000
19	Ross River	RSA/OLS Clearing	\$500,000
20	Ross River	ATB & CARS Office	\$700,000
21	Teslin	Road Relocation (Taxiway Fillet)	\$118,000
22	Haines Junction	RSA/OLS Clearing	\$360,000
23	Ross River	Road Relocation	\$525,000
24	Watson Lake	FEC/Backup Generator	\$100,000
25	Carmacks	ATB & CARS Office	\$60,000
26	Beaver Creek	ATB & CARS Office	\$250,000
27	Teslin Haines	ATB & CARS Office	\$110,000
28	Junction Junction	ATB & CARS Office	\$80,000



29	Silver City	windsocks relocate	\$15,000
30	Silver City	Road Relocation	\$20,000
31	Pelly Crossing	Airfield - windsock relocation	\$15,000
32	Hyland	RSA/OLS Clearing	\$130,000
33	Hyland	Road Relocation	\$785,000
34	Fort Selkirk	Airfield visibility - reflectors and windsocks	\$60,000
35	MacMillan Pass	Runway Widening	\$380,000
36	MacMillan Pass	RSA/OLS Clearing and waterway	\$70,000
37	Ogilvie	Runway Widening	\$550,000
38	McQuesten	RSA/OLS Clearing	\$225,000
39	Cousins	Road Relocation and fencing	\$250,000
40	Mule Creek	Runway Widening	\$220,000
41	Mule Creek	RSA/OLS Clearing	\$35,000
42	Mule Creek	Road Relocation	\$785,000

sub-total: \$15,223,0008

Less aerodrome projects for cost sharing (or deferral): \$2,265,000

\$12,958,000

With the exception of the Watson Lake runway overlay that has an asterisk and is ACAP eligible after 3 years of scheduled service into the airport (by 2020), there are limited opportunities to address the capital infrastructure requirements from federal support. Once inflationary price increases are factored in, the Yukon Aviation System will require a minimum of \$1.0 to \$1.5 million per annum to maintain the infrastructure going forward.

⁸ All capital costs will be confirmed to ensure an appropriate northern allowance is factored in.



9.0 PLAN OF ACTION

The Plan of Action for the Yukon Aviation System has six major areas for address. The Yukon Government must:

- 7) determine if it is going to maintain all 27 airports and aerodromes or reduce the number as recommended in the Plan. The aerodromes recommended for closure could be offered to an outside party for transfer and operating responsibility as an option prior to closure.
- 8) contact the parties that have high use or shared responsibilities for an additional five aerodromes and establish the parameters for cost sharing in capital projects, operations and/or transfer of the aerodrome.
- 9) establish a revitalized governance model for the oversight and ongoing maintenance of the airports and aerodromes in the Yukon Aviation System.
- 10) Prioritize investments of \$5.87 million that are high risk environments at 10 sites in the near term for infrastructure upgrades related to compliance and safety.
- 11) Establish a regular capital program of a minimum of \$1.5 million for the Aviation System and the airports and aerodromes operated by, or on behalf of, the Yukon Government.
- 12) Lobby together with the territories of Nunavut and Government of the Northwest Territories for a northern ACAP program that better funds and supports Canada's development and sovereignty of the north.

