Muskoka Airport Master Plan



PRESENTED TO
Muskoka Airport

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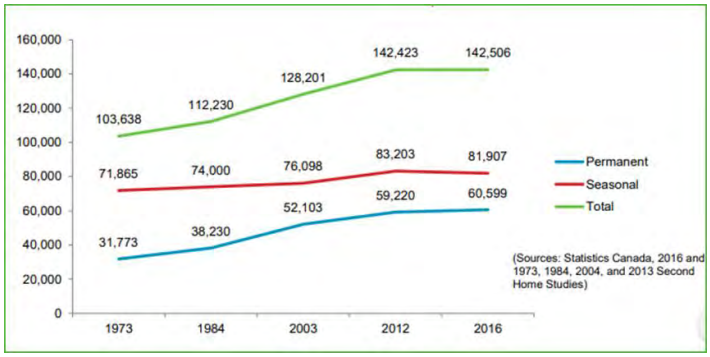
EXECUTIVE SUMMARY

The Municipal District of Muskoka (District) is home to thriving recreational and business interests. The District is comprised of six municipalities that cover 6,475 square km from Georgian Bay in the west to the western border of Algonquin Park in the east, and to the northern tip of Lake Couchiching in the south. The area is renowned for its 1,600 lakes and the area is one of Ontario's prime cottage destinations. The 2016 census showed the District population to be 60,599. As shown on the graph, seasonal residents outnumber permanent residents during the summer months.



In addition to hotels and cottages, dozens of summer camps, outdoor recreation centres, and retreats call Muskoka home. Religious groups, major charities, and traditional overnight camps have facilities on Muskoka lakefront property. Muskoka draws approximately 3.2 million person visits per annum and they spend more than $500 million during the year.

Seasonal residents have been key to the area's economy and culture for decades. While second properties in the area range in size and value, since the 1990s there has been a trend toward the kind of luxury Muskoka has not seen since the 1890s. 26 golf courses are featured on the Golf Muskoka website, and every town in the region has a growing number of high-end retail shops, restaurants, and widespread gentrification. As a result, the District Municipality of Muskoka faces the challenge of balancing the interests of seasonal and permanent residents with the preservation of Muskoka's unique environment, history, and culture.

2017 data from the Municipal Property Assessment Corporation (MPAC) shows seasonal residences (second homes) constitute 47% of all households in the District.

In 2019, in conjunction with the master plan and economic impact assessment was prepared for the airport. The result of the assessment showed the airport generated approximately 46.9 M dollars into the local economy. With planned and anticipated growth as discussed in Section 10.0, the airport can significantly increase its economic impact in the next five years. The planned growth assumptions include continued air services, expanded aircraft servicing, and related services. Assuming new employment would generate as many as 93 Full Time Equivalent (FTE) in areas like airport services, aviation-related services (e.g. aircraft maintenance), ground transportation and accommodation and food services the final economic impact (direct, indirect and induced) could be as high as

- 218 FTEs
- $13.6 M in income,
- $27.5 M in total GDP, and
- $57.3 M in total Output.

With this projection, in five years, the total airport economic impact could reach $104.2 M.

Muskoka Airport

During the summer tourist season, the Muskoka Airport sees over 70% of its annual aircraft movements from charter companies, corporate flights, and recreational flyers. Designated as an 'Airport of Entry' by the Canadian Border

Services Agency (CBSA), many of the larger business jets that frequent the airport at this time of year are from the United States and overseas. The airport is, therefore, significant to the Muskoka tourist industry and the local economy.

The airport also provides a variety of community and social services:

- Air ambulance provides connection to distant health care facilities;
- Helicopter companies provide survey and repair to electrical power companies;
- The Ontario Ministry of Natural Resources (MNR) frequently stages their water-bombers at the airport during periods of high risk for forest fires.
- Hydro helicopters regularly use the airport during power outages in the region;
- Department of National Defense conducts training exercises at the airport using C130 Hercules aircraft; and
- The airport was a significant transportation hub during the 2010 G8 Summit held in Huntsville. Many other government organizations use the airport including the Ontario Provincial Police, the Royal Canadian Mounted Police, Corrections Canada, and the Department of National Defence.

Although there is limited scheduled service, thousands of charter flights arrive at Muskoka each year.

The Municipality continues to own the airport. The District reviewed governance options in 2017 to determine which governance model would best suit the airport and the region. In August 2017, District Council approved establishment of the Muskoka Airport Board (Board). The Board is comprised of seven board members. In 2018, a Strategic Plan was prepared to guide development at the airport. Key to strategic planning was the preparation of a vision and mission for the airport and a practical strategy for success.

Vision

To be the transportation gateway to and from the Muskoka experience for people and business

Mission

To operate safe and efficient air transportation facilities that serve the needs of Muskoka residents, businesses and tourists.

In a way that;

- Creates access to the Muskoka experience and the Canadian wilderness;
- Supports the development of tourism, recreation and the overall economic success of Muskoka;
- Demonstrates fiscal responsibility with a drive for continuous improvement;
- Respects and develops employees, environment, infrastructure and reputation of the airport; and strategically manages the airport's leased and owned real estate assets.

In the fall of 2019, the District issued a contract for a master plan on behalf of the Board. The master plan has two fundamental objectives:

- To assess and evaluate existing infrastructure and determine rehabilitation timelines to maintain ongoing, safe operations, and
- To prepare a logical, cost-effective strategy for land development, based on the highest and best use of lands, to respond to potential commercial interests.

The master plan will guide investment for the next twenty years. The master planning process includes:



Stakeholder consultations have been an important component of airport deliberations since the earliest master plans were prepared (circa 1999). Since that time, there have been numerous studies at the airport and in each case, a consultation strategy was implemented to seek input from airport users and the community at large.

In 2018, the newly formed Muskoka Airport Board of Directors began a series of consultations as part of the strategic plan development process. The master plan includes consultation with airport users and regional organizations. General comments are listed in Section 3.0 of the report and a detailed summary of stakeholder comments is included in the master plan attachments.

Demand Analysis

Between 2008 and 2019, total aircraft movements declined 28.7%, from 16,028 annual movements to 11,421. Small piston aircraft appear to have experienced the most significant decline (-29.4%) and turboprop aircraft increased and decreased but overall declined (-38.4%). Jet aircraft movements are relatively stable; however, this component of the overall aircraft type accounts for about 8% of the total aircraft movements. Helicopter activity is largely cyclical and based on specific events (e.g., forest fire seasons, wildlife surveys).

Pessimistic and optimistic projections were prepared for the master planning period. The pessimistic projection shows overall traffic to decline over the next 10 years. Jet traffic is projected to grow in line with current trends (approximately 2.0% annually). Turboprop traffic is projected to decline based on 10-year averages (-3.5% annually). Rotary traffic is projected to decline at approximately -3.5% annually. The main loss in aircraft movements is projected to continue in the small piston aircraft category.

Optimistic projections assume that piston traffic has reached bottom and remains stable over the course of the projection. Jet traffic is projected to grow in line with current trends (approximately 2.4% annually), and turboprop traffic is projected to grow more strongly than in the base case (2.0% annually). Rotary traffic is projected to remain cyclical but growing at approximately 0.5% annually. With this growth, the airport would see increased traffic from the base year of 2019.

Runway capacity at the Muskoka Airport is not a concern. Single runway airports can serve as many as 250,000 movements annually. Normally capacity is challenged during peak periods when a significant number of aircraft are landing and departing an airport during a specific period (e.g., a one-hour period). This is not typically a problem at Muskoka Airport.

Passenger Traffic

Muskoka Airport has experienced scheduled passenger traffic for less than one year at this time. FlyGTA and Porter service began in the spring of 2019. Given the limited length of time passenger services have existed, scenarios can be created for activity at the airport, but projections and forecasts cannot; a few years of historical data would be required. While it is reasonable to be optimistic about the services, it is difficult to project this activity into the future, particularly as the impact of the Coronavirus 19 (COVID) is yet to be fully understood. Porter Airlines cancelled all flights to Muskoka during the 2020 summer season and FlyGTA only resumed a scheduled service on August 1, 2020. Assuming that after recovery both Porter and FlyGTA will continue service to Muskoka Airport, it is projected that passenger volumes will increase to 3,915 one-way passengers per year. This discussion is important because the trigger to receive Transport Canada's Airports Capital Assistance Program (ACAP) funding is 1,000 passengers per year and the passengers must represent a year-round commercial passenger service.

Airfield and Groundside Needs

Both airfield and groundside infrastructure are assessed as part of the master planning process. The purpose is to determine what is required to maximize the infrastructure lifecycle and ensure viable ongoing airport operations.

In general, the airport infrastructure (aprons, taxiways, runway, roadways, etc.) appear to be in fair to good condition with some exceptions (e.g., a pavement area may have experienced structural stresses and is rated poor, requiring immediate attention).

The airport-owned buildings, ATB and Maintenance Garage, are in excellent and poor to fair condition, respectively, and with lifecycle maintenance these buildings will likely suffice for the plan duration. In the plan we have provided illustration of what an expanded ATB would look like and identified costs for both the expanded ATB and a new Combined Services Building; however, these costs are not extended into the 20-year capital plan.

Section 5.0 shows the airfield infrastructure related costs amount to $1,083,000 in the 2021 to 2025 period, $802,000 in the 2026 to 2030 period, and $3,506,000 in the 2030 and beyond period. It is possible that all these costs could be funded under the ACAP program if the airport meets eligibility requirements.

Groundside infrastructure related costs amount to $716,000 in the 2021 to 2025 period and $139,000 in the 2026 to 2030 period.

Additional costs relate to navigational aid rehabilitation and new equipment ($150,000) and building related maintenance ($25,000 for the ATB, $450,000 for the maintenance garage, and $20,000 for the Airport Building).

Airport Commercial Development

The Land Use Plan (LUP) provides a framework that the airport can use to guide highest and best use development of airport lands over the long-term (e.g., 20 years). The LUP:

- Identifies land use requirements for each airport subsystem in the plan. Common designations include airside commercial, airport operations, air terminal reserve, runway and taxiway system, airport reserve, groundside commercial, and aviation support.
- Assigns areas on the airport for use by specific facilities, based on priority. The priority approach requires a listing of airport facilities in order of priority.
- Ensures future developments proposed in the LUP will not conflict with safe airport operations. All work undertaken at the airport will be in conformance with Transport Canada Aerodrome Standards and Recommended Practices (TP 312 5th Edition). Transport Canada's "Land Use in the Vicinity of Airports

(TP 1247)" is a reference when considering appropriate land uses near airports. Electronic zoning requirements are also considered.

- Reserves land for future expansion or redevelopment (e.g., operational facilities). Lands are identified to ensure those needs are met in consideration of safe and efficient airport activities.
- Provide land for access to development areas.

The Airport Improvement and Development Strategy is structured to respond to demands during the master planning period (20 years). It is difficult to look beyond a 5 to 10-year time frame given external forces can significantly affect the demand for new developments. As an example, the 2020 COVID pandemic has resulted in dramatic shifts in the overall aviation industry and at this time it is difficult to envision what the industry may look like a year from now. The development strategy therefore focuses on potential development over the next 10 years.

All of the proposed development timelines are subject to demand and, as such, specific identified timelines can change rapidly, depending on either a lack of demand or, alternatively, a more significant demand requirement.

Section 10.0 of the plan identifies development strategies that are required to ensure the airport can be commercially developed in a cost effective and efficient manner. The objective of the development strategies is to provide the Airport Board the necessary plans to fulfill their mandate for commercial development.

Short-term plans include the expansion of the airport apron to provide additional aircraft parking during the summer months when parking is at a premium. The next steps consider further development at the airport once the three to five infill lots are occupied.

The logical first step is to develop lands in the Southwest Quadrant (Drawing 10-4), This section of land is contiguous to the existing hangar line and the lands are relatively flat, providing a cost-effective development area. To develop the area, it will be necessary to close Runway 09-27. The closure of Runway 09-27 is detailed in Section 10.5.1.1 of the plan with a more detailed analysis in Attachment 3.

If demand is such that the Southwest Quadrant is fully leased, the next development area would be the Southeast Quadrant (Drawing 10-6).In the event a crosswind runway is required, lands have been protected for a new crosswind runway on an 11-29 alignment (Drawing 10-8). The new crosswind runway is in the Southeast Quadrant of the airport.

In the long-range planning strategy, concepts have been developed to show development in the West Quadrant (Drawing 10-10).

The overall development strategy includes:

Short-Term Development

- Apron I Expansion North and South: designed to relieve parking pressure during the summer season
- Airside Infill Lot development: allows immediate development for 3 to 5 hangars
- Groundside Lot Development at Beaver Creek Road: a number of lots are development-ready and will require minimal investment by the airport
- Drainage Improvements: Initially, there is the requirement for a complete drainage study at the south end so that drainage issues can be resolved. The actual improvements would then follow.

- Depending on commercial development demands, there will be a requirement to close Runway 09-27 so that commercial development can proceed in the Southwest Quadrant
- Southwest Quadrant Development: this development will be triggered by demand.

Medium-Term Development

- Airport Terminal Parking Expansion: the requirement for additional parking is entirely dependent on demand resulting from ongoing scheduled air service.
- Southeast Quadrant Development: based on previous studies and with the availability of infill lots and Southwest Quadrant development, it is likely demand for this area would be in the latter years of medium development (e.g., 2028 to 2030).
- New Crosswind Runway: the need for the runway must be established, at which time the construction can be programmed.

Long-Term Development

West Quadrant Development: The development of a large maintenance repair overhaul operator (MRO) in the southwest quadrant and the development of the southeast quadrant would provide approximately 11 development lots, plus the existing three infill lots. Based on anticipated demand, it is likely complete occupancy would not occur until the 2030 timeframe, at which time the west quadrant development could be considered. In the long-term this will be the last development area in close proximity to the existing areas.

An environmental constraints analysis was completed for all of the potential development areas and the analysis shows that development will not likely impact sensitive areas (e.g., wetlands). When development occurs, it will be necessary to develop an environmental screening to ensure that all potentially sensitive areas are protected. The construction of a new crosswind runway may also trigger federal involvement under the Canadian Impact Assessment Act.

Section 11.0 highlights potential funding for airport projects. To meet the eligibility requirement, it is necessary that the airport is able to demonstrate achieving a minimum of 1,000 passengers annually for at least three years. The airport was on the path to achieving these numbers when the COVID pandemic occurred, resulting in the cancellation of Porter Flights in 2020 and the reduced scheduled service provided by FlyGTA in the spring and early summer. It will be necessary to closely monitor the airlines recovery and then to determine how that recovery will impact airport operations.

Section 12.0 outlines the costs for maintaining and improving infrastructure during the 20-year planning period with particular emphasis on the first ten years. Where possible, investments are scheduled to balance costs over the plan life.

As shown, major capital investment will be required during the 2022 to 2025 timeline, because there is the potential for an immediate need for apron expansion to meet summer aircraft parking needs and land development for a large tenant (e.g., MRO) or, alternatively, the need for additional lots based on potential demand for hangars. Each scenario can influence overall costs. As an example, a large MRO development in the southwest quadrant would result in the likely need to develop the southeast quadrant to meet small hangar development needs. Alternatively, if a large MRO development did not happen, the number of lots in the southwest quadrant would likely support the airport needs for much of the next decade, thereby deferring the need for development in other quadrants.

All costs are considered Class D costs and include a 40% allocation to account for engineering design, administration, and contingencies for unknown factors (e.g., subgrade condition, environmental factors, additional

blasting). Where construction is more straightforward (e.g., an access road overlay) a smaller contingency was added (e.g., 10%). To provide an annual investment budget, engineering costs are included in one calendar year with construction following the next year. Airfield rehabilitation costs have been deferred to post-2023 if the airport would meet ACAP passenger volume eligibility.

The table shows approximately $10,375,000 of investment will be required by the airport to meet infrastructure rehabilitation and development needs during the period 2021 to 2030. With government funding through the Airport Capital Assistance Program, the investment would be $8,545,000 dollars.

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ACRONYMS & ABBREVIATIONS

Acronyms/Abbreviations	Definition
Organizations/Municipalities	
AACC	Airport Authorities Coordinating Council
ACI	Airports Council International
ACRP	Airport Cooperative Research Program
Airport	Muskoka Airport
Board	Muskoka Airport Board of Directors
CBSA	Canadian Border Services Agency
CFB	Canadian Forces Base
District	The District Municipality of Muskoka
DOT	Canadian Department of Transport
GFD	Gravenhurst Fire Department
IATA	International Air Transport Association
MNR	Ontario Ministry of Natural Resources
OEI	Operations Economic Inc.
RCAF	Royal Canadian Air Force
RNAF	Royal Norwegian Air Force
StatsCan	Statistics Canada
Tetra Tech	Tetra Tech Canada Inc.
Tulloch	Tulloch Engineering
TC	Transport Canada
Airport Terminology	
AB	Airport Beacon
AGN	Aircraft Group Number
AOE 15	Airport of Entry, flights with no more than 15 passengers
ARFF	Aircraft Rescue and Fire Fighting
ATB	Air Terminal Building
AZR	Airport Zoning Regulation
AWOS	Automated Weather Observing System
CSB	Combined Services Building
DA	Decision Altitude
ERP	Emergency Response Plan

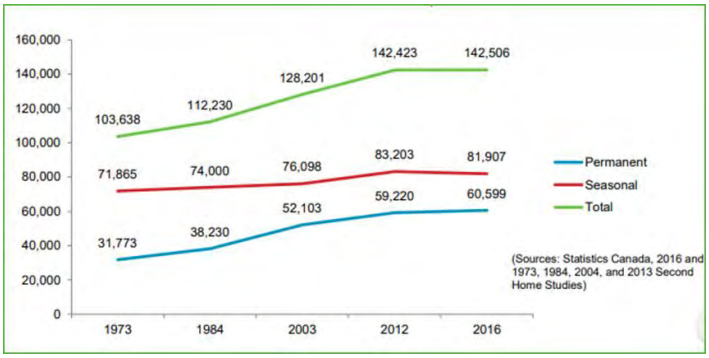
Acronyms/Abbreviations	Definition
GNSS	Global Navigation Satellite System
GPS	Global Positioning System
HVAC	Heating Ventilating Air Conditioning
ILS	Instrument Landing System
IFR	Instrument Flight Rules
LOS	Level of Service
LPV	Localizer Performance with Vertical Guidance
MF	Mandatory Frequency
MRO	Maintenance Repair Overhaul
NCAMS	Nav Canada Aircraft Movement System
NDB	Non-directional Beacon
PAPI	Precision Approach Path Indicator
RCO	Remote Communications Outlet
RNAV	Area Navigation
RNP	Required Navigation Performance
VHF	Direction Finder
VFR	Visual Flight Rules
Planning Terminology	
LUP	Land Use Plan
OP	Official Plan

LIMITATIONS OF REPORT

This report and its contents are intended for the sole use of the District Municipality of Muskoka and their agents. Tetra Tech Canada Inc. (Tetra Tech) does not accept any responsibility for the accuracy of any of the data, the analysis, or the recommendations contained or referenced in the report when the report is used or relied upon by any Party other than District Municipality of Muskoka, or for any Project other than the proposed development at the subject site. Any such unauthorized use of this report is at the sole risk of the user.

1.0 INTRODUCTION

The Municipal District of Muskoka (District) is home to thriving recreational and business interests. The District is comprised of six municipalities that cover 6,475 square km from Georgian Bay in the west to the western border of Algonquin Park in the east, and to the northern tip of Lake Couchiching in the south. The area is renowned for its 1,600 lakes and the area is one of Ontario's prime cottage destinations. The 2016 census showed the District population to be 60,599. As shown on the graph, during the summer, seasonal residents outnumber permanent residents.



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Seasonal residents have been key to the area's economy and culture for decades. While second properties in the area range in size and value, since the 1990s there has been a trend toward the kind of luxury Muskoka has not seen since the 1890s. 26 golf courses are featured on the Golf Muskoka website, and every town in the region has a growing number of high-end retail shops, restaurants, and widespread gentrification. As a result, the District Municipality of Muskoka faces the challenge of balancing the interests of seasonal and permanent residents with the preservation of Muskoka's unique environment, history, and culture.

A detailed district socio-economic profile is included in Attachment 1.

2.0 MUSKOKA AIRPORT

Construction of the Muskoka Airport (Drawing 2-1) began in 1933 and was officially named "Muskoka Airport" in 1938. The first recorded landing at Muskoka Airport was on September 11, 1935 by a Mr. and Mrs. Wallace of Cleveland, Ohio. At that time, the east-west runway was graded to full length. The initial construction of the field was completed in June 1936.

"During the war years, the Royal Canadian Air Force operated the airport as an auxiliary base for CFB Borden, to conduct flight training. In 1942, the field was made available to the Royal Norwegian Air Force (RNAF) under the British Air Commonwealth Training Plan. The RNAF moved their training base to Muskoka from the Toronto City Centre Airport (then Toronto Island Airport). During this period of World War II, the Muskoka Airport was referred to as "Little Norway." Throughout the war, hundreds of Norwegians escaped to Canada to train as pilots and aircrew before returning to the battlefields of Europe."[1]

At the end of the war, the airport was transferred to the Canadian Department of Transport (DOT) and was comprised of three turf runways, two at 3,100 ft. in length and one at 3,000 ft.

[1] Muskoka Airport Website, Airport History

In 1951, the Royal Canadian Air Force (RCAF) established North Bay as a training facility for their new F-86 Sabres and Muskoka Airport was selected as an alternate emergency landing field by the DND, and a new 6,000 ft. paved runway was constructed (including lighting (1954)).

In the mid-1950s, scheduled air service between Muskoka and Toronto was established by Trans Canada Airlines (now Air Canada). DOT continued to operate the airport until November 1996, when control of the facility was transferred to The District Municipality of Muskoka. In 2001, the National Historic Sites and Monuments Board of Canada designated Norwegian Training in Canada during World War II an “event of national historical significance.”

The economic impact assessment prepared as part of this airport master plan shows airport users, airport businesses, and surrounding businesses contribute over 45 million dollars annually to the Muskoka economy. Not only do companies from outside Muskoka rely on the airport, but there are more than a dozen businesses based here that provide jobs and benefits to the local economy. Many of these operations are expanding, and as the airport grows, so does the interest of other aviation businesses to operate in Muskoka.

During the summer tourist season, the Muskoka Airport sees over 70% of its annual aircraft movements from charter companies, corporate flights, and recreational flyers. Designated as an ‘Airport of Entry’ by the Canadian Border Services Agency (CBSA), many of the larger business jets that frequent the airport at this time of year are from the United States and overseas. The airport is therefore significant to the Muskoka tourist industry and the local economy.

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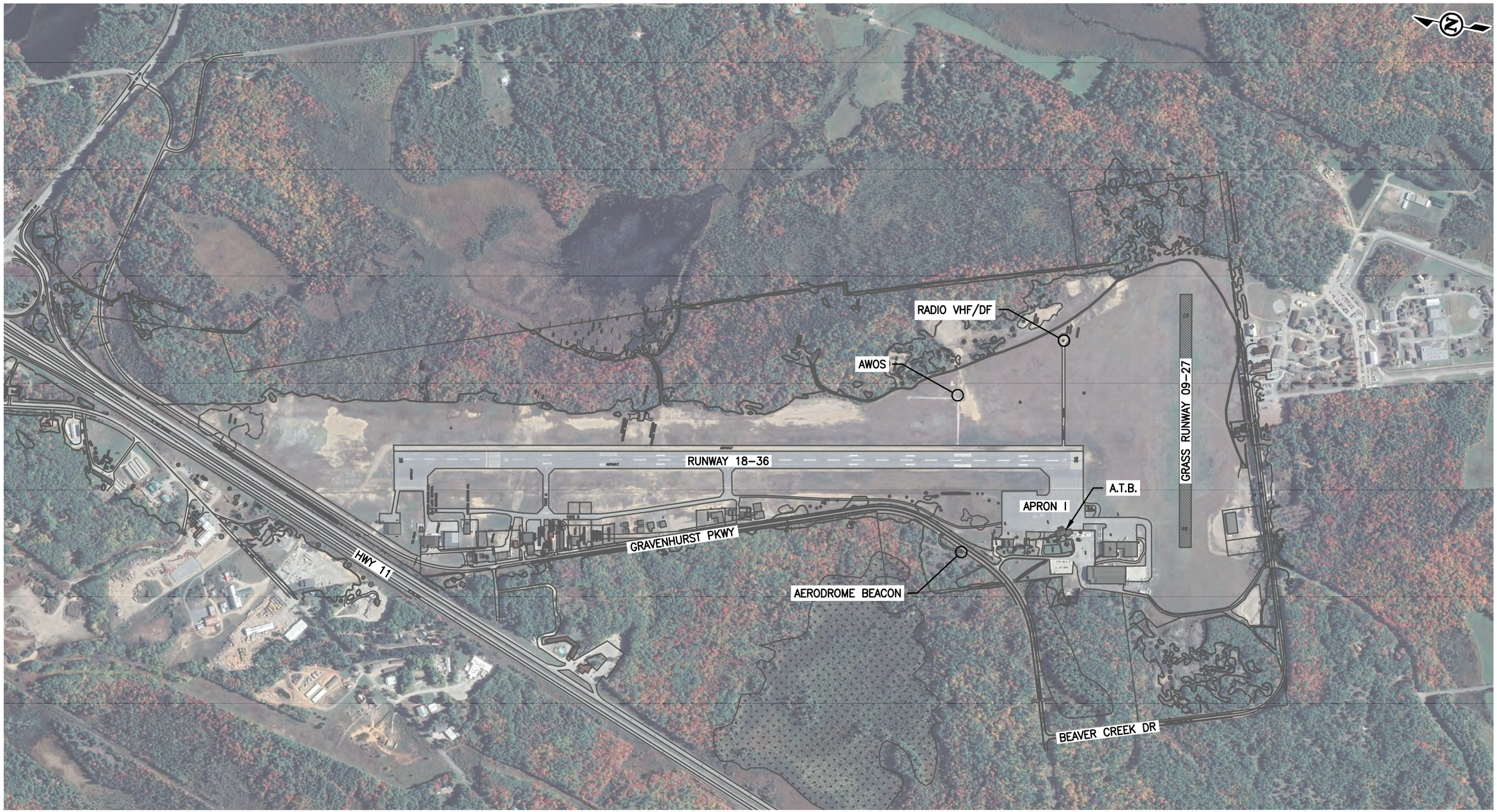
- Hydro helicopters regularly use the airport during power outages in the region;
- Department of National Defense conducts training exercises at the airport using C130 Hercules aircraft; and
- The airport was a significant transportation hub during the 2010 G8 Summit held in Huntsville. Many other government organizations use the airport including the Ontario Provincial Police, the Royal Canadian Mounted Police, Corrections Canada, and the Department of National Defence.

Although there is limited scheduled service, thousands of charter flights arrive at Muskoka each year.

The Municipality continues to own the airport. The District reviewed governance options in 2017 to determine which governance model would best suit the airport and the region. In August 2017, District Council approved establishment of the Muskoka Airport Board.



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TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MUSKOKA AIRPORT MASTER PLAN

MUSKOKA AIRPORT YQA, MUSKOKA ONTARIO

MUSKOKA AIRPORT

PROJ : TRN.AIRP03465-01		CONTR :		DATE : 2020/06/26	**2-1**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

PLOT DATE: 2020/08/11 AT 14:32:55 PLOTTED BY: SCHITTHELM, JOSH
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2.1 Muskoka Airport Board

The Muskoka Airport Board is comprised of seven board members. In 2018, a Strategic Plan was prepared to guide development at the airport. Key to strategic planning was the preparation of a vision and mission for the airport and a practical strategy for success.

Vision

To be the transportation gateway to and from the Muskoka experience for people and business

Mission

To operate safe and efficient air transportation facilities that serve the needs of Muskoka residents, businesses and tourists.

In a way that;

- Creates access to the Muskoka experience and the Canadian wilderness;
- Supports the development of tourism, recreation and the overall economic success of Muskoka;
- Demonstrates fiscal responsibility with a drive for continuous improvement;
- Respects and develops employees, environment, infrastructure and reputation of the airport; and strategically manages the airport's leased and owned real estate assets.



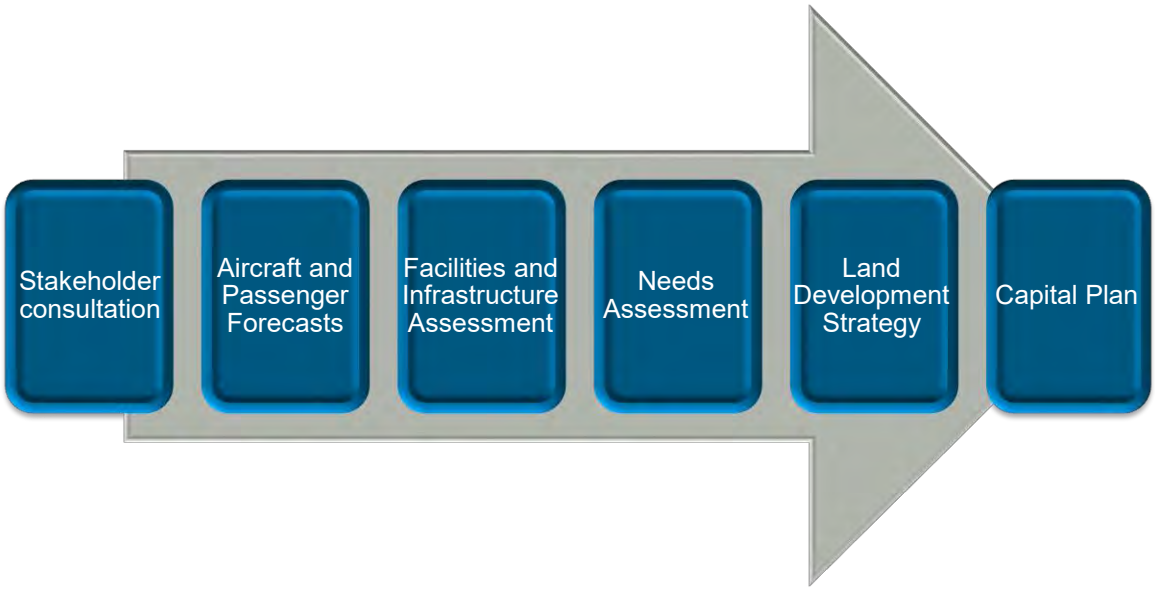
It is essential that the final master plan provide guidance so that the Board can fulfill their obligation to “build value and gain return from real estate and infrastructure investments”.

2.2 The Master Plan

One of the “measures of success” identified in the “Muskoka Airport Strategic Plan, 2019-2022” is the preparation of an Airport Master Plan.

In 2019, the Airport contracted Tetra Tech Canada Inc. to prepare a master plan that would guide airport development over the next twenty years. The Tetra Tech team included two sub-consultants: Operations Economics Inc. and Tulloch Engineering.

The final Master Plan guides airport investment for the next twenty years. The master planning “process” used in this plan is shown in the following figure.



3.0 STAKEHOLDER CONSULTATIONS

Stakeholder consultations have been an important component of airport deliberations since the earliest master plans were prepared (circa 1999). Since that time, there have been numerous studies at the airport and, in each case, a consultation strategy was implemented to seek input from airport users and the community at large.

In 2018, the newly formed Muskoka Airport Board of Directors began a series of consultations as part of the strategic plan development process. As a follow-up, a number of airport users and regional organizations were consulted as part of this master planning process. Table 3-1 shows a list of those consulted. Many of the stakeholder comments mirrored those presented in earlier consultations. A detailed overview of the consultations is included in Appendix A.

Table 3-1: Stakeholder Contacts

Stakeholder Contact	Organization	Telephone	Contact Date
Michael Duben, CAO	District of Muskoka	705-645-2100 x 4272 Michael.duben@muskoka.on.ca	December 12, 2019
Samantha Hastings, Commissioner Community and Planning Services	District of Muskoka	705-645-2100 x 4260 Samantha.hastings@muskoka.on.ca	December 12, 2019
Jeff Loney, Manager Economic Development	Town of Gravenhurst	705-687-2230 x 280 Jeff.loney@gravenhurst.ca	December 11, 2019
Randy Mattice, Manager Economic Development	Town of Bracebridge	rmattice@bracebridge.ca	December 11, 2019
Michael Lawly	Muskoka Tourism	mlawly@muskokatourism.ca	January 16, 2020
James Murphy and Kate Monk	Explorers Edge	james@explorersedge.ca	January 16, 2020
Tenants			
Glenn Williams	Skyservice	905-678-5682 Glenn_williams@skyservice.com	January 10, 2020
Mike Goudie	Muskoka Aircraft Refinishing	705-687-6696 mikeg@muskokaaircrafrt.com	December 17, 2019
Earle Robinson		earlerobinson@sympatico.ca	January 8, 2020
Chris Nowrouzi	Northern Air Solutions	888-470-4595 chris@flygta.com	January 31, 2020
Jim Hodgson	Lake Central Air Service	705-687-4343 jimh@lakecentral.com	January 8, 2020
Adam Gonfor	Air Muskoka	705-687-6696 aronfors@muskoka.com	January 14, 2020
Chris Nowrouzi	FlyGTA		January 31,2020

The comments below are listed in no particular order and are a compilation of past comments as well as input received as part of the 2018 consultations and this master planning process.

- Airport is a gateway to cottage country and is a critical part of the District infrastructure;
- Some tenants have concerns relating to selling airport lands versus leasing. One concern expressed is that there is reluctance from lending institutions to finance airport developments if the sites are being leased rather than owned;
- Changes in District Council leads to issues being revisited;
- Concern that airport revenues do not support airport operating costs;
- General support for increased commercial development;
- Lack of airport development guidelines. Concerns that the airport does not have a specific guide to ensure airport buildings are aesthetically attractive and visible from a safety perspective (e.g., brightly coloured roofs);
- Lack of an airport restaurant to attract fly-ins from a broader spectrum of pilots from other airports;

- The fact the airport provides fuel is a positive attribute;
- Inconsistency in airport oversight and management;
- Lack of vision for the airport;
- Perceived lack of maintenance. Tenants would like to see improved maintenance, particularly on crosswind runway 09-27 and in winter;
- Many of the airport tenants, although not all, adamantly support the continued operation of Runway 09-27;
- Increase number of airshows to showcase the airport;
- Concern that the primary Runway 18-36 is not aligned to the dominant wind direction and, as such, small aircraft pilots are potentially operating in unsafe conditions;
- Concern that previous wind studies did not correctly analyze runway usability;
- Some tenants are adamant that Runway 09-27 should remain because of the historical significance to the airport given the many years the runway has been in operation;
- Runway 09-27 is essential for flight training activities and if properly maintained and lengthened the runway would see a greater use, and
- Runway 09-27 airspace is protected under the Airport Zoning Regulation.

Each of the comments listed has been considered as part of this master plan development. It is also important to recognize the significant consultations that were undertaken with the Muskoka Airport Board as part of the plan development process.

4.0 DEMAND ANALYSIS

4.1 Aircraft Movements

4.1.1 Historic Traffic

Total aircraft movements at Muskoka Airport between 2008 and 2019 are shown in Figure 4-1. Total movements include both itinerant movements that travel from one airport to a second airport, and local movements that remain in the area of origin airport. Between 2008 and 2019, total aircraft movements declined -28.7%, from 16,028 annual movements to 11,421. Aircraft movements are detailed below. Aircraft movement statistics were provided by the Muskoka Airport.

Statistics Canada defines Itinerant and Local Movements as follows:

Itinerant movements

At airports with control towers and/or flight service stations: for the purpose of completing air traffic records, itinerant movements are considered as movements in which aircraft proceed to or arrive from another location; or where aircraft leave the circuit but return without landing at another airport. At airports without control towers: an aircraft movement in which the aircraft arrives from or departs to a point other than the reporting airport; or a movement by an aircraft that leaves the close proximity of an airport and returns without landing at another airport.

Local movements

At airports with control towers and/or flight service stations: for the purpose of completing air traffic records, local movements are considered as movements in which the aircraft remains in the circuit. At airports without control towers: an aircraft movement in which the aircraft remains in the close proximity of the airport. Local movements are often carried out during training flights (touch-and-go), equipment tests, etc[2].

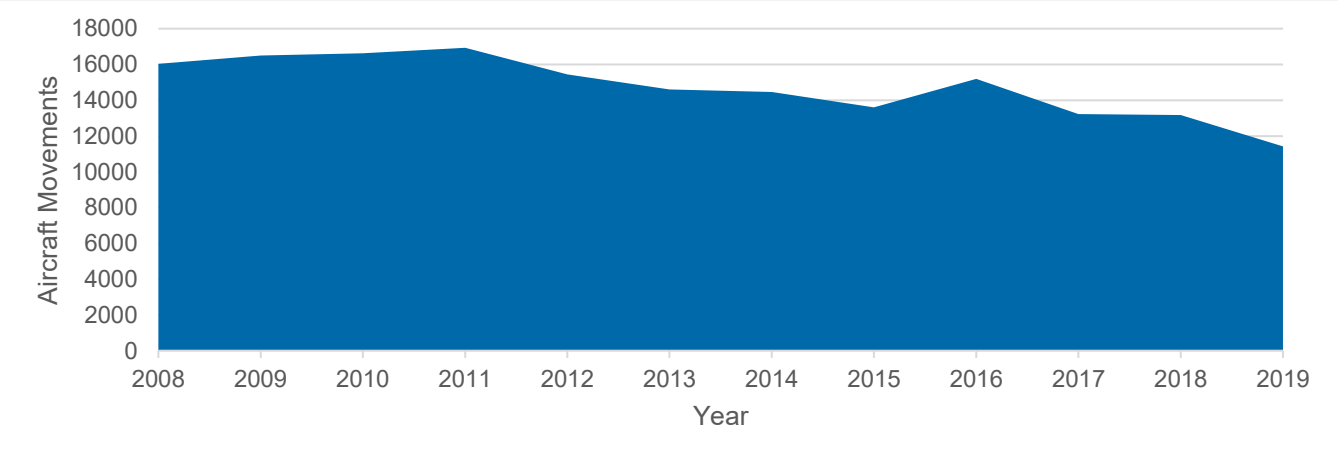


Figure 4-1: Total Aircraft Movements, 2008-19

4.1.2 Itinerant Aircraft Movements

Airports generally pay more attention to itinerant aircraft movements because they are generally tied to higher revenue opportunities. The exception is airports with flight schools which generate many local flights.

The breakdown of itinerant movements is shown in Figure 4-2. Movements are divided by engine type, which is tracked by Statistics Canada. As with total movements, itinerant movements have declined over the 10-year period, by 28.7%. The type of engine generally points to the size of aircraft. Piston aircraft are generally smaller. Turboprops are medium size, and jet aircraft vary in size. Rotary engines refer to helicopters. The majority of operations at the site are by piston aircraft, followed by turboprops, and then jets and rotary aircraft. The types of activity are shown in more detail below to explain trends.

[2] https://www.statcan.gc.ca/eng/statistical-programs/document/2715_D1_T9_V1

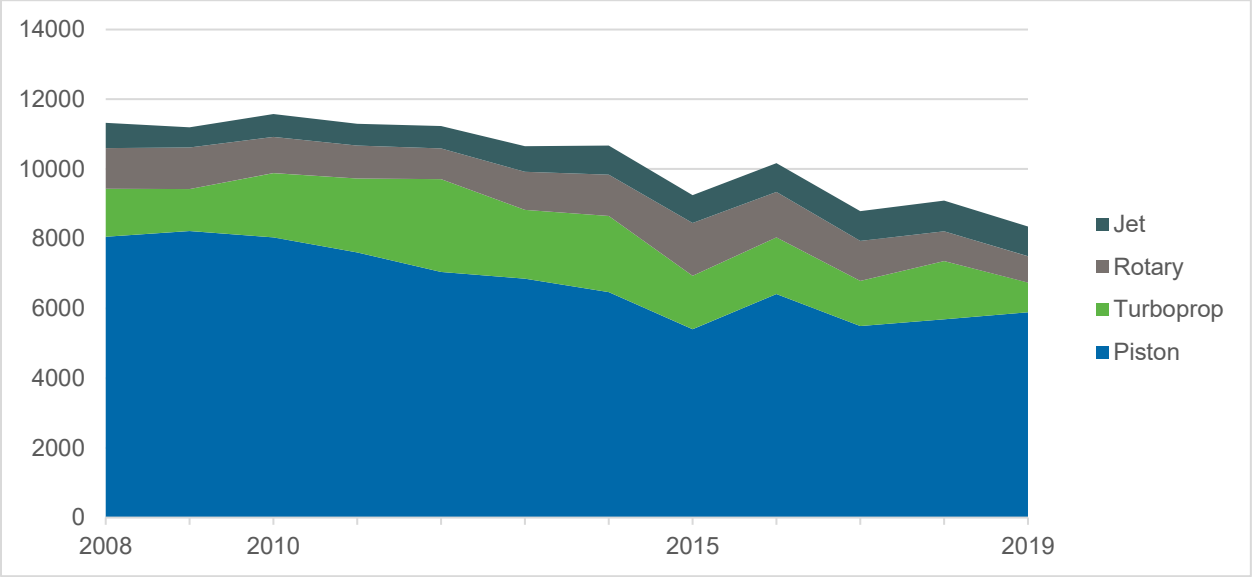


Figure 4-2: Itinerant Aircraft Movements, 2008-19

Figure 4-3 shows piston aircraft movements from 2008 to 2018. Piston aircraft has declined the most rapidly, approximately 27% between 2008 and 2019. Despite this decline, this type of operation will continue to be the most frequent at Muskoka in the foreseeable future.

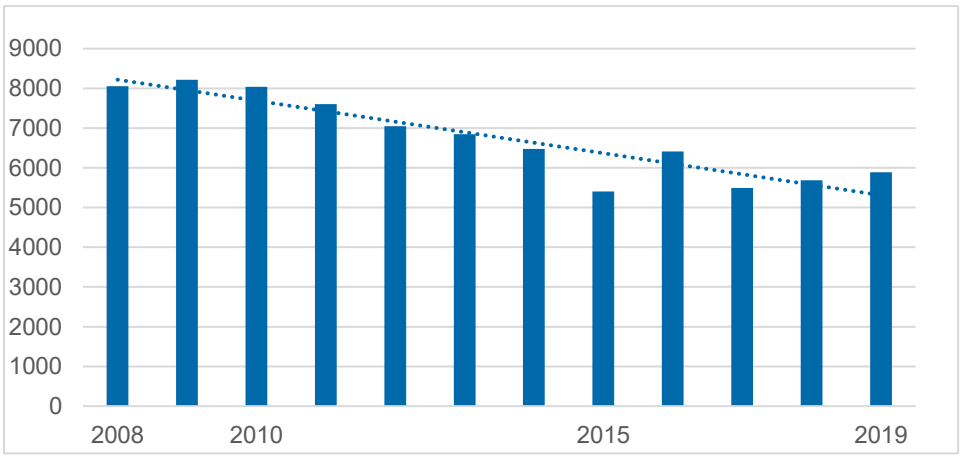


Figure 4-3: Itinerant Piston Aircraft Movements, 2008-18

Itinerant turboprop and rotary traffic varied year by year over the period of analysis, but the traffic was generally stable, except for 2019. In 2019, turboprop traffic declined by almost 50% year over year. One explanation was spring rains and flooding in the Muskoka region. These events impacted travel to the airport and tourism operator activity in the region. A second reason was that Northern Air Solutions was sold to FlyGTA and ceased operations.

Jet traffic is increasing but on a small scale, as shown in Figure 4-4. Jet traffic increased by 16.7% over the time period, but still accounts for less than 1,000 flights per year.

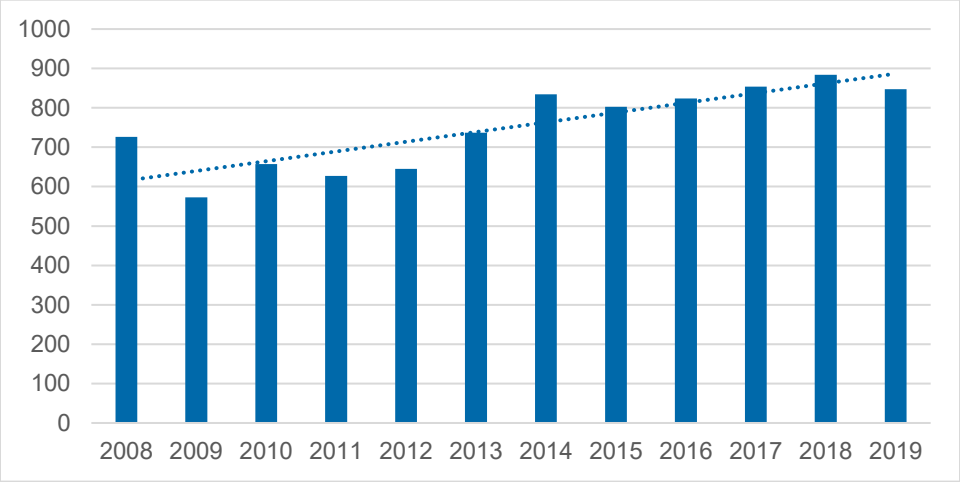


Figure 4-4: Itinerant Jet Operations, 2008-19

4.1.3 Local Traffic

Local traffic are aircraft movements within the region, when the aircraft departs an airport and returns to the same airport. These are often training flights. The scale of these is relatively high at Muskoka for a site without a flight training centre. It is understood that the aircraft movement identified in the NCAMS data show aircraft that originated from other airports as local when these aircraft should have been considered itinerant.

Local flights declined during these years in general, as shown in Figure 4-5, but the trend is dependent on the final year used for analysis. For example, 2016 local movements were much higher than those between 2011-16. A flight training school at the airport would quickly increase these numbers.

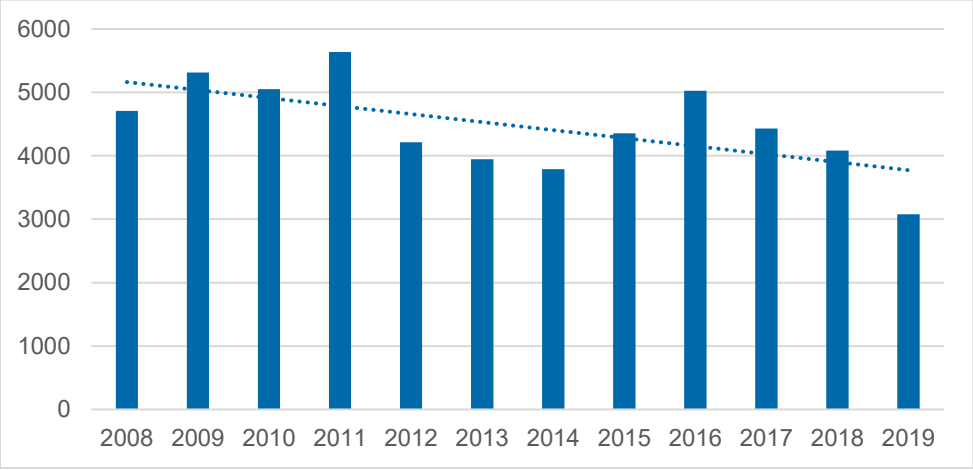


Figure 4-5: Annual Local Traffic, 2008-19

4.1.4 General Aviation Traffic Notes

General Aviation (GA) traffic refers to a broad range of aviation activity including recreational, medical, business, instructional, agricultural, sightseeing, and others. Given the variety and complexity of GA traffic, it is difficult to generalize but a few trends can be noted.

4.1.4.1 Cost of Flight Instruction

Over recent decades, the relative cost of learning to fly has increased. The BC Aviation Council has launched an initiative to include pilot training among courses that can receive student loans and grants. The BCAC estimates that it costs a student today $85,000 to obtain a commercial pilot license. The majority of these costs are for aircraft rental fees and fuel to obtain the hours of flying required. A recreational license is less expensive, but the fees remain high for the average Canadian.

4.1.4.2 Aging Pilots

In Canada, the discussion of aging recreational pilots is largely anecdotal. If you ask how many recreational pilots below 65 are operating aircraft at a Canadian GA airport, people roll their eyes, but can generally count few of them. In 2009, the Aircraft Owners and Pilots Association (AOPA) – the US equivalent of COPA – initiated a study on aging pilots. In its introduction the study notes

> *Like the nation as a whole, the pilot population is growing older. Between 1990 and 2010, the average age of U.S. pilots increased from 40.5 to 44.2. This shift—partly a reflection of broad demographic trends; partly a result of changes in the industry and culture—poses serious challenges for the industry, and raises important questions about the viability of our current flight training model, the perception of general aviation (GA) among non-pilots, and other factors*.[3]

Canada does not have a comparable analysis, but Canada is experiencing the same demographic and cultural shifts. An indicator is that COPA membership is declining. In 2015, COPA had 17,000 members and in 2020 it has 16,000 members.[4] There are a number of indicators that Canadian recreational pilots are ageing and decreasing in number as they stop flying.

4.1.4.3 Cost of Flying

As with aging pilots, there is no Canadian research quantifying the increasing costs of aviation, but there are indicators. The cost of fuel, insurance, maintenance has increased steadily (aside from this year). AOPA has an operating cost calculation on its website. It estimates that flying a Cessna Skyhawk, a 4-seat piston aircraft, would cost $299 per hour (US $225). Annual operating costs would therefore by $29,900 for 100 hours of flying.[5] The minimum capital cost of a Cessna Skyhawk in Canada in 2020, according to examples from controller.com, is a little less than $100,000. The entry point for recreational flying can therefore be estimated at a starting cost of $100,000 plus approximately $30,000 annually. Even before the current crisis, the cost of recreational flying was edging out of reach of many Canadians.

[3] AOPA, “Aging and the General Aviation Pilot, Research and Recommendations
[4] COPA, 2015 Annual General Meeting Slideshow and COPA 2020 website.
[5] https://www.aopa.org/go-fly/aircraft-and-ownership/buying-an-aircraft/tips-on-buying-used-aircraft/hypothetical-operating-cost-calculation

4.1.5 Traffic Projections

The purpose of these projections is to provide a long-term view of traffic activity at the site to guide land use and infrastructure planning. These projections are therefore not appropriate for short-term planning.

4.1.5.1 Assumptions

To develop aircraft movement projections for the airport, the following assumptions have been made:

- The trends of the previous 10 years reflect the key trends for the coming 10 years;
- Traffic at Muskoka recovers in the next three years and follows historic trends post-COVID;
- While the history is short, the future will include passenger aircraft activity;
- Visitor days in the region related to tourism and other activities will continue to grow and support aircraft movements; and
- While a recession or an unpredictable event may occur in the next decade, it would not significantly change activity patterns at the site.

While COVID has had an enormous impact, particularly on passenger air transportation, organizations such as the International Air Transport Association (IATA) are projecting industry recovery within three years. The event is therefore not projected to influence the long-term traffic projections.[6]

4.1.5.2 Base Traffic Projections (Pessimistic)

Assuming current trends continue within three years, overall traffic will decline over the next 10 years. Jet traffic is projected to grow in line with current trends (approximately 2.0% annually). Turboprop traffic is projected to decline based on 10-year averages (3.5% annually). For this projection, rotary traffic is projected to decline as well at approximately 3.5% annually, again in line with 10-year averages. The base projections are shown in Figure 4-6, below. The projections recognize a continued decline in piston aircraft movements.

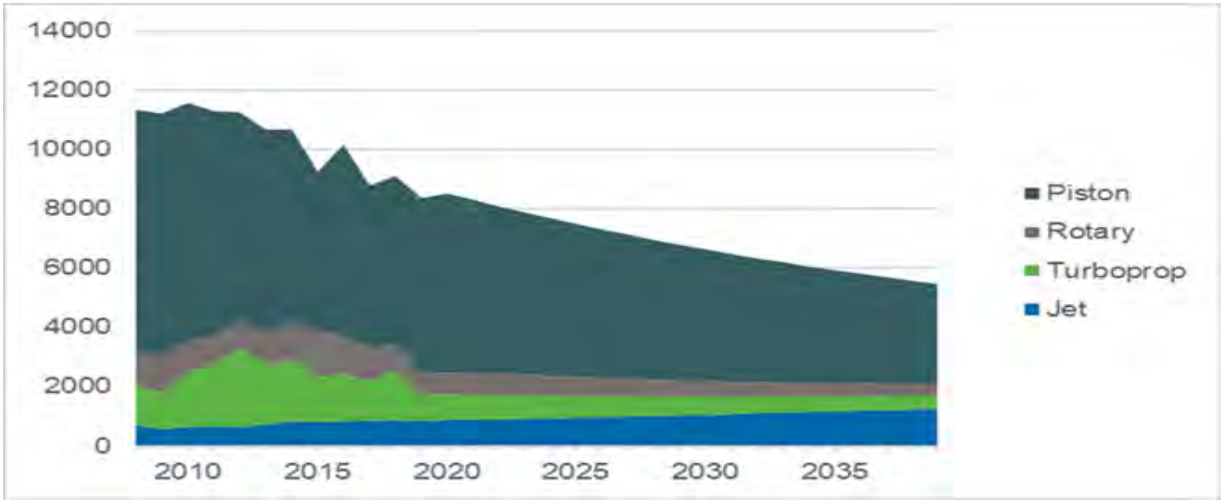


Figure 4-6: Pessimistic Aircraft Operations Projections

[6] https://www.iata.org/en/iata-repository/publications/economic-reports/covid-19-outlook-for-air-travel-in-the-next-5-years/

4.1.5.3 Optimistic Traffic Projections

The optimistic traffic projection showing multi-year growth is shown in Figure 4-7. In this projection, it is assumed that piston traffic has reached bottom, and remains stable over the course of the projection. Jet traffic is projected to grow in line with current trends (approximately 2.0% annually), and turboprop traffic is projected to grow more strongly than in the pessimistic case (2.0% annually). Rotary traffic is projected to remain cyclical but growing at approximately 0.5% annually. With this growth, the airport would see increased traffic from the base year of 2019.

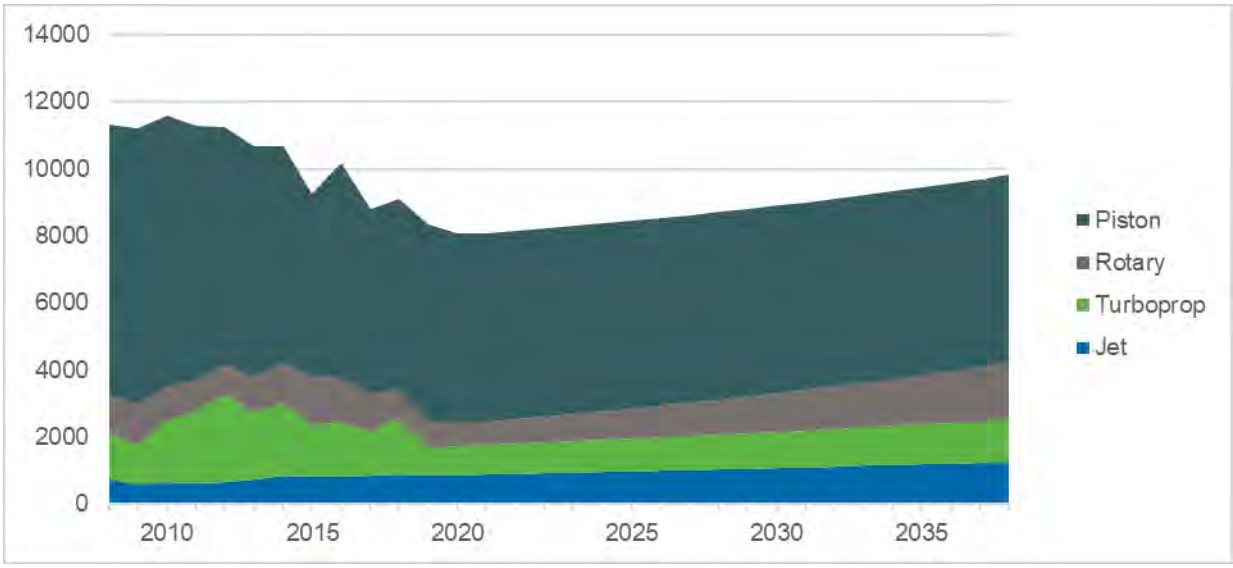


Figure 4-7: Optimistic Aircraft Operations Projections

4.2 Runway Capacity

Runway capacity at the Muskoka Airport is not a concern. Single runway airports can serve as many as 250,000 movements annually. Normally capacity is challenged during peak periods when a significant number of aircraft are landing and departing an airport during a specific period (e.g., a one-hour period). This is not typically a problem at Muskoka Airport.

4.3 Passenger Scenario

Muskoka Airport has experienced scheduled passenger traffic for less than one year at this time. FlyGTA and Porter service began in the spring of 2019. Given the limited length of time passenger services have existed, scenarios can be created for activity at the airport, but projections and forecasts cannot. In 2019, the airport experienced a volume of 2,071 passengers (FlyGTA and Porter Airlines).

While it is reasonable to be optimistic about the services, it is difficult to project this activity into the future; a few years of historical data would be required. However, a five-year scenario based on existing traffic has been prepared to consider what future passenger activity may look like (Table 4-1).

In the scenario, two types of air services are considered using two aircraft types. The service in the first row is seasonal using a 74-seat aircraft. It forecasts 2,664 seats to and from the airport annually. The second air service

is year-round using an eight-seat aircraft, forecasting 2,928 seats to and from the airport annually. Assuming a 70% load factor, these two services would generate 3,915 one-way passengers per year.

Table 4-1: Annual Passenger Scenario in Five Years

Air Service	Aircraft seats	Annual seats	Load factor	Annual passenger estimate
1	74	2,664	70%	1,865
2	8	2,928	70%	2,050
Total		**5,592**		**3,915**

This discussion is important because the trigger to receive Transport Canada's Airports Capital Assistance Program (ACAP) is 1,000 passengers per year. ACAP covers projects to rehabilitate airside facilities or buy equipment for aircraft rescue and firefighting. Airfield projects include runways, taxiways and aprons, lighting and visual aids. As continued air services would result in significant capital funding for the airport, the board may want to take all reasonable steps to encourage air services including even some subsidization of scheduled air service.

5.0 EXISTING AIRFIELD ENGINEERING ASSESSMENTS

Airfield assessments provide valuable information on the condition of various airfield manoeuvring surfaces (e.g., aprons, taxiways, and runways). These assessments allow planners to anticipate capital investments related to airfield rehabilitation, modification or construction over the master plan horizon (e.g., 20 years). Table 5-1 outlines airport information for pilots as identified in the Canada Flight Supplement (CFS).

Table 5-1: Airport Information

Airport Elevation	922 ft.
Operator	District Municipality of Muskoka
Customs	Airport of Entry (AOE) 15. Flights with no more than 15 persons can be cleared with appropriate notice.
Services	Fuel (100 Low Lead, JA-1, SP), Oil On-airport: Telephone (Pilots Lounge in terminal) Within 5 nautical miles: food, taxi, medical facilities, accommodation, car rental
Runway Data	Runway 18-36: 6,000 ft. by 150 ft. asphalt, Threshold of 18 displace 800 ft. Runway 09-27: 2,199 ft. by 100 ft. turf Taxiways A, B, C and D Taxiways A, B and C restricted to wingspan less than 24 m (79 ft.) Apron I – winter maintenance south side only Runway 09-27 – no winter maintenance
Lighting	Medium intensity edge and threshold lighting. Precision Approach Path Indicator (PAPI) on Runway 18
Communications	Flight Service Station Timmins Remote Communications Outlet (RCO), Mandatory Frequency (MF) and VHF Direction Finder (VDF) Automated Weather Observation System (AWOS)
Navigation	Offsite Non-Directional Beacon

5.1 Runways

Throughout the plan there may be a reference to a runway end (e.g., Runway 18). In aviation terminology a single runway (e.g., 18-36) is often referred to by each Runway end (e.g., Runway 18 and Runway 36). This is a standard practice for identifying activities that are specific to that runway end. An aircraft arriving at an airport would state which runway end they are landing on so that other pilots in the vicinity of the airport and airport operators understand the proximity of that airplane to themselves.

5.1.1 Runway 18-36

Runway 18-36 was last rehabilitated in 2015 and the pavements are in very good condition. There is limited longitudinal cracking and no observed transverse cracking. All the cracks are sealed which is a very important ongoing maintenance activity. By preventing water from infiltrating the pavement surface, a pavement lifecycle can be greatly improved.

It is estimated this runway will not require major rehabilitation for at least 15 to 20 years.

5.1.2 Runway 09-27

Runway 09-27 is a turf runway and is in generally poor to fair condition. Although operational year-round, the runway is not maintained in winter and is only available for aircraft equipped with skis. Continued operation of the runway would require grading and reseeding to promote a more even operating surface.

A site visit was conducted by Tulloch Engineering on May 20, 2020[7] (separate from this master plan) to visually inspect the current condition of the landing strip. The turf is inconsistent in coverage, varying from fair to none. Surficial soils were found to be a consistent organic/sand mixture with the presence of stones or rocks, possibly cobbles or boulders, near the surface. Subgrade conditions are unknown and would require further geotechnical investigation.

Transport Canada Advisory Circular (AC) 300-004 provides information and guidance for maintenance and repair of turf landing strips. Using the guidance from the AC, Tulloch concluded that the remedy to remove existing de-compacted oils and rocks/stones, add subgrade materials, place topsoil and grade and seed the strip would be in the $200,000 to $300,000 range.

5.2 Taxiways

5.2.1 Taxiway A

Taxiway A connects Taxiway C to Runway 18-36 approximately 1,300 ft. from the Runway 18 threshold. A portion of Taxiway A was rehabilitated with Runway 18-36 in 2015. The remaining taxiway was rehabilitated in 2010.

The taxiway is exhibiting block cracking and weathering consistent with the pavement age. The taxiway is generally rated in good condition. There was no crack sealing observed and the estimated remaining lifespan is approximately 10 years.

5.2.2 Taxiway B

Taxiway B connects Taxiway C to Runway 18-36 at approximately mid-runway. A portion of Taxiway B was rehabilitated with Runway 18-36 in 2015. The taxiway was constructed in 2005.

[7] Tulloch Engineering, Muskoka Airport – Turf Landing Strip Assessment, May 2020

The taxiway is exhibiting block cracking and weathering consistent with the pavement age. The taxiway is generally rated in fair condition. There were significant drainage issues noted during the winter and spring at the Taxiway B and Taxiway C intersection. Surface modifications will be required. The estimated remaining lifespan is approximately 5 years.

5.2.3 Taxiway C

Taxiway C runs from approximately mid-runway to the Runway 18 threshold. The southern section of the taxiway was constructed with Taxiway B in 2005. The middle section was rehabilitated in 2010. The northern section and Apron II connection was constructed/rehabilitated in 2010. The taxiway is exhibiting block cracking, weathering, raveling and significant edge cracking. Crack sealing efforts are evident and should be continued.

The pavement general condition is rated as fair.

The estimated lifespan is:

- South Section: approximately 5 years
- Middle Section: 8 to 10 years
- North Section: 8 to 10 years

5.2.4 Taxiway D

Taxiway D connects tenant facilities south of the terminal building and Runway 09-27 to Apron I. Taxiway D was constructed in 2005 to serve the Muskoka Aviation Centre. The taxiway was further extended in 2010 to serve the Skyservice hangar. The taxiway is exhibiting longitudinal and transverse cracking, some frost heaving, weathering, and raveling. Crack sealing efforts are evident and should be continued.

The general pavement condition is rated as fair.

There are significant drainage issues at the Muskoka Aviation Centre apron intersection, the fuel tank infield and the CATSA area extending to the terminal at Apron I.

The estimated lifespan is:

- South Section: approximately 5 years
- North Section: approximately 8 years

5.3 Aprons

5.3.1 Apron I

The southern section of Apron I was constructed in 2005 and the northern section in 2010. The apron is exhibiting longitudinal and transverse cracking, block cracking, weathering, and raveling. Crack sealing efforts are evident; however, the overall extent of cracking suggests that continued maintenance may not be cost-effective, and the pavement surface should be rehabilitated.

The general pavement condition is rated as fair to poor.

The estimated lifespan is:

- South Section: approximately 3 years
- North Section: approximately 5 years

5.3.2 Apron II

The western section of Apron II was constructed pre- 2005 and the eastern section abutting Runway 18-36 was rehabilitated with the runway in 2015. Exposed sections of the apron show distresses including longitudinal and transverse cracking, block cracking, weathering, and raveling. Crack sealing efforts are evident; however, the overall extent of cracking suggests that continued maintenance may not be cost-effective, and the pavement surface should be rehabilitated.

The general pavement condition is rated as poor.

The estimated lifespan is:

- West Section: approximately 3 years
- East Section: 15+ years

5.4 Airfield Pavement Summary

Table 5-2 summarizes the airfield pavement assessment conducted on December 11, 2019. A detailed pavement condition report is included in Attachment 2.

Table 5-2: Airfield Engineering Assessment Summary

Pavement Facility	Subsection	General Condition Rating	Last Year of Rehab	Estimated Remaining Pavement Service Life	Est. Year of Rehab.	Comments
Runway 18-36	N/A	Very Good	2015	15 – 20 years	**2035 – 2040**	
Runway 09-27	Grass Strip	Poor to Fair	Unknown	N/A	**Unknown**	The runway is currently in poor to fair condition and will be closed for the next year
Taxi A	N/A	Good	2010	10 years	**2030**	
Taxi B		Fair	2003	5 years	**2025**	Significant drainage issues at Taxi B/C Intersection
Taxi C	Northern Section	Fair	2010	15 to 20 years	**2025 – 2030**	Differing widths (10.5 m)
	Middle Section	Fair	2010	8-10 years	**2028 – 2030**	Differing widths (15 m)
	Southern Section	Poor - Fair	2005	5 years	**2025**	Differing widths (10.5 m)

Pavement Facility	Subsection	General Condition Rating	Last Year of Rehab	Estimated Remaining Pavement Service Life	Est. Year of Rehab.	Comments
Taxi D	Northern Section	Poor – Fair	2005	8-10 years	**2028 – 2030**	Drainage issues Aviation Centre apron intersection, fuel tank infield and CATSA area on Apron I.
	Southern Section	Poor – Fair	2010	5 years	**2025 – 2028**	Some ponding at southwest end
Apron I	Northern Section	Poor - Fair	2010	8 years	**2025 - 2030**	Widespread block cracking
	Southern Section	Poor - Fair	1994 (?)	3 years	**2023**	Widespread block cracking
Apron II	Eastern Section	Very Good	2015	15 – 20 years	**2030 – 2035**	
	Western Section	Poor	1994 (?)	3 years	**2023**	Widespread block cracking

5.5 Airfield Improvements

The following estimates of probable cost are based on the assessments and show where the rehabilitation is scheduled over the next five years (i.e., short term). The remaining mid- and long-term estimates are merely square metre area multiplier takeoffs based on the pricing listed below plus a 35% engineering and contingency.

- Cold milling = $8/m^2
- Asphalt Paving = $20/m^2 (based on asphalt tonnage pricing of $160/T).

Table 5-3: Airfield Infrastructure Rehabilitation

2021 to 2025			
Infrastructure	**Construction Cost**	**Contingency and Engineering Related Costs**	**Total Cost**
Taxi B	$78,000	$12,000	$90,000
Taxi C (Southern Section)	$102,000	$42,000	$144,000
Taxi D	$157,000	$66,000	$223,000
Apron I – South	$357,000	$149,000	$506,000
Apron II West	$82,000	$39,000	$121,000
2026 to 2030			
Infrastructure	**Construction Cost**	**Contingency and Engineering Related Costs**	**Total Cost**
Taxi A	$47,000	$19,000	$66,000
Taxi C (Middle & Northern Sections)	$163,000	$67,000	$230,000
Apron I – North	$357,000	$149,000	$506,000
2030 and Beyond			
Infrastructure	**Construction Cost**	**Contingency and Engineering Related Costs**	**Total Cost**
Runway 18-36	$2,387,000	$996,000	$3,383,000
Apron II East	$87,000	$36,000	$123,000

6.0 GROUNDSIDE ENGINEERING ASSESSMENTS

Groundside assessments were conducted at the airport in December 2019. The complete groundside assessment report is included in Attachment 3. Similar to the airfield assessment, the groundside assessments also provide information needed to develop investment strategies for groundside rehabilitation, modification or new construction during the planning period.

6.1 Gravenhurst Parkway

Gravenhurst Parkway, also known as Muskoka Road 1 (MR1), is the municipal access road to the Airport and is approximately 7.9 km in length between Highway 118 and Muskoka Road 6. The road is owned and maintained by the District of Muskoka. It is approximately 6.5 m wide, with asphalt surface, and an approximate 1 m wide gravel shoulder on both sides of the roadway. The roadway has cracking and various defects such as transverse and edge cracking and ravelling. Localized longitudinal cracking was also observed, along with minor rutting. The transverse cracking may be occurring due to temperature cycles and could also be due to a lack of frost tapers at cross cuts. The longitudinal cracking and rutting could be caused by weak subgrade material resulting in consolidation, or inadequate pavement design for the traffic loads and volumes, or due to heavy equipment being operated on the road.

Overall, Gravenhurst Parkway is in fair condition. In 2013, The District's Roads Needs Study (most recent on public record) indicated that Gravenhurst Parkway from Highway 118 to 1 km north of Road 6 was adequate and in no need of capital repair in a 10-year time period. It was also noted that a 1 km segment north of Road 6 needed repair in 1 to 5 years and this work has presumably been completed.

6.2 Airport Road

Airport Road is the entrance road from Gravenhurst Parkway to the Muskoka Airport Terminal. The road is approximately 6.3 m wide with asphalt surface, and an additional 0.8 m of gravel shoulder on both sides. Defects in the existing Airport Road include: a sharp turn near the entrance that results in vehicles driving on the shoulder and causing damage to the edge of asphalt. Some localized longitudinal cracks and some potholes can be observed throughout Airport Road. No rutting is evident. Airport Road is in fair to good condition.

When the road surface is renewed, the pavement width should be increased to at least 7.0 m wide with a paved shoulder on the inside of curves

6.3 Parking Lots

6.3.1 Long-Term Parking

The long-term parking lot is located at the west side of the area under study. The parking lot has an approximate capacity of 36 vehicles. The surface material is gravel with no evidence of ponding. Overall, the long-term parking lot is in good condition. It should be paved in the future.

6.3.2 Short Term Parking/ Limousine, Bus, and Taxi Parking

The short-term parking lot is located at the southeast corner of the area under study. The parking area has an approximate capacity of 67 vehicles. The north-most 11 parking spaces are restricted to limousines, buses, and taxis only. Assuming buses will occupy 2 stalls each, 2 buses will occupy 4 parking stalls. This results in 7 parking stalls available for taxis and limousines. There is a total of 56 stalls available for short term parking. The surface material is gravel. Ponding water can be observed near the Skyservice building. Overall, the short-term parking lot is in good condition with isolated poor areas. It should be paved in the future after addressing drainage issues near the Skyservice building.

6.3.3 Staff Parking

The staff parking lot is located at the northeast end of the study area, approximately 125.0 m along Airport Road from the intersection at Gravenhurst Parkway. The surface material is 50 mm of hot mix asphalt with minimal ponding, providing 5 parking spaces for staff. Overall, the staff parking lot is in good condition.

6.3.4 Handicap Spaces/ Lot

The 3 handicap parking spaces are located close to the terminal entrance. The hot mix asphalt material is in good condition.

6.3.5 Skyservice Driveway and Parking

The Skyservice Parking Lot is located at the southwest of the study area. Although the maintenance and rehabilitation of this parking lot is the responsibility of the tenant, the parking lot is contiguous to the airport parking

lots and, therefore, many of the pavement problems (e.g., poor stormwater drainage and ponding) affect both tenant and airport parking areas.

The allotted parking along the north-facing wall of the Skyservice building is a 50 mm hot mix asphalt surface in good condition. As the parking lot extends away from the building the hot mix asphalt changes to a gravel surface. Poor grading from the short-term parking lot across the Skyservice driveway has resulted in ponding water and unsafe ice build up. Overall, the Skyservice Parking Lot is in poor condition due to grading and drainage issues.

6.4 Street and Parking Lot Lighting

There is a single light pole at the handicap parking near the terminal building. The staff parking lot also has a single light pole to illuminate the staff lot. Skyservice has lighting fastened to the north side of the building which illuminates the parking spaces in front of the building. The remainder of Gravenhurst Parkway, Airport Road, or any other parking lot does not have lighting installed and the installation of roadway lighting is not required.

6.5 Drainage

6.5.1 Skyservice

Due to the flat topography of the area on the west side of the Skyservice building, stormwater drainage deficiencies can be observed throughout. Ice build up in the early winter is evident. This is caused by the lack of runoff conveyance available either through surface runoff or infiltration. During the winter season the snow depth has increased, and the snow sliding off the metal roof builds up at each door along the west exterior wall, resulting in those exit doors not being functional in the winter. This snow accumulation also poses a risk of flooding the building during the spring melt. Water accumulates along the west exterior wall from the adjacent hill and 5 m wide service roadway to the west. The most obvious flow path away from this west exterior wall is north toward the Skyservice Parking Lot; however, poor grading has trapped the water. The east side of the Skyservice building also has a significant amount of snow accumulation from the roof.

6.5.2 Short Term Parking/ Skyservice Driveway

Ponding was noted at the short-term parking lot and continues across the Skyservice driveway. Frozen ponded water in the swale was observed at the north end of the Skyservice Parking Lot. There is a gravel swale that conveys flow to a 3.75 m wide (top) ditch to direct flow northwest toward the woodlot. Overall, the Skyservice Lot and short-term parking lot are slightly sloped. Drainage improvements through grading and/or storm sewers should be undertaken.

6.5.3 Other Areas

The remainder of the study area consists of the Airport Terminal and lawn, long term parking, Airport Road, and the staff parking lot. All the drainage is generally sloped to the west and conveyed via ditching and culverts to the main Gravenhurst Parkway ditch and eventually to the low-lying woodlot. The long-term parking lot is graded well to allow runoff to the west, toward a 2 m wide (top) swale at the southwest corner of the lot and a shallow 1.75 m wide (top) swale at the northwest corner of the lot. Both swales direct flow to a 1.75 m wide (top) ditch just inside the woodlot edge which conveys the runoff north to the Gravenhurst Parkway south roadside ditch, approximately 58 m west of the Airport Road and Gravenhurst Parkway intersection.

The runoff from the Terminal, lawn (west and north of the Terminal building) and Staff Parking is conveyed to a 500 mm corrugated steel pipe (CSP) located approximately 140 m from the intersection with Gravenhurst Parkway.

The 500 mm diameter CSP is in fair condition and currently has standing water within the pipe. The CSP outlets to a 5.25 m wide (top) ditch that directs runoff north to the south roadside ditch of Gravenhurst Parkway. This 5.25 m wide (top) ditch also collects runoff from the surrounding lawn on either side of it. The lawn just east of the Airport Terminal is showing evidence of ponding.

Also contributing runoff to the Gravenhurst Parkway south roadside ditch is a 400 mm diameter CSP culvert. The CSP is in good condition and acts as a cross culvert beneath Airport Road at the intersection of Airport Road and Gravenhurst Parkway. This culvert conveys flow from runoff collected in the south/east side of the Gravenhurst Parkway roadside ditch. At the culvert, flow is conveyed east to west.

6.6 Servicing

6.6.1 Water

The existing water servicing for the Air Terminal Building (ATB) is provided via a drilled well located at the lawn north of the ATB and east of the staff parking lot on the apron side of the fence barrier.

It is unknown how water is supplied to all buildings aside from the ATB. It is known that there is no municipal water system to the Airport, so it is assumed that all water at the site is provided via wells.

6.6.2 Water - Future

There are numerous options available for long-term potable water supply for the Airport:

- Continue to develop based on individual well systems as the need arises.
- Communal well water system(s) to service more than one building or user.
- Connect all the airport to the Bracebridge (or Gravenhurst) municipal water system.
- A combination of wells for some areas and connection of new facilities in the south to the existing Gravenhurst water system on Beaver Creek Drive.

The Airport is in Gravenhurst and is also near Bracebridge. Both Gravenhurst and Bracebridge have municipal water systems that are owned and operated by the District of Muskoka. District of Muskoka staff indicated that if the entire Airport was connected to a municipal system it would be preferable to connect to the Bracebridge water system for operational reasons and closer distance to an adequate supply source for the entire development. The cost of a watermain connection would be a multi-million-dollar project and would be cost prohibitive.

District of Muskoka staff indicated that there may be operational improvements to the Beaver Creek reservoir and pumping stations in the future. There may be an opportunity to accommodate servicing of a portion of the Airport from the Beaver Creek system. Although the costs of the upgrades to the reservoir and pumping station are unknown, the approximate cost of a watermain extension to the potential southern development areas is estimated below. It could be beneficial to connect larger buildings, with fire protection systems and more staff, to the municipal system.

Communal well water systems are feasible from an engineering and construction viewpoint; however, operational ownership issues create challenges that make communal systems undesirable.

It is most likely that Airport expansion, or most of it, can continue to be accommodated by individual wells. Individual wells can be constructed as they are needed and typically most airport uses are not high water demands.

6.6.3 Wastewater

The sanitary servicing for the ATB is via a septic system which is pumped to a septic tile bed bordering the north and east edge of the Handicap Parking and Airport Road, respectively. Wastewater is pumped from the septic tanks to the tile bed via a Liberty sewage pump system. The system was recently constructed as part of the Terminal Building construction.

It is unknown how wastewater is treated and disposed at all buildings aside from the ATB. It is known that there is no municipal wastewater system to the Airport, so it is assumed that all wastewater at the site is treated and disposed in small private systems such as septic systems.

6.6.4 Wastewater – Future

Similar to the municipal water system, there are numerous options available to provide wastewater treatment and disposal. The options range from connection to the municipal system to private systems (e.g., septic systems). Options that could be considered include:

- Continue to develop based on individual wastewater treatment and disposal systems as the need arises.
- Communal wastewater system(s) to service more than one building or user.
- Connect all the airport to the Gravenhurst municipal wastewater system through a gravity wastewater collection system at the Airport discharging to the existing pumping station on Beaver Creek Drive which pumps through a forcemain to the Gravenhurst system.
- Connect all the airport to the Gravenhurst municipal wastewater system through a gravity collection system at the Airport plus pumping station(s) and a forcemain to the Gravenhurst system for the exclusive use of the Airport.
- A combination of individual wastewater treatment and disposal systems and connection of new facilities in the South to the existing pumping station on Beaver Creek Drive.

Both Gravenhurst and Bracebridge have municipal wastewater systems that are owned and operated by the District of Muskoka. District of Muskoka staff indicated that if the Airport were connected to a municipal system it would be preferable to connect to the Gravenhurst system for operational reasons and closer distance to an adequate discharge point.

District of Muskoka staff indicated that there may be capacity in the existing pumping station on Beaver Creek Drive and forcemain to Gravenhurst, but it is unknown how much capacity is available. The existing pumping station and forcemain was built for the exclusive use of the penitentiaries and they would have to agree to allow connection. Even if the Beaver Creek Drive pumping station and forcemain had adequate capacity for the entire Airport, the cost to install a collection system within the Airport would be a multi-million-dollar project and would be cost prohibitive.

If the existing Beaver Creek Drive system could not be used, or it was too costly to upgrade, a totally new system could be built exclusively for the Airport. The cost of a new wastewater collection system at the Airport plus pumping station and forcemain to Gravenhurst built exclusively for the Airport would be a multi-million-dollar project and would be cost prohibitive.

There may be an opportunity to accommodate servicing of a portion of the Airport in close proximity to Beaver Creek Drive. If there was adequate capacity, or the cost to add capacity was moderate, and the penitentiaries agreed, it

could be beneficial to connect buildings in the potential southern development areas to the existing Beaver Creek Drive system. The approximate cost of a gravity sanitary sewer from the potential southern development areas is estimated below.

Communal wastewater treatment and disposal systems are feasible from an engineering and construction viewpoint; however, operational ownership issues create challenges that make communal systems undesirable.

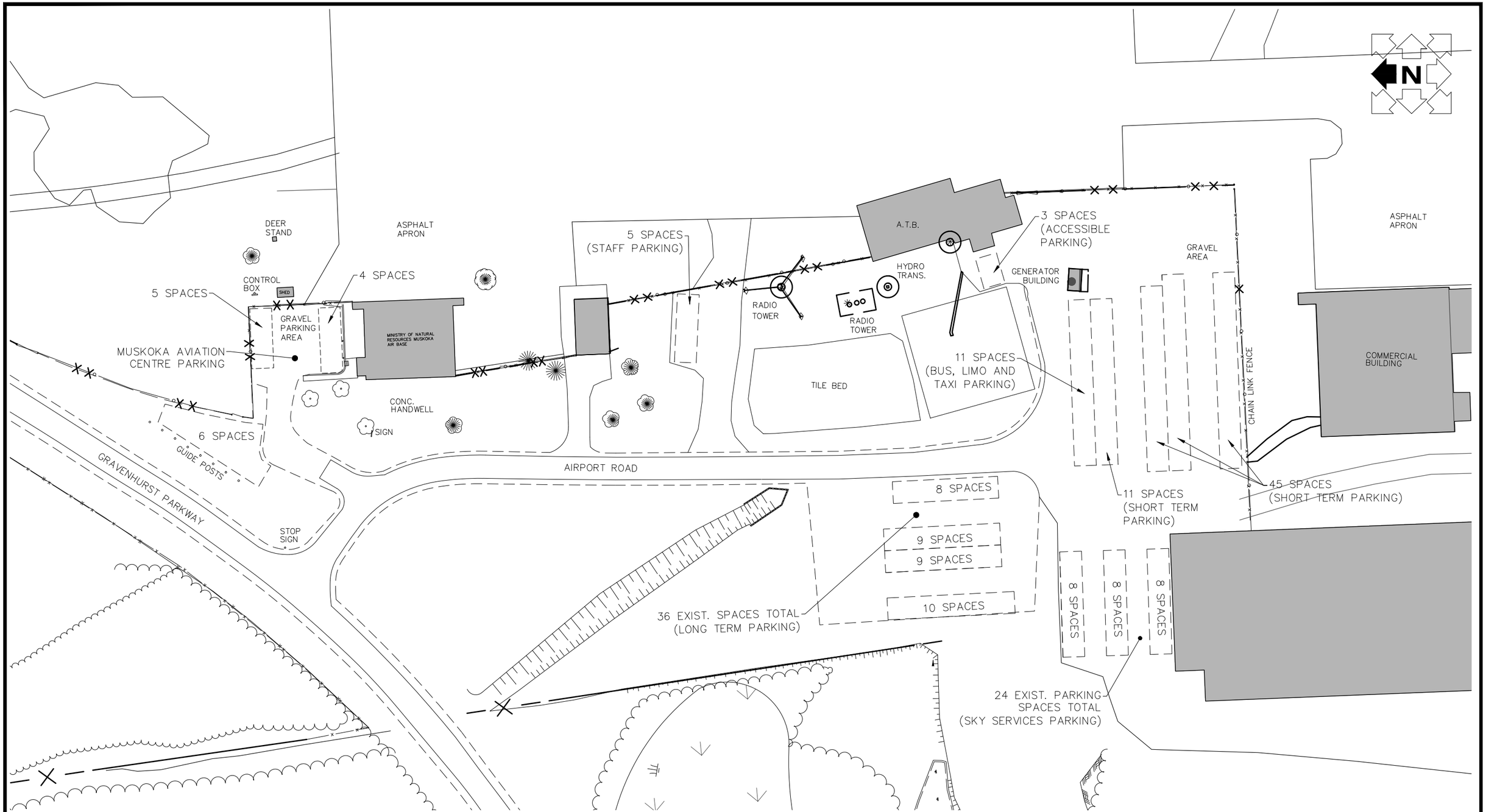
It is most likely that the Airport expansion, or the majority of it, can continue to be accommodated by individual wastewater treatment and disposal systems. Individual systems can be constructed as they are needed and typically most airport uses do not generate high wastewater loads.

6.7 Groundside Infrastructure Cost Summary

Cells coloured orange denote those costs which would be borne by either a tenant or the District under other funding mechanisms other than the airport budgetary system.

Table 6-1: Groundside Infrastructure

2021 to 2025			
Infrastructure	**Construction Cost**	**Contingency and Engineering Related Costs**	**Total Cost**
Existing Gravel to Paved Parking (& Lawn to Paved)	$196,000	$30,000	$226,000
Drainage Improvements	$127,000	$51,000	$178,000
2026 to 2030			
Infrastructure	**Construction Cost**	**Contingency and Engineering Related Costs**	**Total Cost**
Gravenhurst Parkway (District of Muskoka)	$3,137,000	$471,000	$3,608,000
Airport Road	$121,000	$18,000	$139,000
Watermain to Southwest Quadrant from Beaver Creek	$270,000	$108,000	$378,000
Watermain to Southeast Quadrant from Beaver Creek	$375,000	$150,000	$525,000
Sewer from Southwest Quadrant to Beaver Creek Pumping Station	$303,000	$121,000	$424,000
Sewer from Southeast Quadrant to Beaver Creek Pumping Station	$435,000	$174,000	$609,000



No.	DATE	BY	ISSUES / REVISIONS

TULLOCH ENGINEERING

DRAWING: EXISTING PARKING PLAN

PROJECT: MUSKOKA AIRPORT
BRACEBRIDGE, ONTARIO

DRAWN BY:	CHECKED BY:	PROJECT No. :
D.R.	C.S.	19-1920
DESIGNED BY:	APPROVED BY:	DRAWING No. / REVISION No.
C.S.	C.S.	6-1 / 0
SCALE:	DATE:	
1:1000	JUNE 9, 2020	

C:\Users\josh.schlithelm\Desktop\AIRP03465-01 MUSKOKA MASTER PLAN\AIRP03465-01-6-1 (TULLOCH).dwg

6.8 Air Navigation

The airport has a RNAV (GNSS) and Non-directional Beacon (NDB) approach procedure for Runway 18 and an RNAV (GNSS) approach for Runway 36. Area navigation (RNAV) is a method of instrument flight rules (IFR) navigation that allows an aircraft to choose any course within a network of navigation beacons, rather than navigate directly to and from the beacons. This can conserve flight distance, reduce congestion, and allow flights into airports without beacons. Area navigation used to be called "random navigation", hence the acronym RNAV. GNSS (Global Navigation Satellite System) is a satellite system that is used to pinpoint the geographic location of a user's receiver anywhere in the world.

To obtain improved landing minima the airport will be considering a Localizer Performance with Vertical Guidance (LPV) procedure. The LPV is the highest precision GPS (WAAS enabled) aviation instrument approach procedures currently available without specialized aircrew training requirements, such as required navigation performance (RNP). Landing minima are like a Cat I instrument landing system (ILS) (e.g., a decision height of 200 ft. (61 m) and visibility of 800 m). Lateral guidance is equivalent to a localizer and uses a ground-independent electronic glide path. The Decision Altitude (DA) can be as low as 200 ft.

The airport navigational aids include:

- Airport Beacon (AB) located west of the Gravenhurst Parkway, near the Ministry of Natural Resources facility;
- Windsocks (e.g., wind direction indicators) at each end of the main runway;
- Automated Weather Observing System (AWOS) which provides continuous real-time weather information to pilots;
- Remote Communications Outlet (RCO) and Mandatory Frequency (MF) radio communications; and
- Nav Canada owned and operated VHF Direction Finder (VDF) located east of Runway 18-36. The equipment uses radio frequencies to triangulate an aircraft position and the equipment is therefore sensitive to metallic surfaces (e.g., a 45 m radius protection area clear of objects and a 90 m radius clear of trees, fences, and vehicles).
- Precision Approach Path Indicator (PAPI) – the PAPI is located near the threshold of Runway 18.

Table 6-2: Navigational Aids Replacement Costs

2025 to 2030			
	Construction Cost	**Contingency and Engineering Related Costs**	**Total Cost**
PAPI Replacement Runway 18	$75,000	-	$75,000
New PAPI Runway 36	$75,000	-	$75,000

6.9 Fuel Farm

The Muskoka Airport operates the World Fuel Services (WFS) aviation fuel dealership. The fuel farm is located on the south side of the main apron and is equipped with two 50,000 L fuel tanks (Aviation Gasoline 100 Low Lead (LL) and Jet A1 Fuel). A mobile refueling truck provides fuel to aircraft positioned on the main apron.

Figure 6-1 shows fuel amounts for the period 2012 to 2019. As indicated, fuel sales in 2019 (732,813 L) were lower than previous years. This is consistent with the reduction in aircraft movements during the same period.

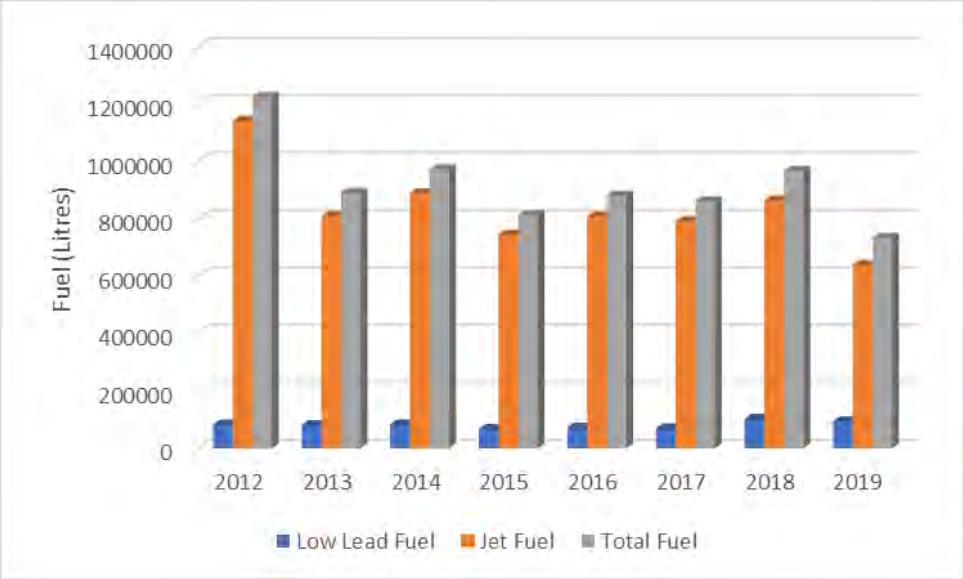


Figure 6-1: Fuel Sales (in Litres)

The fuel farm is meeting the airport needs into the future and it is essential that the airport continue to meet the federal regulation for storage tanks[8].

6.10 Aircraft Rescue and Fire Fighting (ARFF)

The Muskoka Airport is not a designated airport and the airport is therefore not required to have onsite ARFF personnel. Airports that are designated in Canada (i.e., requiring onsite ARFF personnel) are those airports that have more than 180,000 annual enplaning and deplaning passengers.

The airport does, however, have an up-to-date Emergency Response Plan (ERP) that provides guidance to airport personnel in the event of an emergency. Transport Canada Canadian Aviation Regulations Part III, Subpart 2 – Airports, Division II – Airport Emergency Planning stipulate the regulatory requirements associated with emergency planning at airports. The regulation requires certified airports to prepare plans that can guide response efforts in the event of an emergency until the appropriate agencies respond.

[8] Environment and Climate Protection Canada, Canadian Environmental Protection Act, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations, SOR/2008-97.

The plan includes ongoing training exercises. Full Scale Exercises are programmed every four years and tabletop exercises every year with the exception of a year where a full-scale training exercise is programmed. The Plan also identifies staff responsibilities and actions in an emergency situation.

When an emergency occurs (e.g., a fire or fuel spill), airport staff immediately call 911 and initiate control activities until the Gravenhurst Fire Department (GFD) arrives on site (usually around 15-minute response time). The GFD is a professional fire service that includes a Fire Chief, five full-time and more than 50 volunteer fire fighters. There are three fire stations in and around Gravenhurst.

The fire department's two main focus areas are:





Once the 911 call is initiated, other responding organizations can respond to the incident site: the Ontario Provincial Police (OPP) stationed in Bracebridge (e.g., criminal activity of site control) and the District Municipality of Muskoka Paramedic Services (e.g., medical assistance).

Additionally, organizations like the Transportation Safety Board would be notified in certain emergencies (e.g., an aircraft crash).

Based on expected commercial development and even with projected scheduled air service there would not likely be a change in the requirement for emergency response and rescue services.

7.0 AIRPORT BUILDINGS

7.1 The Existing Terminal

The Air Terminal Building (ATB) (Drawing 7-1), is relatively new (June 2007) and is largely wood beam construction with wood siding. The terminal is approximately 5,000 ft.^{2} in size and is comprised of offices, a boardroom, pilots lounge, general waiting area, operations desk, the Little Norway Memorial, and associated mechanical rooms and washrooms.

At present the ATB meets airport needs. As experienced during the summer of 2019, scheduled air service (Porter) showed passenger movements could not be contained within the ATB. A separate CATSA trailer and hold room tent structure was constructed to fulfill security requirements for scheduled flights.

In assessing passenger terminal operating constraints and future expansion, it is important to keep in mind the fine balance between the level of service (LOS) expected by the traveling public and the goals of the airlines for efficient operations at a minimum cost.

LOS is a term that is freely used by most terminal planners and airport operators but is not always fully understood. Adding to this confusion are terms like “world class”, which are even less defined.

LOS, in the context of terminal planning, is a generic term that describes, either qualitatively or quantitatively, the service provided to airport travellers at various points within the passenger terminal building. It often relates to the degree of congestion or crowding experienced by travellers at the passenger and baggage processing facilities in the terminal building. It may also be a measure of the amount of waiting or processing time, or length of the queues or lines encountered by such travellers.

In terms of LOS, a passenger terminal is considered a series of processors, reservoirs or holding areas, and links or corridors. The concept of LOS, as applied to airport terminal design, was originally developed by Transport Canada in the mid to late 1970s. Since then, the Transport Canada concept was adopted by the Airport Authorities Coordinating Council (AACC), now Airports Council International (ACI) and the International Air Transport Association (IATA).

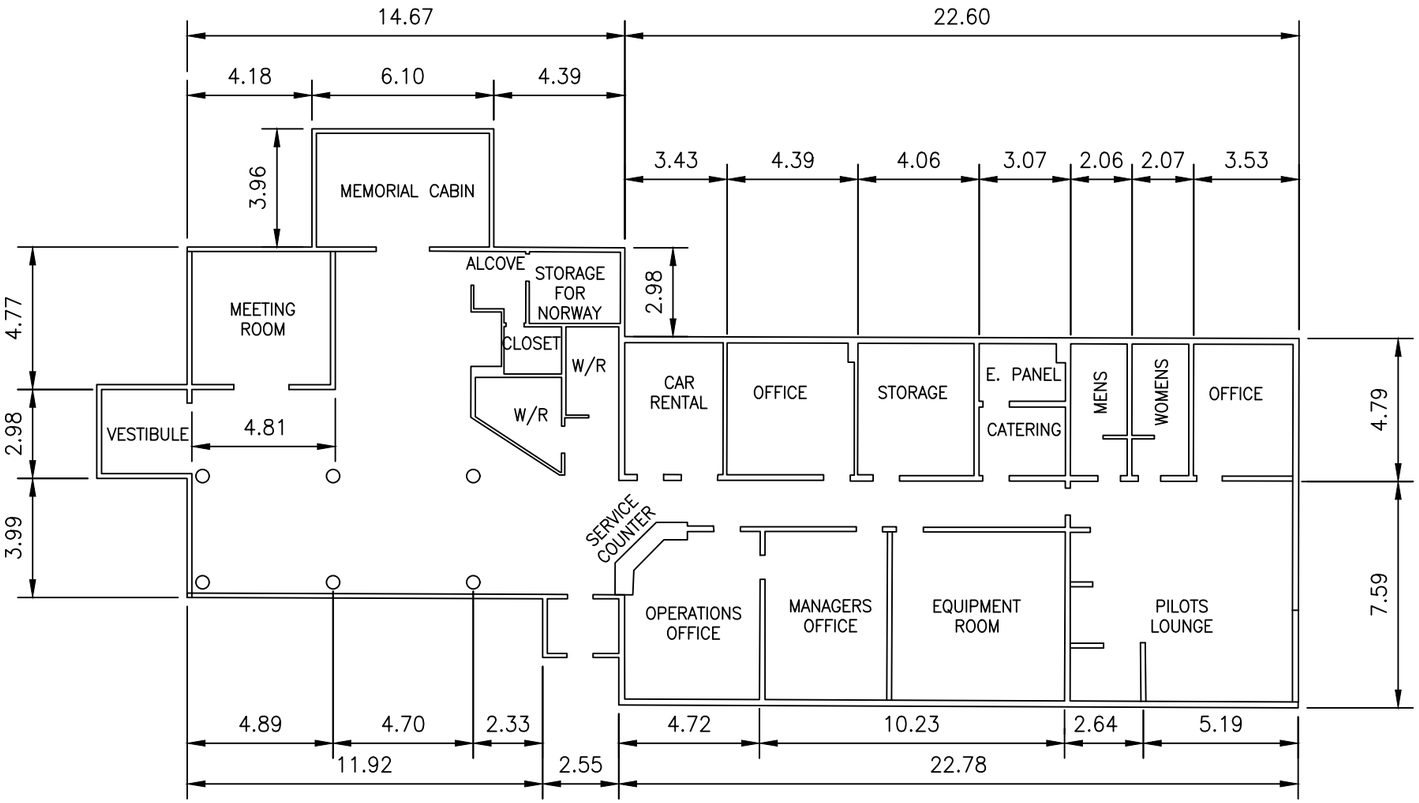
The Airport Cooperative Research Program (ACRP) conducted a study entitled: Report 55 - Passenger Level Service and Spatial Planning for Airport Terminals in 2011. The important conclusion is that passengers want easy access to information about flight status, signage clarity and amenities that allow them to use their time productively or to relax and enjoy an escape from the demands of travel and that larger space by itself does not always generate increased passenger perception of a high-quality level of service. While the clear objective of the study was to produce a new space planning guideline, the analysis showed that the IATA LOS C standards, which have been used for terminal planning for the last 35 years, are still valid and the observations included in Report 55 support the validity of continuing to use this LOS.

Using the Level of Service (LOS) guidelines identified in Table 7-1, the ATB would have a LOS of A or B during normal operations; however, during the short periods (e.g., a few hours) when scheduled service activities are in progress (e.g., ticketing, CATSA screening, hold room seating), the ATB would likely fall to a LOS D given passengers are required to exit the terminal (in all weather) to access the CATSA and Hold Room Tent.

Long-term planning, however, suggests that if a stable, scheduled air service were to continue indefinitely, the airport may be required to expand the ATB so that passenger services can be accommodated within a single building. If air service continues to be seasonal, the existing ATB and support facilities may be adequate.

Table 7-1: Level of Service Definitions

Level of Service	Definition
A	An excellent level of service. Conditions of free flow, no delays and excellent levels of comfort
B	High level of service. Conditions of stable flow, very few delays and high levels of comfort
C	Good level of service. Conditions of stable flow, acceptable delays and good levels of comfort
D	Adequate level of service. Conditions of unstable flow, acceptable delays for short periods of time; adequate levels of comfort
E	Inadequate level of service. Conditions of unstable flow, unacceptable delays; inadequate levels of comfort.
F	Unacceptable level of service. Conditions of crossflows, system breakdowns and unacceptable delays; an unacceptable level of comfort



LEGEND:

——— EXISTING WALLS

0 5 10

SCALE: 1:200

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MUSKOKA AIRPORT MASTER PLAN

MUSKOKA AIRPORT YQA, MUSKOKA ONTARIO

EXISTING TERMINAL LAYOUT

PROJ : TRN,AIRP03465-01		CONTR :		DATE : 2020/06/12	**7-1**
DFTG : J.S.	DSGN: J.S.	CHK : C.N.	APPD : C.N.		

PLOT DATE: 2020/08/11 AT 14:32:56 PLOTTED BY: SCHITTHELM, JOSH
CADD FILE: C:\USERS\JOSH.SCHITTHELM\DESKTOP\AIRP03465-01 MUSKOKA MASTER PLAN\AIRP03465-01-7-1.DWG [ANSI B]

7.2 Future Terminal

The first step in our assessment was to determine the level of service (LOS) expectations for each system: access control, check-in capacity (number of check-in counters, area for queuing and ATMs), security check capacity, departure terminal capacity, concessions, gate capacity, baggage systems and claim areas, and Canadian Border Services areas.

Space should be planned to achieve acceptable wait times and the LOS C guideline for the design year. Specifically, facilities should be designed with a space planning factor greater than LOS C (e.g., LOS B) but grow into LOS B as demand increases and the facility nears the passenger loads expected for the design year. It is with these principles in mind that airport passenger terminal planning recommendations have been developed.

Table 7-2 summarizes airline requirements for "world class" passenger terminals. These have been used to assess the levels of service in terms of queue times and space allocations.

Table 7-2: IATA Planning Standards

Terminal Process	IATA Planning Standard Typical Busy Day	Recommended Practices Applicable to the GSA
Check-in Hall	**Business Class** – Maximum queuing time of 3-5 minutes. **Economy Class** – Maximum queuing time of 15-20 minutes. **Tourist (Charter/No frills) Class** – Maximum queuing time of 25-30 minutes. **Seating** for 5% of passengers.	CUTE (common use terminal equipment) where a clear financial rationale for its implementation is apparent. Special counters for handling oversized baggage. Space for "e" self-check-in kiosks include baggage acceptance
Security	Maximum queuing time of 3 – 5 minutes. **Space** - 1.0 m^2 per passenger. Space for passengers waiting up to 10 minutes.	
Hold Room	**Space** – 1.2 m^2 per passenger standing and 1.7m^2 per passenger seated. **Seating** – 70% of passengers should have seating.	
Baggage Claim Hall	**Space** – 1.7 m^2 per passenger, (excluding baggage claim unit)	
Meeter Greeter Hall	**Space** – 1.7 m^2 per passenger and greeter. 20% of space for seating.	
Airline Offices	10 m^2 per staff member Rule of thumb - # of check-in counters x 100 m^2	Sufficient space to lease to airlines and alliances. Located landside reasonably close to check-in.

To accommodate all of the terminal facilities within a single building, it would be necessary to expand the existing ATB by approximately 230% in size (e.g., from 5,000 ft^2 to 11,400 ft^2). The illustration (Drawing 7-2), shows the building being expanded 3,200 ft^2 to the south and 2,400 ft^2 to the north. As shown, the expanded areas allow for the inclusion of a hold room and CATSA and passenger processing areas.

Unless scheduled service were to increase significantly, it is unlikely that an ATB expansion would be required until late 2035 to 2040.

Drawing 7-2: Future Terminal Layout Plan

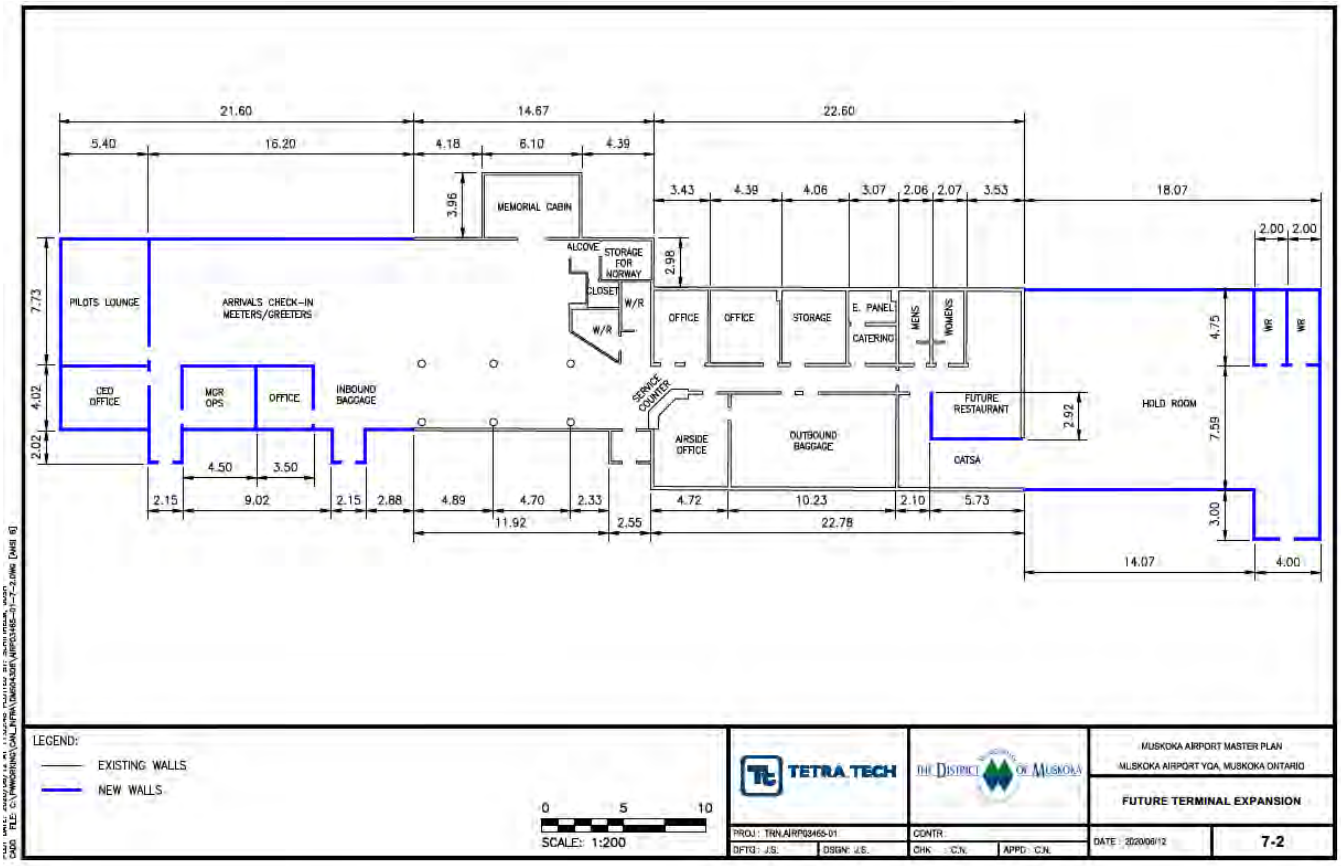


Table 7-3: Terminal Costs Present and Future

2026 to 2030			
	Construction Cost	**Contingency and Engineering Related Costs**	**Total Cost**
ATB HVAC Upgrades	$25,000	-	$25,000
Terminal Building Expansion (2035 to 2040)	Lump Sum for Illustration Purposes		$2,500,000

7.2.1 Field Electric Centre (FEC)

The Field Electric Centre (FEC) is located south and west of the ATB. The FEC provides electrical service to the ATB, airfield lighting and navigation systems. The system includes 4 kW and 7 kW regulators for field lighting. A standby generator provides power in the event of a main line power outage. There are no known issues with the FEC and minor issues will be managed as part of the ongoing maintenance program.

7.2.2 Maintenance Garage



The maintenance garage, originally constructed in 1952 and renovated in 1974, is a one-story, wood truss metal building approximately 10,000 ft^2 in size. The building has six vehicle bays, an office, and a washroom. A general condition rating shows the building to be in poor to fair condition.

Although the building is functional, previous assessments have suggested construction of a new maintenance garage. The electrical systems in the existing garage do not meet code and there is evidence of “dry rot” in some of the wood trusses.

The HVAC system is programmed for replacement in 2020.

In the future it may be necessary to construct a new combined services building (CSB). It may be prudent to relocate the CSB to the south of the airport, along Beaver Creek Road. This would allow for the development of two additional infill lots along the hangar line in place of the existing garage. It is expected the new CSB would be roughly the same size as the existing building (e.g., 4 to 6 bays, offices, washrooms, and mechanical rooms).

The new CSB could connect to the main airfield areas along taxiways constructed as part of the future Southwest Quadrant Development Area. Given the significant costs for a new CSB, it is unlikely that a new CSB would be programmed into this plan horizon; however, the costs identified in Table 7-4 illustrate the scale of cost for a new CSB.

Table 7-4: Maintenance Garage Related Costs

2021 to 2025			
	Construction Cost	**Contingency and Engineering Related Costs**	**Total Cost**
Existing Garage			
Existing Maintenance Garage Life-cycle modifications and building renovations	$450,000	-	$450,000
Future Construction (2040 Timeline)			
New CSB, including support buildings	Lump Sum for Illustration Purposes		$3,500,000
Note: The estimated cost for the garage modifications was taken from the airport 2019 capital budget. The cost for a new COB is based on $350/ft^2, using rough estimates from buildings recently constructed at other airports			

7.2.2.1 Storage Building

The storage building was constructed in 1982 and is a wood frame structure with metal siding. Previous assessments concluded the building is in good condition but may not meet current structural codes. The building will be maintained as required (ongoing maintenance).

7.2.3 Airport House

The wood frame house was constructed in the early 1950s and is in generally poor condition. With renovation the house could be used for different purposes (e.g., a training centre or leased to a non-aviation related commercial business).

Alternatively, the building could be demolished and the lands used for other purposes (e.g., storage compound, greenhouse leased to local residents) or the building could be offered for sale to anyone wishing to relocate the building off airport property or salvage any specific components of the building.

Table 7-5: Airport Manager House Renovation Cost

	2021 to 2025		
	Construction Cost	Contingency and Engineering Related Costs	Total Cost
Airport House Renovations	$200,000	-	$200,000
Airport House Demolish	$20,000	-	$20,000

8.0 INFRASTRUCTURE SUMMARY

The previous sections described overall infrastructure and systems conditions at the airport. Infrastructure rehabilitation, modification, or new construction is identified in the following sections.

8.1.1 Short-Term Capital Needs (2021 to 2025)

Airfield

- Taxi B /C intersection improvements
- Taxi C – south section rehabilitation
- Taxi D – south section rehabilitation
- Apron I – south section rehabilitation
- Apron II – west section rehabilitation

Groundside

- Long-term parking lot
- Existing parking upgrades
- Drainage improvements near terminal area south to existing Runway 09-27

Buildings

- Maintenance garage HVAC improvements
- Airport manager house renovation or demolition

8.1.2 Medium-Term Capital Needs (2026 to 2030)

Airfield

- Taxi A rehabilitation

- Taxi C – middle and north section rehabilitation
- Apron I – north section rehabilitation

Groundside

- Airport Road rehabilitation
- Connection to municipal water system (possible)
- Connection to municipal wastewater system (possible)
- Gravenhurst parkway rehabilitation (District costs)

Navigational Aids

- PAPI replacement Runway 18
- PAPI installation Runway 36

8.1.3 Long-Term Capital Needs (2030 Onward)

Airfield

- Taxi A rehabilitation
- Taxi D – north section rehabilitation
- Apron II – east section rehabilitation
- Runway 18-36 rehabilitation

Groundside

- Gravenhurst Parkway rehabilitation

Buildings

- ATB Expansion
- New Combined Services Building

Table 8-1: Infrastructure Summary Costs

Infrastructure	Construction Cost	Contingency and Engineering Related Costs	Total Cost
2021 to 2025			
Taxi B	$78,000	$12,000	$90,000
Taxi C (Southern Section)	$102,000	$42,000	$144,000
Taxi D	$157,000	$66,000	$223,000
Apron I – South	$357,000	$149,000	$506,000
Apron II West	$82,000	$39,000	$121,000
Existing Gravel to Paved Parking (& Lawn to Paved)	$196,000	$30,000	$226,000
Drainage Improvements	$127,000	$51,000	$178,000
HVAC Upgrades	$25,000	-	$25,000
Existing Maintenance Garage Life-cycle modifications and building renovations	$450,000	-	$450,000
Airport House Demolish	$20,000	-	$20,000
Total Costs	**$1,594,000**	**$389,000**	**$1,983,000**
Possible Funding	**$776,000**	**$308,000**	**$1,084,000**
Airport Costs	**$818,000**	**$81,000**	**$899,000**
2026 to 2030			
Taxi A	$47,000	$19,000	$66,000
Taxi C (Middle & Northern Sections)	$163,000	$67,000	$230,000
Apron I – North	$357,000	$149,000	$506,000
Airport Road	$121,000	$18,000	$139,000
PAPI Replacement Runway 18	$75,000	-	$75,000
New PAPI Runway 36	$75,000	-	$75,000
ATB HVAC Upgrades	$25,000	-	$25,000
Total Costs	**$863,000**	**$253,000**	**$1,116,000**
Possible Funding	**$567,000**	**$235,000**	**$802,000**
Airport Costs	**$296,000**	**$18,000**	**$314,000**
2030 and Beyond			
Runway 18-36	$2,387,000	$996,000	$3,383,000
Apron II East	$87,000	$36,000	$123,000
Total Costs	**$2,474,000**	**$1,032,000**	**$3,506,000**
Possible Funding	**$2,474,000**	**$1,032,000**	**$3,506,000**
Airport Costs	**$0**	**$0**	**$0**

9.0 AIRPORT AND MUNICIPAL ZONING

9.1 Airport Zoning/Airspace Protection

9.1.1 Airport Zoning Regulation

Airport zoning regulations (AZRs) restrict the heights of buildings, structures, and objects (including natural growth, such as trees) on regulated land. AZRs are enacted in order to:

- protect aircraft from hazards (e.g., bird strikes and electronic signal interference);
- protect existing airport operations (e.g., airspace management and emergency response), and
- ensure that future development near an airport stays compatible with the safe operation of aircraft and of the airport itself.

Lands within the airport boundary are under the control of the airport operator and do not require AZR. Since Transport Canada certification requirements normally extend beyond airport boundaries, the AZR applies to surrounding off-airport lands.

The Muskoka Airport Zoning Regulation (SOR/84-567) generally protects aircraft operations by limiting the height of buildings, structures, or objects in approach surfaces extending approximately 3 km from each end of Runway 18-36 (1:50 slope) and 2.5 km from each end of Runway 09-27 (1:40 slope).

9.2 Municipal Zoning

The Town of Gravenhurst Official Plan (OP), Schedule A, Land Use, shows the airport to be designated as “Airport Industrial Use” (Figure 9-1).

Under this designation developments at the airport can include:

- Medium and light industrial;
- Service commercial uses;
- Small scale commercial (e.g., restaurants, motels, automotive fuel sales, and convenience retail) uses adjacent to airport lands.

The OP states that development will include private water and septic services. Commercial development using more than 10,000 litres of water per day or that require a high level of servicing should occur only in areas with municipal water and sanitary sewer facilities.

Minimum lot area, frontage, setbacks and maximum lot coverage are established in the Zoning Bylaw (2010-04).

Table 9-1 shows typical guidelines for General Industrial Zone (M-3).

Table 9-1: Typical Lot Areas and Setbacks in Industrial Areas

Minimum Lot Area	600 square metres for lots served by public water and sanitary sewers, or 0.4 hectare for lots served by public water only
Minimum Lot Frontage	30 metres for lots served by public water and sanitary sewers, or 40 metres for lots served by public water only
Minimum Front Yard and Minimum Side Yard Abutting a Street	12 metres
Minimum Side Yard	6 metres
Minimum Rear Yard	10 metres
Maximum Lot Coverage of Principal Building and Accessory Buildings	65 percent
Maximum Height of Principal Buildings	12 metres

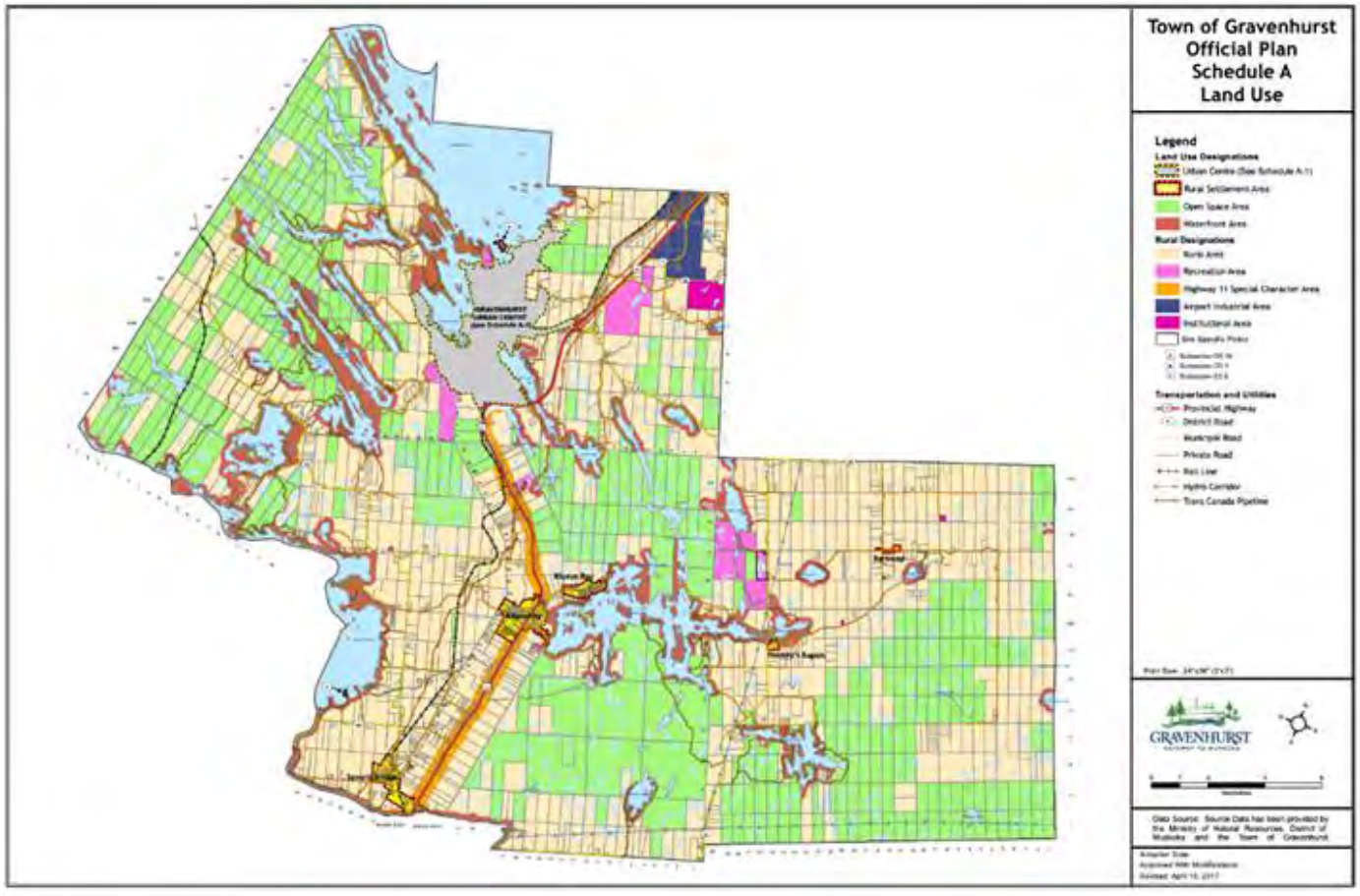


Figure 9-1: Town of Gravenhurst Official Plan

9.3 Environmental Protection

A Natural Heritage opportunities and constraints assessment was included in the Muskoka Airport Master Plan and Land Use Plan to assist the airport with facilitating long-term development. A detailed report is included in Attachment 4 and includes the results of a Natural Heritage records review, constraints mapping and mitigation strategies for the entire property. This opportunities and constraints assessment is intended to inform future airport expansion and operation by identifying areas with relatively high and relatively low environmental sensitivity/constraints as well as to identify knowledge gaps, the potential for future environmental study requirements, mitigations/avoidances, permitting and work timing strategies that can reasonably be expected in association with future development.

In the absence of final development plans, mitigation and avoidance strategies provided are generalized best-practices applicable and appropriate to most foreseeable undertakings in the Master Plan. The assessments of impact and the mitigation/avoidance strategies are provided for information purposes only and should be re-evaluated once the exact nature and extent of development on site is known.

Developments proposed in this master plan show three areas with potential environmental constraint: The Southwest Quadrant Development Area, the Southeast Quadrant Development Area, and the West Quadrant Development Area.

It is expected the environmental constraints will be minor and specific issues can be addressed during the final design and construction phases.

9.4 Noise Exposure Forecasts

The NEF is the official metric in Canada for the assessment of aircraft related noise and is referenced by both federal and provincial governments. Appropriate land uses are defined in Transport Canada's Land Use in the Vicinity of Airports guideline which fundamentally limit residential development in areas greater than 30 NEF.

Although there are several models used to calculate noise exposure worldwide, Canada's model is the NEFCAL program. The NEF is based on a sophisticated noise metric, the Effective Perceived Noise Level (EPNL), expressed in the unit (EPNLdB). The metric was developed specifically for use in the measurement of aircraft noise. Transport Canada document TP1247 Part IV, Aircraft Noise, is based on NEF contours calculations produced using the NEFCAL models. Municipalities use the NEFCAL program and the Ontario Ministry of Environment has adopted this NEF metric.

In an urbanized area, ambient noise levels are generally higher than those experienced in a rural environment, and as such, rural residents may have higher expectations in terms in terms of quiet and reduced noise levels. Although the NEF/NEP contours are excellent representations of a cumulative noise effect, these contours do not necessarily reflect the impact of a single event noise levels. For example, a jet aircraft flying over a residence at midnight may be more disruptive than several other aircraft continuously flying over an area during the daytime. Table 9-2 illustrates community responses within specific noise exposure areas.

Table 9-2: Community Response Prediction

Response Area	Response Prediction
1 (over 40 NEF)	Repeated and vigorous individual complaints are likely. Concerned group and legal action might be expected.
2 (35 - 40 NEF)	Individual complaints may be vigorous. Possible group action and appeals to authorities.
3 (30 - 35 NEF)	Sporadic to repeated individual complaints. Group action is possible.
4 (below 30 NEF)	Sporadic complaints may occur. Noise may interfere occasionally with certain activities of the resident.
Note: The above community response predictions are generalizations based upon experience resulting from the evolutionary development of various noise exposure units used by other countries. For specific locations, the above response areas may vary somewhat in accordance with existing ambient or background noise levels and prevailing social, economic and political conditions.	

9.4.1 Provincial Policy Statement

The Provincial Policy Statement (PPS) provides policy direction on matters of interest related to land use planning and development. Airports shall be protected from incompatible land uses and development by:

a. Prohibiting new residential development and other sensitive land uses in areas near airports above 30 NEF/NEP;

b. Considering redevelopment of existing residential uses and other sensitive land uses or infilling of residential and other sensitive land uses in areas above 30 NEF/NEP only if it has been demonstrated that there will be no negative impacts on the long-term function of the airport; and

c. Discouraging land uses which may cause a potential aviation safety hazard.

9.5 NEF Contour Discussion

The relatively low aircraft movements taken from the busiest day movements in August 2019 and projected using our forecasts shows the overall aircraft movements will not change significantly. Based on our experience it is likely the impacts from aircraft noise on adjacent communities will be minimal. It is expected the 30 NEF contour will not extend significantly beyond the airport boundaries.

Table 9-3: Airport Planning Day

	Existing Planning Day	Future Planning Day
Piston	102	113
Turbo Prop	8	12
Jet	13	21
Helicopter	4	4
	127	**150**

9.6 Land Use Plan

The Land Use Plan (LUP) provides a framework that the airport can use to guide highest and best use development of airport lands over the long-term (e.g., 20 years). The LUP:

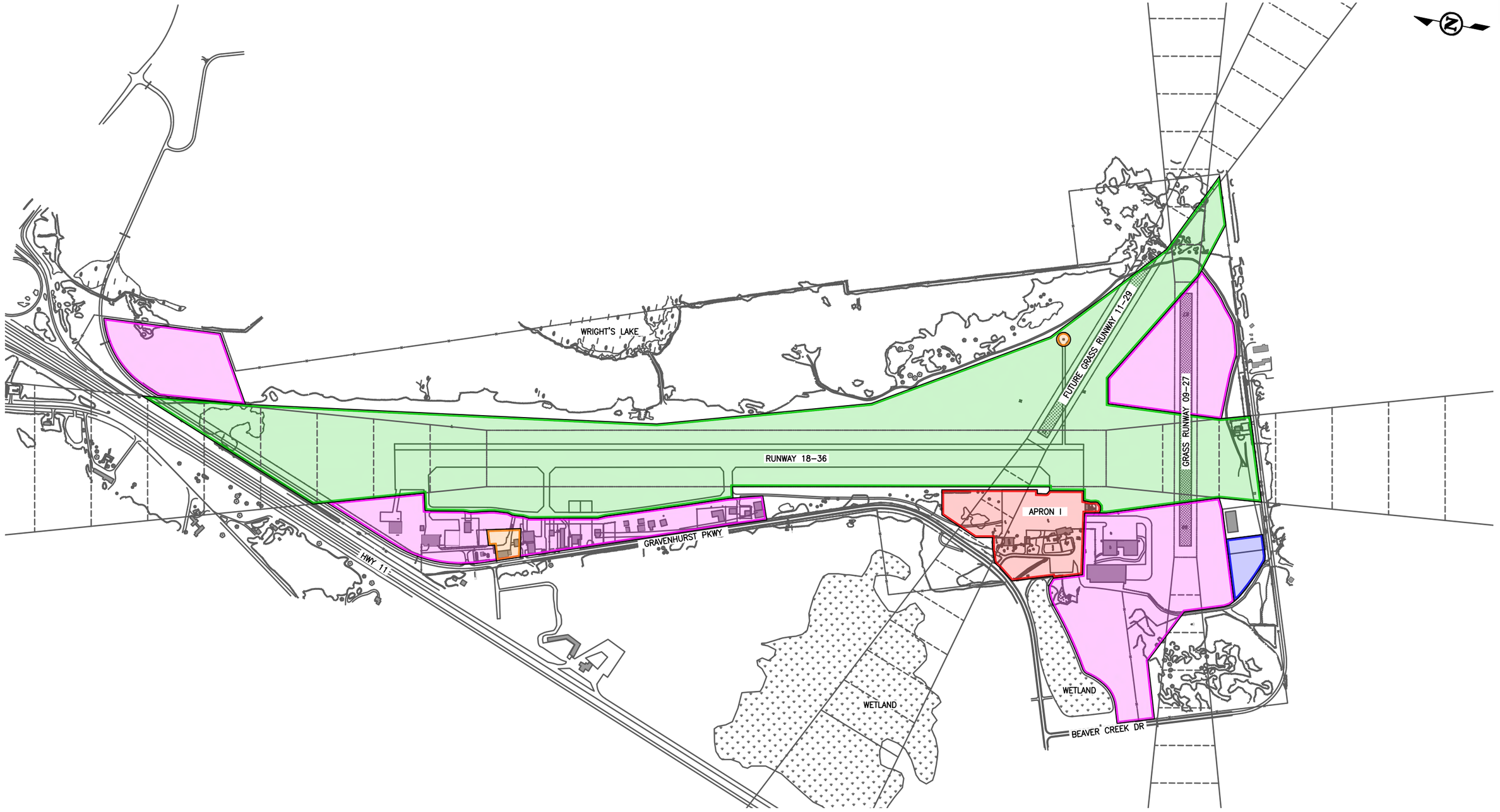
- Identifies land use requirements for each airport subsystem in the plan. Common designations include airside commercial, airport operations, air terminal reserve, runway and taxiway system, airport reserve, groundside commercial, and aviation support.
- Assigns areas on the airport for use by specific facilities, based on priority. The priority approach requires a listing of airport facilities in order of priority.
- Ensures future developments proposed in the LUP will not conflict with safe airport operations. All work undertaken at the airport will be in conformance with Transport Canada Aerodrome Standards and Recommended Practices (TP 312 5th Edition). Transport Canada's "Land Use in the Vicinity of Airports (TP1247)" is a reference when considering appropriate land uses near airports. Electronic zoning requirements are also considered.
- Reserves land for future expansion or redevelopment (e.g., operational facilities). Lands are identified to ensure those needs are met in consideration of safe and efficient airport activities.
- Provide land for access to development areas.

Land use classifications define airport land use. Characteristics such as surrounding topography, proximity to airport services, and adjacent properties determine the most efficient use for each parcel of land. Land reserves include key aviation services, passenger, and administrative needs. Auxiliary lands are those lands not reserved for key aviation services, or lands that could serve an alternate and temporary purpose until required within the 20-year plan. Suitable guidelines for development are integral to the plan.

The following represent airport activity by type:

- Airport Reserve: lands designated for airfield infrastructure including runways, taxiways, aprons, navigational aids.
- Airside Commercial Reserve: commercial development where airfield access is required (e.g., hangars, maintenance repair overhaul facilities, fixed base operators, T-hangars).
- Groundside Commercial Reserve: commercial development not requiring airfield access (e.g., aviation support, transportation facilities, storage units).
- Terminal Reserve: terminal building needs, parking, aprons.
- Operational Reserve: maintenance garage and support buildings, cold storage areas, etc.

Drawing 9-1 shows the overall land use for the airport. Each of the specific development areas are detailed in the next section of the plan. All developments will meet the Town of Gravenhurst Official Plan approved land uses.



LEGEND:

- AIRSIDE COMMERCIAL RESERVE
- AIRFIELD RESERVE
- GROUNDSIDE COMMERCIAL
- TERMINAL RESERVE
- OPERATIONS RESERVES

0 200 500

SCALE: 1:10,000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MUSKOKA AIRPORT MASTER PLAN

MUSKOKA AIRPORT YQA, MUSKOKA ONTARIO

LAND USE PLAN

PROJ : TRN.AIRP03465-01		CONTR :		DATE : 2020/08/10	**9-1**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

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10.0 AIRPORT IMPROVEMENT AND DEVELOPMENT STRATEGY

The Airport Improvement and Development Strategy is structured to respond to demands during the master planning period (20 years). It is difficult to look beyond a 5 to 10-year time frame given external forces can significantly affect the demand for new developments. As an example, the 2020 COVID pandemic has resulted in dramatic shifts in the overall aviation industry and at this time it is difficult to envision what the industry may look like a year from now. The development strategy therefore focuses on potential development over the next 10 years.

All of the proposed development timelines are subject to demand and as such, specific identified timelines can change rapidly depending on either a lack of demand or alternatively a more significant demand requirement.

The Capital Plan (Section 12.0) provides a guide for capital investment over the 20-year period.

The development timelines are: Short Term (2021 – 2025)

- Medium Term (2026 - 2030)
- Long Term (2030 and Beyond).

10.1 Land Development Concepts

The Muskoka Airport lands are largely developed, and the availability of new commercial development lands are extremely limited (e.g., 3 to 5 available lots). The airport is situated such that future commercial development is seriously constrained by topography. Airport-owned lands to the east and west of the existing developed areas are constrained by rock outcrops, forested lands, and wetland areas. Although these areas may be developed, the costs for development render most options fiscally impractical.

The development strategies identified in this plan therefore focus on the most cost-effective development options that will allow the airport to respond to commercial business interests while at the same time respecting existing user needs.

Development concepts are based on lot configurations that can easily be combined or divided to suit developer requirements. The phased development strategy is such that when 70% of the number of lots in a particular phase are occupied, the airport would begin development on the next phase. At present, the airport has approximately 3 to 5 infill lots ready for development. The phasing for development of the next major development area (Southwest Quadrant) will depend on the speed at which theses infill lots are leased, or, alternatively, interest from a large MRO may speed up the need to develop the area.

General assumptions used in the development plans include:

- Highest and Best Land Use.
- The timing of development will be entirely dependent on demand.
- The airport will be responsible to provide access, airfield connections (e.g., taxiways) and power to the development areas.
- Access roads, airside common use aprons, and taxiways will be asphalt surface.
- Road width will be 6 m to 8 m depending on location.
- Taxiways will be AGN II (10.5 m) and AGN III (15 m) in width as noted on drawings.

- Lots are developed to grade level. Overall site development is the developer responsibility.
- Each lot will require individual septic fields or holding tanks and the developer will also provide potable water. The installation of water wells will be at the discretion of the developer.
- Power will be provided to the lot lines.
- Buildings will be designed to meet future airport development guidelines (e.g., preferably brightly coloured roofs for pilot visibility). The airport will prepare "Development Guidelines" for the airport to establish criteria that developers must follow when designing their building and site.
- Large buildings (e.g., greater than 5 m in height) should include wind turbulence studies as part of the building design so that the orientation of the building and lot selection can be optimized to prevent inadvertent impacts to aircraft landing and taking off (reference Section 10.2).
- The development areas are conceptual in nature and developers will be required to complete geotechnical and drainage studies as part of the design process.

10.2 Building Alignment

In 2015, Transport Canada enacted the Aerodrome Standards and Recommended Practices (5th Edition). One of the key changes in the new standard was the recognition of aircraft performance characteristics within the airfield operational environment. One change in the new standard that impacts the location of buildings, is the transitional surfaces which in the previous version, TP312 4th edition, required a 1:7 transitional slope; that is, for every 1 m vertical there would be a 7 m horizontal (e.g., a 15 m high building would have been required to be located a minimum 105 m from the edge of the runway strip. Under the new standard the transitional slope is 1:4, therefore theoretically a 15 m high building would only need to be located 60 m from the edge of the runway strip.

One consideration when locating new buildings relates to safety associated with wind turbulence around buildings that are located adjacent to runways. The principle is that a runway crosswind of high enough velocity encountering an obstacle (e.g., a building) can create low level wind shear (both vertical and horizontal), create building generated turbulence and wind vortices (vortices are caused when air flow begins to spin after strong winds encounter an obstacle), that result in wind gusts that can be problematic to pilots during critical phases of departures and landings. The effect of the turbulence is dependent on wind speed, upstream turbulence, orientation of the wind to the obstacle, size of the obstacle and location of the obstacle to the safety-critical zones (e.g., touchdown zone). Figure 10 is an example of wind flows around a building[9]. Because aircraft are flying at relatively low speeds during these phases of operations, and the fact the aircraft are relatively close to the ground, can result in pilots, in severe situations, having difficulty maintaining flight control.

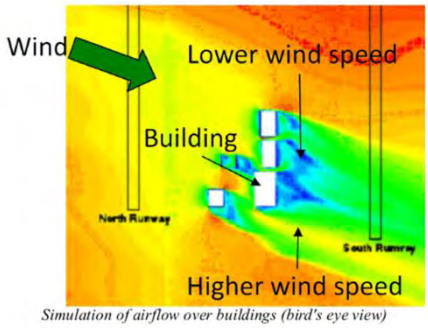

Figure 10: Illustration of Typical Airflow Around Buildings

[9] Hong Kong Observatory, Low Level Wind Effect at Airports – Information for Pilots and Planners of New Buildings

To offset the potential for adverse wind related turbulence, building related best practices include[10]:

- Length of the building should be greater than width in alignment with the wind;
- Avoid 45-degree orientation of buildings to nearby runways, particularly near touchdown zones;
- Situate the building at a 1:35 slope from runway centreline. The physical restrictions (e.g., topography) on development at Muskoka Airport would largely eliminate cost effective development at the airport if a 1:35 slope was required. Existing buildings located near the Runway 18-36 thresholds are located approximately at a 1:20 slope. As such, each building will be located and oriented to best meet the requirement (e.g., for buildings less than 10 m in height, a minimum 1:20 slope. Buildings that will be higher than 10 m will require a wind turbulence study based on the building proximity to the runway threshold and approach surfaces).

10.3 Short-term Airfield Improvement

10.3.1 Apron I Expansion – North

One of the challenges the airport experiences in the summer months is the lack of aircraft parking spaces. The expansion of the main apron to the north will allow parking for an additional 10 aircraft (minimum). The apron will be asphalt and constructed to the same standard as Apron I.

Table 10-1: Apron Expansion North Benefits and Challenges

Benefits	Challenges
Additional aircraft parking.	Proper clearance around the MNR, particularly in the event of a forest fire season and expanded operations at the airport.
The topography is relatively flat.	Provide adequate clearance from Runway 18-36 transitional slopes
Logical expansion direction in that an expansion to the south is more limited by Runway 18-36 transitional zoning and clearance requirements from Taxiway D.	Relatively high costs for expanded apron.

Table 10-2: Apron Expansion North Development Area Attributes

Land Tenure Policy	Parking Fees
Total Development Area	17,667 m^2
Expanded Apron Size	17,667 m^2
Height Limitations	Aircraft tail heights must not penetrate transitional surfaces
Airside Access	Extension to Apron 1
Landside Access	Connection from main gate at terminal building
Services Required	Apron lighting

[10] Guideline B: Managing the Risk of Building Generated Windshear and Turbulence at Airports, Background and Guidance Material for Planners, Airport Operators and Wind Specialists to Manage the Risk of Building Generated Wind Shear and Turbulence at Airports

Table 10-3: Apron Expansion North Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
2021 to 2025			
Apron 1 Expansion	$1,717,000	$687,000	$2,404,000

10.3.2 Apron I Expansion South

One of the challenges the airport experiences in the summer months is the lack of parking for aircraft. The expansion of the main apron to the south will allow aircraft parking spots for a minimum 9 smaller type aircraft. This apron will be used as a tie-down area and will have a gravel surface. It is expected aircraft will be towed into and out of this parking area.

Table 10-4: Apron I Expansion South Benefits and Challenges

Benefits	Challenges
Additional small aircraft parking/tie-down.	Logical expansion direction however the area is more limited by Runway 18-36 transitional zoning and clearance requirements from Taxiway D.
The topography is relatively flat.	Provide adequate clearance from Runway 18-36 transitional slopes
To reduce costs the surface would be gravel	

Table 10-5: Apron I Expansion South Development Area Attributes

Land Tenure Policy	Parking Fees
Total Development Area	5,032 m^2
Expanded Apron Size	5,032 m^2
Height Limitations	Aircraft tail heights must not penetrate transitional surfaces
Airside Access	Southerly extension to Apron 1
Landside Access	Connection from main gate at terminal building
Services Required	Tie-down

Table 10-6: Apron I Expansion South Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
2021 to 2025			
Apron I south expansion	$197,000	$79,000	$276,000

RUNWAY 18–36

36

160m

5.0m

GRASS RUNWAY 09–27

09

APRON EXPANSION

97m

127m

APRON I

GRAVEL TIE DOWN AREA

A.T.B

71m

GRAVENHURST PKWY

5.0m

10.0m

15.0m

20.0m

25.0m

30.0m

45.0m

40.0m

35.0m

30.0m

25.0m

20.0m

15.0m

10.0m

5.0m

5.0m

PROPOSED APRON SPECIFICATIONS TABLE		
TYPE	LOT AREA (m²)	LOT DIMS (m)
NORTH APRON	17667	160X127
SOUTH APRON	5032	117X43

LEGEND:

PROPOSED APRON & AGN II APRON TAXILANE

KING AIR 350

CESSNA 206

CITATION CJ2+

NOTE:
AGN II TAXIWAY–10.5m WIDE
ACCESS ROAD–15.0m ROW, 8m ROAD WIDTH

0 50 100

SCALE: 1:2000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MUSKOKA AIRPORT MASTER PLAN

MUSKOKA AIRPORT YQA, MUSKOKA ONTARIO

APRON I EXPANSION

PROJ : TRN.AIRP03465-01		CONTR :	
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :

DATE : 2020/06/26

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10.3.3 Infill Lot Development

At present there are 3 lots (lots 6,12 and 18) that are available for development. Lot 18 could potentially be divided into two development lots.

Table 10-7: Infill Lot Development Benefits and Challenges

Benefits	Challenges
Easy access from Gravenhurst Parkway.	
The area is well-developed (e.g. power) and access.	
The topography is relatively flat.	
Relatively easy connection to existing taxiway.	
The land would be suitable for smaller hangar type development.	
Lots are development ready.	

Table 10-8: Infill Lot Development Area Attributes

Land Tenure Policy	Lease only
Total Development Area	NA
Typical Lot Size	Lot 6: 42 m x 71 m Lot 12: 31 m x 53 m Lot 18: 50m x 100 m
Typical Lot Area	Lot 6: 0.30 ha Lot 12: 0.16 ha Lot 18:0.5 ha
Height Limitations	20 m
Airside Access	Connection to Taxiway C
Landside Access	Connection to Gravenhurst Parkway
Services Available	Developer to provide septic services and water well

Table 10-9: Infill Lot Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
2021 to 2025			
Infill lot development costs	$125,000	_	$125,000

DIVERGENCE 10%

10.0m

5.0m

DIVERGENCE 10%

RUNWAY 18–36

TAXIWAY A

TAXIWAY B

TAXIWAY C

5.0m

10.0m

15.0m

20.0m

25.0m

30.0m

35.0m

40.0m

45.0m

6

12

18

GRAVENHURST PKWY

HWY 11

INFILL LOT SPECIFICATIONS TABLE		
LOT #	LOT AREA (m^2)	LOT DIMS (m)
6	2950	(73–69)x42
12	1600	53x31
18	5000	100x50

LEGEND:

INFILL LOT (LOT SIZES AND DIMENSIONS ARE APPROXIMATE)

0 100 150

SCALE: 1:3000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MUSKOKA AIRPORT MASTER PLAN

MUSKOKA AIRPORT YQA, MUSKOKA ONTARIO

INFILL LOT DEVELOPMENT

PROJ : TRN.AIRP03465-01		CONTR :		DATE : 2020/06/12	**10-2**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

PLOT DATE: 2020/08/11 AT 14:32:35 PLOTTED BY: SCHITTHELM, JOSH
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10.4 Short-term Groundside Improvements

10.4.1 Airport Terminal Parking

Table 10-10 provides a summary of the existing and future parking stalls. Future parking requirements were provided by Tetra Tech. Currently the largest estimated parking stall quantity upgrade required is the Skyservice Parking Lot, which will require 106 additional stalls.

The short-term parking lot is estimated to have minimal change from existing conditions. The short-term parking lot has the capacity to re-designate 13 of the existing parking stalls to parking lots that require additional spaces in the future.

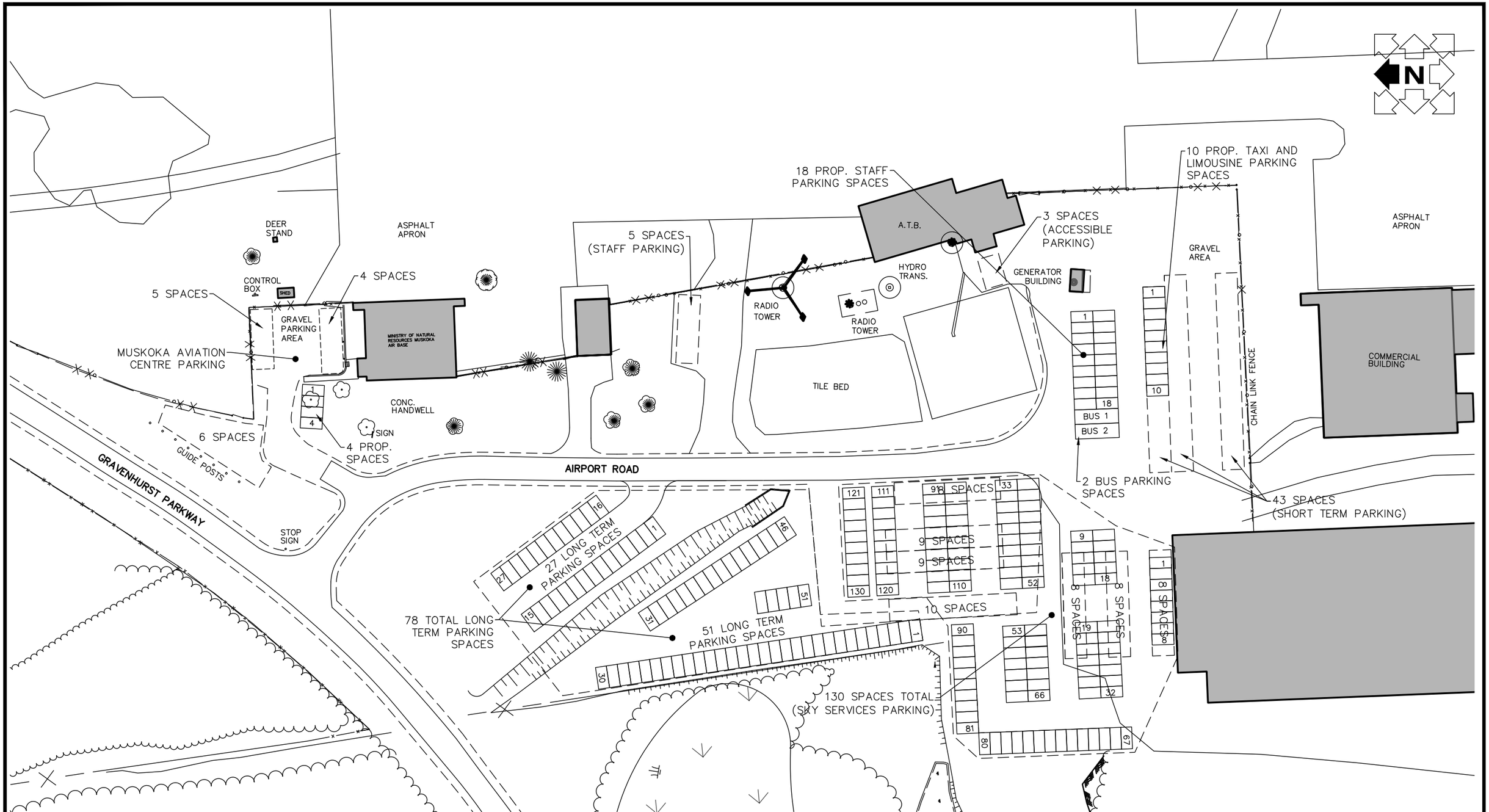
The long-term parking lot will require 42 additional stalls and the staff parking lot will require 13 additional stalls. The existing 11 limousine and taxi parking stalls satisfy the future requirements; however, 2 additional bus parking stalls are required for the future demands. The Muskoka Aviation Centre building will require 4 additional parking spaces. The existing and proposed conceptual locations for additional parking stalls/lots are shown in Drawing 10-3. The proposed location for additional parking stalls/lots will be addressed under a proposed site plan.

Table 10-10: Existing and Future Parking Stall Requirements

Parking Location	Existing Parking	Future Required	Future Additional Stalls Required
Long Term Parking	36	78	42
Short Term Parking	56	43	-13
Staff Parking	5	18	13
Handicap Parking	3	3	0
Skyservice Parking	24	130	106
Muskoka Aviation Centre	15	19	4
Buses	0	2	2
Taxis and Limousines	11	10	-1

Table 10-11: Groundside Parking Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
2021 to 2025			
Parking Area Construction Costs			
Parking (Long-Term)	$271,000	$41,000	$312,000



No.	DATE	BY	ISSUES / REVISIONS

TULLOCH ENGINEERING

DRAWING: CONCEPTUAL PARKING PLAN

PROJECT: MUSKOKA AIRPORT
BRACEBRIDGE, ONTARIO

DRAWN BY:	CHECKED BY:	PROJECT No. :
D.R.	C.S.	19-1920
DESIGNED BY:	APPROVED BY:	DRAWING No. / REVISION No.
C.S.	C.S.	10-3 / 0
SCALE:	DATE:	
1:1000	JUNE 9, 2020	

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10.4.2 Drainage Improvements

Drainage issues were discussed in detail in Section 6.5 of this plan. Areas at the south side of the terminal extending to the southwest to the Skyservice building and southeast to the Fuel Farm and further south have experienced drainage problems over the years. It will be necessary to address the drainage issues so that future development in this area can proceed (e.g., terminal expansion, Apron I south extension, parking area).

Groundside Development Along Beaver Creek Road

There are currently 2 to 3 lots available along Beaver Creek Drive. The determination as to whether these lots are suitable for groundside or airside development will largely depend on the timing of development in the Southwest Quadrant Development Area and demand for groundside commercial development.

Table 10-12: Groundside Commercial Development Benefits and Challenges

Benefits	Challenges
Easy access from Beaver Creek Road.	Perceived disadvantage that the area is not located closer to the “traditional” hangar line and higher visibility areas
Depending on the required lot size this parcel could be divided into two or three lots.	
The topography is relatively flat.	
The land would be suitable for commercial business not requiring airfield access.	

Table 10-13: Groundside Commercial Development Area Attributes

Land Tenure Policy	Lease only
Total Development Area	
Typical Lot Size	Lots vary in size from:
Typical Lot Area	0.26 ha to 0.7 ha
Height Limitations	
Airside Access	None
Landside Access	Connection to Beaver Creek Drive, south end
Services Available	Developer to provide septic services and water well

Table 10-14: Groundside Commercial Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
2021 to 2025			
General Development Costs	$50,000	-	$50,000
Note: The cost for Groundside Development is only applicable if the Southwest Quadrant is not developed. If this quadrant is developed the lots would be considered aviation related. The cost is not extended into the capital plan costs.			

10.5 Medium-term Airfield Development

10.5.1 Southwest Quadrant Development

The Southwest quadrant of the airport shows the best promise for cost-effective development that will provide the airport with development potential over the next five to ten years.

The site is ideal for development because of the existing topography and relatively low development costs.

Table 10-15: Southwest Development Area Benefits and Challenges

Benefits	Challenges
Easy access from Beaver Creek Drive	Would require the closure of crosswind Runway 09-27
Depending on the required lot size this parcel could provide for a relatively significant number of development lots (10+)	Development scenarios would have to consider the location of the gravel pit
The topography is relatively flat and clear	Drainage issues in the general development area can cause seasonal flooding in some areas
Relatively easy Taxiway D connection to access Apron I and Runway 18-36	
The land would be suitable for any type of development (e.g. large maintenance, repair, overhaul (MRO, or smaller parcels for hangar development)	
Infrastructure development costs would be reasonable	
Would allow continued development on the east side of the main Runway 18-36	

Table 10-16: Southwest Development Area Attributes

Land Tenure Policy	Lease
Total Development Area	5.5 ha
Typical Lot Size	Concept A 1 large MRO: Apron 18,361 m2, Building 9,600 m2 and parking area 7,200 m2 1 Lot 100 m by 70 m Concept B 12 Lots ranging from 30 m x 90 m to 70 m x 100 m
Typical Lot Area	Concept A: 3.5 ha to 0.7 ha Concept B: 0.07 ha to 0.24 ha
Height Limitations	10 m plus
Airside Access	Extension to Taxiway D
Landside Access	Connection to Beaver Creek Drive, west end or south end
Services Available	Developer to provide septic services and water well

The major constraint to development in this quadrant is that the development area is located within the boundaries of existing Runway 09-27. Closing this runway is a major concern to small aircraft operators based on safety concerns when crosswinds (e.g., >10 knots) are such that operations on the main Runway 18-36 become problematic.

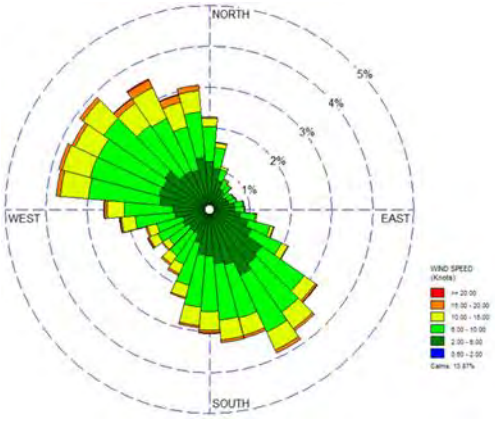
10.5.1.1 Runway 09-27 Closure

The requirement for the continued operations of Runway 09-27 has been controversial. It is recognized that some users, concerned about flight safety due to crosswind components (e.g., winds exceeding 10 knots), are adamant that this runway should be preserved.

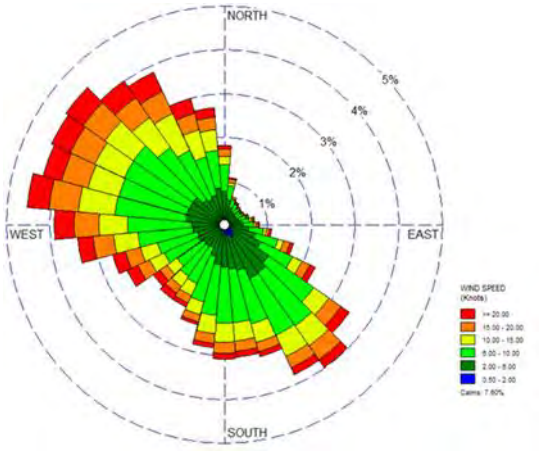
To address wind related issues, two planning studies were contracted by the District which included the assessment of wind direction and speed for the airport (i.e., development of a wind rose):

- Genivar, Muskoka Airport Crosswind Runway Relocation Feasibility Study, August 2011
- SNC Lavalin, Final Report, Business Plan and Master Plan, May 2013

Both the Genivar and SNC studies used a long-term analysis of meteorological data (18 years) and the analysis was based on one-minute averages. The results of the Genivar and SNC studies were similar, suggesting a greater than 93 % usability for Runway 18-36. Tetra Tech conducted a review of the studies and concluded the Genivar and SNC studies used a standard, “traditional” methodology to develop the wind rose and, as such, the findings from those studies was considered reasonable. To confirm the wind direction and speed and runway usability Tetra Tech prepared a new wind rose study (Attachment 5). The following wind rose illustrations show wind direction and speed with and without wind gusts. The findings from the Tetra Tech study concluded the preferential runway alignment would be 11-29 which is consistent with the previous study findings. Table 10-18 shows the different runway usability factors for Runway 18-36 using different input criteria.



Without Gusts



With Gusts

Table 10-18: Wind Rose Usability Analysis

Data Set	Usability for Runway 18-36	
	10 Knots	**13 Knots**
Environment and Climate Change Canada Winds Related Data	96.2%	99.2%
Nav Canada METAR Data	93.9%	98.5%
Nav Canada METAR Data including Gusts	83.7%	87.8%

It is important to note that the actual runway orientation will be determined when detailed surveys, geotechnical investigations and land use applications (e.g. Nav Canada) are approved. The location shown on the drawings is based on limited topographic information and assumed obstacle heights. The wind rose study confirmed the final orientation can range from 10-28 to 13-31 with minimal change in theoretical runway usability. One commonality in all of the studies is the recognition that there are significant winds from a southeasterly/northwesterly direction.

A final consideration relates to “actual” usability of the crosswind runway. During the period 2008 to 2018, the highest recorded use of the runway was in 2015. The number of small aircraft using Runway 09-27 accounted for 3.2% of the annual aircraft movements. In typical years the runway use is less than 2% of the total annual movements.

In 2019, runway use statistics show the runway accounted for 1.37% of the total annual movements. 40 different aircraft operators accounted for the runway use. 12 of the 40 aircraft operators are tenants of the Muskoka Airport.

It is important then to recognize that the airport has for all intents and purposes been a single runway airport for decades.

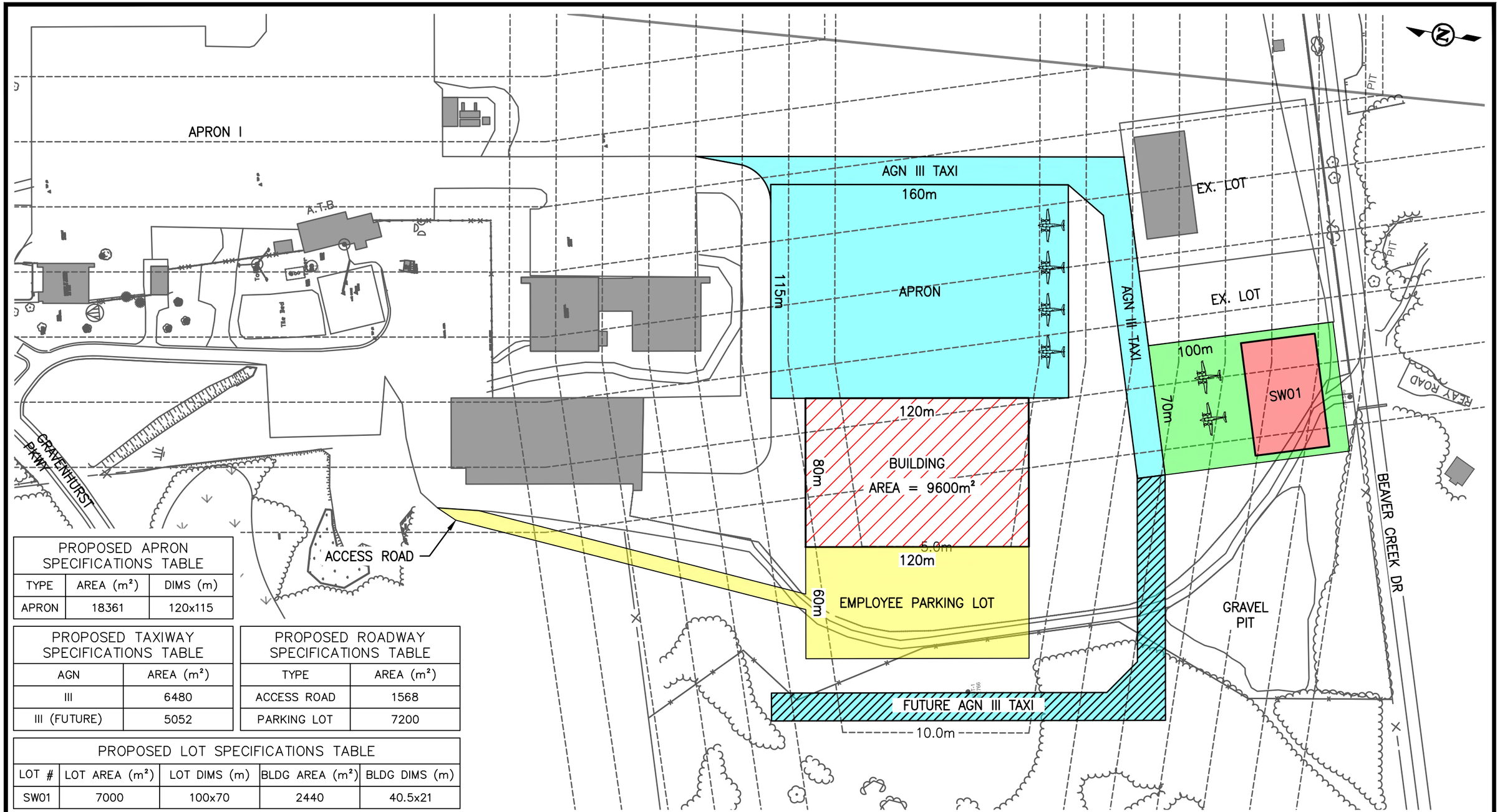
One limitation in the analysis is that there are no records of pilots not using the main runway because of crosswind components. The likely explanation is that recreational and training pilots either do not fly when there are significant crosswinds or, in the case of flight training largely originating from other airports, they opt for an alternate airport with a preferred runway orientation for training purposes. Typically, pilots will prefer longer, paved runways. Even with improved maintenance it is expected that runway use would only increase incrementally (e.g., to perhaps 4%).

Based on the above, it is our view that Runway 18-36 is providing pilots a safe operating environment in most conditions. It is the pilot responsibility to determine when conditions are such that an operation at the airport would not be considered due to excessive crosswind components. Our recommendation is to therefore consider the closure of Runway 09-27 to allow cost-effective land development to proceed so that the Board can meet their mandate to increase commercial development and long-term aviation-related business needs at the airport.

A detailed cost-benefit evaluation of the closure of Runway 09-27 is included as Appendix B.

Table 10-17: Southwest Development Area Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
2021 to 2025			
Large MRO Development			
Large MRO Development (assumes airport funds taxiway connection , access road and lease lot preparation MRO) (Refer to Drawing 10-4)	$1,348,000	$539,000	$1,887,000
Airside Commercial Development (refer to Drawing 10-5)			
Phase 1	$1,941,000	$776,000	$2,717,000
2025 to 2030			
Phase 2	$1,941,000	$776,000	$2,717,000



PROPOSED APRON SPECIFICATIONS TABLE		
TYPE	AREA (m²)	DIMS (m)
APRON	18361	120x115

PROPOSED TAXIWAY SPECIFICATIONS TABLE	
AGN	AREA (m²)
III	6480
III (FUTURE)	5052

PROPOSED ROADWAY SPECIFICATIONS TABLE	
TYPE	AREA (m²)
ACCESS ROAD	1568
PARKING LOT	7200

PROPOSED LOT SPECIFICATIONS TABLE				
LOT #	LOT AREA (m²)	LOT DIMS (m)	BLDG AREA (m²)	BLDG DIMS (m)
SW01	7000	100x70	2440	40.5x21

LEGEND:

- PROPOSED LOT
- PROPOSED ACCESS ROAD & PARKING LOT
- PROPOSED APRON & AGN III TAXIWAY
- PROPOSED FUTURE AGN III TAXIWAY
- PROPOSED HANGAR

KING AIR 350

NOTE:
AGN III TAXIWAY–15.0m WIDE
ACCESS ROAD–15.0m ROW, 8m ROAD WIDTH

0 50 100
SCALE: 1:2000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MUSKOKA AIRPORT MASTER PLAN

MUSKOKA AIRPORT YQA, MUSKOKA ONTARIO

SOUTHWEST QUADRANT DEVELOPMENT (MRO)

PROJ : TRN.AIRP03465-01		CONTR :	
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :

DATE : 2020/06/26

10-4

PLOT DATE: 2020/08/11 AT 14:32:39 PLOTTED BY: SCHITTHELM, JOSH
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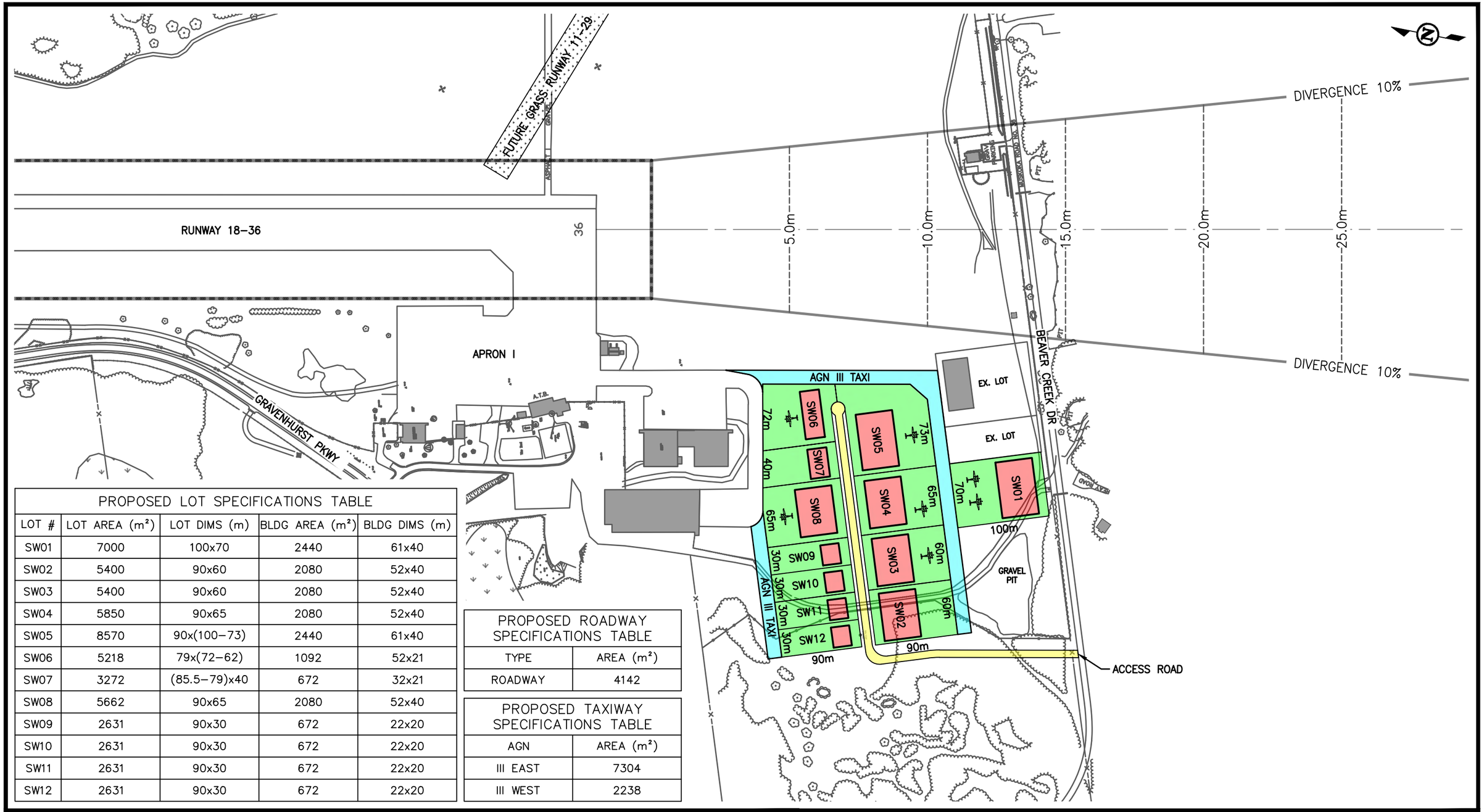

PROPOSED LOT SPECIFICATIONS TABLE				
LOT #	LOT AREA (m²)	LOT DIMS (m)	BLDG AREA (m²)	BLDG DIMS (m)
SW01	7000	100x70	2440	61x40
SW02	5400	90x60	2080	52x40
SW03	5400	90x60	2080	52x40
SW04	5850	90x65	2080	52x40
SW05	8570	90x(100–73)	2440	61x40
SW06	5218	79x(72–62)	1092	52x21
SW07	3272	(85.5–79)x40	672	32x21
SW08	5662	90x65	2080	52x40
SW09	2631	90x30	672	22x20
SW10	2631	90x30	672	22x20
SW11	2631	90x30	672	22x20
SW12	2631	90x30	672	22x20

PROPOSED ROADWAY SPECIFICATIONS TABLE	
TYPE	AREA (m²)
ROADWAY	4142

PROPOSED TAXIWAY SPECIFICATIONS TABLE	
AGN	AREA (m²)
III EAST	7304
III WEST	2238

LEGEND:

- PROPOSED LOT
- PROPOSED ACCESS ROAD
- PROPOSED AGN III TAXIWAY
- PROPOSED HANGAR

KING AIR 350

NOTE:
AGN III TAXIWAY–15.0m WIDE
ACCESS ROAD–15.0m ROW, 8m ROAD WIDTH

0 100 200

SCALE: 1:4,000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MUSKOKA AIRPORT MASTER PLAN

MUSKOKA AIRPORT YQA, MUSKOKA ONTARIO

SOUTHWEST QUADRANT AIRSIDE COMMERCIAL DEVELOPMENT

PROJ : TRN.AIRP03465-01		CONTR :		DATE : 2020/08/10	**10-5**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

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10.6 Long-term Airfield Development

10.6.1 Southeast Quadrant Development

The Southeast Quadrant of the airport is suitable for development. The site is ideal for development because of the generally flat topography. The Southeast Quadrant development is predicated on the closure of Runway 09-27.

Table 10-18: Benefits and Challenges

Benefits	Challenges
Easy access from Beaver Creek Drive	Separation from the main hangar line is not desirable
The topography is relatively flat and clear	Development must consider separation from AWOS and VHF receivers
Easy taxiway connection to Runway 18-36	Possible environmental constraints (e.g. wetlands)
Large parcels for development	
The land would be suitable for any type of development (e.g. hangars)	
Infrastructure development costs would be reasonable	

Table 10-19: Development Area Attributes

Land Tenure Policy	Lease only
Total Development Area	6.1 ha
Typical Lot Size	Concept A 11 Lots: 50m by 85m Concept B 11 lots: 50 m x 70 m to 50 m x 80 m
Typical Lot Area	Concept A: 0.4 has
Height Limitations	10 m plus
Airside Access	Connection to Threshold Runway 36
Landside Access	Connection to Beaver Creek Road
Services Available	Developer to provide septic services and water well

Table 10-20: Southeast Quadrant Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
Southeast Development Option A (Refer Drawing 10-6)			
2026 to 2030			
Phase 1	$1,212,000	$485,000	$1,697,000
2030 and Beyond			
Phase 2	$1,212,000	$485,000	$1,697,000

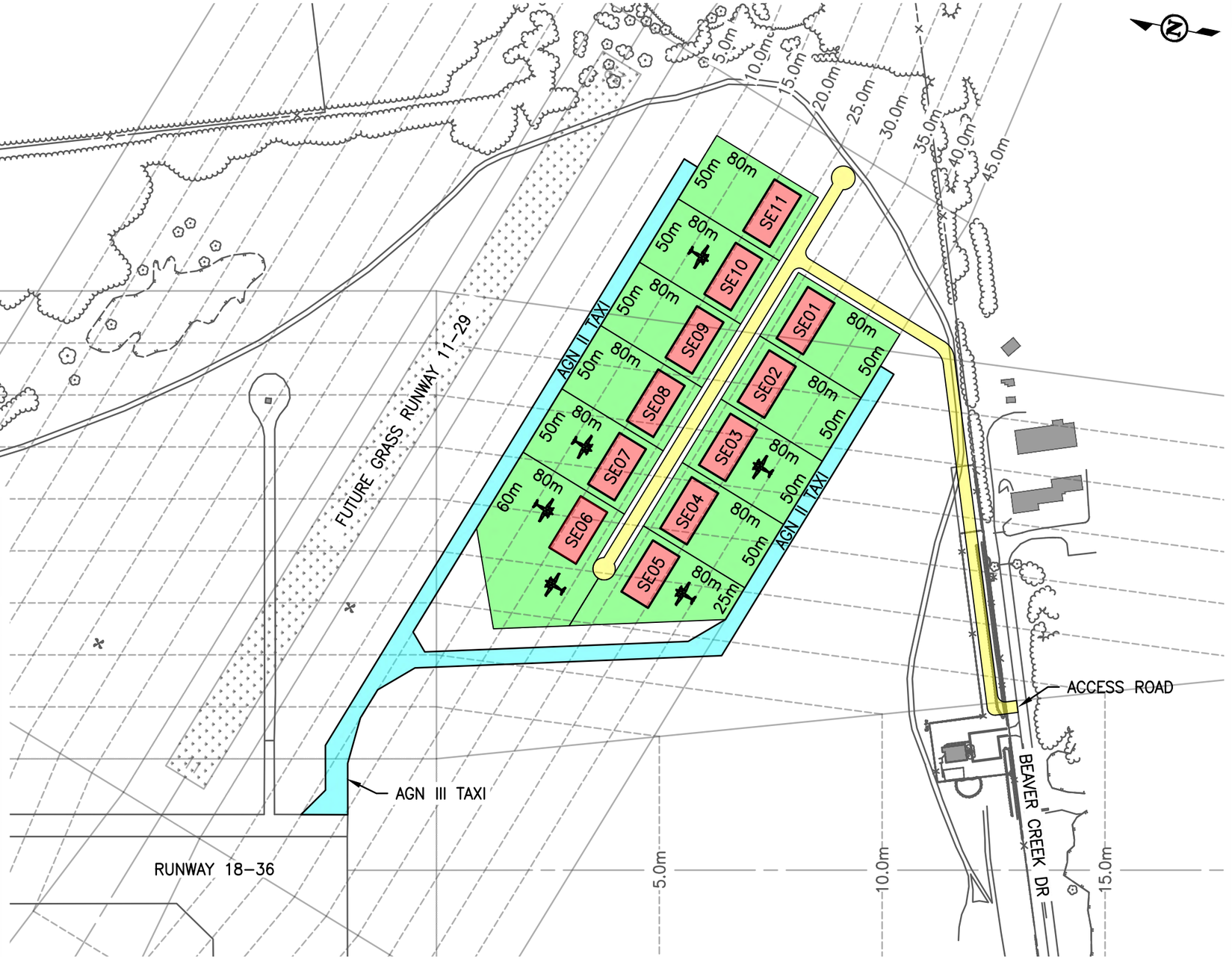
	Construction Cost	Contingency and Engineering Related Costs	Total Cost
Southeast Development Option B (Refer Drawing 10-7)			
2026 to 2030			
Phase 1	$1,098,000	$439,000	$1,537,000
2030 and Beyond			
Phase 2	$1,098,000	$439,000	$1,537,000

PROPOSED TAXIWAY SPECIFICATIONS TABLE	
AGN	AREA (m²)
II	9630
III	1026

PROPOSED ROADWAY SPECIFICATIONS TABLE	
TYPE	AREA (m²)
ROADWAY	5749

PROPOSED LOT SPECIFICATIONS TABLE

LOT #	LOT AREA (m²)	LOT DIMS (m)	BLDG AREA (m²)	BLDG DIMS (m)
SE01	4000	80x50	850	40.5x21
SE02	4000	80x50	850	40.5x21
SE03	4000	80x50	850	40.5x21
SE04	4000	80x50	850	40.5x21
SE05	4411	80x(83–25)	850	40.5x21
SE06	7680	80x(112–60)	850	40.5x21
SE07	4000	80x50	850	40.5x21
SE08	4000	80x50	850	40.5x21
SE09	4000	80x50	850	40.5x21
SE10	4000	80x50	850	40.5x21
SE11	4000	80x50	850	40.5x21



LEGEND:

- PROPOSED LOT
- PROPOSED ACCESS ROAD
- PROPOSED AGN II & AGN III TAXIWAY
- PROPOSED HANGAR

KING AIR 350

NOTE:
AGN II TAXIWAY–10.5m WIDE
AGN III TAXIWAY–15.0m WIDE
ACCESS ROAD–15.0m ROW, 8m ROAD WIDTH

0 100 150

SCALE: 1:3000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MUSKOKA AIRPORT MASTER PLAN

MUSKOKA AIRPORT YQA, MUSKOKA ONTARIO

SOUTHEAST QUADRANT AIRSIDE COMMERCIAL DEVELOPMENT OPTION A

PROJ : TRN.AIRP03465-01		CONTR :		DATE : 2020/08/10	**10-6**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

PLOT DATE: 2020/08/11 AT 14:32:43 PLOTTED BY: SCHITTHELM, JOSH
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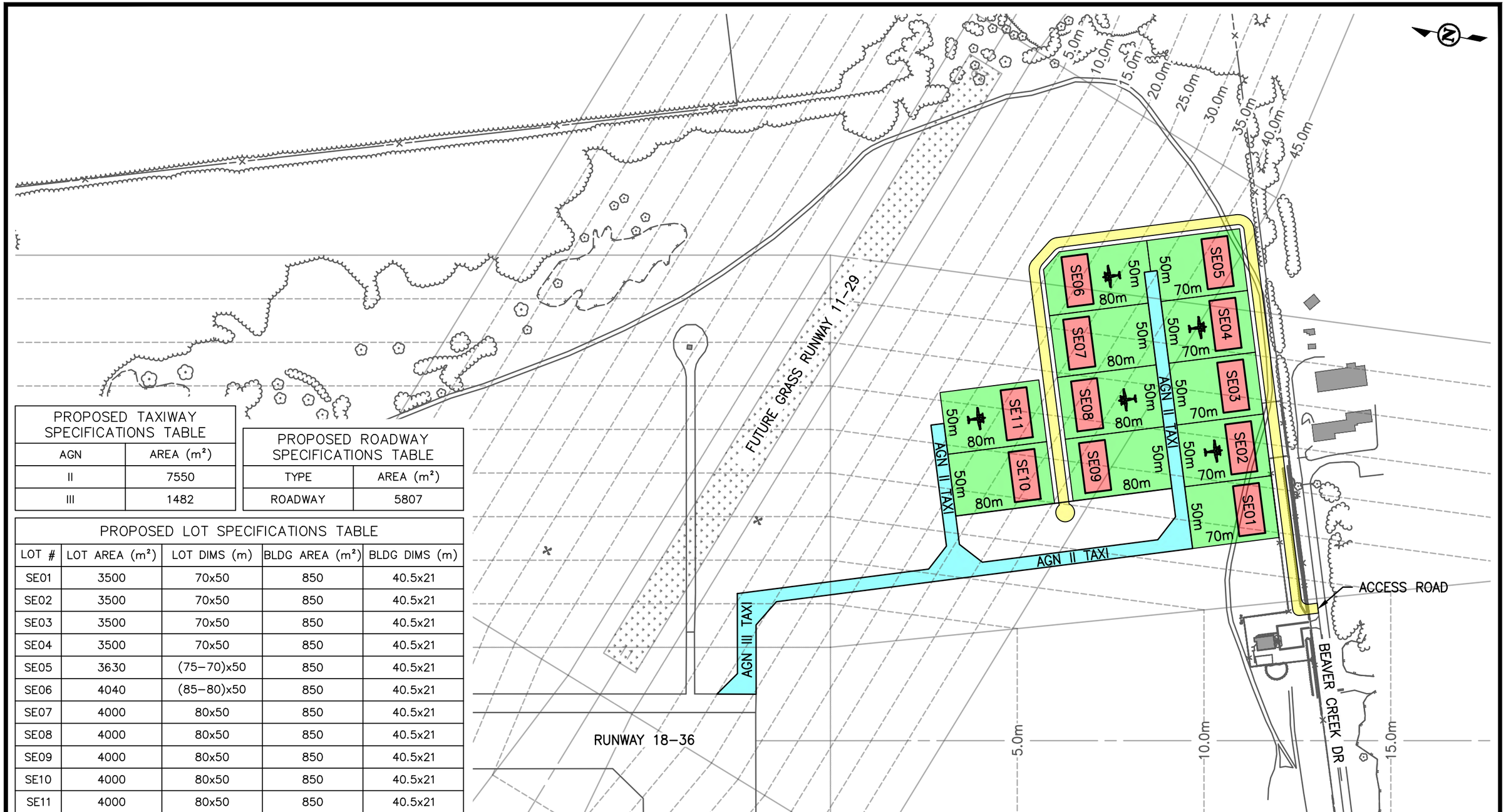
PROPOSED TAXIWAY SPECIFICATIONS TABLE	
AGN	AREA (m²)
II	7550
III	1482

PROPOSED ROADWAY SPECIFICATIONS TABLE	
TYPE	AREA (m²)
ROADWAY	5807

PROPOSED LOT SPECIFICATIONS TABLE				
LOT #	LOT AREA (m²)	LOT DIMS (m)	BLDG AREA (m²)	BLDG DIMS (m)
SE01	3500	70x50	850	40.5x21
SE02	3500	70x50	850	40.5x21
SE03	3500	70x50	850	40.5x21
SE04	3500	70x50	850	40.5x21
SE05	3630	(75–70)x50	850	40.5x21
SE06	4040	(85–80)x50	850	40.5x21
SE07	4000	80x50	850	40.5x21
SE08	4000	80x50	850	40.5x21
SE09	4000	80x50	850	40.5x21
SE10	4000	80x50	850	40.5x21
SE11	4000	80x50	850	40.5x21



LEGEND:

- PROPOSED LOT
- PROPOSED ACCESS ROAD
- PROPOSED AGN II & AGN III TAXIWAY
- PROPOSED HANGAR

KING AIR 350

NOTE:
AGN II TAXIWAY–10.5m WIDE
AGN III TAXIWAY–15.0m WIDE
ACCESS ROAD–15.0m ROW, 8m ROAD WIDTH

0 100 150

SCALE: 1:3000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MUSKOKA AIRPORT MASTER PLAN

MUSKOKA AIRPORT YQA, MUSKOKA ONTARIO

SOUTHEAST QUADRANT AIRSIDE COMMERCIAL DEVELOPMENT OPTION B

PROJ : TRN.AIRP03465-01		CONTR :		DATE : 2020/08/10	**10-7**
DFTG : J.S.	DSGN : C.N.	CHK : C.N.	APPD :		

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10.6.2 New Crosswind Runway

The necessity to promote airport-related commercial development at the airport shows the only economically viable development areas are located on the existing Runway 09-27 airstrip. As described in Section 10.5.1.1, previous wind studies have shown relatively significant winds in the west/northwest quadrant of the airport.

The best fit for a new turf runway that respects existing topography and navigational features and information systems (e.g., Environment and Climate Change Canada, Nav Canada's METAR) appears to be a Runway 11-29 and for illustration purposes that alignment is shown. As stated in Section 10.5.1.1, the final crosswind runway alignment can vary from 10-28 to 13-31 with similar usability and the final alignment will be determined after final topographical surveys, geotechnical investigations and Nav Canada Land Use Applications are complete.

The justification for protecting lands for a future crosswind runway is largely in response to small aircraft pilot requests for a crosswind runway when winds exceed 10 knots. A second reason that is apparent from analysis of Runway 09-27 flights appears to relate to the runway being used for flight training purposes. As indicated previously, Runway 09-27 has traditionally accounted for less than 2% of the overall annual aircraft movements and it is therefore expected that a new crosswind runway would provide the same level of use.

As stated in earlier sections, airport topography as well as immediate airport operational needs (e.g., an expanded apron for aircraft parking) does not allow for an extended runway, therefore the proposed new turf runway will be limited to 1,850 ft. in length.

The actual need for a short, crosswind runway that serves a relatively small user base and provides only minor revenues to support airport operations must be carefully considered. In the short-term, the airport must carefully monitor aircraft activity at the airport to determine:

- How many aircraft have used Runway 09-27 specifically because of excessive crosswinds? This would require a correlation of wind direction and speed to actual aircraft movements on Runway 09-27.
- In the past, how many aircraft have been diverted from the airport due to crosswinds exceeding allowable aircraft operational limits? A pilot survey would have to be developed. The survey would be conducted with all small aircraft users landing at the airport over a typical summer season.
- Will the loss of a crosswind runway impact potential commercial development at the airport? A survey would be conducted with existing businesses and potential businesses to determine how important a short, turf crosswind runway would be when determining whether the Muskoka Airport is the preferred airport for business.

Other Consideration

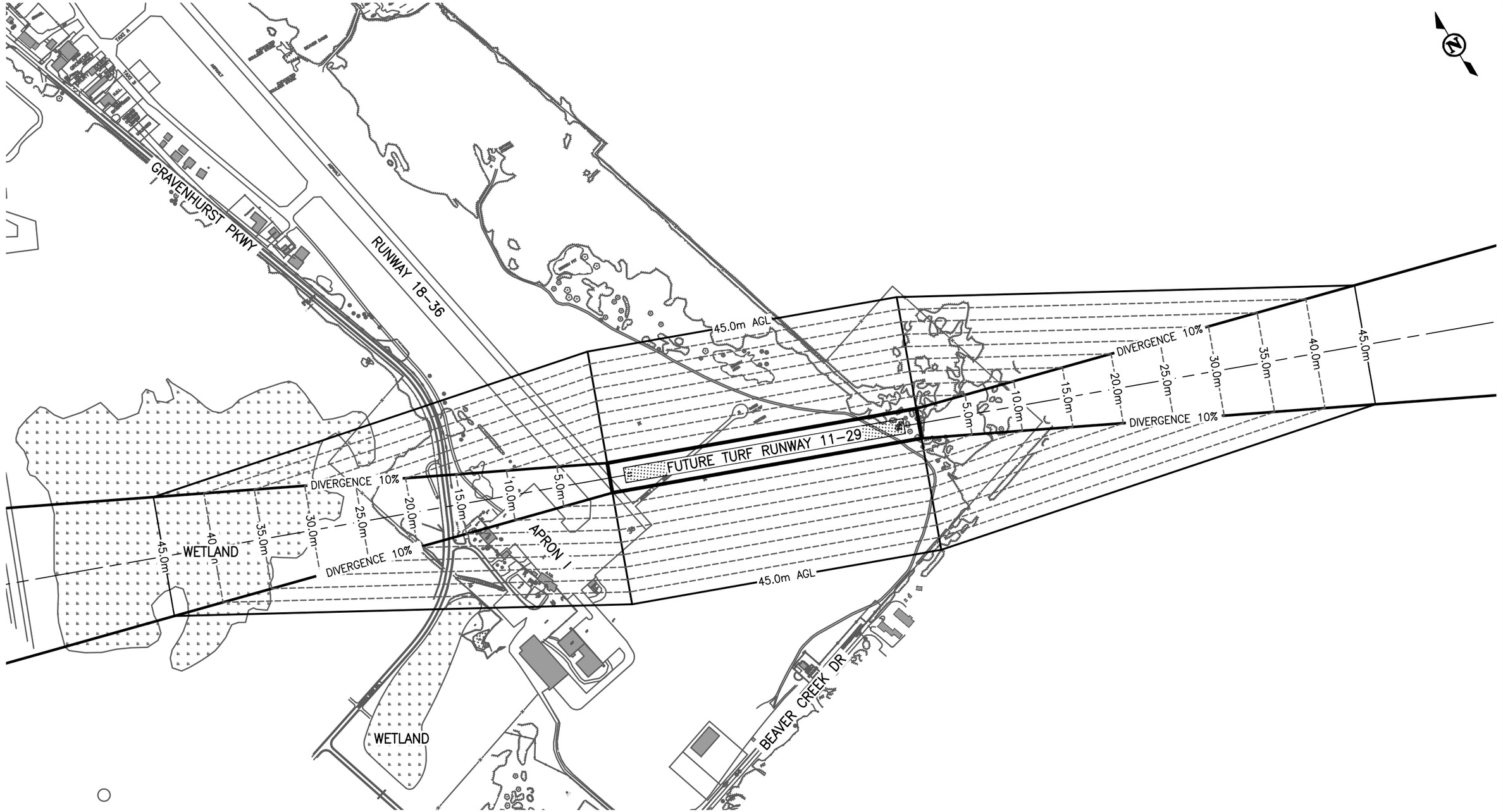
- Will the loss of the existing Runway 09-27 result in a reduction in overall aircraft movements? Analysis of records of annual aircraft movements over the past decade suggest this would not be a significant factor.

It is recommended that a study be conducted to answer these questions. The information provided from the study can then be used to determine the actual need for the new crosswind runway.

Table 10-22 identifies what the cost would be for a new crosswind runway.

Table 10-21: New Turf Crosswind Runway

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
2021 to 2025			
Crosswind Runway Needs Study	$15,000		$15,000
2026 to 2030			
New crosswind runway	$422,000	$169,000	$591,000



- FUTURE TURF RUNWAY 11-29
- AGN I NON-INSTRUMENT
- 563.880m X 30m (1850' X 98.43')

0 200 500

SCALE: 1:7500

TETRA TECH

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MUSKOKA AIRPORT MASTER PLAN

MUSKOKA AIRPORT YQA, MUSKOKA ONTARIO

FUTURE TURF CROSSWIND RUNWAY

PROJ : TRN.AIRP03465-01		CONTR :		DATE : 2020/08/10	**10-8**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

PLOT DATE: 2020/08/11 AT 14:32:48 PLOTTED BY: SCHITTHELM, JOSH
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10.6.3 Northeast Quadrant Development

The Northeast Quadrant of the airport was considered as part of the overall development scenarios. The site is not suitable for development because of the significant topographic features (e.g., rock outcrops, general topography 5 m to 10 m higher than the airfield environment).

Development of this area would require significant blasting, clearing and grubbing and, as such, the overall costs for the land development ($5,950,000), in addition to the requirement for a relatively long taxiway connection ($1,929,000) render this option impractical.

In addition, the location of this site in relation to Wright's Lake watershed could present additional issues in relation to the wetland and watershed areas.

This option is not considered further.

10.6.4 West Quadrant Development (West of Existing Skyservice Building)

The West Quadrant of the airport is considered in the long-term development scenarios. The site is challenging because of the significant topographic features (e.g., rock outcrops), nearby wetland areas, and general topography.

Development of this area would require blasting, clearing, and grubbing and as such, the overall costs for the land development is relatively significant.

Table 10-22: West Quadrant Development Area Benefits and Challenges

Benefits	Challenges
Easy access from Beaver Creek Drive or from main terminal area	Development cost will be very high due to topography. Aircraft can only operate on taxiways with relatively flat slopes (e.g. less than 2%) and therefore this site would require significant blasting and clearing and grubbing.
Easy taxiway extension from Taxiway D	Possible environmental constraints (e.g. wetlands)
Large parcels for development	The airport does not own this land.
The land would be suitable for any type of development (e.g. hangars)	

Table 10-23: West Quadrant Development Area Attributes

Land Tenure Policy	Lease only
Total Development Area	5 ha
Typical Lot Size	**Concept A** 10 Lots vary in size from: 50 m by 70 m to 50 m x 80 m **Concept B** MRO development – 3.9 ha
Typical Lot Area	Concept A: 0.35 ha Concept B: 3.9 ha
Height Limitations	15 m plus
Airside Access	Extension to Taxiway D
Landside Access	Connection to Beaver Creek Drive
Services Available	Developer to provide septic services and water well

Table 10-24: West Quadrant Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
2030 Onward			
Large MRO Development			
Large MRO Development (assumes airport funds taxiway, access road and parking lot for MRO) (refer Drawing 10-9)	$1,252,000	$500,000	$1,752,000
Airside Commercial (Refer Drawing 10-10)			
Phase 1	$1,781,000	$712,000	$2,493,000
Phase 2	$1,781,000	$712,000	$2,493,000



PROPOSED LOT SPECIFICATIONS TABLE				
LOT #	LOT AREA (m²)	LOT DIMS (m)	BLDG AREA (m²)	BLDG DIMS (m)
W01	3089	(64.7–58.8)x50	850	40.5x21
W02	3384	(70–64.7)x50	850	40.5x21
W03	3500	70x50	850	40.5x21
W04	3500	70x50	850	40.5x21
W05	3500	70x50	850	40.5x21
W06	3679	(77.5–70)x50	850	40.5x21
W07	3679	(77.5–70)x50	850	40.5x21
W08	3500	70x50	850	40.5x21
W09	3500	70x50	850	40.5x21
W10	3762	(80.5–70)x50	850	40.5x21

PROPOSED ROADWAY SPECIFICATIONS TABLE	
TYPE	AREA (m²)
ROADWAY	2707

PROPOSED TAXIWAY SPECIFICATIONS TABLE	
AGN	AREA (m²)
II	3414
III	5131.5

LEGEND:

- PROPOSED LOT
- PROPOSED ACCESS ROAD
- PROPOSED AGN II & III TAXIWAY
- PROPOSED HANGAR
- KING AIR 350

NOTE:
AGN II TAXIWAY–10.5m WIDE
AGN III TAXIWAY–15.0m WIDE
ACCESS ROAD–15.0m ROW, 8m ROAD WIDTH

0 50 100

SCALE: 1:2000

TETRA TECH

THE DISTRICT MUNICIPALITY OF MUSKOKA

MUSKOKA AIRPORT MASTER PLAN

MUSKOKA AIRPORT YQA, MUSKOKA ONTARIO

WEST QUADRANT AIRSIDE COMMERCIAL DEVELOPMENT

PROJ : TRN.AIRP03465-01		CONTR :		DATE : 2020/06/12	**10-9**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

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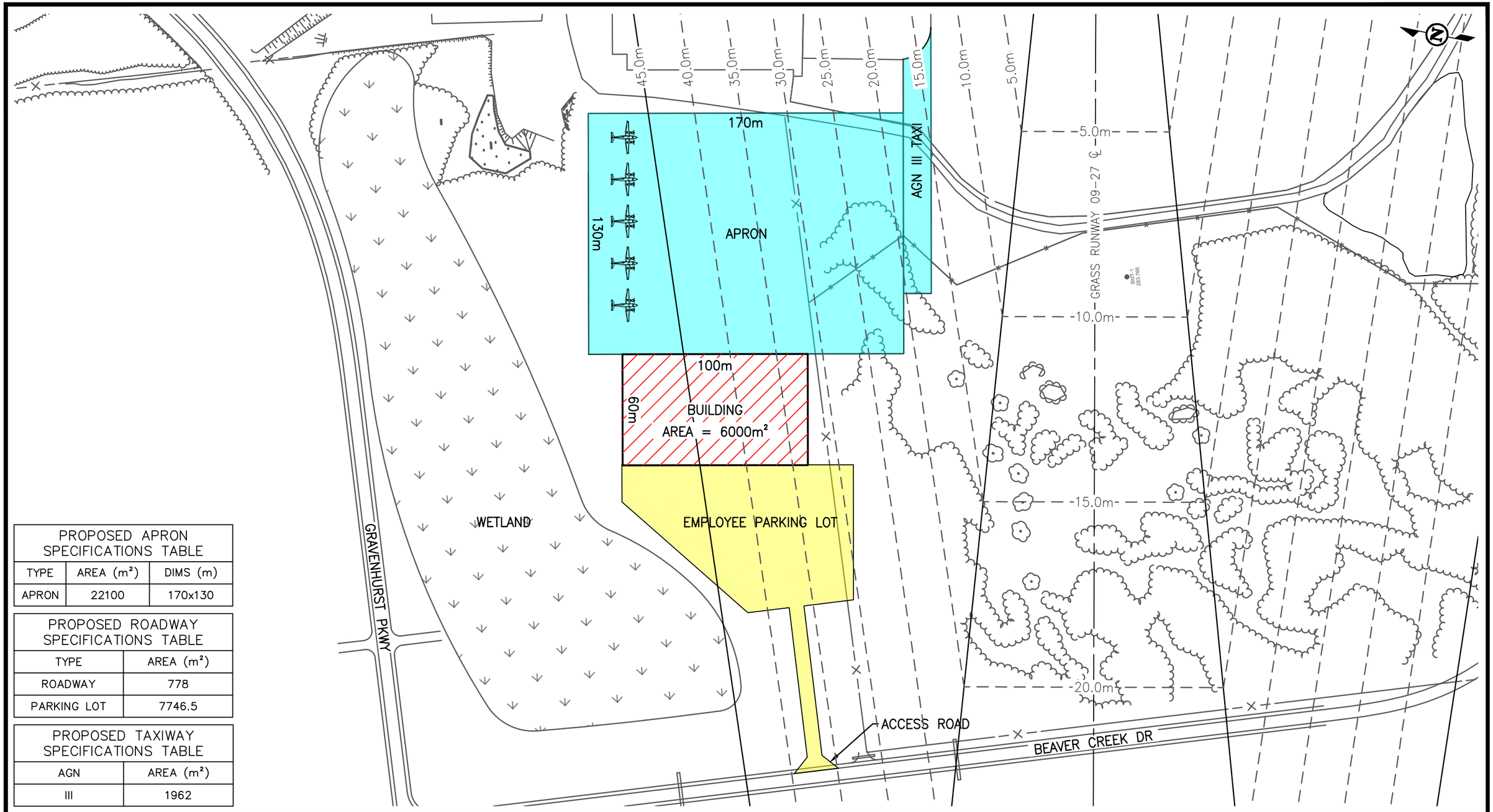

PROPOSED APRON SPECIFICATIONS TABLE		
TYPE	AREA (m²)	DIMS (m)
APRON	22100	170x130

PROPOSED ROADWAY SPECIFICATIONS TABLE	
TYPE	AREA (m²)
ROADWAY	778
PARKING LOT	7746.5

PROPOSED TAXIWAY SPECIFICATIONS TABLE	
AGN	AREA (m²)
III	1962

LEGEND:

- PROPOSED LOT
- PROPOSED ACCESS ROAD
- PROPOSED AGN III TAXIWAY

KING AIR 350

NOTE:
AGN III TAXIWAY–15.0m WIDE
ACCESS ROAD–15.0m ROW, 8m ROAD WIDTH

0 50 100

SCALE: 1:2000

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MUSKOKA AIRPORT MASTER PLAN

MUSKOKA AIRPORT YQA, MUSKOKA ONTARIO

WEST QUADRANT DEVELOPMENT (MRO)

PROJ : TRN.AIRP03465-01		CONTR :		DATE : 2020/09/23	**10-10**
DFTG : J.S.	DSGN: C.N.	CHK : C.N.	APPD :		

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10.7 Airport Improvement and Development Strategy

The Airport Improvement and Development Strategy focuses on a phased strategy to respond to immediate needs as opposed to needs that are required in response to commercial demand.

Short-Term Demand

- Apron I Expansion North and South – designed to relieve parking pressure during the summer season
- Airside Infill Lot development – allows immediate development for 3 to 5 hangars
- Groundside Lot Development at Beaver Creek Road – a number of lots are development-ready and will require minimal investment by the airport
- Drainage Improvements – initially there is the requirement for a complete drainage study at the south end so that drainage issues can be resolved. The actual improvements would then follow.
- Depending on commercial development demands there will be a requirement to close Runway 09-27 so that commercial development can proceed in the Southwest Quadrant
- Southwest Quadrant Development – this development will be triggered by demand.

Medium-Term Development

- Airport Terminal Parking Expansion – the requirement for additional parking is entirely dependent on demand resulting from ongoing scheduled air service.
- Southeast Quadrant Development – based on previous studies and with the availability of infill lots and Southwest Quadrant development, it is likely demand for this area would be in the latter years of medium development (e.g., 2028 to 2030).
- New Crosswind Runway – the need for the runway must be established at which time the construction can be programmed.

Long-Term Development

- West Quadrant Development – The development of a large MRO in the southwest quadrant and the development of the southeast quadrant would provide approximately 11 development lots, plus the existing three infill lots. Based on anticipated demand it is likely complete occupancy would not occur until the 2030 timeframe at which time the west quadrant development could be considered. In the long-term this will be the last development area in close proximity to the existing areas.

Table 10-25 illustrates the timing for various recommended developments at the airport. Commercial demand will be the fundamental driver for land development and as such, the predicted time frames can change quickly. As an example, a large MRO type development would require the Southwest Quadrant to be immediately developed. Demand for smaller, hangar type developments may allow the Southwest Quadrant development to be phased (e.g., 40% of the development area in the 2021 to 2025 timeline and the remainder in the 2026 to 2030 timeframe). The orange shaded cells represent alternative options for development and only the preferred options costs are extended into the Table 10-27 summary.

Table 10-25: Development Costs

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
2021 to 2025			
Apron I Expansion North	$1,914,000	$766,000	$2,680,000
Apron I Expansion South	$197,000	$79,000	$276,000
Infill Lot Development	$125,000	-	$125,000
Airport Terminal Parking	$271,000	$41,000	$312,000
Groundside Commercial Development along Beaver Creek Road	$50,000	-	$50,000
Southwest Quadrant Development (Large MRO) – assumes airport constructs apron, access road and parking lot)	$1,348,000	$539,000	$1,887,000
2025 - 2030			
Southeast Quadrant Development Option A			
Phase 1	$1,212,000	$485,000	$1,697,000
New Crosswind Runway			
Crosswind Runway Needs Study	$15,000	-	$15,000
New Crosswind runway	$422,000	$169,000	$591,000
2030 and Beyond			
Southeast Quadrant Development Option A			
Phase 2	$1,212,000	$485,000	$1,752,000
West Quadrant Development Option A			
Phase 1 and 2	$3,562,000	$1,424,000	$4,987,000

Table 10-27: Airport Development Capital Investment Summary

	Construction Cost	Contingency and Engineering Related Costs	Total Cost
2021 to 2025	$3,905,000	$1,425,000	$5,330,000
2026 to 2030	$1,649,000	$654,000	$2,303,000
2030 and Beyond	$4,774,000	$1,909,000	$6,683,000

11.0 FEDERAL AND PROVINCIAL FUNDING

Federal and provincial governments offer numerous capital programs which can be relevant to municipal airports. An overview of these programs is provided below. It will be necessary to determine which programs are available, particularly as a result of the COVID pandemic and the serious impact the pandemic has had on the aviation industry as a whole.

11.1 FEDERAL

11.1.1 Airports Capital Assistance Program (ACAP).

ACAP was created in 1995 when Transport Canada devolved airports to municipalities and airport authorities to provide capital support to airports. ACAP is available to certified airports with scheduled passenger service. If Muskoka Airport is able to sustain an annual scheduled air service for at least three years, the airport would be able to apply to this program. The program is aimed at safety-related projects. Runway and taxiway rehabilitation projects are included in the program and these are the types of projects that can be very capital intensive.

11.1.2 Federal Infrastructure Fund

The Liberal government has committed to continued infrastructure funding aimed at targeted goals such as Trade and Transportation, and Rural and Northern Communities.

In the last four years through the Investing in Canada plan, the federal government allocated over $180 billion over 12 years. Analysts are projecting higher infrastructure spending during this government because of its desire to please other parties during its minority status. Targeted infrastructure funding can be assumed going forward though the targets on an annual basis will be announced by the new federal government when it is in power. Examples of programs in recent years include the Building Canada Fund, the Gas Tax Fund (GTF), and the Infrastructure Stimulus Fund (ISF).

11.1.3 FedNor

FedNor is the federal government's economic development organization for Northern Ontario, and reports to the Department of Innovation, Science and Economic Development. It has six funding programs at this time, but as with the infrastructure funding, this may be modified in the next federal budget. As the federal minister has remained the same, similar policy should be anticipated.

FedNor has existed since 1987 along with the other federal regional support organizations (e.g., the Atlantic Canada Opportunities Agency (ACOA)) and funding programs are expected to continue, though their focus and funding may change depending on the new federal government.

11.2 PROVINCIAL

The Ontario government also has funding programs, although it does not have non-government airport-specific programs. In many cases funds are used to top up federal program funding requirements.

11.2.1 Northern Ontario Heritage Fund Corporation (NOHFC)

NOHFC was established in 1988 to stimulate economic development initiatives in Northern Ontario with financial assistance. The Ministry of Energy, Northern Development and Mines (MNDM) provides support to its operations. The NOHFC funds a wide variety of projects and initiatives. The Strategic Economic Infrastructure Program is the most relevant. The programs have a yearly intake.

The MNDM also funds winter road and other transportation projects. It does not fund airport projects at this time, but this could change if a case for the importance of northern airports can be made.

11.3 FUNDING SUMMARY

It is essential that the Airport continue submitting applications for funding in a timely basis. For the larger capital projects (e.g., the runway overlay), the most likely source of funds would come from federal and provincial infrastructure funding programs.

12.0 CAPITAL PLAN

12.1 Investment Strategy

Table 12-1 and 12-2 outline the proposed implementation schedule for airport infrastructure rehabilitation and new development. The investment timing is entirely dependent on lifecycle requirements for infrastructure rehabilitation, new airside and groundside infrastructure and the demand for land development.

Some projects require additional timing (e.g., those requiring funding applications) whereas other projects can be constructed start to finish within a given season. In the tables, engineering design related costs are identified in one year with the construction scheduled for the following year.

The table includes all costs and illustrates (blue cells) the costs either shared or covered by potential funding from government agencies or are the responsibility of others (e.g., the District). As an example, if the Muskoka Airport were to sustain an annual scheduled service for more than three years the airport would be eligible for the Transport Canada Airports Capital Assistance Program (ACAP) funding. In this scenario the ACAP program would potentially cover 100% of the airfield rehabilitation costs. Additionally, other government stimulus programs sometimes offer funding support for airports (e.g., tri-party funding: federal, provincial, and municipal).

Where possible investments are scheduled to balance costs over the plan life. As shown, the major capital investment will likely occur during the 2022 to 2025 timeline because there is the potential for an immediate need for apron expansion to meet summer aircraft parking needs and land development for a large tenant (e.g., MRO) or alternatively the need for additional lots based on potential demand for hangars. Each scenario can influence overall costs. As an example, a large MRO development in the southwest quadrant would result in the likely need to develop the southeast quadrant to meet small hangar development needs. Alternatively, if a large MRO development did not happen, the number of lots in the southwest quadrant would likely support the airport needs for much of the next decade thereby deferring the need for development in other quadrants.

For simplicity Table 12-1 shows the total estimated costs (construction, contingencies, engineering and administration). In general, 40% has been added to all estimated costs, unless the construction was more likely, straight forward (e.g. an access road overlay) in which case a smaller contingency was added (e.g. 10%).

To provide an annual investment budget, engineering costs (assumed 15%) were included in one calendar year with construction following the next year. Airfield rehabilitation costs have been deferred to post-2023 so that the airport can determine if they are meeting the ACAP passenger volume eligibility requirements.

The table shows approximately $10,375,000 is required to meet infrastructure rehabilitation and development needs during the period 2021 to 2030. If the eligibility for federal funding is achieved, the required investment by the Airport would be $8,545,000 dollars.

Using a ballpark estimate of “incremental” revenues (e.g. lease revenues, increased fuel sales and parking fees), analysis shows a potential capital expenditure of $6,705,000 during the period 2021 to 2026 to meet immediate upgrade and commercial development needs. To service this debt the airport would require an annual budget increase of approximately $347,000 (e.g., based on a 20-year amortization period at 4% interest).

In 2019, the economic impact assessment completed in conjunction with the master plan showed a total economic impact to the community from airport activities to be $46.9 M. With planned and anticipated growth alone, the airport would significantly increase its economic impact in five years. This planned growth includes continued air services, expanded aircraft servicing, and related services. Assuming new employment as follows, potential impacts and growth can be estimated: four (4) FTEs, airport services; eighty (80), aviation services such as aircraft maintenance; four (4), ground transportation; and five (5) related to accommodation and food services,

If this potential employment is obtained, the resulting total new impacts could be as high as

- 218 FTEs
- $13.6 M in income,
- $27.5 M in total GDP, and
- $57.3 M in total Output.

Table 12-1 shows each category of potential impact. These potential impacts are conceptual and based on realizing potential economic activity in the future.

Table 12-1: Potential Incremental Economic Impact Growth within Existing Plans

	Employment (FTEs)	Income ($ Millions)	GDP ($ millions)	Output ($ millions)
Direct	93	6.2	12.1	28.3
Indirect	78.5	5.0	9.5	20.1
Induced	46.3	2.4	5.9	8.9
TOTAL	217.7	13.6	27.5	57.3

Note: columns may not add as a result of rounding

Based the above projections the total economic impact from airport activities could reach $104.2 M.

Table 12-2: Proposed Timelines for Airport Improvements 2021 to 2030

Project Works	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Airside Infrastructure											
Taxi A										$10,000	$55,000
Taxi B				$14,000	$76,000						
Taxi C (Middle & Northern Sections)								$35,000	$195,000		
Taxi C (Southern Section)				$22,000	$122,000						
Taxi D							$33,000	$190,000			
Apron I – South				$76,000	$430,000						
Apron I – North						$76,000	$430,000				
Apron II West				$18,000	$103,000						
Groundside Infrastructure											
Airport Road						$21,000	$118,000				
Existing Parking Rehabilitation	$34,000	$192,000									
Drainage	$27,000	$151,000									
Navigational Aids											
PAPI Upgrade Runway 18					$75,000						
New PAPI Runway 36					$75,000						
Buildings											
Existing Terminal HVAC Upgrades							$25,000				
Maintenance Garage Renovations and System Upgrades			$450,000								
Airport Managers House Demolish or Sale			$20,000								
New Developments											
Apron I Expansion North			$361,000	$2,043,000							
Apron I Expansion South		$41,000	$235,000								
Infill Lot Development	$25,000	$50,000	$50,000								
Parking Long-term				$47,000	$265,000						
Groundside Lot Improvements					$50,000						

Project Works	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Southwest Quadrant											
MRO Type Development		$283,000	$1,604,000								
Southeast Quadrant											
Airside Commercial Phase 1									$255,000	$1,442,000	
New Crosswind Turf Runway		$15,000	$89,000	$502,000							
Total Cost	**$86,000**	**$732,000**	**$2,809,000**	**$2,722,000**	**$1,196,000**	**$97,000**	**$606,000**	**$225,000**	**$450,000**	**$1,452,000**	**$55,000**
Potential Funding	**$0**	**$0**	**$0**	**$130,000**	**$731,000**	**$76,000**	**$463,000**	**$225,000**	**$195,000**	**$10,000**	**$55,000**
Muskoka Airport Capital Needs	**$86,000**	**$732,000**	**$2,809,000**	**$2,592,000**	**$465,000**	**$21,000**	**$143,000**	**$0**	**$255,000**	**$1,442,000**	**$0**

Note:
The blue shaded cells reflect costs that if eligible would be covered under the Airport Capital Assistance Program.

Table 12-3: Proposed Timelines for Airport Improvements 2032 to 2041

Project Works	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	
Airside Infrastructure											
Runway 18 – 36							$507,000	$2,876,000			
Southeast Quadrant Commercial				$255,000	$1,442,000						
Apron II East		$18,000	$105,000								
West Quadrant Development											
Phase 1 and 2									$748,000	$4,238,000	
Total Cost		**$18,000**	**$105,000**	**$255,000**	**$1,442,000**	**-**	**$507,000**	**$2,876,000**	**$748,000**	**$4,238,000**	
Potential Funding		**$0**	**$0**	**$0**	**$0**	**-**	**$507,000**	**$2,876,000**	**$0**	**$0**	
Muskoka Airport Capital Needs		**$18,000**	**$105,000**	**$255,000**	**$1,442,000**	**-**	**$0**	**$0**	**$748,000**	**$4,238,000**	

13.0 CLOSURE

We trust this master plan meets your present requirements. If you have any questions or comments, please contact the undersigned.

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